17 October 2016

MOUNT POLLEY MINE
LONG TERM WATER MANAGEMENT PLAN

Permit Amendment Application under the *Environmental Management Act*: Technical Assessment Report

Submitted to:
Mount Polley Mining Corporation
Box 12
Likely, BC
V0L 1N0

Attention: Mr. Dale Reimer

REPORT

Reference Number: 1411734-162-R-Rev0-16000

Distribution:

1 Electronic Copy - Mount Polley Mining Corporation
1 Hard Copy - Mount Polley Mining Corporation
1 Hard Copy - Golder Associates Ltd.

Golder Associates

Executive Summary

Background

The Mount Polley Mine is a copper-gold mine owned and operated by Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation. The mine is located 56 km northeast of Williams Lake, British Columbia (BC). As a result of a foundation failure of the Tailings Storage Facility (TSF) in 2014, mining and milling operations were suspended and MPMC did not have a permitted water discharge, and mine contact water was conveyed to and stored in the Springer Pit. The TSF has since been repaired and authorized for use under *Mines Act* Permit M-200 and *Environmental Management Act* (EMA) Permit 11678. An amended effluent discharge permit (EMA Permit 11678) currently allows water discharge from the mine; however, the permitted discharge expires on 30 November 2017.

A condition of EMA Permit 11678 is the development of a Long-Term Water Management Plan that incorporates consultation, and a draft Technical Assessment Report (TAR) was submitted to the BC Ministry of Environment (MoE) by 30 June 2016. This TAR, now being formally submitted, provides the details of the proposed Long-Term Water Management Plan for the mine, including the discharge quantity and quality for the operations, closure, and post-closure phases of the mine. It includes a technical assessment of the effluent discharge during operations to identify whether or not receiving water uses would be impaired. That assessment, contained in this TAR, is prepared for use by the MoE in permitting decisions and by MPMC as part of its due diligence to follow a plan that meets the requirements of the EMA (SBC 2003, Chapter 53) and the Metal Mining Effluent Regulation (MMER; SOR/2002-222).

Approach

The focus of this TAR is on water management during operations, based on the recently approved four-year mine plan. Accordingly, this TAR has been developed to satisfy three objectives:

- develop a Long-Term Water Management Plan that is adaptable to mine development and that considers the operations, closure, and post-closure conditions of the mine and in the receiving environment
- propose discharge characteristic limits for EMA Permit 11678 for the operations phase, which entails using best applicable practices, assessing best available technology (BAT), establishing a discharge location, and assessing receiving environment conditions
- provide responses to information requirements (Appendix A) for *Mines Act* permitting during operations, closure, and post-closure

The TAR describes the receiving environment, water quantity during the various mine phases, an options analysis of operations discharge locations and water treatment technologies, and predicted effluent and receiving environment water quality during operations for the four-year mine plan.

The existing water treatment plant, with some modifications, was considered the best option for the remainder of operations. In the near-term, treated effluent will continue to be released via the present discharge to Hazeltine Creek and subsequent conveyance by pipe from the upper sedimentation pond in lower Hazeltine Creek to Quesnel Lake. By or before 30 November 2017, MPMC is required to remove the effluent from the Hazeltine Creek channel, at which point the effluent is proposed to be conveyed directly via pipeline to the existing diffusers in Quesnel Lake.

The technical evaluation of the operations discharge presented in this TAR involved the identification of BAT for effluent treatment, identification of proposed effluent permit quantity and quality limits, and prediction of conditions in the receiving environment to identify the potential for impacts on receiving environment use.

The impact assessment was based on a structured and transparent process guided by MoE policy, guidance, and statute. For effluent discharges to aquatic receiving environments in BC, both federal and provincial environmental legislation applies. While a permit to discharge is required by the provincial government, there is no federal permit requirement. Federal requirements are imposed on a metal mine discharge by regulation. While this TAR has been prepared in support of a provincial permit amendment process, federal requirements have also been addressed in the evaluations.

The common expectations under the federal MMER and provincial EMA are three-fold:

- The effluent should not be acutely lethal.
- The effluent constituents must not exceed the numeric limits specified in the MMER (Schedule 4) and the pH and toxicity requirements specified in S.4(1)(b,c).
- Chronic sublethal effects should not occur outside of the initial dilution zone (IDZ). A lack of chronic sublethal effects are maintained when the constituent of concern has a concentration lower than the BC ambient water quality guidelines (BC WQGs) for applicable receiving environment uses.

For the proposed effluent discharge to Quesnel Lake, the IDZ was defined as a cylindrical body of water around the outfall with a lateral radius of 100 m, which is a common IDZ. Predicted concentrations of constituents at the edge of the IDZ for the mixed effluent were compared to applicable BC ambient WQGs. Comparisons were made to the most conservative guideline for each constituent, representing the most sensitive receiving environment use relevant to the West Basin of Quesnel Lake.

The derivation of effluent permit limits was based on the protection goal of attainment of BC WQGs at edge of IDZ and no acute lethality at end-of-pipe. The typical effluent quality of the discharge during operations is expected to reflect predicted median concentrations. It is, however, normal for effluent volume and quality to fluctuate based on conditions of mining operations, weather, and other natural factors. Additionally, the model and input data carry inherent uncertainty. Accordingly, a margin of safety between expected quality and enforceable limits has been incorporated into the derivation of effluent permit limits proposed in this TAR. This allowance prevents the administrative burden of non-compliance events that are above permit limits but are not environmentally disruptive, while providing firm and enforceable limits that are protective of the environment and do not cause pollution (as per the *EMA* definition of pollution: *the presence in the environment of substances or contaminants that substantially alter or impair the usefulness of the environment*).

The following approach was adopted in the TAR to establish effluent limits for the discharge to Quesnel Lake:

- Surface water quality objectives were identified at the edge of the IDZ. Objectives were set as the BC WQGs for the Protection of Freshwater Aquatic Life.
- The minimum 30-day dilution factor at the edge of the IDZ during operations was estimated using a near-field dispersion model and a far-field hydrodynamic model for Quesnel Lake.
- Effluent targets were calculated at the discharge point using the minimum 30-day dilution factors to determine discharge concentrations that would meet the BC WQGs at the edge of the IDZ.
- The proposed end-of-pipe effluent discharge targets were screened against MMER limits, where available, and for the potential for acute toxicity by comparison to short-term maximum BC WQGs and acute screening values derived in the effluent assessment.
- Discharge targets were reduced to a concentration not considered to have the potential for acute lethality at end-of-pipe, where applicable.
- Some effluent targets were further refined by lowering them to a value based on upper limits of predicted effluent to allow a margin of safety between expected quality and enforceable limits.

The proposed flow rate for the discharge to Quesnel Lake is an instantaneous rate of 0.6 m^3/s and an annual maximum of 10 Mm^3, which equates to an average of 0.33 m^3/s. The higher rates are being sought to allow more rapid drawdown of Springer Pit water in the near term and TSF supernatant during freshet conditions for the remainder of operations.

In addition to the active discharge of treated effluent to Quesnel Lake, MPMC is seeking a permit to passively discharge water from Springer Pit through groundwater to Bootjack Lake. This seepage is predicted to occur if water level in the pit rises above 1030 metres above sea level, which could occur under contingency scenarios during mine operations and is part of the mine closure plan. A similar approach was taken to establish limits for the Springer Pit discharge to Bootjack Lake, although the approach was simplified because the flow rate is much lower and, consequently, there was no need to adjust targets beyond the modelled values.

A Comprehensive Environmental Monitoring Plan (CEMP) has been developed by MPMC to confirm that the current effluent permit limits are protective of water quality and aquatic resources in Quesnel Lake and Bootjack Lake. Monitoring related to the proposed discharges and associated effluent permit limits will be incorporated into this existing CEMP.

Closure/post-closure options for mining-influenced water treatment were assessed to provide confidence that a practical transition can be made between operations and closure, and a BAT assessment of these options was carried out. It is MPMC's preference to return flows to pre-development watersheds using decentralized passive water treatment systems, subject to the performance limits of such systems. This preference reflects the views expressed by various parties during consultation. MPMC has invested in the development and evaluation of passive systems in the context of the mine site, and a conceptual design for a conventional passive water treatment system is included in this TAR. This option requires optimization through bench scale and pilot testing, and a plan to evaluate the system's performance during operations is provided. In addition to the bench scale and pilot testing, uncertainties related to future feed water quality, updates to the closure water management plan, and flows and target qualities for the receiving environment need to be refined before this option can be considered a proven system.

Therefore, a second option was identified as closure mine water treatment BAT, which consists of using in-pit lake treatment, involving elements of passive technologies, combined with an optimized operations water treatment system. This is currently deemed the most viable option for continued use in the closure and post-closure phases and is the basis for the permit amendments sought. This option is considered a backstop in the event that bench scale testing and piloting indicate that a passive system may not be viable at this site.

Proposed Effluent Permit Limits and Impact Assessment Findings

The proposed EMA Permit 11678 limits are compliant with the limits specified by the MMER; therefore, compliance with EMA Permit 11678 will facilitate regulatory consistency between the discharge requirements of the EMA and the MMER. The treated effluent itself is not predicted to be acutely lethal at the point of discharge, a finding supported by the absence of acute toxicity to rainbow trout and *Daphnia magna,* in the untreated water in the Springer Pit and the current treated effluent.

A number of contingency scenarios were considered for the remainder of operations. First, a No Discharge scenario was simulated, assuming discharge from the site could not occur for an extended period of time and water would accumulate in the Springer Pit. This was considered a "worst-case" scenario in which to assess the seepage from the Springer Pit to Bootjack Lake, which would have a higher rate of discharge if water levels rose to 1,050 metres above sea level in the Springer Pit. The seepage from the Springer Pit is proposed to be permitted as an operational discharge. The proposed rate was estimated using the worst-case scenario above, and it is therefore likely to exceed the actual rate throughout operations, during which dewatering of the Springer Pit is ongoing. An impact assessment was conducted based on the predictions generated for this scenario, and EMA Permit 11678 limits are proposed for Springer Pit seepage for the remainder of operations.

The impact assessment carried out in this report concluded that pollution (as per the EMA definition) is unlikely to occur as a result of the proposed Quesnel Lake discharge or the potential seepage from Springer Pit to Bootjack Lake; specifically:

- Adverse effects on aquatic life and impairment of other receiving environment uses identified for the West Basin of Quesnel Lake (i.e., drinking water source, recreational contact, wildlife) are not expected based on predicted concentrations at the edge of the IDZ in Quesnel Lake. The treated whole effluent at the point of discharge is not expected to be acutely lethal to aquatic life. Following dilution and mixing, conditions within the IDZ would likewise not be expected to be acutely toxic to aquatic life. Chronic toxicity is not expected beyond the IDZ boundary.

- Adverse effects on aquatic life and impairment of other receiving environment uses identified for Bootjack Lake (i.e., drinking water source, recreational contact, wildlife) are not expected due to seepage from Springer Pit. The seepage at the point of discharge is not expected to be acutely lethal to aquatic life and, following dilution and mixing, conditions within the IDZ would likewise not be expected to be acutely toxic to aquatic life. Chronic toxicity is not expected beyond the IDZ boundary.

Based on this assessment, no additional parameters are identified for assessment or regulation in the proposed permit amendment. Monitoring proposed in this assessment will be undertaken to verify predictions at the end-of-pipe and at the IDZ.

Assessment of Uncertainty

The assessments in the TAR were necessarily predictive exercises, with the objective of identifying whether the proposed treated effluent will result in adverse effects to the receiving environment. Assessing impact before the discharge occurs requires the use of various predictive tools, such as water chemistry predictions, effluent dilution modelling, and comparison to established benchmarks. While these tools are useful and provide a reasonable prediction of likely circumstances, it is important to identify the main uncertainties associated with a predictive assessment and to consider the implications of these uncertainties on predictions made. The main areas of uncertainty identified in the present assessment, which are described in greater detail in the TAR, are as follows:

- Plume dilution and surface water quality are as predicted by the computer simulation models.
- Background water quality concentrations were as identified in the dataset available for Quesnel Lake.
- Confirmation of inputs (flows, water qualities, and receiving environment water quality targets) for the closure water treatment system.
- Treated effluent concentrations from the proposed closure treatment system.
- Implications of the interaction of constituent mixtures with regard to toxicity.

Potential implications of these uncertainties and monitoring that can be undertaken to reduce uncertainties are described in this TAR. When uncertainty is taken into consideration, the overall prediction that pollution will not occur remains unchanged.

Consultation

The selection of the water treatment technology and discharge location is a result of a BAT assessment and options analysis including conceptual design work, in consultation with regulators, First Nations, local community members, and local governments. Consultation with various parties on this EMA Permit 11678 amendment application has been an ongoing process in the development of the TAR, and further consultation (30 days) is a statutory requirement following formal submission of the amendment application and supporting TAR. The application now being pursued has benefited from early consultation that MPMC has elected to undertake. All parties have provided helpful and constructive input during their participation, and all parties are invited to provide further comment on the application during the 30-day public comment period.

Some of the major points raised during consultation included support for the mine's continued operation and acceptance of the necessity of managing water balance, including having a discharge, a desire to pursue options at closure to return appropriately treated water to area drainages (e.g., Bootjack Lake, Edney Creek, Polley Lake/Hazeltine Creek), and a strong desire by some of the area residents that the discharge not go to Quesnel Lake, regardless of whether BC WQGs would be met. These views have been considered in this TAR, and water management plans include further evaluation of the feasibility of discharge to local watercourses in a post-closure scenario. With regard to the fundamental objection of discharge to Quesnel Lake, this option is the technically and environmentally better option, and the concerns have been pursued by a robust evaluation so that impacts on Quesnel Lake water quality will not result in impairment of water use of Quesnel Lake water. This was approached first through a comprehensive sampling of mine contact water and application of BAT to provide an appropriate level of source control and then through a detailed evaluation of potential effects on Quesnel Lake water quality. This evaluation included the application of cautious assumptions during plume modelling and a multi-year projection of water quality in Quesnel Lake using a three-dimensional hydrodynamic model. Monitoring of the existing authorized discharge over the past six months has confirmed the previous predictions of high dilution that were generated using the same models that were updated and applied for this TAR. The designs and evaluation carried out here will again take into consideration information obtained from the public comment period.

Table of Contents

EXECUTIVE SUMMARY ..... **i**

1.0 INTRODUCTION **1**

1.1 Background and Overview 2

1.2 Company Information 5

1.3 Terms of Reference 5

2.0 PROJECT DESCRIPTION AND MINE PLAN **7**

2.1 Mine Processing 7

2.1.1 Restricted Operations 7

2.1.2 Full Operations 8

2.1.3 Pre-closure 8

2.2 Mine Waste Management 8

2.2.1 Waste Rock 8

2.2.2 Tailings 9

2.2.3 Process Water 9

2.3 Operations Mine Water Management 11

2.3.1 Restricted Operations Phase 11

2.3.2 Operations 12

2.3.3 Closure and Post-closure 12

2.3.4 No Discharge Scenario 12

2.4 Regulatory Framework 12

2.4.3 Metal Mining Effluent Regulations 14

3.0 BASELINE INFORMATION **16**

3.1 Geology and Geochemistry 16

3.1.1 Regional Geology 16

3.1.2 Deposit Geology 19

3.1.3 Metal Leaching/Acid Rock Drainage Geochemistry 19

3.2 Climate and Hydrology 20

3.2.1 Climate 20

3.2.1.1 Temperature 23
3.2.1.2 Annual Precipitation 24
3.2.1.3 24-Hour Design Rainfall Depths 26
3.2.1.4 Evaporation 27
3.2.2 Future Climate Change Projections 27
3.2.3 Site Drainage and Hydrology 29
3.2.3.1 Measured Flows in Hazeltine Creek 31
3.2.3.1.1 2015 to 2016 Flows 32
3.2.3.2 Mine Site Gauges 34
3.2.3.2.1 Lower Edney Creek 34
3.2.3.2.2 Morehead Creek 35
3.2.3.2.3 Other Mine Site Gauges 36
3.2.3.3 Derived Flows for Hazeltine Creek 36
3.2.3.3.1 Annual Discharge 38
3.2.3.3.2 Seven-Day Low Flow 41
3.2.3.3.3 Annual Flood 41
3.2.3.4 Quesnel River at Likely 43
3.2.4 Adopted Design Flows 45
3.3 Groundwater Conditions 46
3.3.1 Conceptual Hydrogeological Model 46
3.3.1.1 Information Sources 46
3.3.1.2 Topography 47
3.3.1.3 Local Geology 47
3.3.1.4 Hydraulic Conductivity 47
3.3.1.5 Recharge and Discharge Areas 48
3.3.1.6 Downgradient Groundwater Use 48
3.3.1.7 Tailings Storage Facility Design 48
3.3.2 Groundwater Flow Regime – Pre-mining 49
3.3.3 Pre- and Post-Foundation Failure Groundwater Conditions 51
3.3.3.1 Open Pit Area 54
3.3.3.2 Tailings Storage Facility Area 57

3.3.3.3 Seasonal Variability in Hydraulic Heads 57
3.4 Surface Water Quality 58
3.4.1 Quesnel Lake 60
3.4.2 Bootjack Lake 62
3.4.3 Polley Lake 64
3.4.4 Hazeltine Creek 66
3.5 Sediment Quality 68
3.5.1 Quesnel Lake 70
3.5.2 Bootjack Lake 71
3.5.3 Polley Lake 71
3.5.4 Hazeltine Creek 72
3.6 Fisheries and Aquatic Resources 72
3.6.1 Quesnel Lake 73
3.6.2 Bootjack Lake 75
3.6.3 Hazeltine Creek 77
3.6.4 Polley Lake 78
3.6.5 Biological Tissue Sampling 79
3.7 Vegetation and Wildlife 82
3.7.1 Vegetation 82
3.7.2 Wildlife and Wildlife Habitat 82
4.0 RECLAMATION PLANNING AND EFFECTIVE MINE CLOSURE 85
4.1 Approach to Reclamation Planning 85
4.1.1 Waste Rock 85
4.1.2 Tailings Storage Facility 86
4.1.3 Ore Stockpiles 87
4.1.4 Pit Lakes 87
4.2 End Land Use and Capability Objectives 87
5.0 DISCHARGES AND TREATMENT 88
5.1 Summary 88
5.2 Description of Discharges 89
5.2.1 Operations 90

5.2.1.1 Quantity of Discharge 91
5.2.1.2 Quality of Discharge 92
5.2.2 No Discharge Scenario 97
5.2.3 Closure/Post-closure 99
5.2.3.1 Quantity of Discharge 100
5.2.3.2 Quality of Discharge 101
5.3 Discharge Location 107
5.4 Proposed Effluent Limits 109
5.4.1 Quality of Discharge 109
5.4.2 Quantity of Discharge 110
5.5 Treatment Options Assessment 110
5.5.1 Operations 111
5.5.1.1 Plan Overview 111
5.5.1.2 Treatment Plant Information 113
5.5.2 No Discharge Scenario 113
5.5.3 Closure/Post-closure 115
5.5.3.1 Overview 115
5.5.3.2 Alternative Water Treatment Systems 117
6.0 ENVIRONMENTAL EFFECTS PREDICTIONS 118
6.1 Groundwater Quantity and Quality 118
6.1.1 Groundwater Quantity 118
6.1.1.1 Open Pits 119
6.1.1.2 Tailings Storage Facility 119
6.1.1.3 Other Facilities 120
6.1.2 Groundwater Quality 121
6.2 Surface Water Quantity and Quality 125
6.3 Impact Assessment – Operations 126
6.3.1 Effluent Assessment 127
6.3.1.1 Main Constituents of Interest 127
6.3.1.2 Comparison to Metal Mining Effluent Regulation Limits 129
6.3.1.3 Untreated Effluent Assessment 130

6.3.1.4 Summary 138
6.3.2 Effluent Permit Limits 139
6.3.3 Modelled Conditions Assuming Proposed Permit Limits 141
6.3.3.1 Quesnel Lake Near-Field Model 142
6.3.3.2 Quesnel Lake Far-Field Model 142
6.3.3.3 Bootjack Lake Model 143
6.3.4 Impact Assessment: Aquatic Resources and other Receptors 143
6.3.4.1 Approach 143
6.3.4.2 Study Boundaries and Assessment Nodes 144
6.3.4.3 Receiving Environment Uses and Relevant Water Quality Guidelines 147
6.3.4.4 Identification of Constituents of Potential Concern 150
6.3.4.5 Summary 155
6.4 Impact Assessment – Closure 156
6.5 Uncertainty Assessment 156
7.0 MINE MANAGEMENT PLANS 158
8.0 MONITORING 159
8.1 Operations Monitoring 159
8.1.1 Compliance Monitoring 159
8.1.2 Receiving Environment Monitoring 160
8.1.3 Surface Water Quality Monitoring 160
8.1.4 Groundwater Quality Monitoring 160
8.1.5 Aquatic Effects Monitoring 160
8.2 No Discharge Scenario Monitoring 161
8.3 Closure/Post-closure Monitoring 162
8.4 Quality Assurance Requirements 162
9.0 IMPLEMENTATION SCHEDULE 163
10.0 CLOSURE 164
REFERENCES 165
STUDY LIMITATIONS 176

TABLES

Table 1-1: Concordance with Generic Terms of Reference for Technical Assessment Reports under the EMA 6
Table 3-1: Local and Regional Climate Stations for the Mount Polley Mine 21
Table 3-2: Local Snowcourse Stations at the Mount Polley Mine 23
Table 3-3: Likely Climate Station Monthly Temperatures (1974 to 1993) 23
Table 3-4: Frequency Analysis of Mount Polley Mine Site Annual Precipitation (31 Years) 24
Table 3-5: Long-Term Precipitation at the Mount Polley Mine Site (1974 to 2015) 25
Table 3-6: 24-Hour Precipitation Depths 26
Table 3-7: Estimated Average Monthly and Annual Lake Evaporation (1997 to 2012) 27
Table 3-8: Projected Annual Mount Polley Climate from CanESM2 Model 29
Table 3-9: Summary of Existing Hydrometric Stations 31
Table 3-10: Regional Hydrometric Stations 37
Table 3-11: Average Discharge at Upper Hazeltine Creek 38
Table 3-12: Frequency Analysis of Upper Hazeltine Annual Discharge (47 Years) 39
Table 3-13: Estimated Daily Design Flows 42
Table 3-14: Recommended Design Flows 46
Table 3-15: Surface Water Quality Characterization, Existing Conditions: Location of Supporting Detailed Information Required by MoE (2014a,b) 60
Table 3-16: Summary of Water Quality Statistics for Quesnel Lake: Existing Conditions, East of Cariboo Island (2015) 61
Table 3-17: Summary of Water Quality Statistics for Bootjack Lake: 2001 to 2015 63
Table 3-18: Summary of Water Quality Statistics for Polley Lake: Existing Conditions (2015) 65
Table 3-19: Summary of Water Quality Statistics for Hazeltine Creek: Existing Conditions (June to November 2015 and upstream of discharge December 2015 to April 2016) 67
Table 3-20: Sediment Quality Existing Condition Characterization: Location of Supporting Detailed Information Required by MoE (2014a,b) 69
Table 3-21: Documented Fish Species in Quesnel Lake 75
Table 3-22: Wildlife Species Detected in the Vicinity of the Mine, 2014 to 2015 83
Table 3-23: At-Risk Terrestrial Wildlife Species Potentially Present in the Hazeltine Creek Corridor 84
Table 5-1: Water Quality Model Constituent List 89
Table 5-2: Estimated Annual Discharge (treated plus bypass) of Mine Water during Operations 92
Table 5-3: Summary of Predicted Springer Pit and Perimeter Embankment Till Borrow Pond Water Quality 94
Table 5-4: Summary of Predicted Springer Pit Seepage Water Quality – No Discharge Scenario 98
Table 5-5: Estimated Annual Discharge of Mine Water during Closure and Post-closure 101
Table 5-6: Summary of Predicted Springer Pit Water Quality 103

Table 5-7: Summary of Predicted Perimeter Embankment Till Borrow Pond Water Quality 104

Table 5-8: Operations Treatment Screening 112

Table 5-9: Material and Reagent Usage 113

Table 5-10: No Discharge Scenario Treatment Screening 114

Table 5-11: Closure/Post-closure Water Quality 116

Table 6-1: Summary of Seepage Components and Method of Effects Assessment 118

Table 6-2: Comparison of Predicted Untreated Mine Site Water Chemistry Relevant to the Quesnel Lake Discharge and Springer Pit Seepage to Maximum BC Water Quality Guidelines and Metal Mining Effluent Regulation Limits 133

Table 6-3: Derivation of Proposed Effluent Discharge Limits 140

Table 6-4: BC Water Quality Guidelines for Receiving Environment Uses Relevant to the Water Quality Impact Assessment 149

Table 6-5: Water Quality Screening at the Edge of Initial Dilution Zone for Quesnel Lake Based on the Daily Minimum Dilution Quesnel Lake Discharge 151

Table 6-6: Water Quality Screening at Edge of the Initial Dilution Zone for Quesnel Lake Based on the 30-Day Average Dilution of Quesnel Lake Discharge 152

Table 6-7: Water Quality Screening at Edge of Initial Dilution Zone for Bootjack Lake Based on the Daily Minimum Dilution of Springer Pit Seepage 153

Table 6-8: Water Quality Screening at Edge of Initial Dilution Zone for Bootjack Lake Based on the 30-Day Average Dilution of Springer Pit Seepage 154

Table 6-9: Identified Uncertainties in the Technical Assessment Report for the Proposed Long-Term Effluent Discharge 157

Table 9-1: Implementation Schedule 163

FIGURES

Figure 1-1: Location of Mount Polley Mine 3

Figure 2-1: Mine Site Layout 10

Figure 3-1: Regional Geology of the Mount Polley Property 17

Figure 3-2: Simplified Geology of the Mount Polley Intrusive Complex 18

Figure 3-3: Mount Polley Climate and Snowcourse Stations 22

Figure 3-4: Frequency Analysis of Annual Precipitation – Wet-Year Values (Generalized Extreme Value Distribution) 24

Figure 3-5: Frequency Analysis of Annual Precipitation – Dry-Year Values (Generalized Extreme Value Distribution) 25

Figure 3-6: Frequency Analysis of 24-Hour Rainfall (Two-Parameter Log-Normal Distribution) 26

Figure 3-7: $C0_2$ Equivalent Climate Forcings for Representative Concentration Pathways Scenarios 28

Figure 3-8: Major Drainages and Flow Monitoring Stations 30

Figure 3-9: Measured Daily Discharge in Hazeltine Creek, 2015 to 2016, at Gauges H1 and H2 32

Figure 3-10A: Paired Regression of Daily Flows between Gauges H1 and H2 – Prior to Discharge from the Water Treatment Plant (Before December 2015) 33

Figure 3-10B: Paired Regression of Daily Flows between Gauges H1 and H2 – Affected by Polley Lake Weir and Includes Discharge from the Water Treatment Plant (Data from 2016) 34

Figure 3-11: Measured Flow at Lower Edney Creek for 2015/2016 35

Figure 3-12: Measured W1b Flow and Temperature for 2015 36

Figure 3-13: Average Monthly Discharge Flow Rates for Upper Hazeltine Creek 38

Figure 3-14: Derived Annual Discharge Upper Hazeltine Creek 39

Figure 3-15: Annual Discharge Upper Hazeltine Creek: Wet-Year Scenario (Two-Parameter Log-Normal Distribution) 40

Figure 3-16: Annual Discharge Upper Hazeltine Creek: Dry-Year Scenario (Two-Parameter Log-Normal Distribution) 40

Figure 3-17: Frequency Analysis of Annual Minimum Seven-Day Low Flows (Three-Parameter Log-Normal Distribution) 41

Figure 3-18: Frequency Analysis of Derived Upper Hazeltine Creek Annual Maximum Series (Generalized Extreme Value Distribution) 42

Figure 3-19: Frequency Analysis of Moffat Creek Annual Maximum Series (Generalized Extreme Value Distribution) 43

Figure 3-20: Maximum and Minimum Historical Flows at Quesnel River at Likely (1924 to 2013) and the 2013 Hydrograph 44

Figure 3-21: Average Monthly Discharge for Quesnel River at Likely 45

Figure 3-22: Conceptual Hydrogeological Model, Pre-mining Conditions 50

Figure 3-23: Site Plan and Location of Groundwater Monitoring Stations for the MPMC Monitoring Program 52

Figure 3-24: Hydraulic Heads and Shallow Groundwater Flow Directions – May 2014 53

Figure 3-25: Conceptual Hydrogeological Model Conditions during Mining 55

Figure 5-1: Discharge of Mine Water during Full Operations 92

Figure 5-2: Springer Pit – Time Series Plots for Selected Parameters, Operations 95

Figure 5-3: Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters, Operations 96

Figure 5-4: Discharge of Mine Water during Closure and Post-closure Phases 100

Figure 5-5: Springer Pit – Time Series Plots for Selected Parameters, Closure and Post-closure Phases 105

Figure 5-6: Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters, Closure and Post-closure Phases 106

Figure 5-7: Proposed Pipeline Alignment, Plan and Profile 108

Figure 6-2: Initial Dilution Zone in Quesnel Lake 145

Figure 6-3: Initial Dilution Zone in Bootjack Lake 146

APPENDICES

APPENDIX A
Table of Concordance

APPENDIX B
Operations and Closure – Mount Polley Mine Water Balance

APPENDIX C
Derivation of Geochemical Source Terms, Mount Polley Mine - SRK

APPENDIX D
Water Quality Modelling Report

APPENDIX E
Proposed Water Treatment Plan for Operations Phase Water Management

APPENDIX F
Closure Water Treatment Plan – Conceptual Design

APPENDIX G
Options Analysis for Long-Term Water Management Plan

APPENDIX H
Dilution Performance Review of As-Built Temporary Diffusers in Quesnel Lake

APPENDIX I
Bootjack Lake Hydrodynamic Modelling

APPENDIX J
Long Term Far Field Diffuser Modelling

APPENDIX K
Best Available Technology Assessment of Closure Water Treatment

APPENDIX L
Development of a Molybdenum Screening Value for the Impact Assessment

APPENDIX M
Selenium Management Plan

LIST OF ABBREVIATIONS

7Q10 low flow	1-in-10-year, 7-day average low flow
+	plus
-	minus
>	greater than
<	less than
≤	less than or equal to
≥	greater than or equal to
µg/L	micrograms per litre
µm	micrometre
BAT	Best Available Technology
BC	British Columbia
BC WQG	British Columbia Water Quality Guideline
$CaCO_3$	calcium carbonate
CCME	Canadian Council of Ministers of the Environment
CCS	Central Collection Sump
CEMP	Comprehensive Environmental Monitoring Plan
COPC	Constituent of Potential Concern
CORMIX	Cornell Mixing Zone Expert System
Cr(VI)	chromium VI
DOC	dissolved organic carbon
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
EEM	environmental effects monitoring
EMA	*Environmental Management Act*
EPT	Ephemeroptera, Plecoptera, and Trichoptera
Golder	Golder Associates Ltd.
ICHwk2	interior cedar hemlock; wet cool; subzone 2
ICHmk3	interior cedar hemlock; moist cool; subzone 3
IDZ	initial dilution zone
KP	Knight Piésold Ltd.
LC50	concentration that is lethal to 50% of test population
LEL	lowest effect level
MAD	mean annual discharge
MAF	mean annual flood
masl	metres above sea level

MDL	method detection limit
MEM	BC Ministry of Energy and Mines
Minnow	Minnow Environmental Inc.
ML/ARD	metal leaching / acid rock drainage
MMER	Metal Mining Effluent Regulation
MoE	BC Ministry of Environment
MPIC	Mount Polley Intrusive Complex
MPMC	Mount Polley Mining Corporation
Mt	million tonnes
N/A	not applicable
NAG	non-acid generating
NEZ	Northeast Zone
NTU	nephelometric turbidity unit
NW	northwest
PAC	polyaluminum chloride
PAG	potentially acid generating
PEEIAR	Post-event Environmental Impact Assessment Report
PEL	probable effect level
PETBP	Perimeter Embankment Till Borrow Pond
PMP	probable maximum precipitation
QA/QC	quality assurance/quality control
Q10	1:10-year flow
Q100	1:100-year flow
Q200	1:200-year flow
RCP	Reclamation and Closure Plan
RDS	Rock Disposal Site
SERDS	Southeast Rock Disposal Site
SQG	sediment quality guidelines
SWWBM	site-wide water balance model
TAR	Technical Assessment Report
TDS	total dissolved solids
TMT	trimercaptotriazine
TOR	Terms of Reference
tpd	tonnes per day
TSF	Tailings Storage Facility
TSS	total suspended solids
USA	United States of America

US EPA	United States Environmental Protection Agency
WQM	water quality model
WSA	*Water Sustainability Act*
WTP	water treatment plant
WQG	Water Quality Guideline

1.0 INTRODUCTION

The Mount Polley Mine is a copper-gold mine owned and operated by Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation (IMC). The mine site is located 56 km northeast of Williams Lake, British Columbia (BC) (Figure 1-1). On 4 August 2014, failure of the Tailings Storage Facility (TSF) foundation resulted in mining and milling operations being suspended and mine contact water being conveyed to, and stored in, the Springer Pit.

An amended effluent discharge permit (Permit 11678), issued under the *Environmental Management Act* (EMA) currently allows discharge from the mine; however, the permitted discharge expires on 30 November 2017. Condition 2.9 of EMA Permit 11678 requires the development and implementation of a Long-Term Water Management Plan that incorporates consultation. This TAR provides the details of the proposed Long-Term Water Management Plan for the mine, including the discharge quantity and quality, for the operations, closure, and post-closure phases of the mine life.

The focus of the current TAR is on water management during operations for the currently authorized four-year mine life plan. The information provided in this TAR also addresses information requests from the Ministry of Energy and Mines (MEM) regarding long-term water management, as generated during the review of the application for the (now authorized) return to full operations and use of the TSF (MPMC 2015a). The MEM developed Terms of Reference (TOR) (Appendix A) for information that was also to be submitted with the TAR on 30 June 2016 (including that which is incorporated into the TAR) to satisfy questions raised by the MEM during this review, as included as Appendix A to the 23 June 2016, amendment to *Mines* Act Permit M-200. This includes supporting information that is being carried forward into this TAR (e.g., results of hydrogeological modelling, geochemical model source terms). Accordingly, in addition to its procedural role in applying for an effluent permit amendment, this TAR has been developed to satisfy three complementary objectives:

- develop a Long-Term Water Management Plan that is adaptable to mine development and considers the operations, closure, and post-closure conditions of the mine and in the receiving environment
- propose discharge characteristic limits for EMA Permit 11678 for the operations phase, which entails assessing Best Available Technology (BAT), establishing a discharge location, and assessing receiving environment conditions so that pollution does not occur
- satisfy information requirements for *Mines Act* permitting during operations, closure, and post-closure

1.1 Background and Overview

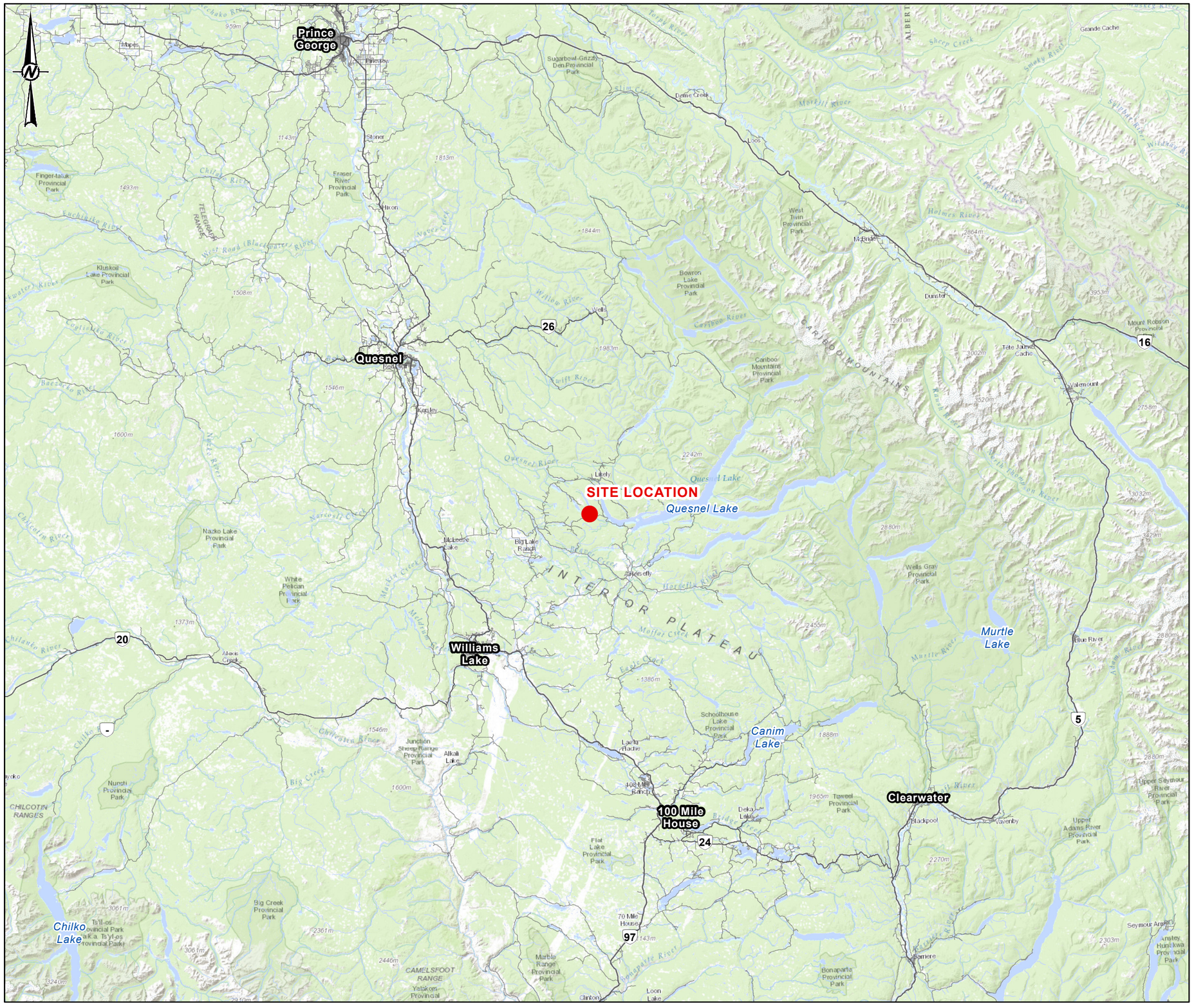
Following the TSF foundation failure on 4 August 2014, and subsequent Pollution Abatement Order 107461 issued to MPMC by the MoE, MPMC did not have a permitted water discharge from the mine. MPMC diverted all mine contact water on site to the Springer Pit, and, with the establishment of containment infrastructure for collection of drainage from the breached section of the TSF being completed on 4 September 2014, all contact water was subsequently directed to and contained within the Springer Pit. This measure was implemented as part of the emergency response and was considered a temporary water management plan. It was known at the time that the mine had a positive water balance and that the Springer Pit had a finite capacity; thus, the strategy had a finite time frame.

In 2015, MPMC submitted a *Mines Act* permit amendment application to the MEM to amend its existing Permit M-200 and resume operations at the mine. A *Mines Act* Permit M-200 amendment was received from the MEM on 9 July 2015, allowing MPMC to return the mine to restricted operations, which included the following permitted activities:

- mining of up to 4 million tonnes (Mt) of ore for a period of no more than one year
- deposition of 4 Mt of tailings in the Springer Pit

Mill operations restarted on 4 August 2015.

On 31 May 2015, MPMC submitted an application to amend EMA Permit 11678 for a short-term discharge. The EMA Permit 11678 amendment application was approved on 29 November 2015. The permitted short-term water discharge involves the discharge of treated effluent to Quesnel Lake via the Hazeltine Creek channel, which has been reconstructed following the TSF dam foundation failure, but is currently not fish habitat. MPMC commenced discharge of treated effluent under this authorization on 1 December 2015.



0 25 50

1:1,250,000 KILOMETRES

LEGEND

- SITE LOCATION
- ROAD
- WATERCOURSE
- WATERBODY

REFERENCES

1. INSET MAP DATA OBTAINED FROM GEOBASE®.
2. BASEMAP OBTAINED FROM ESRI. USED UNDER LICENCE, ALL RIGHTS RESERVED.
3. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM IHS INC.
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
LOCATION OF MOUNT POLLEY MINE

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-05-29
DESIGNED	JR
PREPARED	CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	PHASE/DOC	REV.	FIGURE
1411734	16000/162	0	**1-1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

0 25mm

PATH: \\golder.gds\gal\burnaby\CAD-GIS\client\1413803\1411734\PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modeling_Report\TAR\1411734_12000_F0_1_1_PROJECT_LOCATION.mxd

The key objectives of the 29 November 2015 EMA Permit 11678 amendment were to manage contact water that had accumulated on site since the TSF foundation failure, while allowing time to develop a Long-Term Water Management Plan. It was recognized by MPMC, the MoE, and the MEM that the proposed short-term water management plan was developed within the scope of the short-term water management objectives and did not reflect the preferred long-term treatment and discharge options. Notably, transition to an alternative discharge option is part of the strategy to rehabilitate and return Hazeltine Creek to a fish-bearing aquatic system. As such, the MoE included the following condition in the amended EMA Permit 11678:

> *"The Permittee must develop and implement a long term water management plan."* and *"A draft Technical Assessment Report in support of the long term water management plan, that includes an implementation schedule, must be submitted to [MoE] Environmental Protection by June 30, 2016."*

Condition 2.8 of the 29 November 2015 amendment of EMA Permit 11678 also required MPMC to "develop and implement an alternative to the discharge to Hazeltine Creek" by 30 November 2016, with an Alternative Discharge Design and Construction Plan to be submitted to the MoE by 31 January 2016. The *Alternative Discharge Design and Construction Plan* (Golder 2016a) was submitted to the MoE on 29 January 2016. Following consultation with local communities, the MoE removed EMA Permit 116878 condition 2.8 to allow for additional planning, assessment, and consultation on long-term discharge alternatives.

On 6 November 2015, MPMC submitted a *Mines Act* Permit M-200 amendment application to return the mine to full operations (MPMC 2015a). This application was approved on 23 June 2016, and the proposed mine waste and water management plans, as well as the Reclamation and Closure Plan (RCP), included in the application were used to inform the development of the Long-Term Water Management Plan presented in this TAR. Within the context of this TAR, "long-term" water management is planned around the following distinct phases of the mine life: operations, closure, and post-closure.

Recognizing that a decision on the *Mines Act* Permit M-200 amendment application for full operations would not be made by the MEM prior to the then authorized 4 Mt of ore being processed, MPMC submitted a "bridging" permit application to amend *Mines Act* Permit M-200 and EMA Permit 11678 to allow for processing of an additional 1 Mt of ore under the conditions of the restricted operations. Required authorizations for this extension to the restricted operations were received from the MoE and the MEM on 29 April 2016.

1.2 Company Information

MPMC is a wholly owned subsidiary of Imperial Metals Corporation, a Canadian mining company active in the acquisition, exploration, development, mining, and production of base and precious metals, with a focus on western North America. Key properties are the Mount Polley Mine; Huckleberry Mine, an open pit copper/molybdenum mine (50% interest) in west-central BC; Red Chris Mine, an operating copper-gold property in northwest BC; Sterling Mine, a heap leach gold mine in Nevada, USA; and Ruddock Creek, a pre-development stage zinc/lead property (50% interest) in southeast BC.

The main contact information for MPMC is:

Mount Polley Mining Corporation

Dale Reimer, General Manager
P.O. Box 12
Likely BC V0L 1N0

The mine, located 56 km northeast of Williams Lake, BC, is owned by MPMC. The property covers 18,892 ha, consisting of seven mining leases totalling 2,007 ha and 44 mineral claims encompassing 16,885 ha.

1.3 Terms of Reference

Generic TOR outlined in the *Technical Guidance 1: Environmental Management Act Applications* (MoE 2014a) are intended for proponents of major mine projects applying for an effluent discharge permit under the EMA. Additional guidance is also provided in the document entitled *Joint Application Information Requirements for* Mines Act *and* Environmental Management Act *Permits* prepared by the MEM and the MoE (2016).

The TOR and Joint Application Information Requirements have been adapted to the current TAR. A summary of major sections are listed in Table 1-1 to orient the reader, and a concordance table, as outlined in *Technical Guidance 2: Environmental Management Act Applications* (MoE 2014b), has been filled out and is provided in Appendix A to verify concordance with provincial guidance. A second concordance table, consisting of a series of information requirements provided by the MEM, is also included in Appendix A. Collectively, these tables are intended to serve as a TOR for this TAR.

Table 1-1: Concordance with Generic Terms of Reference for Technical Assessment Reports under the EMA

Provincial Guidance		Relevant Section in this Technical Assessment Report
Project description and overview	Introduction	Section 1.0
	Project description and mine plan	Section 2.0
Baseline information	Geology and geochemistry	Section 3.1
	Climate and hydrology	Section 3.2
	Groundwater quality	Section 3.3
	Surface water quality	Section 3.4
	Fisheries and aquatic resources	Section 3.6
	Vegetation and Wildlife	Section 3.7
Reclamation planning and effective mine closure	Approach to reclamation planning	Section 4.1
	End land use and capability objectives	Section 4.2
Discharges and treatment	Description of discharges	Section 5.2
	Discharge location	Section 5.3
	Proposed effluent limits	Section 5.4
	Treatment options assessment	Section 5.5
Environmental effects prediction	Groundwater quantity and quality	Section 6.1
	Surface water quantity and quality	Section 6.2
	Impact Assessment - Operations	Section 6.3
	Impact Assessment - Closure	Section 6.4
	Uncertainty assessment	Section 6.5
Mine management plans	Mine site water management plan	Section 7.0
	Selenium water management plan	Section 7.0
Discharges and environmental monitoring requirements for EMA permits	Operations monitoring	Section 8.1
	No Discharge Scenario monitoring	Section 8.2
	Closure/Post-closure monitoring	Section 8.3
	Quality Assurance Requirements	Section 8.4

2.0 PROJECT DESCRIPTION AND MINE PLAN

2.1 Mine Processing

On 6 November 2015, MPMC submitted a *Mines Act* Permit M-200 amendment application to the MEM (MPMC 2015a) to mine the Phase 4 Cariboo-Springer Pit. On 23 June 2016, this application was approved by the MEM, and an amendment to *Mines Act* Permit M-200, Approving the Return to Full Operations and Use of the Tailings Storage Facility, was received. The required approval from the MoE to resume deposition of tailings in the TSF, as required under EMA Permit 11678, was also received on 23 June 2016. The Phase 4 Cariboo-Springer Pit contains 27 Mt of reserves that will be mined and processed or stockpiled over a four-year mine life. As part of this mine plan, the TSF will be constructed to a crest elevation of 970 metres above sea level (masl). The available capacity at this elevation (34 Mt) will be consumed through processing of ore from the following:

- Phase 4 Cariboo-Springer Pit (22.5 Mt)
- Boundary Zone Underground (0.5 Mt)
- Boundary Zone Open Pit (0.59 Mt)
- Ore stockpiles (5.31 Mt)

The TSF will also receive tailings re-handled from the Springer Pit (5 Mt) that were deposited during restricted operations.

The four-year mine life considers the following three phases: restricted operations, full operations, and pre-closure. Details of the mine plan are presented in the *Mines Act* Permit M-200 amendment application to return the mine to full operations (MPMC 2015a) and summarized in the following subsections. Collectively, these three phases in the mine plan comprise the operations phase in the Long-Term Water Management Plan.

2.1.1 Restricted Operations

From August 2015 to November 2015, milling occurred on a week-on, week-off schedule with a target milling rate of 20,000 tonnes per day (tpd). Processing was increased in December 2015 to 24 hours per day, seven days per week, with a target milling rate of 18,000 tpd because of challenges with the temporary shutdown of mill operations during the winter and in consideration of changed market conditions.

At the time the *Mines Act* Permit M-200 amendment application to return the mine to full operations was submitted (6 November 2015), it was assumed that all permits would be received in time to allow the TSF to be operational on 1 May 2016. As such, the *Mines Act* Permit M-200 amendment application and subsequent authorizations only included milling of 4 Mt of ore. However, permitting delays necessitated the bridging permit described in Section 1.1 and the tailings resulting from milling of the additional 1 Mt of ore being deposited in the Springer Pit. Tailings deposition in the TSF resumed in June 2016.

2.1.2 Full Operations

Full operations includes the mining of the Phase 4 Cariboo-Springer Pit with a proposed average milling rate of 22,000 tpd. Full operations coincides with a transition from deposition of tailings in the Springer Pit to deposition in the TSF. Mining of the Phase 4 Cariboo-Springer Pit is expected to be completed in 2019. Mining of the Phase 4 Cariboo-Springer Pit will require mine-contact water and tailings currently stored in the Springer Pit to be removed. Tailings are planned to be removed by a combination of hydraulic and conventional shovel-truck methods and deposited in the repaired TSF.

2.1.3 Pre-closure

Under the currently authorized mine plan, pre-closure will commence when mining of the Phase 4 Cariboo-Springer Pit is completed. The onset of the pre-closure period may be postponed if the four-year mine plan is extended. Viable reserve estimates for the mine extend an additional five years beyond the full operations four-year mine plan; thus, depending on future economic conditions, application may be made during the full operations phase to extend the mine life, postponing onset of pre-closure and closure phases.

During pre-closure, no active mining will take place; however, processing of ore stored in stockpiles will occur. Potentially acid generating (PAG) waste rock stored in the Temporary Northwest (NW) PAG Stockpile will also be re-handled for permanent storage in the mined-out Cariboo-Springer Pit. The current mine schedule has processing of stockpiled ore ceasing in July 2020. The amount of stockpiled ore that will be mined during pre-closure will be dependent on the available capacity in the TSF with a crest elevation of 970 masl. MPMC projected that 5.3 Mt of stockpiled ore will be milled with approximately 6 Mt remaining in ore stockpiles at closure (MPMC 2015a).

2.2 Mine Waste Management

The following three waste streams will be produced during operations: waste rock, tailings, and process water. These waste streams are summarized in the following subsections; additional details are provided in the *Mines Act* Permit M-200 amendment application (MPMC 2015a).

2.2.1 Waste Rock

Mining of the Phase 4 Cariboo-Springer Pit will produce 40 Mt of non-acid generating (NAG) waste rock and 25.2 Mt of PAG waste rock. NAG waste rock will be used in construction of the TSF, used on site for projects, or stored in the Southeast Rock Disposal Site (SERDS) (Figure 2-1). PAG waste rock, as identified and managed in accordance with site metal leaching / acid rock drainage (ML/ARD) considerations, will be stored in the Temporary NW PAG Stockpile (Figure 2-1). All PAG rock stored in the Temporary NW PAG Stockpile is planned for subaqueous disposal at closure, and, accordingly, is to be deposited and submerged in the mined-out Cariboo-Springer Pit.

2.2.2 Tailings

With the return to full operations, the 5 Mt of tailings stored in the Springer Pit are expected to be removed from the pit by January 2018. Tailings produced from processing of ore mined from the Phase 4 Cariboo-Springer Pit and ore stockpiles during the return to full operations will be deposited in the TSF. Approximately 22.5 Mt of tailings will be produced from mining of fresh ore from the Phase 4 Cariboo-Springer Pit and 5.31 Mt from mining of stockpiled ore.

2.2.3 Process Water

Similar to the tailings, the contact water stored in the Springer Pit will be removed and discharged by January 2018 (Appendix B). Process water that is liberated from the tailings slurry in the TSF will be reclaimed to the mill to supplement the plant water requirements. Surplus water will be treated and discharged as described in Section 5.0.

LEGEND

WATER COLLECTION SYSTEMS

- CLEAN WATER DITCH
- CONTACT WATER DITCH
- PIPELINE
- CONTOUR (10m)

0 750 1,500

1:30,000 METRES

REFERENCES

1. CONTOURS AND PROJECT IMAGERY OBTAINED FROM SNC LAVALIN (2014)
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
MINE SITE LAYOUT

CONSULTANT

Golder Associates

YYYY-MM-DD	2016-06-29
DESIGNED	RM
PREPARED	RH / CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	PHASE/DOC	REV.	FIGURE
1411734	16000/162	0	2-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

2.3 Operations Mine Water Management

The main objective of the Mine Water Management Plan (MWMP) developed as part of this TAR is to define the water management practices that will help prevent the year-over-year accumulation of contact water at the mine, and to mitigate the potential for unplanned and/or non-compliant releases to the environment. The following strategies are proposed to meet this objective:

- To the extent practicable, reduce the volume of non-contact water collected on site by diverting non-contact water away from site collection systems.
- Treat and discharge surplus water so that minimal water accumulates, with minimal carry-over from year to year, and sufficient capacity is available to withstand conditions up to the 1-in-200-year wet conditions.
- Maintain a minimum pond volume of one million cubic metres (1 Mm^3) in the TSF for operation of reclaim pumps.
- Maintain adequate tailings beaches in the TSF, with a minimum of 100 m long beaches.

There will be minimal storage of contact water on site; however, during freshet (April through June) and extreme storm events, the volume of mine water runoff will exceed the discharge and treatment capacity. Therefore, temporary detention of the freshet and extreme storm runoff volume will be necessary to equalize flows prior to discharge. Details of the MWMP are presented in Appendix B of the TAR; this section provides a summary.

2.3.1 Restricted Operations Phase

Restricted operations extended until late June 2016. During this time, contact water from roads, haul roads, waste rock dumps, and other mine areas north of Bootjack Creek was either collected in sumps (e.g., NW, 9K, Mine Drainage Creek, Mill Site, Wight Pit, Cariboo Pit) or flowed directly to the SERDS, West, and Long Ditches (Figure 2-1). The water that collected in the sumps was either pumped directly to the Springer Pit, or to the SERDS, West, or Long Ditches, which flowed to the Central Collection Sump (CCS). Water in the TSF was pumped to the CCS. Water in the CCS was used to meet mill process requirements, or reported to the Springer Pit or the Perimeter Embankment Till Borrow Pond (PETBP). Surplus water in the Springer Pit was pumped to the water treatment plant (WTP) and discharged to Hazeltine Creek (Figure 2-1).

Discharge from the WTP was conveyed via the Hazeltine Channel to two twin diffusers, where it was subsequently discharged to Quesnel Lake.

2.3.2 Operations

Full operations extend from completion of restricted operations until the second quarter of 2020. Until the Springer Pit is drawn down, water stored in the pit will be discharged from site via the WTP or used to supplement mill process water requirements. Outside of the TSF, mine contact water will either flow or be pumped to the SERDS, West, and Long Ditches, which flow to the CCS (Figure 2-1). Water from the CCS will be used to provide mill process water, allowed to flow by gravity to the PETBP to be treated and discharged, or conveyed to the TSF for temporary detention (typically during the freshet period). At other times, water from the TSF may be pumped to the CCS for use in processing or treatment prior to discharge.

From the fourth quarter of 2017 to the third quarter of 2018, water and tailings in the Springer Pit are planned to be pumped as a slurry, or excavated and hauled, to the TSF.

2.3.3 Closure and Post-closure

The closure phase will begin in July 2020 and is planned to continue for two years. Post-closure represents the time period beyond July 2022. Water management during closure/post-closure is discussed in Section 4.0 of this TAR.

2.3.4 No Discharge Scenario

In the event that MPMC is not able to discharge from site, water originating from within the mine footprint will be stored in the Springer Pit or another mined-out pit, if these facilities are available to store water during a No Discharge scenario.

2.4 Regulatory Framework

For effluent discharges to aquatic receiving environments in BC, the applicable legislation includes the federal *Fisheries Act* (R.S.C., 1985, c. F-14), which contains a general prohibition against the deposit of a deleterious substance into waters frequented by fish (Section 36), and the provincial EMA, which contains a general prohibition against causing pollution. Under the general provisions of the *Fisheries Act*, what constitutes a deleterious substance is a matter of expert opinion; however, for the purposes of discharges involving a metal mine, which applies to the current effluent discharge permit amendment application, what constitutes a deleterious substance is specifically defined in the Metal Mining Effluent Regulations (MMER). While a permit to discharge is required by the provincial government, there is not a federal permit requirement; federal requirements are imposed on a metal mine discharge by regulation.

While this TAR has been prepared in support of a provincial permit amendment process, federal requirements have also been addressed in the evaluations carried out because MPMC must comply with both provincial and federal laws.

2.4.1 Environmental Management Act

The EMA is BC's principal pollution control statute with regulations made pursuant to that Act for more specific regulatory purposes. The EMA prohibits causing pollution, and (per subordinate regulation) requires specified dischargers to obtain an effluent discharge permit. Because federal legislation has no effluent permitting system, federal agencies (i.e., Environment and Climate Change Canada [ECCC] and Fisheries and Oceans Canada [DFO]) utilize the provincial permit process to communicate their specific requirements to the proponent. However, the proponent remains responsible for compliance with the general prohibitions of those federal laws (described further below), notwithstanding the presence of a provincial permit. The amended permit for the effluent discharge is being sought under Schedule 1 of the *Waste Discharge Regulation* (B.C. Reg. 54/2016), pursuant to the EMA.

In the EMA, pollution is defined as "the presence in the environment of substances or contaminants that substantially alter or impair the usefulness of the environment." The common expectations under the EMA are two-fold:

- Acutely lethal conditions should not exist at the point of discharge or within the initial dilution zone (IDZ) of the effluent.
- Chronic sublethal effects should not occur outside of the IDZ. A lack of chronic sublethal effects is reliably predicted when the parameter of concern has a concentration lower than applicable BC ambient water quality guidelines (WQGs) (MoE 2015a, 2016a).

The IDZ is the three-dimensional zone around the point of discharge where mixing of the effluent and the receiving water occurs. For a large waterbody, the IDZ is commonly defined as a cylindrical body of water around the outfall with a lateral radius the lesser of 100 m from the outfall or 25% of the width of the body of water and extending upwards to the surface of the water column. This definition is consistent with the BC Municipal Wastewater Regulation (B.C. Reg. 87/2012); while this is not a municipal wastewater effluent, the Municipal Wastewater Regulation provides delineation of commonly accepted IDZs under regulations made pursuant to the EMA.

2.4.2 Fisheries Act

With respect to the *Fisheries Act*, a deleterious substance is a substance that, if added to water, would degrade or alter or form part of a process of degradation of that water such that it would likely be rendered deleterious to fish or fish habitat, or the use by man of fish that frequent that water. The specific properties defining a substance as being deleterious under the parent Act are up to interpretation by experts, except where sector-specific regulations have been developed, such as the MMER (SOR/2002-222). ECCC may request more stringent requirements by communicating those requirements to the provincial permitting authority.

DFO also regulates the placement of physical structures within fish habitats. The need for a DFO authorization for effluent discharge infrastructure will be determined prior to installation, as was done for the current pipelines on the Quesnel Lake bottom.

2.4.3 Metal Mining Effluent Regulations

The MMER is a sector-specific regulation written under the authority of the *Fisheries Act* and Subsections 34(2), 36(5) and 38(9) of the Act show how it fits with the parent legislation. The MMER includes specific definition of what constitutes a deleterious substance in effluent from a metal mine. The MMER also contains a requirement to undertake an environmental effects monitoring (EEM) program. Undertaking an EEM program provides assurances that the technology-based effluent limits specified in the MMER are sufficient to protect the aquatic receiving environment. The MMER limits were used as one set of criteria for screening end-of-pipe concentrations in Sections 5.0 and 6.0. Given that MMER limits are technology based and the majority of effluent constituents considered in this TAR do not have MMER limits, the MMER limits are viewed here as a minimal compliance requirement (i.e., if the evaluation shows it to be necessary, more stringent requirements can be set under provincial permit); however, the assessment of impacts in Section 6.3.4 is broader as necessitated by the requirements of provincial legislation.

2.4.4 Navigation Protection Act

Consideration should also be given to the *Navigation Protection Act* (R.S.C., 1985, c. N-22), which is concerned with promoting the safe navigation of vessels, including verification that the installation of physical structures does not impede navigation. With specific regard to subsurface pipes, this process leads to protection against damage to the pipe by restricting vessel anchoring at the location of a pipe. The need for a *Navigation Protection Act* permit for the short-term pipe placement, as well as the potential long-term placement of a diffuser, will be determined prior to installation of any infrastructure, as was done for the current Quesnel Lake installation.

2.4.5 Water Sustainability Act

In BC, legislation of matters relating to use and flow of surface water and groundwater, and protection of water resources, are governed by the *Water Sustainability Act* (WSA; SBC 2014). The WSA was brought into force on 29 February 2016, replacing the *Water Act*. Five new regulations were introduced under the WSA, consisting of the Water Sustainability Regulation (B.C. Reg. 36/2016), the Water Sustainability Fees, Rentals and Charges Tariff Regulation (B.C. Reg. 37/2016), the new Groundwater Protection Regulation (B.C. Reg. 39/2016), the new Dam Safety Regulation (B.C. Reg. 40/2016), and the Water Districts Regulation (B.C. Reg. 38/2016). The Water Sustainability Regulation includes requirements for the licensing, diversion, and use of groundwater and surface water to protect water resources and ecosystems, while the Groundwater Protection Regulation specifically addresses protection of the groundwater resource and identifies requirements for the construction of wells.

MPMC currently holds three surface water licences, specifically:

- 5002458, which authorizes the non-power storage of Hazeltine Creek (500,000 m^3/yr)
- C101763, which authorizes Polley Lake water to be stored (1,000,352 m^3/yr) and used for processing ore (455 m^3/d)
- C111741, which allows Polley Lake water to be used for dust suppression (818 m^3/d) and work camps (36 m^3/d)

With the introduction of the WSA, these licences continue to be valid under the WSA rather than the former *Water Act*. An increase in the annual fees for these licences came into effect on 29 February 2016, based on the new Water Sustainability Fees, Rentals and Charges Tariff Regulation.

Section 11 of the WSA requires an authorization for works in and about a stream, which includes a broader definition of “stream” in law than what is commonly understood to be a stream in ordinary use. In the present case, a stream would include Hazeltine Creek and Quesnel Lake. There are certain activities that are authorized by regulation; however, the need for a written authorization will depend on the specific effluent discharge infrastructure being constructed.

3.0 BASELINE INFORMATION

3.1 Geology and Geochemistry

An understanding of the regional and local geology, as well as the geochemical characteristics of materials to be mined (e.g., waste rock), is required to develop an understanding of how mine wastes will weather and to identify the processes that will control the release of constituents under ambient conditions. The following subsections provide a summary of the mine geology and geochemical characteristics that were subsequently used to derive the geochemical source terms (Appendix C) for inclusion into the site-wide water quality model (WQM; Appendix D). Subsections of Section 3.1 were written by SRK Consulting (SRK), which was also responsible for the geochemistry component of this TAR (Appendix C).

3.1.1 Regional Geology

The mine is in Quesnellia, an accreted terrane in the Intermontane Belt of the Canadian Cordillera. Quesnellia is characterized by Triassic to Jurassic volcanic, sedimentary, and mafic to intermediate intrusive rocks formed in a west-facing arc that developed west of the continental margin of ancestral North America. The mine is within the Mount Polley Intrusive Complex (MPIC), situated in the Central Quesnel Belt, a region of Quesnellia roughly between latitudes 51.5° and 53.5°N (Figures 3-1 and 3-2). In this area, the arc and a marginal basin immediately to its east were obducted eastwards onto the then continental margin in the late Early Jurassic. Continued crustal shortening in the Middle Jurassic resulted in regional metamorphism and southwest-verging back-folding of the now coupled arc-marginal basin and continental margin assemblages. The mine lies in the core of a broad regional, northwest-trending upright syncline at the western limit of this Middle Jurassic folding. Regional metamorphic grade at the mine is no more than zeolite facies.

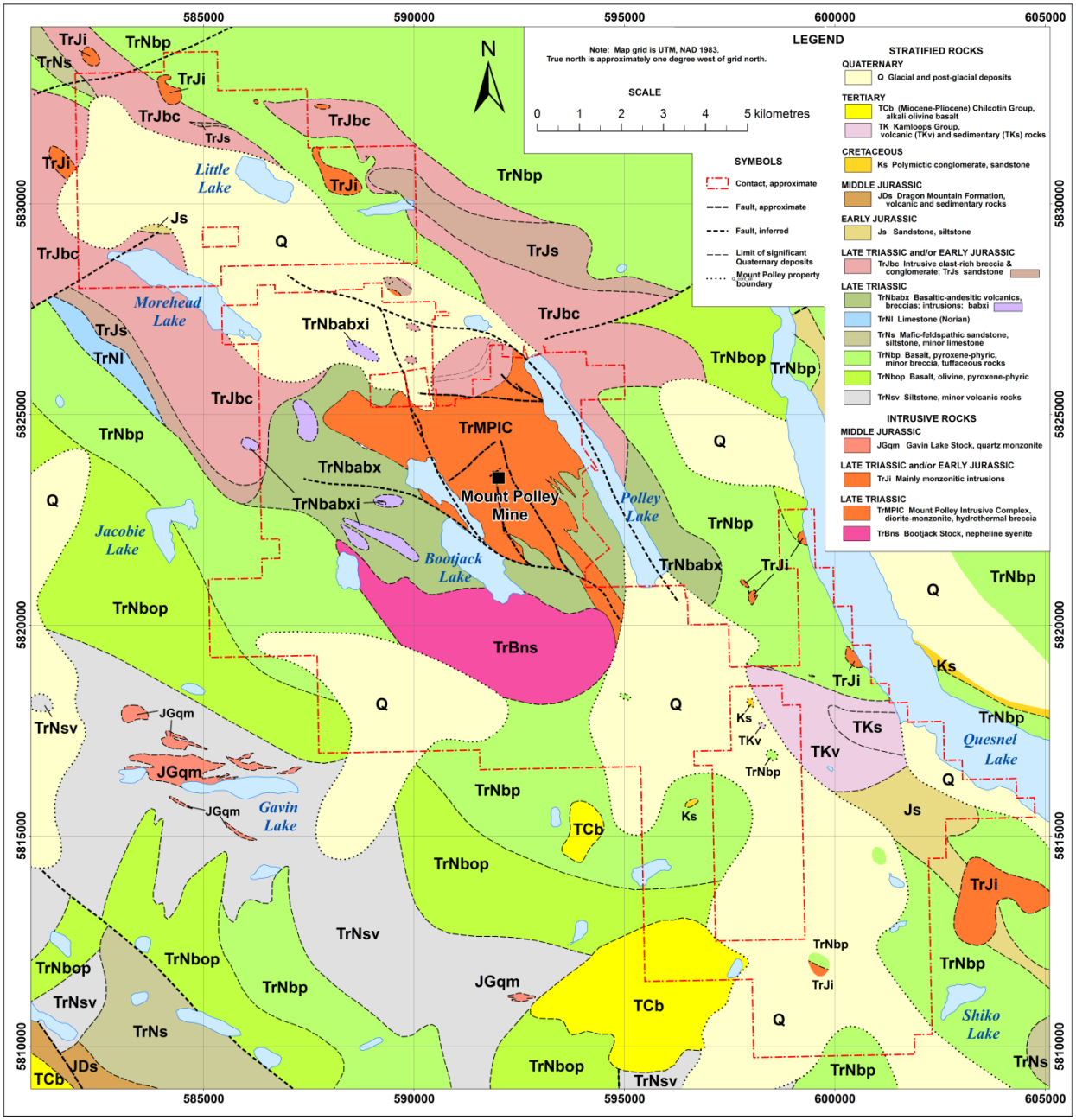


Figure 3-1: Regional Geology of the Mount Polley Property

Source: Ress 2013.

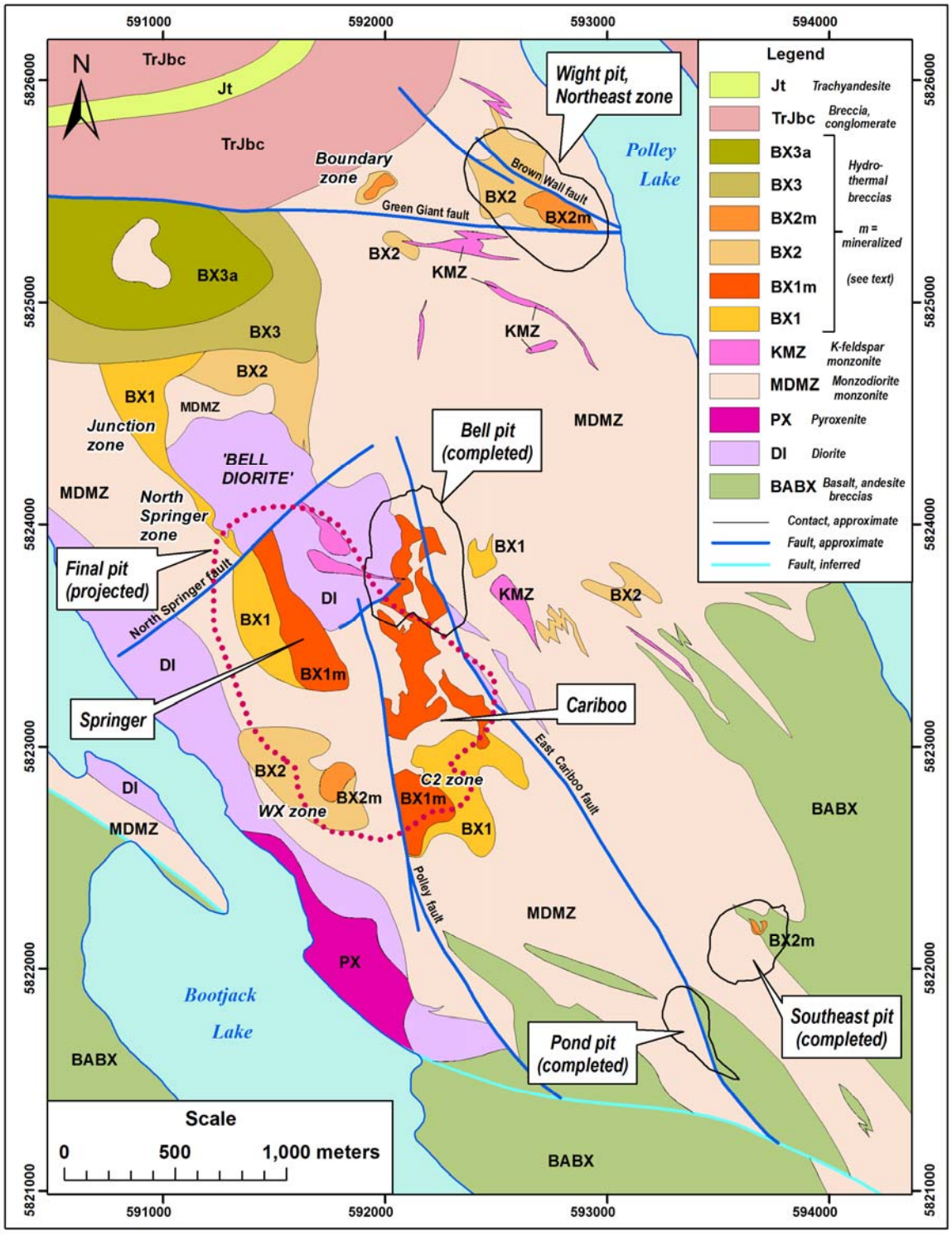


Figure 3-2: Simplified Geology of the Mount Polley Intrusive Complex

Source: Ress 2013.

Stratified Triassic rocks surrounding Mount Polley are assigned to the Nicola Group, the type-area of which is in southern Quesnellia, where the Nicola hosts other porphyry copper deposits such as the Highland Valley, Copper Mountain, and New Afton mines. The arc stratigraphy in the Mount Polley district extends from the Middle and Late Triassic Nicola Group into the Early Jurassic. From the base, the Nicola Group consists of Middle to early Late Triassic sedimentary and minor volcanic rocks, overlain by a thick Late Triassic succession of submarine, trachybasaltic volcanics and related tuffaceous sediments and volcaniclastic breccias. The youngest assemblage, which extended into the Early Jurassic, consists of volcanic, plutonic, and sedimentary rocks representing a more mature stage of arc activity, and more differentiated magmatism, when the MPIC was formed. The youngest arc rocks are polymictic breccia and conglomerate that unconformably overlie the MPIC, and are products of late arc uplift and erosion. In the southern part of the Mount Polley property, Nicola Group country rocks are covered by post-accretion units, including outliers of unnamed Cretaceous sandstone and conglomerate, early Tertiary andesitic volcanic and sedimentary rocks of the Kamloops Group, and Miocene-Pliocene basaltic volcanics of the Chilcotin Group.

3.1.2 Deposit Geology

The MPIC hosts the Mount Polley copper-gold porphyry deposit (Figures 3-1 and 3-2). It is a Late Triassic magmatic centre approximately 6 by 4 km, elongated in a north-northwest direction. It consists of alkalic, marginally silica-undersaturated intrusions, and magmatic-hydrothermal breccias. The age of the deposit is approximately 205 million years based on uranium-lead isotopic dating; there is close agreement between age determinations from MPIC intrusions and minerals associated with sulphide mineralization. Mineralization occurs in almost all constituent rock types of the MPIC, and thus occurred late in its formation. Nearly all economic mineralization is in breccias, or in mineralized stockwork veins in adjacent wall rock intrusion. Country rocks of the Nicola Group closest to the MPIC are mafic to intermediate volcanic and subvolcanic coherent rocks, and related breccias, and may form components of mineralized hydrothermal breccias in the periphery of the MPIC.

3.1.3 Metal Leaching/Acid Rock Drainage Geochemistry

Details of the characterization of ML/ARD potential at the mine are provided in Appendix C. Findings are summarized below.

The Mount Polley deposit is classified as an alkalic porphyry copper-gold deposit. With the exception of the distinctive small Pond Zone skarn deposit, it has been mined from several mineralized zones (Springer, Cariboo, Bell, Southeast, Northeast, Boundary) with common geological features including mainly a monzonitic plutonic host rock, association with breccia bodies in the intrusion, dominantly potassic hydrothermal alteration, lack of pronounced pyrite haloes, enrichment in copper and selenium relative to global norms, pervasive calcite, and natural oxide alteration. As a result, geochemical characteristics are consistent between zones, allowing a site-wide approach to geochemical characterization.

PAG and NAG waste rock materials occur locally as pyrite zones, but NAG rock dominates. ARD potential has been used to segregate waste rock, with NAG waste rock being placed in several waste rock disposal sites and PAG waste rock either deposited in completed pits that are projected to flood at the closure of the mine (in accordance with the management practice of subaqueous disposal), or placed in the Temporary NW PAG Stockpile for final subaqueous disposal in the Springer Pit. Based on review of operational processes and data, NAG waste rock is expected to be non-acidic in perpetuity because the classification approach tended to result in NAG waste rock reporting to PAG waste rock disposal locations rather than the reverse.

Tailings are classified as NAG based on operational monitoring and testing of tailings spilled into Hazeltine Creek in August 2014 (Appendix C of SRK 2015).

The ML/ARD assessment was used to inform the development of geochemical source terms for use in the site-wide WQM. Major geochemical source terms were identified as waste rock stockpiles and tailings. Other sources included backfilled waste rock, ore processing, pit walls, ore stockpiles, and the sulphur and magnetite stockpiles. Source terms were mainly developed from conceptual geochemical models, then interpretation of rock geochemical characteristics and seepage data, rather than scale-up of laboratory kinetic test data. The reader is referred to Appendix C for details on the derivation of geochemical source terms and to Appendix D for how these source terms are applied in the model.

3.2 Climate and Hydrology

This section describes the baseline climate and hydrology at the mine. The analyses have previously been described by Golder Associates Ltd. (Golder 2015a,b,c).

3.2.1 Climate

The mine is located in the Cariboo region of BC, approximately 56 km northeast of Williams Lake. This region experiences high spatial climate variation due to its topographical complexity. MPMC has operated climate stations on site since 1995, although records are not continuous. From 1995 through 2012, MPMC maintained one climate station at the mill site (Figure 3-3) that measured and recorded rainfall and temperature. In 2012, this was replaced with two stations: one near the mill site and one adjacent to the TSF. These new stations measure and record wind speed and direction, relative humidity, solar radiation, temperature, and rainfall. The details of these stations are shown in Table 3-1 and their locations are shown in Figure 3-3.

The climate of the mine site was characterized using data from the ECCC station previously operated in the nearby town of Likely, as well as from the three on-site climate stations.

Table 3-1: Local and Regional Climate Stations for the Mount Polley Mine

Station Name	Northing (m N) [(a)]	Easting (m E)	Elevation (masl) [(b)]	Data Type	Period of Record
Likely	5828785	599332	724	Temperature, rainfall, snowfall, total precipitation	1974-1993
Mill Site Weather Station	5822420	592495	1,118	Rainfall, temperature	1995-2012
Weather Station #1 (near mill)	5822420	592792	1,171	Rainfall, temperature, relative humidity, solar radiation, wind speed, wind direction	2012-2016
Weather Station #2 (TSF)	5819955	594059	964	Rainfall, temperature, relative humidity, solar radiation, wind speed, wind direction	2012-2016

(a) UTM Coordinate system- Zone 10U

(b) Elevation for on-site climate stations measured with handheld GPS device

TSF = tailings storage facility; masl = metres above sea level.

During the winter, snowpack is measured at four snowcourse sites at minimum frequency of once per month, with more frequent measurements typically being taken during the melt phase. The details of the snowcourse stations are provided in Table 3-2 and their locations are shown in Figure 3-3.

LEGEND

- CLIMATE STATION
- CONTOUR (10m)

0 750 1,500

1:30,000 METRES

REFERENCES

1. CONTOURS AND PROJECT IMAGERY OBTAINED FROM SNC LAVALIN (2014)
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
MOUNT POLLEY CLIMATE AND SNOWCOURSE STATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-06-29
DESIGNED	RM
PREPARED	RH / CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	PHASE/DOC	REV.	FIGURE
1411734	16000/162	0	**3-3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1in

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\14138\31\1411734\PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\TAR\1411734_12000_FIG_3_3_CLIMATE_STATIONS.mxd

Table 3-2: Local Snowcourse Stations at the Mount Polley Mine

Station Name	Northing (m N) [a]	Easting (m E)	Approximate Elevation (masl) [b]	Period of Record
Snowcourse 1 (near mill)	5823182	592792	1,171	1997–2010, 2016
Snowcourse 2 (near TSF)	5819976	594092	964	1997–2016
Snowcourse 3	5823895	593632	976	2012–2016
Snowcourse 4	5823537	590835	1,112	2015-2016

(a) UTM Coordinate system- Zone 10U

(b) Elevation measured by handheld GPS device

TSF = tailings storage facility; masl = metres above sea level.

3.2.1.1 Temperature

The community of Likely is located approximately 9 km northeast of the mine at an elevation of 724 masl. The elevation of the mine ranges from about 920 to 1,200 masl, and therefore the average temperatures are generally 0.3°C to 1.0°C cooler than recorded at Likely.

Monthly temperature values for the Likely climate station are shown in Table 3-3. Temperatures at Likely are generally mild to cold, with average monthly temperatures ranging from 15.1°C in July and August to -6.6°C in January.

Table 3-3: Likely Climate Station Monthly Temperatures (1974 to 1993)

Month	Temperature (°C)		
	Average	Maximum	Minimum
January	-6.6	-2.9	-11.1
February	-4.5	0.6	-9.4
March	-0.8	5.8	-6.0
April	4.0	11.3	-2.1
May	9.1	16.3	2.3
June	12.8	19.8	6.0
July	15.1	22.7	8.1
August	15.1	22.3	7.8
September	10.7	17.3	4.0
October	4.7	10.6	0.1
November	-1.3	2.4	-4.8
December	-5.6	-2.1	-9.2
Annual	**4.4**	**22.7**	**-11.1**

3.2.1.2 Annual Precipitation

Long-term precipitation time series representative of the climate conditions at the mine were derived using the long-term regional data from the Likely station (1974 to 1993) and available local data from the three on-site climate stations (1995 to 2015).

The mine experiences high summer precipitation due to summer storms, with the lowest precipitation occurring in February. Precipitation typically occurs as snowfall starting in November, and accumulates until March. Average annual precipitation at the mine is estimated to be 670 mm. Estimated wet and dry values for a range of return periods are shown in Table 3-4, and in Figure 3-4 and Figure 3-5.

Table 3-4: Frequency Analysis of Mount Polley Mine Site Annual Precipitation (31 Years)

Return Period (yr)	Wet (mm)	Dry (mm)
200	1,091	354
100	1,048	378
50	1,001	406
25	948	438
10	865	491
5	791	545
Average	**670**	

Note: Generalized extreme value distribution.

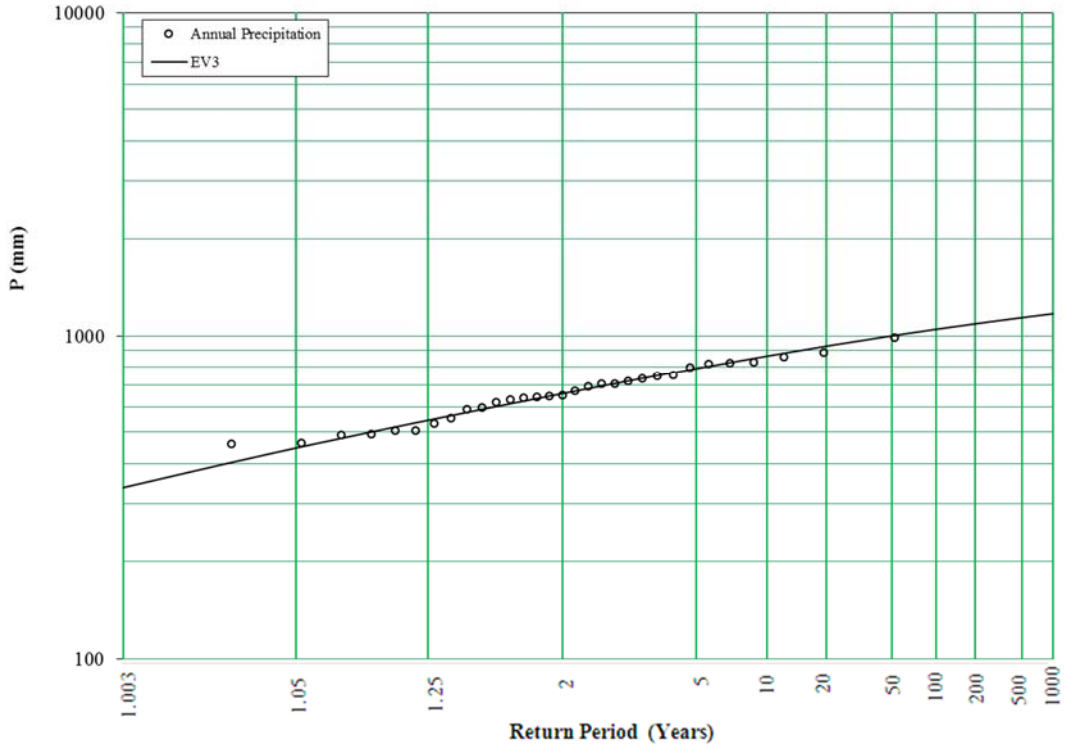


Figure 3-4: Frequency Analysis of Annual Precipitation – Wet-Year Values (Generalized Extreme Value Distribution)

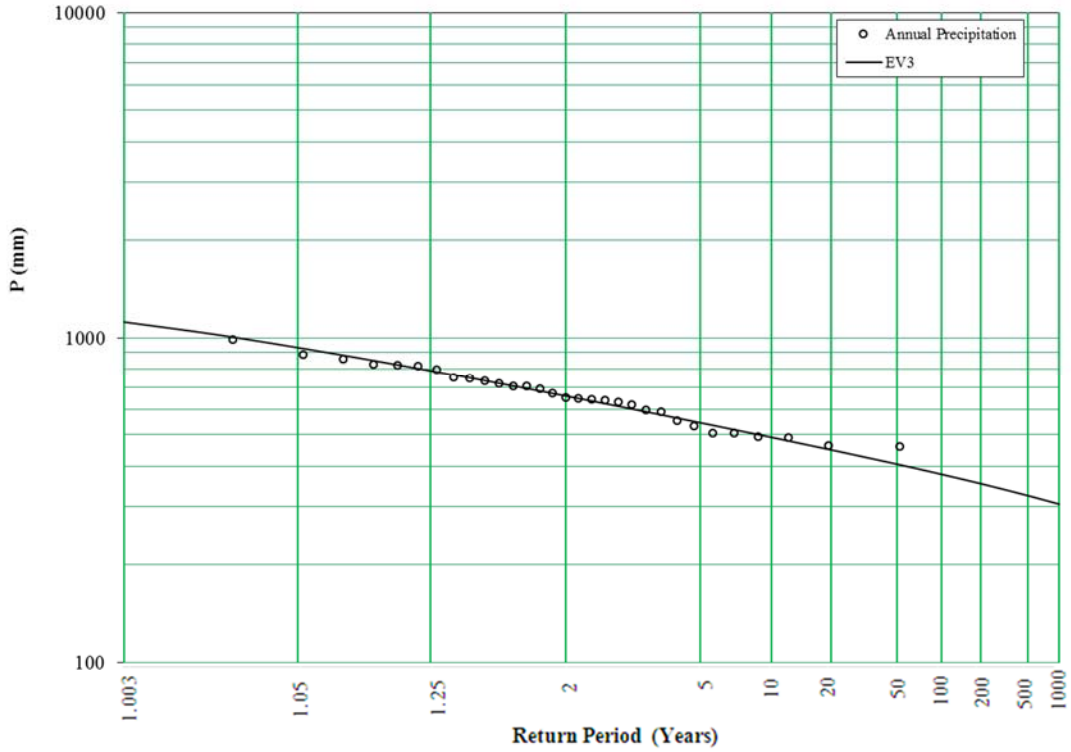


Figure 3-5: Frequency Analysis of Annual Precipitation – Dry-Year Values (Generalized Extreme Value Distribution)

Monthly values for the 1:25 year dry and wet precipitation and for the 1:200 year dry and wet precipitation were assumed to follow the same monthly distribution as the average precipitation (Table 3-5).

Table 3-5: Long-Term Precipitation at the Mount Polley Mine Site (1974 to 2015)

Month	Precipitation (mm)				
	Average	1:200-Year Dry	1:25-Year Dry	1:25-Year Wet	1:200-Year Wet
January	50.8	26.9	33.3	72.0	82.9
February	37.5	19.8	24.5	53.1	61.1
March	42.8	22.7	28.0	60.7	69.8
April	49.5	26.2	32.4	70.2	80.7
May	53.5	28.3	35.1	75.8	87.3
June	78.2	41.4	51.3	111	128
July	58.9	31.2	38.6	83.4	96.0
August	52.2	27.6	34.2	73.9	85.1
September	48.2	25.5	31.5	68.3	78.6
October	58.2	30.8	38.1	82.5	94.9
November	53.5	28.3	35.1	75.8	87.3
December	85.6	45.3	56.1	121	140
Annual Total	**670**	**354**	**438**	**948**	**1,091**

Note: Includes Likely weather station data (1974 to 1993).

3.2.1.3 24-Hour Design Rainfall Depths

Annual maximum series for 24-hour precipitation from the Likely weather station (1974 to 1993) and MPMC data from 2001 to 2006 and 2012 to 2015 were used to undertake a frequency analysis to provide design values. Results are shown in Table 3-6 and Figure 3-6. The 24-hour probable maximum precipitation (PMP) depth of 188 mm was estimated using the Hirschfield method (Hogg and Carr 1985) using the Likely weather station data.

Table 3-6: 24-Hour Precipitation Depths

Return Period (yr)	Depth (mm)[a]
2	32.1
10	46.1
25	52.2
100	60.6
200	64.6
1000	73.5
Probable maximum precipitation (PMP)[b]	**188**

a) Three-parameter log-normal distribution.

b) The PMP does not have a return period.

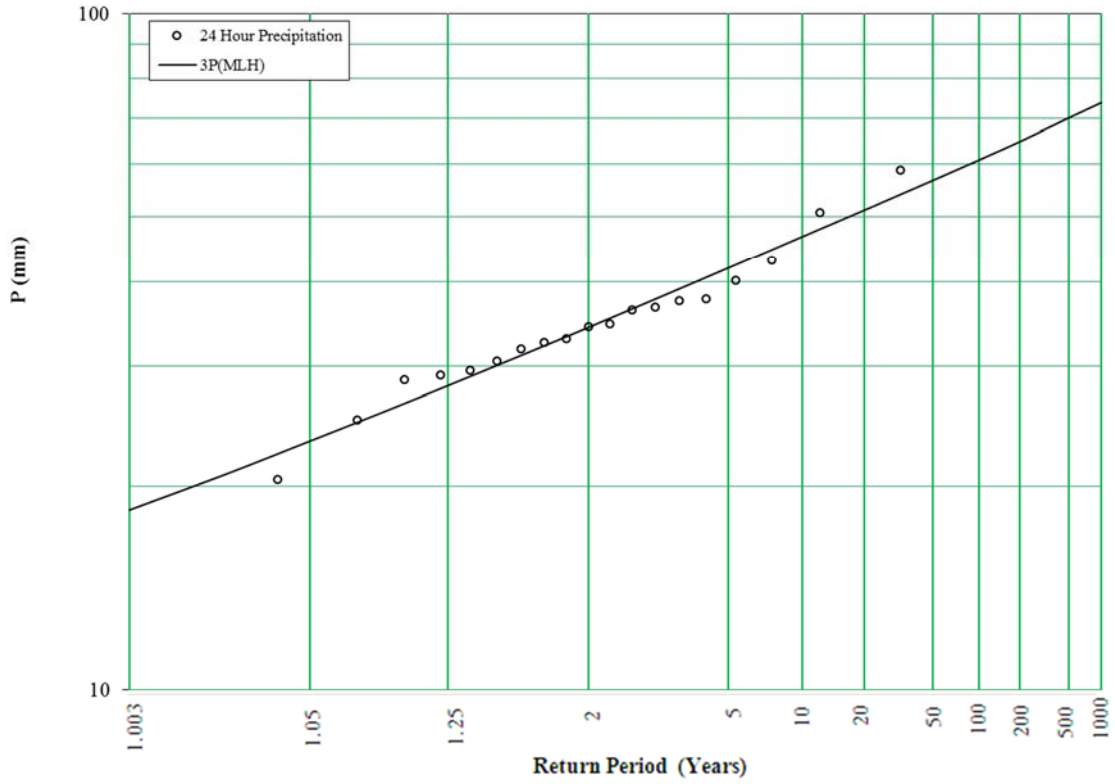


Figure 3-6: Frequency Analysis of 24-Hour Rainfall (Two-Parameter Log-Normal Distribution)

3.2.1.4 Evaporation

Currently, there are two climate stations at the mine that measure and record precipitation (rain), temperature, wind speed and direction, solar radiation, and relative humidity every 5 to 30 minutes. Lake (open water) evaporation was calculated based on measured climate parameters such as solar radiation, wind speed, and temperature, using the Penman equation (Penman 1948). Lake evaporation estimates were derived for the period 2005 to 2012. Lake evaporation shows a typical seasonal profile, with no evaporation in the winter months and maximum evaporation in the summer months. Average annual lake evaporation at the mine site was estimated to be 404 mm. Estimated average monthly and annual lake evaporation values are provided in Table 3-7.

Table 3-7: Estimated Average Monthly and Annual Lake Evaporation (1997 to 2012)

Month	Average Lake Evaporation (mm)
January	0
February	0
March	0
April	0
May	52.0
June	94.3
July	102
August	88.8
September	48.1
October	18.2
November	0.3
December	0
Annual	**404**

Note: Derived from data measured at on-site climate stations, pro-rated with long-term data from Likely weather station (19 years).

3.2.2 Future Climate Change Projections

Current operations are scheduled until 2020, and therefore adjustments for future climate change are not required. However, over the longer term into post-closure, climate change may become significant. Although the current water balance focuses on the current operations, pit lake filling (Appendix B, Section 6.6) extends several decades into post-closure; therefore, the potential effects of climate change should be considered.

The effect of climate change on precipitation and temperature can be assessed using results from global circulation models that have been run to forecast changes under different climate scenarios. The resolution of these models is typically spatially coarse. For example, the Canadian Earth System Model CanESM2 (Chylek et al. 2011) has a horizontal resolution of 310 km (2.81 degrees), which limits the application to local changes, particularly in mountainous environments. Statistical downscaling and interpolation techniques are available to provide greater resolution. An approach that is used in BC is PRISM (Parameter-elevation Regressions on Independent Slopes Model), which is an expert system that uses point data and a digital elevation model to generate gridded estimates of climate parameters (Daley et al. 2002). In BC and North America, PRISM-generated data for historical conditions and for future climate scenarios are available from the ClimateBC online resource (Wang et al. 2012).

PRISM-generated values from ClimateBC have been used to assess future changes to temperature and precipitation (Appendix B, Attachment G). Results from the CanESM2 are available for two scenarios: Representative Concentration Pathway 4.5 and Representative Concentration Pathway 8.5. Representaive Concentration Pathways refer to climate scenarios and indicate the additional climate forcing (W/m^2) in the year 2100 (e.g., 4.5 W/m^2). Representative Concentration Pathway 8.5 is the warmer scenario (Figure 3-7), although there are indications that the projected CO_2 forcings for Representative Concentration Pathway 8.5 are too extreme to be realized (Inman 2011).

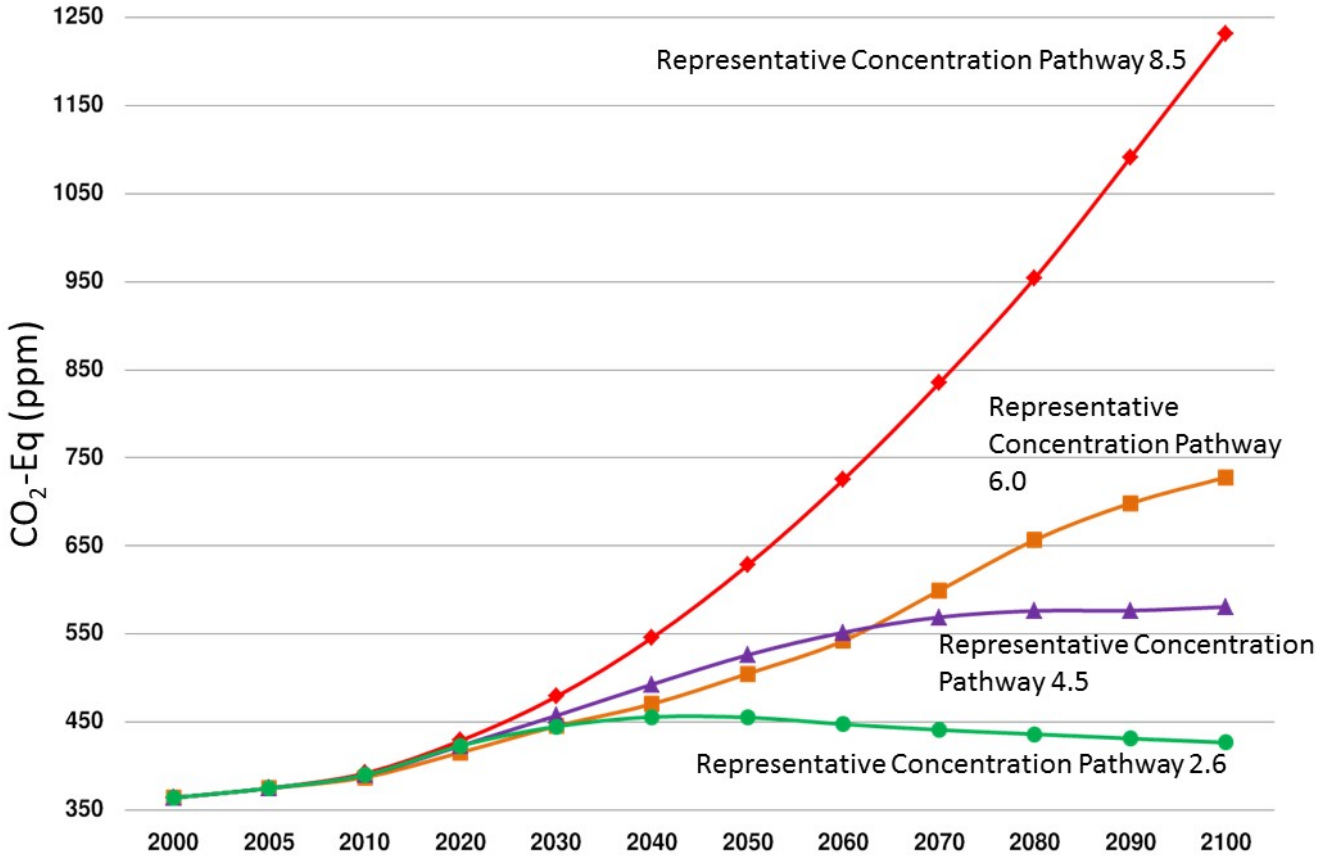


Figure 3-7: $C0_2$ Equivalent Climate Forcings for Representative Concentration Pathways Scenarios

Source: After Moss et al. 2008.

Changes to current conditions were determined for the Representative Concentration Pathway 4.5 and Representative Concentration Pathway 8.5 scenarios for years 2025, 2055, and 2085. The relative changes determined from the ClimateBC data were added to the current (2016) Mount Polley monthly values to derive future average monthly and annual values for 2025, 2055, and 2085. The projected annual climate parameters for current (2016) conditions and for Representative Concentration Pathway 4.5 and Representative Concentration Pathway 8.5 scenarios for 2025, 2055, and 2085 are summarized in Table 3-8. The climate change scenarios are based on the CanESM2 model values provided from the ClimateBC online resource. In general, the future climate change scenarios indicate warmer, wetter conditions, with increased evaporation and reduced snowfall (Table 3-8). The climate change scenarios are based on the CanESM2 model values provided from the ClimateBC online resource.

Table 3-8: Projected Annual Mount Polley Climate from CanESM2 Model

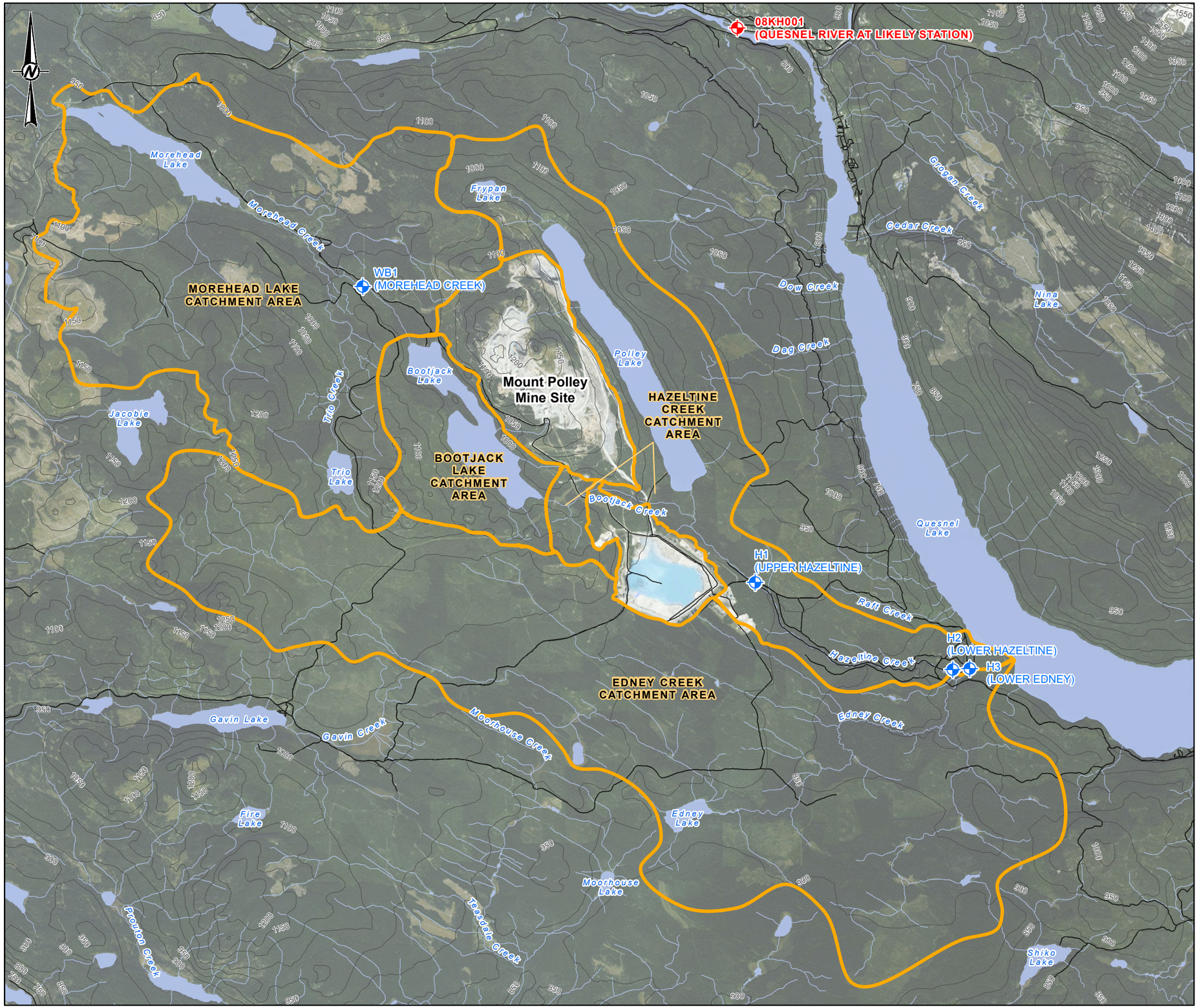
Scenario	Year	Mean Annual Temp (°C)	Delta Mean Annual Temp (°C)	Precipitation (mm)	Rainfall (%)	Snowfall (%)[a]	Evaporation (mm)
Current	2016	4.4	0	670	67	33	404
Representative Concentration Pathway 4.5	2025	5.9	1.5	692	67	33	457
	2055	7.3	2.9	694	73	27	524
	2085	8.1	3.7	721	74	26	547
Representative Concentration Pathway 8.5	2025	6.0	1.6	689	67	33	458
	2055	8.4	4	718	74	26	557
	2085	11.1	6.7	742	84	16	644

a) After sublimation loss.

3.2.3 Site Drainage and Hydrology

The mine is drained by three main watersheds: Hazeltine Creek (30.2 km^2) at Quesnel Lake, Edney Creek (87.4 km^2) at Quesnel Lake, and Morehead Lake (62.7 km^2) (Figure 3-8). The Hazeltine Creek watershed includes Polley Lake and conveys all water from Polley Lake, the east side of Mount Polley, and the area surrounding the TSF. The Morehead Creek watershed includes the Bootjack Lake catchment area (11.2 km^2). These areas do not include the current mine footprint (13.0 km^2).

The focus of the baseline hydrology is upper Hazeltine Creek because it is the current location of discharge and has the most complete and extensive record for the mine drainages. Design discharges and flow volumes for the mine drainages are based largely on analysis of upper Hazeltine Creek.



LEGEND

- MPMC HYDROMETRIC STATION
- ENVIRONMENT CANADA HYDROMETRIC STATIONS
- WATER CATCHMENT AREA
- CONTOUR (50m)
- ROAD
- WATERCOURSE
- WATERBODY

0 2 4

1:80,000 KILOMETRES

REFERENCES

1. CONTOURS, ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
MAJOR DRAINAGES AND FLOW MONITORING STATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-06-02
DESIGNED	RM
PREPARED	RH / CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	PHASE/DOC	REV.	FIGURE
1411734	16000/162	0	**3-8**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\1411803\1411734\PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\TAR\1411734_12000_FIG_3_8_MAJOR_DRAINAGE_FLOW_MONITORING.mxd

Both the Hazeltine Creek and the Morehead Lake watersheds have been significantly altered by historical (pre-mine) water diversions. Bootjack Creek, a small remnant of which now flows into Polley Lake, historically conveyed water from Bootjack Lake to Hazeltine Creek. In 1913, flow from Bootjack Lake was reversed by damming its southeast end and digging a new outlet westward to Morehead Creek. Around the same time, a control structure was also built at the outlet of Polley Lake (Hazeltine Creek), and Hazeltine Creek water was diverted to the previously existing Bullion Pit. Flow from Polley Lake to Hazeltine Creek was restored with the abandonment of mining at the Bullion Pit during World War II. However, the flow from Bootjack Lake to Hazeltine Creek was never restored. In 1997, the Bootjack Dam was strengthened by MPMC under the guidance of DFO to protect the fisheries resource of Bootjack Lake.

Before the TSF foundation failure in August 2014, Edney Creek and Hazeltine Creek converged just prior to discharging into Quesnel Lake. Separate channels have been constructed to maintain fish passage in Edney Creek while restricting fish passage in Hazeltine Creek. Historically, Bootjack Creek flowed into Hazeltine Creek below Polley Lake. Since the TSF foundation failure, Bootjack Creek now flows into Polley Lake.

MPMC has maintained a hydrological monitoring station on upper Hazeltine Creek (currently H1, Table 3-9) that was originally installed by the Water Survey of Canada (08KH027). In general, the hydrology of Hazeltine Creek (and by extension, the mine area) can be described as snowmelt driven, with the majority of annual runoff occurring during the spring snowmelt in April and May freshet (KP 2014).

Table 3-9: Summary of Existing Hydrometric Stations

Gauge	Northing (m N)	Easting (m E)	Catchment Area (km^2)	Years of Record	Operator
Upper Hazeltine (H1)[a]	5818978	597030	24.3	1994-2016	MPMC
Lower Hazeltine (H2)	5817253	601024	28.6	2015-2016	MPMC
Lower Edney Creek (H3)	5817123	601583	87.4	2015-2016	MPMC
Morehead Creek (W1b)	5825162	588907	11.2	1997-2016	MPMC
Quesnel River at Likely (08KH001)	5830493	596664	5970	1924-2016	EC

a) Installed at the location of Environment and Climate Change Canada Station 08KH027. Also known as Station W7.

3.2.3.1 Measured Flows in Hazeltine Creek

The Hazeltine Creek below Polley Lake gauge (08KH027) was installed by Water Survey of Canada in 1994 approximately 2.7 km downstream of Polley Lake, at Gavin Bridge on the Likely Road. In 1995, MPMC took over operation of the gauge and renamed the gauge W7 (Table 3-9). The gauge typically operated from April through October. Knight Piésold Ltd. (KP) completed a review of the flow data and determined that data collected prior to 2007 were subject to numerous quality issues, including a non-stationary rating curve. Data collected since 2007 at gauge W7 are considered of acceptable quality (KP 2014).

Gauge W7 was destroyed during the debris flow that occurred following the foundation failure along a section of the TSF. It was re-established as gauge H1 in April 2015. A second gauge (H2) was installed in July 2015 on lower Hazeltine Creek. A weir with a sluice gate was installed at the outlet of Polley Lake in April 2015, which is currently used to regulate flows. Discharge to upper Hazeltine Creek from the WTP began on 1 December 2015, as per EMA Permit 11678.

Annual average flow at the upper Hazeltine Creek station is 0.19 m^3/s, and ranges from 0.05 m^3/s in the winter (December through February) to 0.74 m^3/s in April (KP 2014). The largest observed flow was approximately 2.3 m^3/s.

3.2.3.1.1 2015 to 2016 Flows

Approximately one year of data are available from gauges H1 (upper Hazeltine) and H2 (lower Hazeltine) (Figure 3-9). Details of gauge installation, rating curves, and data were provided by WaterSmith Research Inc. (WaterSmith 2016a). Flows after December 2015 include discharge from the WTP. Currently, outflows from Polley Lake are regulated by operation of the sluice gate at the Polley Lake weir.

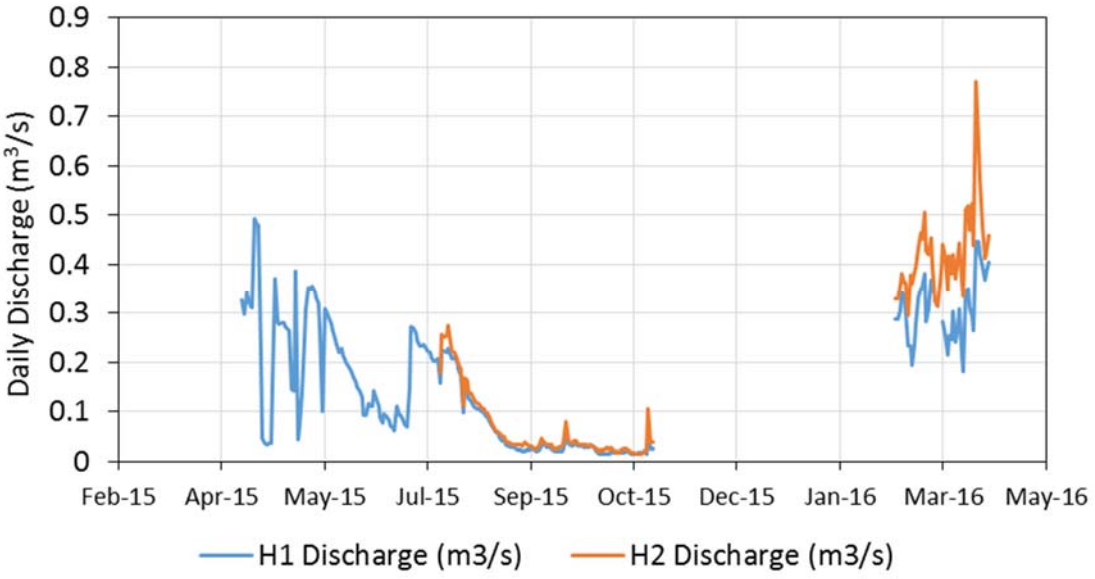


Figure 3-9: Measured Daily Discharge in Hazeltine Creek, 2015 to 2016, at Gauges H1 and H2

Daily paired regression of flows from gauges H1 and H2 prior to discharges from the WTP (Figure 3-10A) indicates that flows in lower Hazeltine Creek are 1.12 times the measured flows in upper Hazeltine Creek, which reflects the larger catchment area for lower Hazeltine Creek.

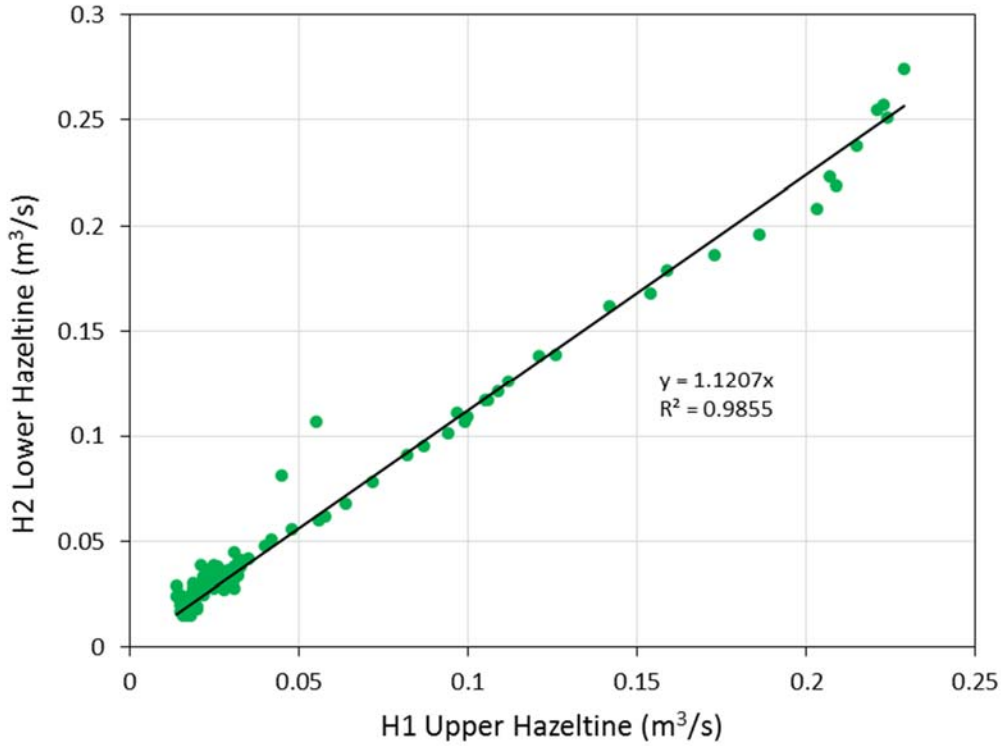


Figure 3-10A: Paired Regression of Daily Flows between Gauges H1 and H2 – Prior to Discharge from the WTP (Before December 2015)

Hazeltine Creek flow data from 2016 show a poorer correlation between gauges H1 and H2 (Figure 3-10B), which is attributed to the regulation of outflow from Polley Lake by operation of the sluice gate at the Polley Lake weir and discharge from the WTP (which is located above H1).

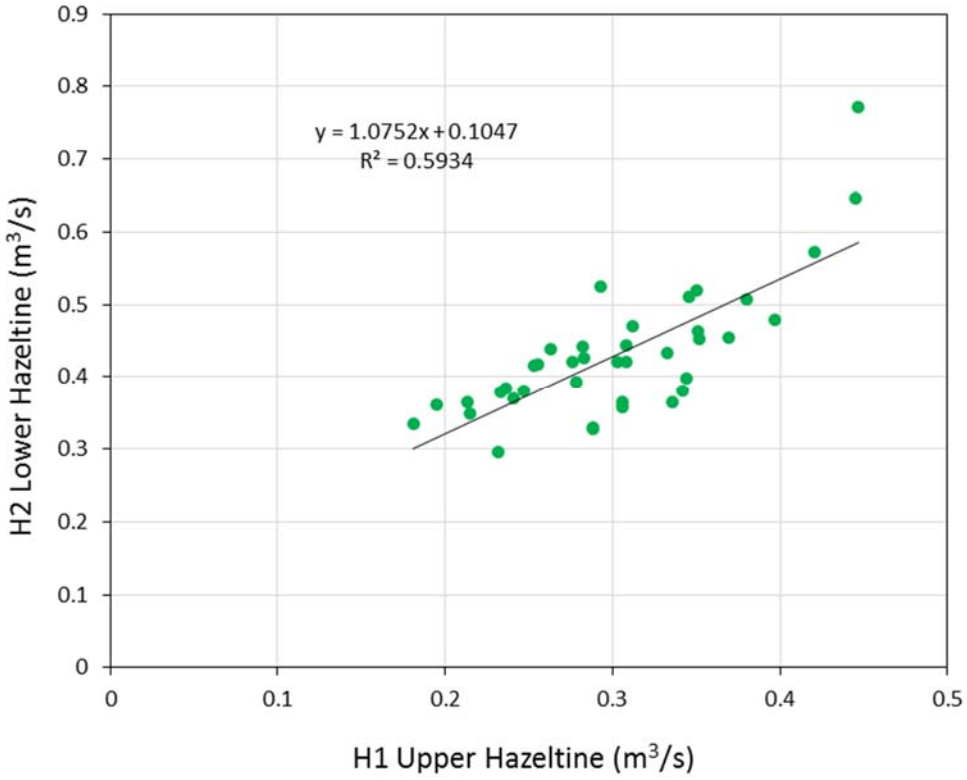


Figure 3-10B: Paired Regression of Daily Flows between Gauges H1 and H2 – Affected by Polley Lake Weir and Includes Discharge from the WTP (Data from 2016)

3.2.3.2 Mine Site Gauges

3.2.3.2.1 Lower Edney Creek

Flow data from lower Edney Creek (gauge H3) for 2015 until May 2016 are shown in Figure 3-11 (data from WaterSmith [2016a]). Water elevations are collected from continuous monitoring with a pressure transducer, and the rating curve is developed from a combination of manual gauging with a FlowTracker® at low flows, and salt dilution at high flows.

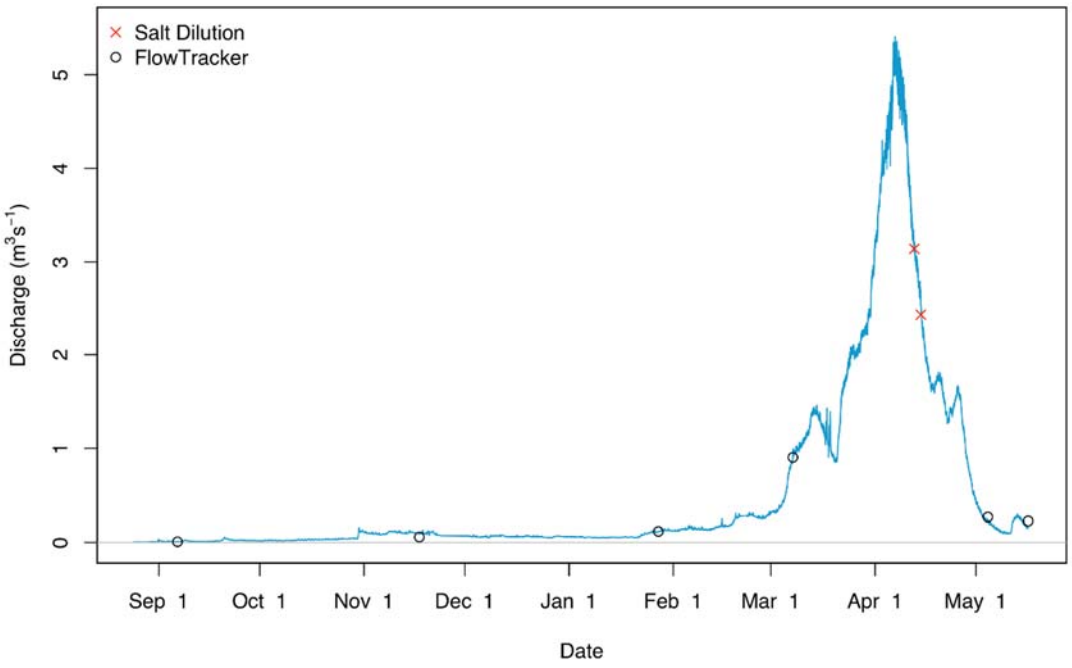


Figure 3-11: Measured Flow at Lower Edney Creek for 2015/2016

Source: WaterSmith 2016a.

3.2.3.2.2 Morehead Creek

Flow data have been collected at Morehead Creek below Bootjack Lake at gauge W1b by MPMC since 1997, although data are not continuous. Most recent data from 2016 are not available, as a new rating curve will have to be developed following removal of channel debris in 2016. Flow and temperature data for the 2015 season are shown in Figure 3-12. Water elevations are collected from continuous monitoring with a pressure transducer, and the rating curve is developed form manual gauging with a FlowTracker®.

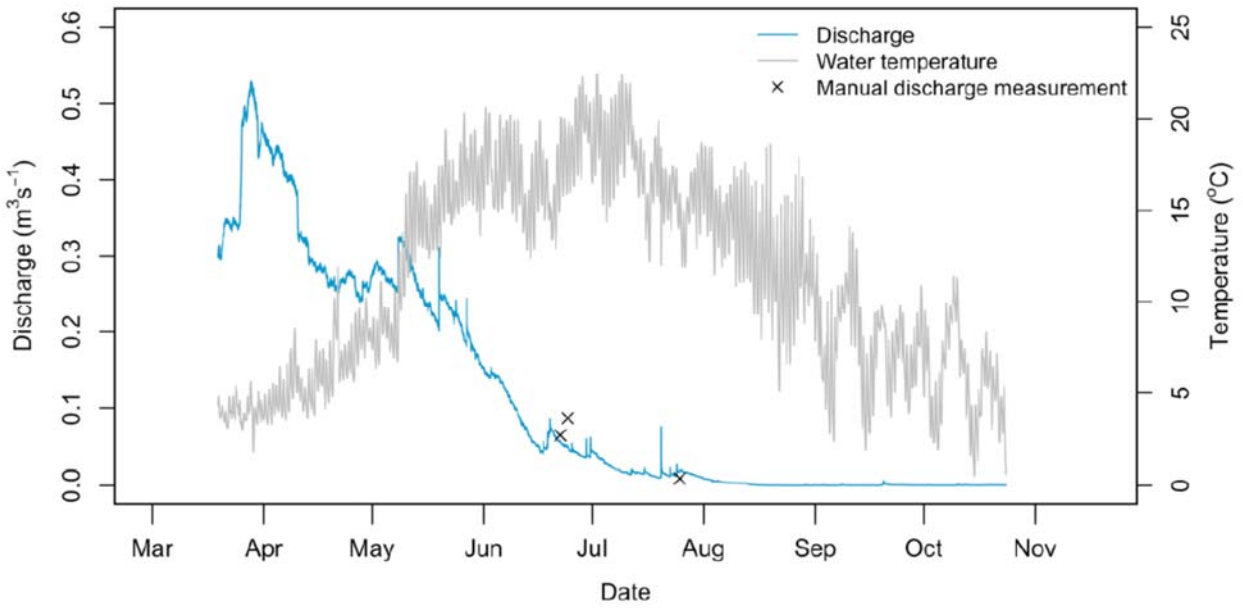


Figure 3-12: Measured W1b Flow and Temperature for 2015

Source: WaterSmith 2016b.

3.2.3.2.3 Other Mine Site Gauges

In 2015 and 2016, water levels and/or flow were monitored at gauges W4a (North Dump Creek), W5 (Bootjack Creek), and W12 (6km Creek) as required under EMA Permit 11678, and at several locations in the mine's water collection system (WaterSmith 2016b).

3.2.3.3 Derived Flows for Hazeltine Creek

Although flow has been measured in upper Hazeltine Creek since 1994, the overall record length is too short with substantial data gaps and data quality issues to develop long-term flow statistics and design flows. Long-term derived flows at upper Hazeltine Creek have been developed using statistical correlation with regional gauges by KP (2014). These derived flows were used as the basis to develop design flows for the mine drainages. The methodology is described below.

KP (2014) assessed 15 regional flow gauges (Table 3-10) and concluded that Moffat Creek near Horsefly (08KH019) has the most similar catchment conditions and hydrology to Hazeltine Creek. The catchment area of Moffat Creek is 548 km^2.

Table 3-10: Regional Hydrometric Stations

Station Number	Station Name	Latitude (°N)	Longitude (°W)	Distance from Hazeltine Creek (km)	Catchment Area (km^2)	Years of Record	Regulation Status
08KH027	Hazeltine Creek below Polley Lake (H1/W7)	52.51	121.57	0	24.3	19	Natural/ Regulated since 2015
08KH011	Quesnel Lake near Likely	52.58	121.54	7.27	Unknown	55	Natural
08KH001	Quesnel River at Likely	52.62	121.57	11.42	5,970	87	Natural
08KH031	Horsefly River above Quesnel Lake	52.45	121.42	12.71	Unknown	7	Natural
08KH019	Moffat Creek near Horsefly	52.32	121.41	24.68	548	47	Natural
08KH010	Horsefly River above McKinley Creek	52.29	121.06	42.64	790	51	Natural
08KH020	McKinley Creek below outlet of McKinley Lake	52.28	121.00	46.59	431	47	Regulated
08KE024	Little Swift River at the Mouth	52.92	121.76	46.79	127	40	Natural
08MC045	Sheridan Creek above McLeese Lake	52.43	122.29	49.8	99	17	Natural
08MC039	Borland Creek below Valley Creek	52.11	121.94	50.76	192	27	Regulated
08MC040	San Jose River above Borland Creek	52.08	121.99	56.24	1,990	27	Natural
08KH006	Quesnel River near Quesnel	52.84	122.22	57.32	11,500	72	Natural
08MC018	Fraser River near Marguerite	52.53	122.44	58.95	114,000	61	Natural
08KH030	Penfold Creek near the Mouth	52.79	120.75	63.58	Unknown	12	Natural
08KH029	Camp Creek near the Mouth	52.78	120.74	63.89	Unknown	13	Natural
08KE016	Baker Creek at Quesnel	52.97	122.52	81.81	1,550	48	Natural

Source: KP 2014.

KP developed correlation between daily flows in upper Hazeltine Creek (W7) and Moffat Creek using empirical frequency pairing (Butt and Millar 2013) between the 2007 to 2013 daily flows from Hazeltine Creek and the corresponding daily flows for Moffat Creek. The correlation was then applied to the entire historical flow data on Moffat Creek to derive 47 years of synthetic flows for Hazeltine Creek (1967 to 2013).

Like any correlation method, empirical frequency pairing provides a relationship between two gauges within the range of the observed data. The largest daily flow on Hazeltine Creek for the period 2007 to 2013 was 2.3 m^3/s, and therefore the synthetic flows greater than this value are based on extrapolation.

Average monthly derived discharge values for upper Hazeltine Creek are shown in Table 3-11 and Figure 3-13. These values are for unregulated flows.

Table 3-11: Average Discharge at Upper Hazeltine Creek

Date	Q (m^3/s)	Ratio of Annual
January	0.056	0.30
February	0.055	0.29
March	0.083	0.44
April	0.377	2.00
May	0.731	3.87
June	0.390	2.06
July	0.198	1.05
August	0.078	0.41
September	0.069	0.37
October	0.077	0.41
November	0.090	0.48
December	0.063	0.34
Annual	**0.189**	**1.00**

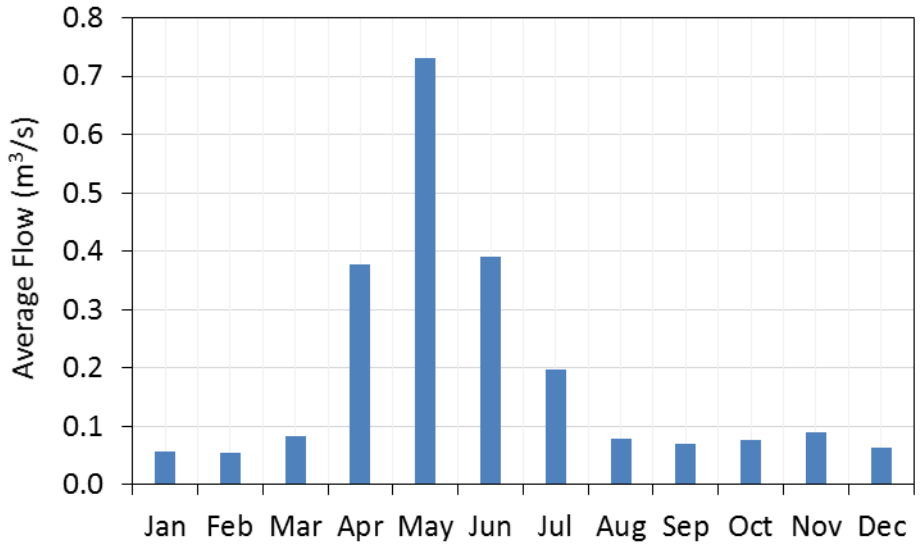


Figure 3-13: Average Monthly Discharge Flow Rates for Upper Hazeltine Creek

3.2.3.3.1 Annual Discharge

The annual discharge flow series was derived from KP (2014), for upper Hazeltine Creek for 1967 through 2013 (47 years) (Figure 3-14).

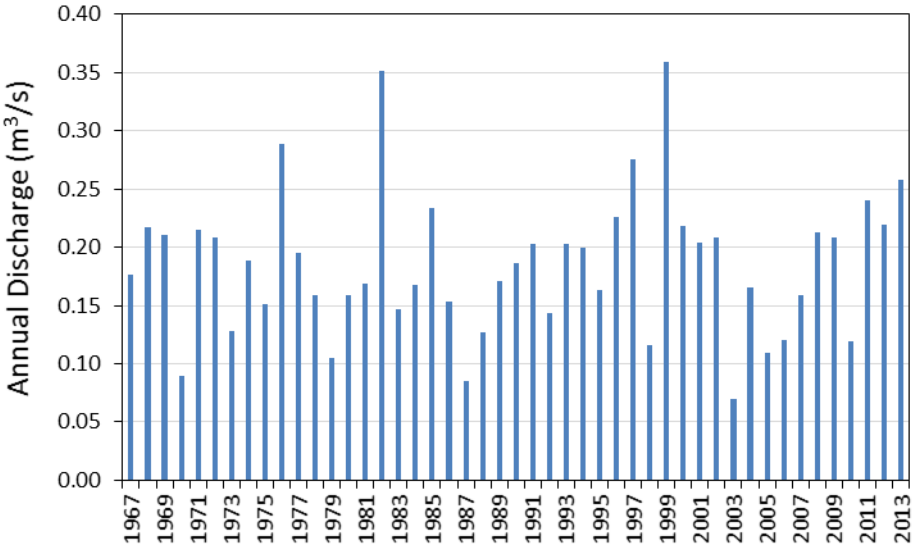


Figure 3-14: Derived Annual Discharge Upper Hazeltine Creek

Source: KP 2014.

Frequency analysis was performed on the derived annual discharge flow series to derive extreme wet-year and dry-year values (Table 3-12 and Figures 3-15 and 3-16).

Table 3-12: Frequency Analysis of Upper Hazeltine Annual Discharge (47 Years)

Return Period (yr)	Wet (m^3/s)	Dry (m^3/s)
200	0.38	0.06
100	0.35	0.07
50	0.33	0.08
25	0.30	0.09
10	0.26	0.11
5	0.23	0.13
Average	0.19	

Note: Two-parameter log normal distribution.

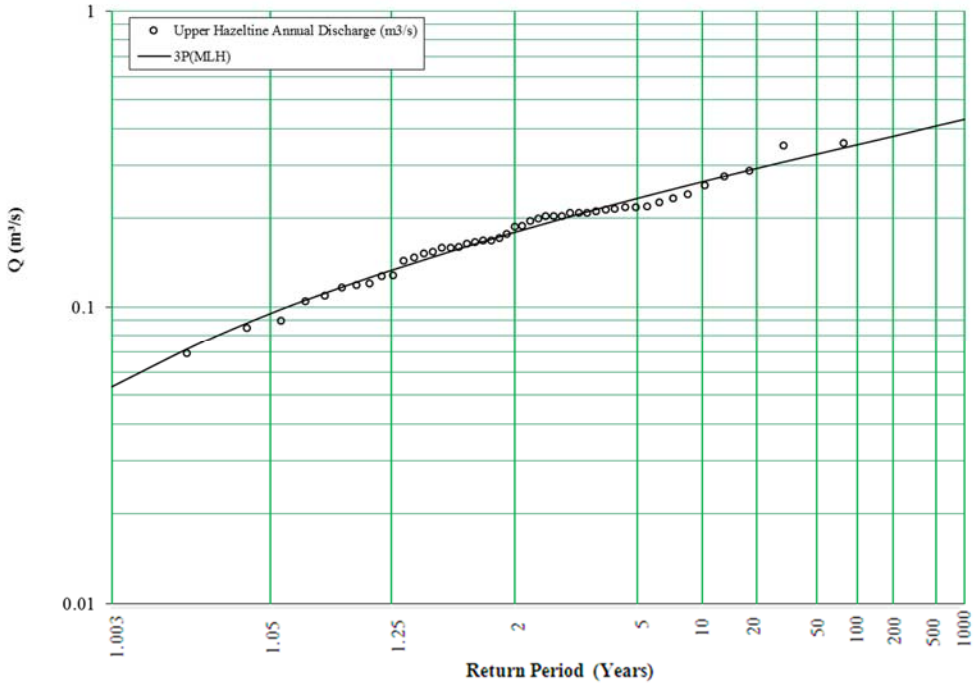


Figure 3-15: Annual Discharge Upper Hazeltine Creek: Wet-Year Scenario (Two-Parameter Log-Normal Distribution)

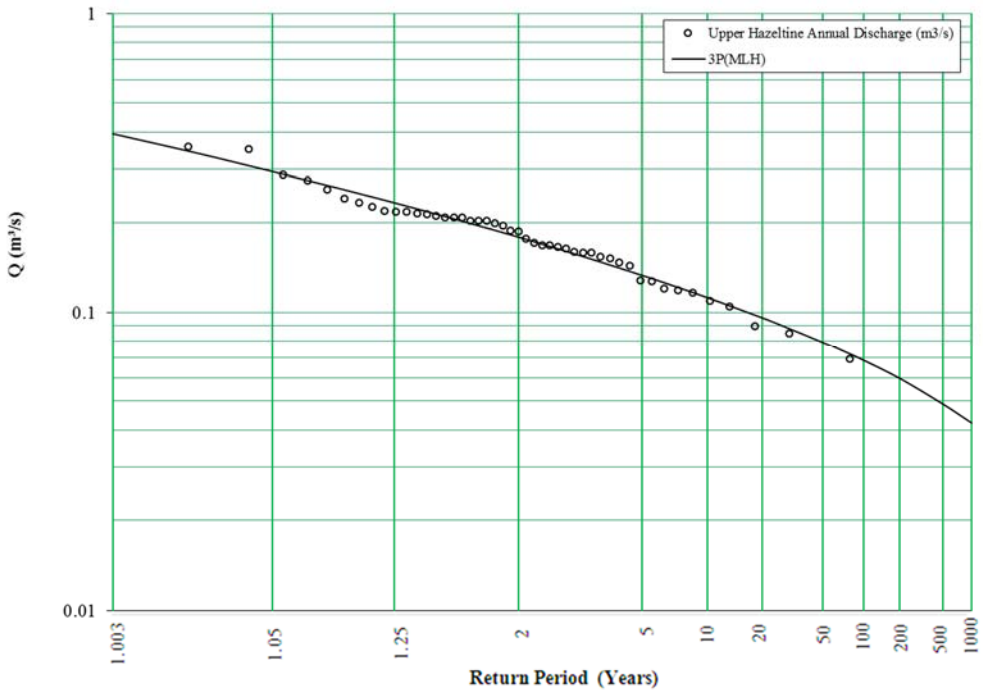


Figure 3-16: Annual Discharge Upper Hazeltine Creek: Dry-Year Scenario (Two-Parameter Log-Normal Distribution)

3.2.3.3.2 Seven-Day Low Flow

Frequency analysis was performed on the annual seven-day low flow series to derive annual average and 1-in-10-year, seven-day average low flow (7Q10 low flow) for upper Hazeltine Creek (Figure 3-17). The average annual seven-day low flow is 0.016 m^3/s, and the 7Q10 low flow is 0.0017 m^3/s.

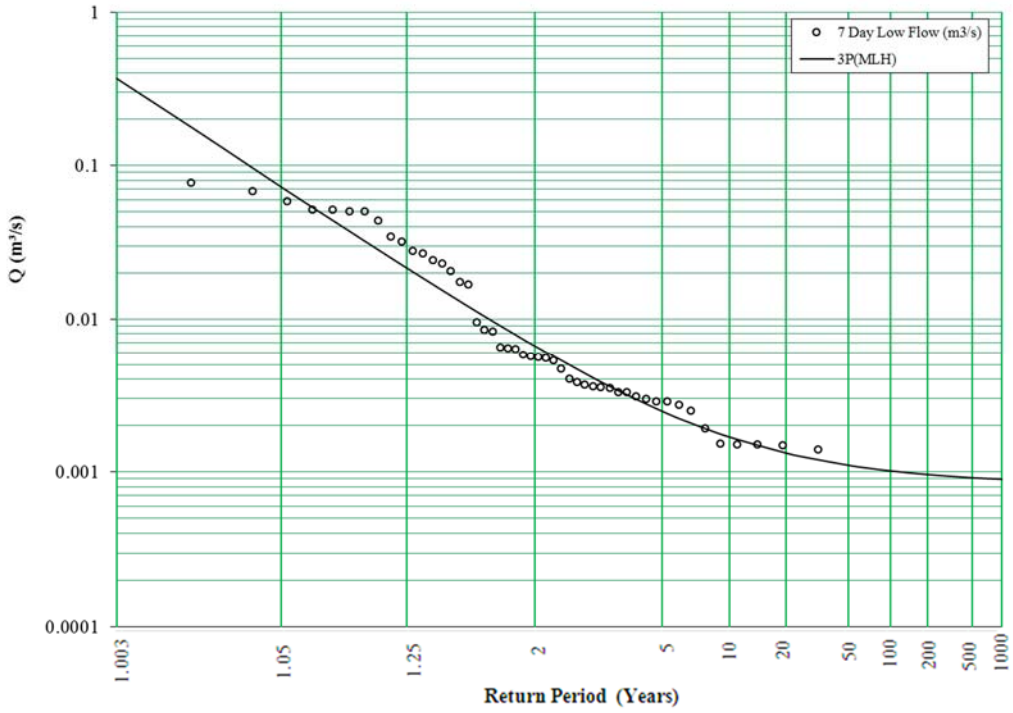


Figure 3-17: Frequency Analysis of Annual Minimum Seven-Day Low Flows (Three-Parameter Log-Normal Distribution)

3.2.3.3.3 Annual Flood

The mean annual flood (MAF) for the derived upper Hazeltine Creek flows is 1.6 m^3/s (Golder 2015b). Frequency analyses were performed on derived upper Hazeltine Creek (Figure 3-18) and Moffat Creek flows (Figure 3-19). Design flows for upper Hazeltine Creek larger than the MAF (Q10, Q100, and Q200) were estimated in two ways: from frequency analysis of the derived upper Hazeltine Creek flows (Table 3-13, Column 1) and by scaling the values from Moffat Creek based on the ratio of the MAF values (i.e., 1.6/25.1 = 0.064; Table 3-13, Column 3). The recommended design flows for Hazeltine Creek (Table 3-13) are conservatively based on scaling of the MAF from Moffat Creek (Table 3-13, Column 3), which are in the order of 10% larger than the values obtained from direct frequency analysis of the derived Hazeltine Creek flows (Table 3-13). The larger flows may reflect the absence of a significant lake in the Moffat Creek watershed.

Table 3-13: Estimated Daily Design Flows

Return Period (year)	Frequency Analysis of Derived Upper Hazeltine Creek[a] (m^3/s)	Frequency Analysis of Moffat Creek[a] (m^3/s)	Scaled Moffat Creek to Hazeltine[b] (m^3/s)
	(1)	(2)	(3)
MAF	1.6	25.1	1.6
10	2.5	39.4	2.5
100	3.4	57.9	3.7
200	3.7	63.1	4.0

a) Generalized extreme value distribution.

b) Scaled from Column 2 based on ratio of the MAFs, (i.e., × 1.6/25.1 = 0.064).

Source: Golder 2015b.

MAF = mean annual flood.

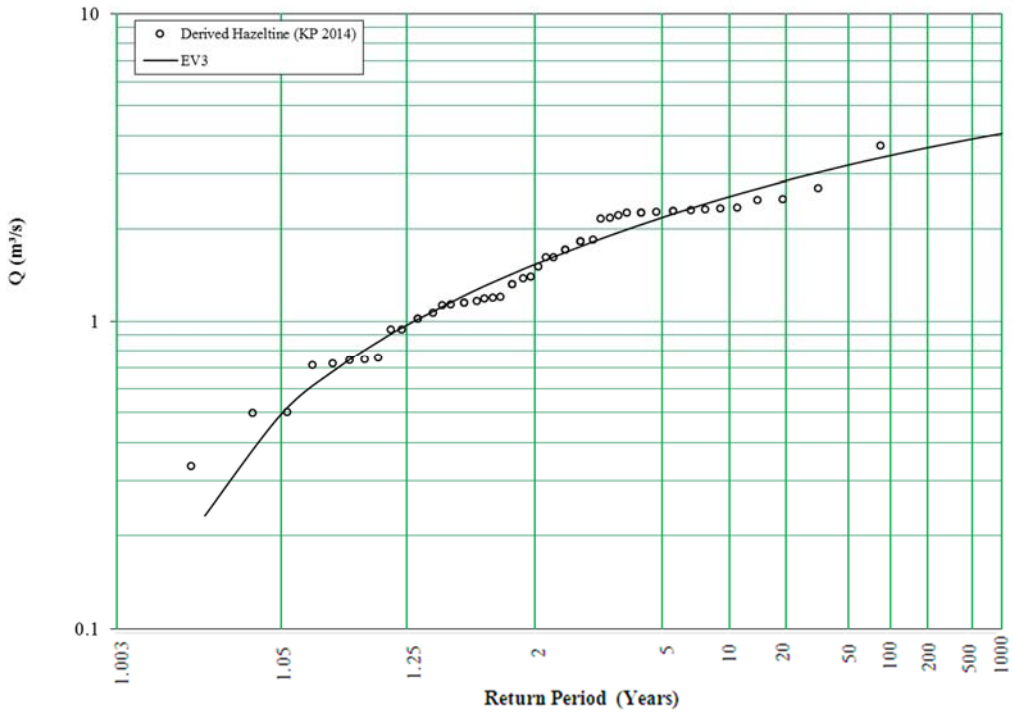


Figure 3-18: Frequency Analysis of Derived Upper Hazeltine Creek Annual Maximum Series (Generalized Extreme Value Distribution)

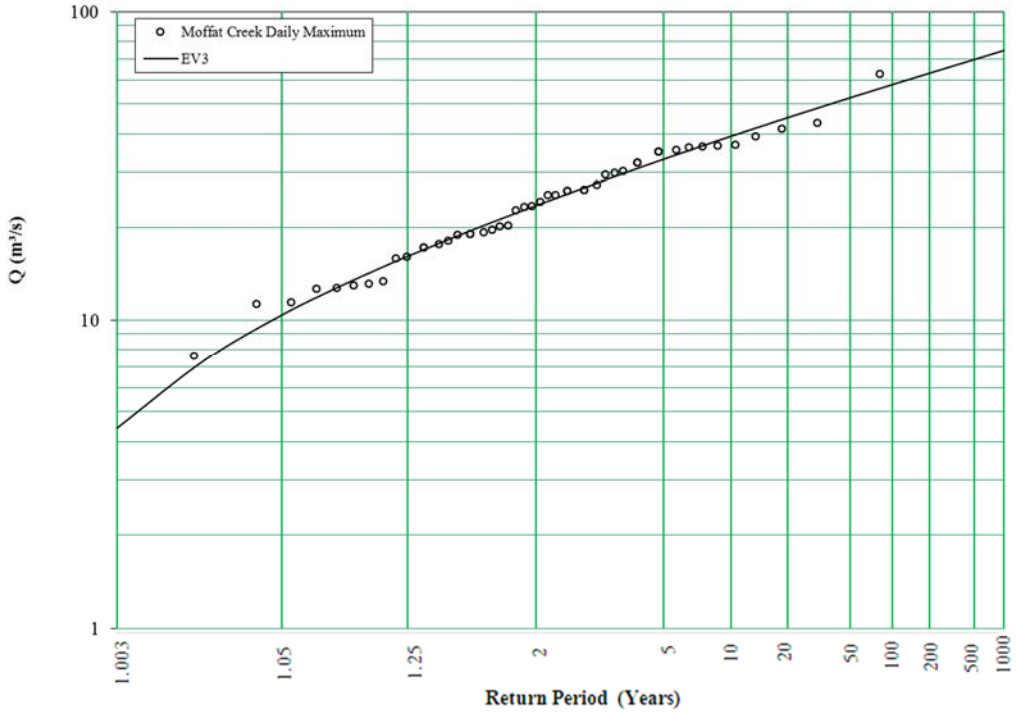


Figure 3-19: Frequency Analysis of Moffat Creek Annual Maximum Series (Generalized Extreme Value Distribution)

3.2.3.4 Quesnel River at Likely

The Quesnel River at Likely gauge (08KH001) has been in continuous operation since 1924, with historical data available until 2013 (90 years). Minimum and maximum recorded daily flows (and the 2013 hydrograph) are shown in Figure 3-20.

The mean annual flow is 129 m^3/s, with the monthly distribution shown in Figure 3-21. Design flows are summarized in Table 3-14.

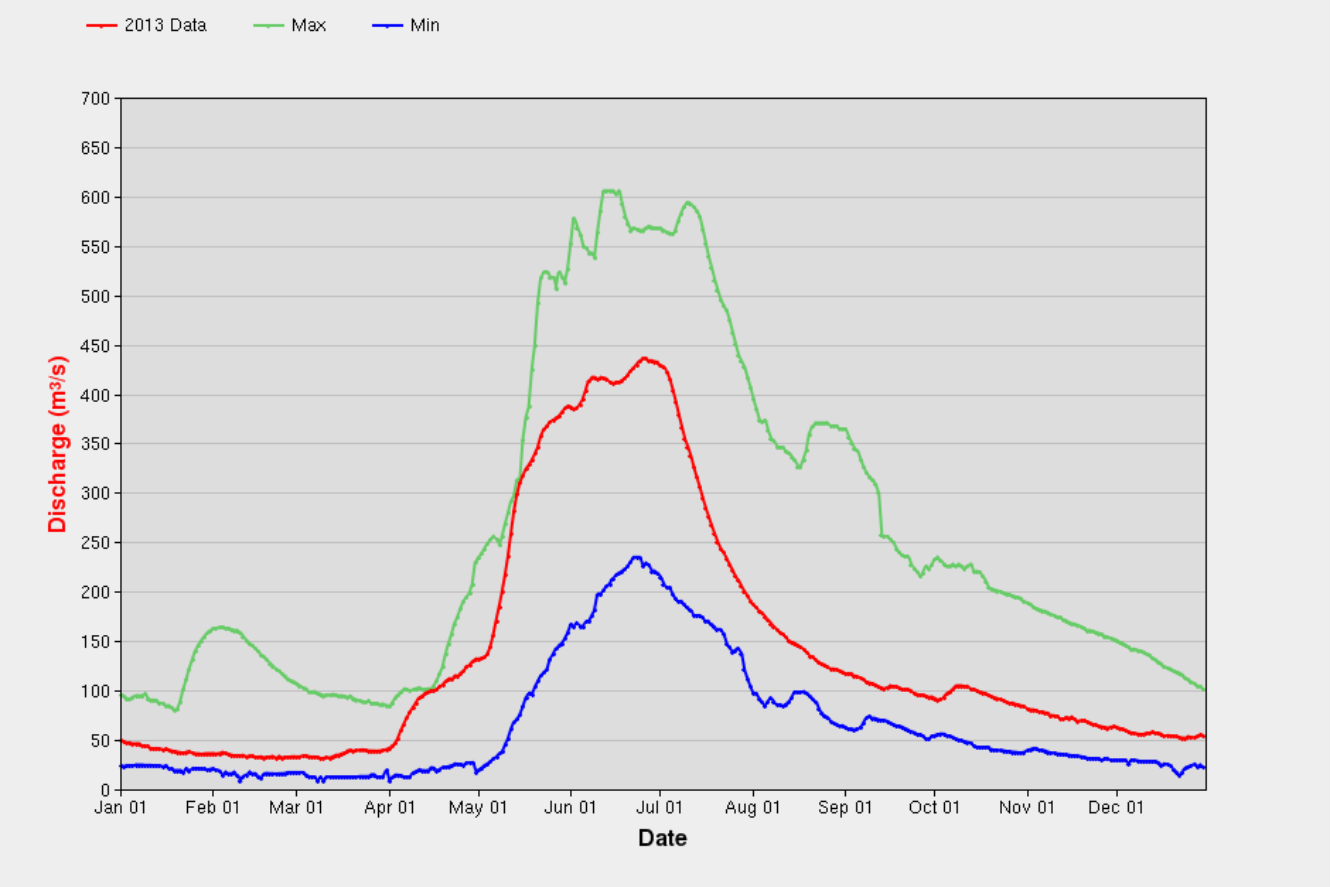


Figure 3-20: Maximum and Minimum Historical Flows at Quesnel River at Likely (1924 to 2013) and the 2013 Hydrograph

Source: Environment and Climate Change Canada.

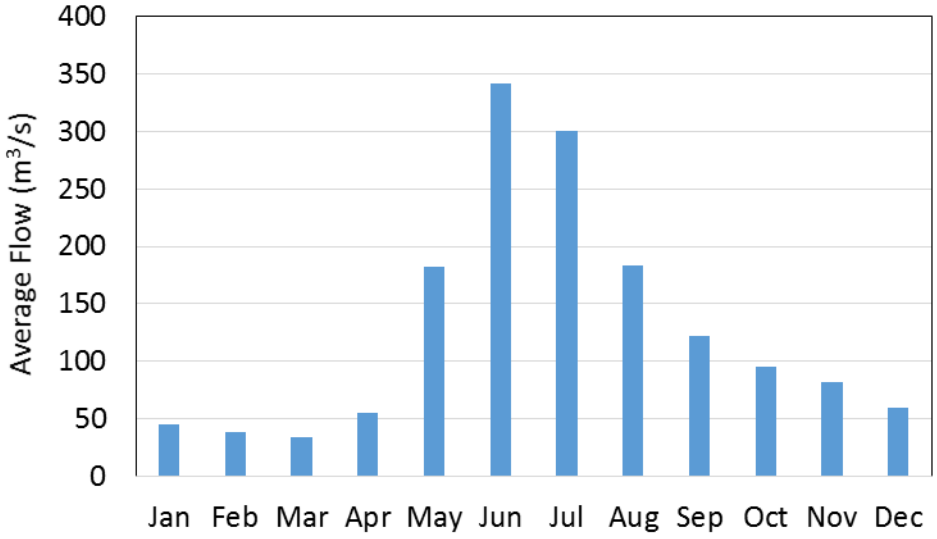


Figure 3-21: Average Monthly Discharge for Quesnel River at Likely

3.2.4 Adopted Design Flows

Based on the derived flow series for Hazeltine Creek below Polley Lake (KP 2014), the estimated mean annual discharge (MAD) at upper Hazeltine Creek is 0.19 m^3/s, the mean annual seven-day low flow is 0.016 m^3/s, and the MAF is 1.6 m^3/s (Table 3-14).

The MAD, mean annual seven-day low flow, and 7Q10 low flow values at lower Hazeltine Creek (H2) were scaled by 1.12 based on measured flows in 2015 and 2016 (Figures 3-10A and 3-10B). The MAD, mean annual seven-day low, and 7Q10 low flow values for Hazeltine Creek at the outlet of Polley Lake, lower Edney Creek above Hazeltine confluence, and Morehead Creek at the outlet of Bootjack Lake (Table 3-14) were scaled from the flows at Hazeltine Creek gauge linearly with the catchment area ratio. The MAF and larger design flows were scaled by the catchment area ratio to the power 0.75 after Eaton et al. (2002).

Quesnel River at Likely (08KH001) design values were calculated from measured historic flow data (1924 to 2013).

Table 3-14: Recommended Design Flows

Location	Area[(a)] (km^2)	Discharge (m^3/s)						
		MAD	Mean 7-Day Low Flow	7Q10 Low Flow	MAF	Q10	Q100	Q200
Polley Lake Outlet (including Lake Area)	21.4	0.17	0.014	0.0015	1.5	2.3	3.4	3.6
Upper Hazeltine Creek Gauge (H1)	24.3	0.19	0.016	0.0017	1.6	2.5	3.7	4.0
Lower Hazeltine Creek (H2)	28.6	0.21[(b)]	0.018[(b)]	0.0019	1.8	2.8	4.2	4.5
Morehead Creek (at outlet of Bootjack Lake)	11.2	0.09	0.007	0.0008	0.9	1.4	2.1	2.2
Edney Creek (above Hazeltine Creek confluence)	87.4	0.68	0.058	0.0061	4.2	6.5	9.7	10.4
Quesnel River at Likely	5970	129	29.9	19.4	398	522	651	682

a) Catchment areas provided by MPMC.

b) Adjusted by 1.12 from H1 based on measured flows (Figures 3-10A and 3-10B).

Source: Golder 2015b.

Q10 = 1:10-year flow; Q100 = 1:100-year flow; Q200 = 1:200-year flow.

3.3 Groundwater Conditions

This section describes the conceptual hydrogeological model for the mine facilities and their surroundings. The information presented in this section was used to support the development of predictive seepage models for the open pits and the TSF. As appropriate, groundwater conditions are described for pre-mining, operations prior to the TSF foundation failure (May 2014), and conditions following the foundation failure (October/November 2015).

3.3.1 Conceptual Hydrogeological Model

3.3.1.1 Information Sources

The conceptual model of groundwater conditions at the mine was previously summarized by Golder (2015d, 2016b) as part of the groundwater characterization and monitoring review for the mine. Groundwater conditions near the Springer Pit, Cariboo Pit, and Wight Pit were based on Golder's (2001) hydrogeological studies for the Cariboo Pit, Golder's (2006) assessment for the Wight Pit, AMEC's (2013) hydrogeology assessment and data review, and Golder's (2010, 2014) pit lake studies for the Springer Pit. The conceptual understanding of groundwater conditions near the TSF was interpreted from the drilling observations described by KP (1997), the geologic overview report by Golder (2015e), the TSF detailed design report by Golder (2015f), and the hydrogeological assessment and data review for the mine site by AMEC (2013).

3.3.1.2 Topography

The main area of the mine is a topographic high, centred on Polley Mountain, which reaches an elevation of approximately 1,250 masl. This topographic high is adjacent to the Cariboo-Springer Pit and is bounded to the northeast by Polley Lake and to the southwest by Bootjack Lake. The TSF is located about 3 km southeast of the mill in a topographically low area with an original ground elevation of approximately 920 to 940 masl. The current crest of the dam embankment is approximately 967 masl, except for the area in Corner 1, which has a crest of 950 masl.

3.3.1.3 Local Geology

The area of the open pits (e.g., Wight, Boundary, Springer, Cariboo) is underlain by monzonite bedrock that has been intruded by hydrothermal breccias and intersected by northwest–southeast striking faults. The bedrock in the area of Springer and Cariboo pits is overlain by a discontinuous and relatively thin (i.e., a few metres) layer of overburden of glacio-lacustrine and glacio-fluvial origin, primarily silt/clay. Near the Wight Pit, a thicker zone of overburden was identified between the southeast crest of the pit and Polley Lake, with coarser and more permeable sand/gravel sediments present at depth, directly above bedrock.

The overburden underlying the TSF consists predominantly of glacial till with interbeds of glaciofluvial and glacio-lacustrine sediments. The overburden ranges in thickness from approximately 5 m along a bedrock knoll near the South Embankment to approximately 50 m along portions of the Main Embankment (Golder 2015e, Figures 6 and 9). The underlying shallow bedrock is weathered and/or fractured and predominantly volcanic conglomerate (IMC 1990). The thickness of this weathered bedrock zone is highly variable and is inferred to range from 2 to 43 m (based on borehole logs for the 1996 series monitoring wells [KP 1997] and the 2015 series boreholes [Golder 2015g]). Competent bedrock that underlies the weathered zone consists of Nicola Group volcanics that, according to the local geology map (Logan et al. 2007), likely consist of undivided mafic volcanic and volcanoclastic rocks and/or intrusive rocks (pseudoleucite syenite). Drilling observations in the TSF footprint prior to mining indicated predominately volcanic conglomerate bedrock (IMC 1990).

3.3.1.4 Hydraulic Conductivity

The hydraulic conductivity of the monzonite bedrock in the area of the open pits was found to generally decrease with depth, from approximately mid-10^{-7} m/s to 10^{-6} m/s near the bedrock top, to 10^{-8} m/s at greater depth (Golder 2014). These values indicate that this bedrock has a low, and at greater depth very low, capacity to transmit groundwater (Powers and Corwin 2007). The northwest–southeast striking faults in the area of the Cariboo and Springer pits appear to be well healed and not conductive, whereas in the area of the Wight Pit, faults are associated with seepage that was observed in the southeast wall of this pit. In situ testing completed in the overburden unit that overlies bedrock near the southeast corner of the Wight Pit (Golder 2004) indicated that hydraulic conductivity of coarser materials within this unit is in the 10^{-5} m/s range.

The results of in situ hydraulic conductivity testing in the area of the TSF summarized by KP (1990) indicated an average hydraulic conductivity, calculated as a geometric mean of individual tests, for weathered (shallow) and competent (deep) bedrock of approximately 1×10^{-7} m/s and 1×10^{-8} m/s, respectively. Measured hydraulic conductivity values in the overburden ranged from 5×10^{-6} m/s to 1×10^{-8} m/s, with a geometric mean of approximately 2×10^{-7} m/s.

3.3.1.5 Recharge and Discharge Areas

Groundwater recharge occurs through the infiltration of precipitation in the topographic high area of Polley Mountain and the surrounding slopes, excluding the existing mine pits. The open pits act as sinks for groundwater flow when they are dewatered, and as both sinks and sources of groundwater seepage when flooded to the spillover elevation. The recharge rate along the topographic high near the open pits was estimated during calibration of the groundwater model (Golder 2014) to be approximately 30% of average annual precipitation.

The primary groundwater discharge areas at the mine are Polley Lake to the northeast, Bootjack Lake to the southwest, and Hazeltine and Edney creeks to the southeast. Quesnel Lake, which is the largest lake in the area and approximately 5 km to the east of the mine, along with Bootjack and Polley lakes, strongly control regional groundwater flow and act as significant hydrogeological boundaries.

3.3.1.6 Downgradient Groundwater Use

A search in the MoE's iMapBC online database in May 2016 indicated that there are no mapped aquifers within a radius of 10 km from the mine. The closest mapped aquifer, Fraser Plateau Lave Aquifer No. 124 IIIB (11), is a laterally extensive bedrock unit that was classified as having low demand and moderate vulnerability. The northern terminus of this aquifer is located more than 15 km south of the mine. This database search also showed that water supply wells are not present in the immediate vicinity of the mine. The closest wells are approximately 6 km east, on the eastern shore of Quesnel Lake. The database also contains information on water wells that are located northwest from the mine (near Little Lake) and southwest from the mine (near Gavin Lake) at a distance of at least 7 km. Considering these distances and the fact that several surface water features are between these wells and the mine, it is unlikely that seepage from the mine facilities could reach these wells or the closest mapped aquifer.

3.3.1.7 Tailings Storage Facility Design

The TSF includes one embankment that is approximately 4.8 km in length and is bounded to the west by rising natural ground. The embankment is subdivided into three sections: the Main Embankment, Perimeter Embankment, and South Embankment. Seepage from the tailings through the embankment and foundation is collected in a series of toe and foundation drains, which report to three seepage collection ponds situated next to the outer perimeter of the facility. Prior to the TSF foundation failure, when the TSF was operational, water in the seepage collection ponds (seepage, runoff, and precipitation) was pumped back to the TSF reclamation pond, or was recycled to the mill for use in the milling process (MPMC 2009). Currently, seepage is pumped to the PETBP, from where it is either directed to the WTP for subsequent discharge via a diffuser to Quesnel Lake or used for process water and temporarily stored in the Springer Pit.

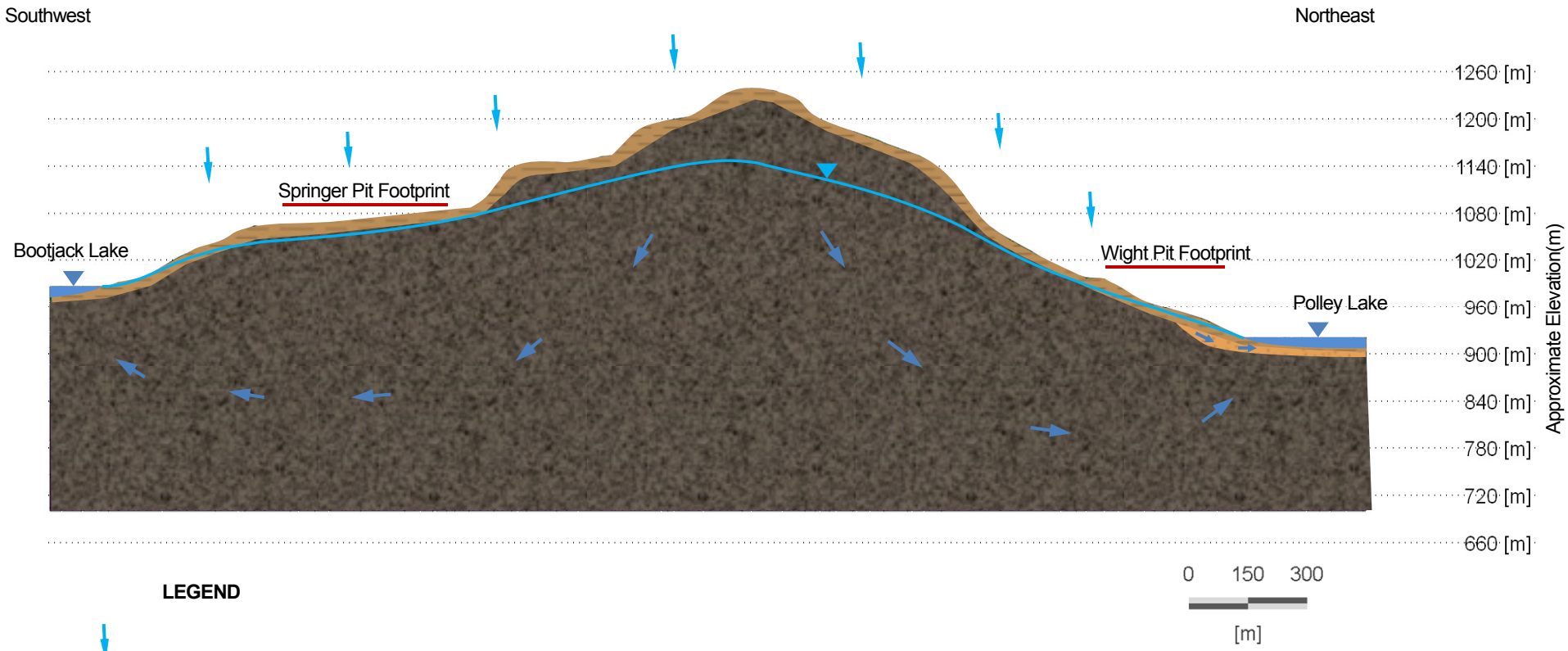
The TSF was generally constructed over low permeability glacial till. Where natural surficial glacial till cover was thin (less than 2 m) and was underlain by glacio-fluvial/glacio-lacustrine sediments, a low permeability glacial till basin liner was constructed (KP 1997).

3.3.2 Groundwater Flow Regime – Pre-mining

A conceptual cross-section showing groundwater conditions near the open pits prior to mining is provided in Figure 3-22. Recharge to groundwater from precipitation along the topographic high resulted in a water table that mounded relatively close to the ground surface and was a subdued replica of the topography. At higher elevations, near the present location of the Cariboo Pit, the water table was approximately 30 m below the ground surface, and at lower elevations the water table was within a few metres of the ground surface. The majority of groundwater flow occurred in bedrock with discharge directed southwest towards Bootjack Lake and northeast towards Polley Lake, with both lakes acting as strong hydrogeologic boundaries. Perched groundwater conditions might have existed within pockets of lower permeability overburden along the topographic highs, and a more continuous flow system (fully saturated) was likely active in the thicker overburden zone near the current location of the Wight Pit southeast wall.

The groundwater regime below the TSF footprint prior to construction was assessed based on hydraulic head measurements collected by KP (1990). Based on these measurements, the groundwater flow direction prior to the development of the TSF was inferred to be from the west and northwest towards the east and southeast. The water table was observed to be near ground surface, with small artesian pressures noted in the sandy materials underlying or embedded in the surficial till. Upward groundwater flow gradients were measured along the Main and Perimeter embankments, whereas a downward hydraulic gradient was observed beneath a bedrock ridge (topographic high), adjacent to and beneath the South Embankment.

O:\Active_2014\1421\1411734 Mount Polley\Ph 16000 LT TAR\4 - Hydrogeology 4001-4003\Baseline Hydrogeology\Figures\Rev0\FIG_3-22 & FIG_3-25.PPTX



LEGEND

- Recharge from Direct Precipitation
- Water Table
- Inferred Groundwater Flow Direction
- Bedrock
- Overburden (discontinuous silts/clays)
- Overburden (sand and gravel)

NOTES:
SCHEMATIC ONLY
Scale is approximate and vertical exaggeration is 2:1.
Arrows only show the direction of groundwater flow and their size is not proportional to the flow magnitude.

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-09-15
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
CONCEPTUAL HYDROGEOLOGICAL MODEL PRE-MINING CONDITIONS

PROJECT No.	PHASE	Rev.	FIGURE NO
1411734	**16000**	**0**	**3-22**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

3.3.3 Pre- and Post-Foundation Failure Groundwater Conditions

Groundwater conditions for the mine both prior to and following the TSF foundation failure were assessed based on recent historical data from the mine groundwater monitoring program. The groundwater monitoring program has been ongoing since 1995, with the objectives to monitor direction, quantity, and quality of groundwater seepage near the mine facilities. As part of this program, 14 groundwater well pairs (each with one deep and one shallow) and four single wells surrounding the mine and the TSF are monitored monthly to annually, depending on location. The monitoring well locations are shown in Figure 3-23.

The groundwater regime below the mine and the TSF immediately prior to the TSF foundation failure was inferred from the May 2014 hydraulic head measurements in the monitoring wells and surface-water level elevations in the surrounding lakes, together with the measured or inferred water level elevations in the mine pits. The May 2014 hydraulic heads are shown in Figure 3-24.

SCALE IN METERS

0 1000 2000 3000 4000

LEGEND

- EXISTING OR PRE-EXISTING MONITORING WELLS

NOTES

1. WELL 95R-4 DECOMMISSIONED IN 2012.
2. WELL GW96-5a/b DESTROYED DUE TO 2013 TSF EXPANSION.
3. WELLS GW96-6 AND GW96-9 DEACTIVATED IN 2006.
4. WELL GW96-8a/b DESTROYED DUE TO ROAD CONSTRUCTION IN 2012.
5. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY DATUM: NAD 1983 UTM ZONE 10N
6. WELL LOCATIONS BASED ON UPDATED CO-ORDINATES FROM THE 2016 SURVEY BY MPMC EXCEPT FOR THE FOLLOWING INACCESSIBLE LOCATIONS DURING THE SURVEY: GW96-5a/b, GW96-6, GW96-8a/b, GW96-9 AND GW14-1.

TSF - Tailings Storage Facility
SERDS - Southeast Rock Disposal Site
PESCP - Perimeter Embankment Seepage Collection Pond
MESCP - Main Embankment Seepage Collection Pond
PAG - Potentially Acid Generating
NEZ - Northeast Zone
EAST DUMP/RDS – East Dump and Rock Disposal Site

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
SITE PLAN AND LOCATION OF GROUNDWATER MONITORING STATIONS FOR THE MPMC MONITORING PROGRAM

YYYY-MM-DD	2016-03-25
PREPARED	CR
DESIGN	CR
REVIEW	WZ
APPROVED	WZ

PROJECT No.	PHASE	Rev.	FIGURE NO.
1411734	15000	0	3-23

SCALE IN METERS

0 1000 2000 3000 4000

LEGEND

- EXISTING OR PRE-EXISTING MONITORING WELLS
- SHALLOW GROUNDWATER LEVEL ELEVATION CONTOURS (MASL)
- INFERRED SHALLOW GROUNDWATER FLOW DIRECTION
- 950.00 SHALLOW WELL (OVERBURDEN OR SHALLOW BEDROCK) WATER LEVEL ELEVATION (MASL)
- 950.00 DEEPER WELL (BEDROCK) WATER LEVEL ELEVATION (MASL)

NOTES

1. WATER LEVELS RECORDED MAY 2014 UNLESS OTHERWISE SPECIFIED.
2. GROUNDWATER LEVEL ELEVATIONS BASED ON MARCH 2016 WELL SURVEY DATA (TOP-OF-PIPE ELEVATIONS) PROVIDED BY MPMC, EXCEPT AT GW96-5. GROUNDWATER ELEVATIONS AT GW96-5 ARE APPROXIMATE ONLY (BASED ON PREVIOUS GROUND SURFACE ELEVATION DATA PROVIDED BY MPMC).
3. WELL 95R-4 DECOMMISSIONED IN 2012.
4. WELL GW96-5a/b DESTROYED DUE TO 2013 TSF EXPANSION.
5. WELLS GW96-6 AND GW96-9 DEACTIVATED IN 2006.
6. WELL GW96-8a/b DESTROYED DUE TO ROAD CONSTRUCTION IN 2012.
7. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY DATUM: NAD 1983 UTM ZONE 10N

TSF - Tailings Storage Facility
SERDS - Southeast Rock Disposal Site
PESCP - Perimeter Embankment Seepage Collection Pond
MESCP - Main Embankment Seepage Collection Pond
PAG - Potentially Acid Generating
NEZ - Northeast Zone
EAST DUMP/RDS – East Dump and Rock Disposal Site

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
GROUNDWATER LEVELS AND SHALLOW GROUNDWATER FLOW DIRECTIONS – MAY 2014

YYYY-MM-DD	2016-03-25
PREPARED	CR
DESIGN	CR
REVIEW	WZ
APPROVED	WZ

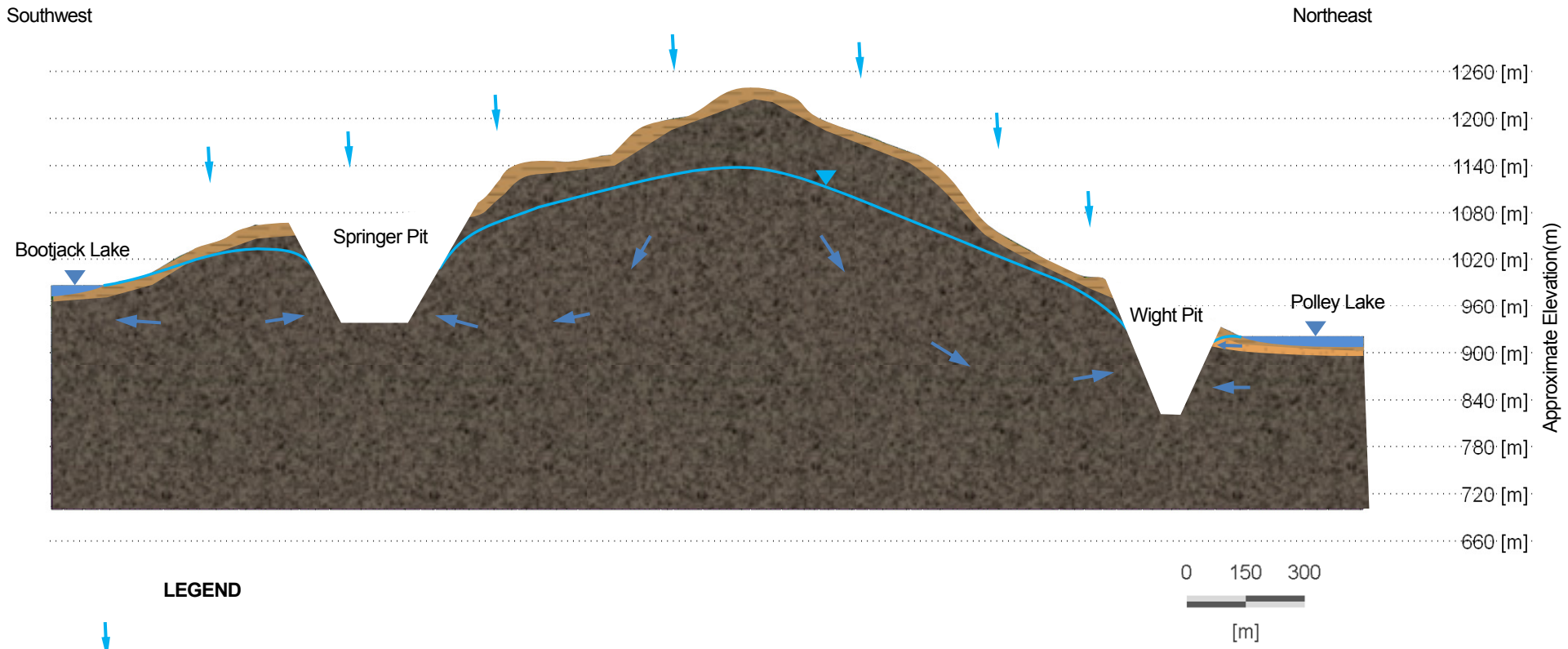
PROJECT No.	PHASE	Rev.	FIGURE NO.
1411734	16000	0	3-24

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THEN SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

3.3.3.1 Open Pit Area

A conceptual cross-section depicting groundwater conditions at the mine that have developed during mining near the open pits is provided in Figure 3-25. Once the floors of the open pits were lowered below the water table, they started to act as sinks for groundwater flow. Immediately prior to the TSF foundation failure, the Springer Pit and the Wight Pit were operated in a dewatered state, the Cariboo Pit was flooded, and the reclamation water pond in the TSF covered almost all of the tailings surface. Under these conditions, the Springer Pit and the Wight Pit acted as sinks for groundwater flow, with groundwater directed in a radial pattern towards the pit walls. Inflow to the Springer Pit occurred primarily through bedrock, with the majority of this inflow originating from the precipitation-driven recharge from the topographic high area of Polley Mountain and from the flooded Cariboo Pit located adjacent to it. An approximately northwest–southeast trending groundwater divide was inferred to exist between the Springer Pit and Bootjack Lake; therefore, the Springer Pit was not inferred to be recharged by lake water. Due to the relatively close proximity of the Wight Pit to Polley Lake, groundwater inflow to this pit likely included recharge from Polley Lake that occurred primarily through the overburden unit and, to a lesser degree, through bedrock, as well as precipitation-driven recharge from the topographic high area of Polley Mountain. Groundwater inflow to the Springer Pit and Wight Pit that MPMC observed during mining was relatively low and in reasonable agreement with permeability testing conducted near these pits.

O:\Active_2014\1421\1411734 Mount Polley\Ph 16000 LT TAR\4 - Hydrogeology 4001-4003\Baseline Hydrogeology\Figures\Rev0\FIG_3-22 & FIG_3-25.PPTX



LEGEND

- Recharge from Direct Precipitation
- Water Table
- Inferred Groundwater Flow Direction
- Bedrock
- Overburden (discontinuous silts/clays)
- Overburden (sand and gravel)

NOTES:
SCHEMATIC ONLY
Scale is approximate and vertical exaggeration is 2:1.
Arrows only show the direction of groundwater flow and their size is not proportional to the flow magnitude.

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-09-15
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
CONCEPTUAL HYDROGEOLOGICAL MODEL CONDITIONS DURING MINING

PROJECT No.	PHASE	Rev.	FIGURE NO
1411734	**16000**	**0**	**3-25**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

Water table elevations near the open pits were inferred to be highest below the central, topographic high area of Polley Mountain. From this area, groundwater was inferred to be directed radially outwards towards Polley Lake to the east, Bootjack Lake to the west, the TSF to the south, a drainage channel to the southeast (between the open pit area and the TSF) that drains into the south end of Polley Lake, and the area northwest of the open pits.

The local groundwater flow directions, as presented in Figure 3-24, near individual mine waste and storage facilities were as follows:

- **Temporary NW PAG Stockpile**—towards the northwest and west, in the direction of Bootjack Lake, with a small component of flow towards the dewatered Springer Pit.
- **#1 Ore and Cariboo Ore stockpiles**—towards the southwest, in the direction of Bootjack Lake.
- **Mill area**—towards the southwest, south, and southeast, in the direction of Bootjack Lake and the drainage channel between the open pit area and the TSF.
- **High Oxide Stockpile, Pond Zone soil stockpile, and SERDS and associated soil stockpile**—towards the southeast in the direction of Polley Lake and/or the drainage channel between the open pit area and the TSF.
- **East Dump / Rock Disposal Site (RDS)**—towards the southeast, east, and northeast, in the direction of Polley Lake.
- **Northeast Zone (NEZ) Dump**—towards the east in the direction of Polley Lake.
- **NEZ Soil Stockpile**—towards the east-northeast in the direction of Polley Lake.
- **North Bell Dump**—because it is located near the centre of the mine, groundwater flow from this facility is likely radially outwards, towards the southwest to northeast, in the direction of the Springer Pit, Bootjack Lake, the Wight Pit, and Polley Lake.
- **Boundary Dump**—towards the north-northeast, in the direction of the Wight Pit.

Comparison of the shallow versus deeper hydraulic heads at the paired well locations situated within the lower lying areas of the mine perimeter (near the lakes) indicated that the vertical component of groundwater flow was generally directed downward except at two locations close to the northeast side of Bootjack Lake (GW11-1a/b and GW12-2a/b), where the vertical groundwater flow component was upward.

Since the TSF foundation failure, the Springer Pit has become partially flooded because of its use for water and tailings storage, while the Cariboo Pit has been dewatered as required for continued operations and the Wight Pit has remained dewatered. Under these conditions, the Wight Pit continues to act as a sink for groundwater flow, whereas the Springer Pit and the Cariboo Pit act only as partial sinks, with the magnitude of the inward and outward hydraulic gradients dependent on the water level in the pits. The site-wide directions of groundwater flow under these conditions are inferred to be similar to those observed under operational conditions, described above.

3.3.3.2 Tailings Storage Facility Area

Prior to the TSF foundation failure, upgradient groundwater flow towards the TSF was generally from the northwest, originating from the area of Bootjack Lake and the topographic high area of Polley Mountain. Thus, groundwater inflow to the TSF also included recharge from Bootjack Lake. Groundwater outflow from the TSF prior to the foundation failure, when the pond was at an elevation of approximately 965 masl, was generally radially directed outward from the TSF, with some groundwater flow east and south towards Hazeltine Creek, and some groundwater flow southwest towards Edney Creek and its tributaries.

The hydraulic heads measured at the perimeter of the TSF in May 2014 (pre-foundation failure) were highest on the northwest side of the TSF and lowest on the southeast side of the facility, as shown in Figure 3-24. Comparison of the shallow versus deeper hydraulic heads at the paired well locations indicated that the vertical component of groundwater flow was generally directed upward on the southwest side of the TSF and downward on the east side, with a strong downward gradient on the southeast side.

Hydraulic heads measured in monitoring wells between October and November 2015 were reviewed to assess the groundwater flow regime near the TSF after the foundation failure, which included the subsequent draining of the tailings and change in water management (i.e., water storage in the Springer Pit rather than the TSF). Overall, these flow conditions were inferred to be somewhat similar to pre-construction conditions, with groundwater flow generally directed from the northwest and southwest towards the east-southeast across the facility. The primary difference between the pre- and post-foundation failure regime was that the groundwater high associated with the TSF pond was reduced after the foundation failure, with less groundwater outflow from the TSF towards the southwest. However, the groundwater levels within the TSF footprint are currently higher (i.e., above the pre-construction ground surface elevation) due to the presence of the tailings.

3.3.3.3 Seasonal Variability in Hydraulic Heads

Review of hydraulic head measurements recorded at the monitoring wells since the start of the monitoring program indicated that hydraulic heads are generally higher (shallower) in May and lower (deeper) in October on a year-to-year basis. Prior to the TSF dam foundation failure, the seasonal variation in hydraulic heads (May vs. October) at the monitoring well locations varied between approximately 0 m and 2.4 m with the following exceptions: the seasonal variation was up to 3.5 m (in May/October 2013) for the well pair between the Springer Pit and Bootjack Lake (GW12-2a/b) (Figure 3-23) as a result of progressive drawdown during pit dewatering (to facilitate mining operations), and was up to approximately 4.0 m (between October 2012 and May 2013) for the deep well on the south side of the TSF (GW96-3a). The reason for the higher variation at monitoring well GW96-3a is unknown. Overall, the observed seasonal variability in groundwater levels was not inferred to substantially change the groundwater flow directions near the open pit area or the TSF.

3.4 Surface Water Quality

A brief characterization of existing surface water quality in waterbodies located near the mine that could potentially be influenced by mine-related inputs, either during operations or closure, is presented below for Quesnel Lake, Bootjack Lake, Hazeltine Creek, and Polley Lake. Table 3-15 provides information related to the description and rationale of survey study design, including sampling locations, collection methods, and identification of analytical laboratories used, analytical methods, and quality assurance/quality control (QA/QC) procedures; details can be found in the original reports cited. Water quality samples were collected by MPMC staff following the *Post TSF-Breach Monitoring Plan – 2015* (MPMC 2015b) in accordance with relevant MoE guidance cited in MEM and MoE (2016).

The following time periods were considered most appropriate to characterize baseline water quality for the purposes of the impact assessment. Baseline water quality data were intended to represent existing conditions prior to the proposed effluent discharge. These data were also used as the baseline input to the WQM developed for this TAR (Appendix D) to make water quality predictions for operations, closure, and post-closure assessment periods.

- **Quesnel Lake**—The 2015 data collected in the West Basin, east of the sill near Cariboo Island, were summarized. These data represent the upstream background water quality of Quesnel Lake flowing into the West Basin. In 2015, turbidity was not elevated east of the sill and was lower than the background level of 1 nephelometric turbidity unit (NTU) referred to by the MoE in Pollution Abatement Order 107461 (MoE 2015b).
- **Bootjack Lake**—As discussed in Section 3.4.2, Bootjack Lake is not considered to have been impacted by mine operations or by the TSF foundation failure. The earliest available data for this lake include one sampling event in 2001, with routine monitoring beginning in 2006. Therefore, baseline water quality was defined by the 2001 through 2015 dataset, with the exception of selenium. For selenium, only the 2015 data were used because samples from previous years were analyzed using method detection limits (MDLs) that were higher than BC WQGs (MoE 2015a). Data collected prior to 2015 were below the MDL applicable at the time (lowest MDL: less than 0.0005 milligrams per liter [mg/L]). More recent analyses with lower detection limits in 2015 resulted in detected concentrations less than 0.0005 mg/L selenium.
- **Polley Lake**—The 2015 data were summarized to provide a conservative input to the WQM to reflect current conditions in the lake, as concentrations of some parameters have remained elevated above pre-TSF foundation failure concentrations. Data collected in 2014 were not appropriate to define existing conditions for the impact assessment because these data either reflected conditions before the TSF foundation failure or reflected conditions in the immediate aftermath of the TSF foundation failure. Neither of these time periods represent existing conditions.

- **Hazeltine Creek**—The 2015 data were summarized to provide conservative input to the WQM to reflect current conditions in Hazeltine Creek, as concentrations of some parameters have remained elevated above pre-TSF foundation failure concentrations. Data were restricted to June through November 2015 to reflect conditions after reconstruction of the creek channel was completed, but prior to the discharge of treated effluent from Springer Pit to the creek. To provide a longer time series to characterize this baseline (in accordance with MoE guidance [2012]), data were supplemented with monitoring data from stations upstream of the effluent discharge between 1 December 2015 and 4 April 2016 (most recent available data). Data collected during or prior to 2014 either reflected conditions before the TSF foundation failure or reflected conditions immediately after the TSF foundation failure, and do not represent existing conditions. These data were therefore not used to characterize baseline water quality in Hazeltine Creek. While not used to describe baseline conditions, data collected by the MoE along Polley Flats were used to derive model inputs to account for a loading source from tailings that remain along Hazeltine Creek.

The following summary statistics were calculated for the resulting datasets for each waterbody to represent existing conditions:

- number of samples
- number and percentage of samples with values below the MDL
- minimum, median, arithmetic mean, 95th percentile, and maximum concentrations

Minimum, maximum, and median values were calculated using absolute values; that is, when the summary statistic corresponded to a non-detect value in the dataset, the MDL was reported. For values reported as less than the MDL, the MDL was substituted for calculation of the mean and 95th percentile. A mean was not calculated for parameters with greater than 50% non-detect values. A median was only reported where a mean was not calculated. A 95th percentile was not calculated for parameters with less than 10 measurements or with greater than 95% non-detect values.

Baseline concentrations were defined as arithmetic mean concentrations or median where a mean was not calculated. Baseline data were compared to applicable BC drinking water guidelines and BC 30-day WQGs (MoE 2016a) protective of aquatic life; the maximum WQG was substituted where a 30-day WQG did not exist, as indicated in summary tables provided in Sections 3.4.1 through 3.4.4. WQGs calculated based on toxicity modifying factors (e.g., hardness, pH, chloride) were calculated based on corresponding toxicity modifying factor values described in the summary statistics for each waterbody.

BC WQGs protective of the most sensitive receiving environment use (generally aquatic life) were used for screening water quality.

Table 3-15: Surface Water Quality Characterization, Existing Conditions: Location of Supporting Detailed Information Required by MoE (2014a,b)

Information	Quesnel Lake	Bootjack Lake	Hazeltine Creek	Polley Lake
Baseline study design – description and rationale [(a,b)]	MPMC (2015b)	MPMC Annual Reporting	MPMC (2015b)	MPMC (2015b)
Identity of certified laboratories that analyzed the samples	MPMC (2015b)	MPMC Annual Reporting	MPMC (2015b)	MPMC (2015b)
Summary table of sample site locations, sample dates, sample size, and rationale/purpose for each site	MPMC (2015b)	MPMC Annual Reporting	MPMC (2015b)	MPMC (2015b)
Identification of which data reflect un-impacted baseline versus conditions influenced by development	Golder (2016c.d)	MPMC Annual Reporting	Golder (2016c.d)	Golder (2016c.d)
Detailed map of sampling locations	MPMC (2015b)	MPMC Annual Reporting	MPMC (2015b)	MPMC (2015b)
Illustration of spatial and temporal variance in key parameters using graphs	Golder (2016c.d)	MPMC Annual Reporting	Golder (2016c.d)	Golder (2016c.d)
Summary of available baseline data and comparison to water quality guidelines	This TAR	This TAR	This TAR	This TAR

(a) Unless otherwise stated, study design description and rationale includes parameters analyzed, field instrumentation, sampling frequency and period, site locations, statistical considerations, and collection methods and quality assurance/quality control protocols.

(b) Sampling sites that appear to be influenced by groundwater discharge, or may be in the future, were not identified in any of the baseline reports.

TAR = Technical Assessment Report; MPMC = Mount Polley Mining Corporation.

3.4.1 Quesnel Lake

The average residence time of Quesnel Lake is approximately 10 years, but is estimated to be 90 days within the West Basin (Laval et al. 2008). Quesnel Lake is oligotrophic, with low primary productivity, and total dissolved solids (TDS). The West Basin has vertical mixing typical of temperate lakes, with thermal stratification for most of the year, interrupted by brief turnover periods in the spring and the fall when vertical density gradients are lowest. The physical limnology of the West Basin is described more fully in Laval et al. (2008) and Tetra Tech EBA Inc. (Tetra Tech 2015).

Levels of total suspended solids (TSS), turbidity, and total metals previously elevated in the West Basin as a result of the TSF foundation failure remained below WQGs throughout 2015 east of Cariboo Island (Golder 2016c,d). All mean constituent concentrations were below applicable BC WQGs in Quesnel Lake baseline water quality measured east of Cariboo Island in 2015 (Table 3-16).

Table 3-16. Summary of Water Quality Statistics for Quesnel Lake: Existing Conditions, East of Cariboo Island (2015)

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Quesnel Lake							
		Maximum	Notes	30-day Average	Notes	Number of Samples	Number of Samples <MDL	Percent of Samples <MDL	Minimum[s]	Median[s]	Mean[t]	95th[u,v]	Maximum[s]
Physical Parameters													
pH (field)	pH units	6.5 - 8.5	A	6.5 - 9.0	A	60	0	0	7.3	NC	7.6	8	8.7
Temperature (field)	°C	-	-	-	-	60	0	0	3.1	NC	6.6	19	20
Conductivity (field)	µs/cm	-	-	-	-	60	0	0	59	NC	128	184	202
Turbidity	NTU	+5 NTU	A	+2 NTU from background	A, c	61	0	0	0	NC	1.5	2.3	48
Hardness (Dissolved)	mg/L	-	-	-	-	90	0	0	48	NC	54	56	57
Total Dissolved Solids	mg/L	-	-	-	-	90	0	0	60	NC	69	77	85
Total Suspended Solids	mg/L	-	-	+5 mg/L from background	A, c	90	89	99	<3	<3	NC	<3	12
Major Ions													
Alkalinity, Total (as $CaCO_3$)	mg/L	-	-	see note	W, d	90	0	0	40	NC	50	52	53
Chloride	mg/L	250	A	150	A	90	90	100	<0.5	<0.5	NC	NC	<0.5
Fluoride	mg/L	1.5	A	1.0 - 1.1	A, Max, e	90	0	0	0.025	NC	0.033	0.036	0.036
Sulphate	mg/L	-	-	218	A, f	90	0	0	4.5	NC	6.3	6.5	6.6
Nutrients													
Ammonia	mg/L (as N)	-	-	1.8	A, g	90	88	98	<0.005	<0.005	NC	NC	0.013
Nitrate	mg/L (as N)	10	A	3	A	90	0	0	0.044	NC	0.13	0.15	0.15
Nitrite	mg/L (as N)	1	A	0.02	A, h	90	90	100	<0.001	<0.001	NC	NC	<0.001
Total Phosphorus	mg/L	0.01	A, lakes	0.005 - 0.015 in lakes	A	90	51	57	<0.002	<0.002	NC	0.0038	0.098
Total Metals													
Aluminum	mg/L	-		5	A, WW, Max	90	0	0	0.0081	NC	0.019	0.034	0.22
Antimony	mg/L	0.014	W	0.0009	W	90	85	94	<0.0001	<0.0001	NC	<0.0001	0.00013
Arsenic	mg/L	0.025	Interim	0.005	A	90	10	11	<0.0001	NC	0.00012	0.00015	0.00022
Barium	mg/L	-	-	1	W	90	0	0	0.0047	NC	0.0053	0.0058	0.0081
Beryllium	mg/L	0.004	W	0.00013	W	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Boron	mg/L	5	A	1.2	A	90	89	99	<0.01	<0.01	NC	NC	0.01
Cadmium	mg/L	-	-	no total WQG, see dissolved	A	90	86	96	<0.000005	<0.000005	NC	NC	<0.00001
Calcium	mg/L	-	-	see note	W, d	90	0	0	16	NC	18	19	19
Chromium	mg/L	-	-	0.001	W, i	90	90	100	<0.0005	<0.0005	NC	NC	<0.0005
Cobalt	mg/L	-	-	0.004	A	90	89	99	<0.0001	<0.0001	NC	NC	0.00017
Copper	mg/L	0.5	A	0.002	A, j	90	5	5.6	0.0005	NC	0.00085	0.0012	0.0073
Iron	mg/L	-	-	1	A, Max	90	82	91	<0.03	<0.03	NC	0.04	0.17
Lead	mg/L	0.05	A	0.005	A, k	90	46	51	<0.00005	0.000053	NC	0.0004	0.0031
Lithium	mg/L	-	-	-	-	90	58	64	<0.0005	<0.001	NC	0.0012	0.0016
Magnesium	mg/L	-	-	-	-	90	0	0	1.9	NC	2	2.1	2.3
Manganese	mg/L	-	-	0.85	A, l	90	0	0	0.00038	NC	0.0013	0.0027	0.0089
Mercury	mg/L	0.001	A	0.00001	A, m	10	10	100	<0.000005	<0.000005	NC	NC	<0.000005
Molybdenum	mg/L	0.25	A	1	A	90	0	0	0.00027	NC	0.00035	0.00043	0.00051
Nickel	mg/L	-	-	0.025	W, n	90	88	98	<0.0005	<0.0005	NC	NC	0.00052
Selenium	mg/L	0.01	A	0.002	A	90	10	11	0.000065	NC	0.00014	<0.0005	<0.0005
Silicon	mg/L	-	-	-	-	90	0	0	1.4	NC	1.7	1.9	2.1
Silver	mg/L	-	-	0.00005	A, o	90	90	100	<0.00001	<0.00001	NC	NC	<0.00001
Sodium	mg/L	-	-	-	-	90	0	0	0.86	NC	0.96	1	1.5
Strontium	mg/L	-	-	-	-	90	0	0	0.11	NC	0.13	0.14	0.15
Thallium	mg/L	0.002	A	0.0008	W	90	90	100	<0.00001	<0.00001	NC	NC	<0.00001
Tin	mg/L	-	-	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Titanium	mg/L	-	-	-	-	90	89	99	<0.01	<0.01	NC	NC	0.011
Uranium	mg/L	-	-	0.0085	W	90	0	0	0.00014	NC	0.00016	0.00017	0.00018
Vanadium	mg/L	-	-	-	-	90	89	99	<0.0005	<0.0005	NC	NC	<0.001
Zinc	mg/L	5	A	0.0075	A, p	90	90	100	<0.003	<0.003	NC	NC	<0.003
Dissolved Metals													
Aluminum	mg/L	0.2	A	0.05	A, q	90	0	0	0.0043	NC	0.0063	0.0091	0.011
Antimony	mg/L	0.014	W	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Arsenic	mg/L	0.025	Interim	-	-	90	58	64	<0.0001	<0.0001	NC	0.00012	0.00013
Barium	mg/L	-	-	-	-	90	0	0	0.0047	NC	0.0051	0.0054	0.0058
Beryllium	mg/L	0.004	W	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Boron	mg/L	5	A	-	-	90	90	100	<0.01	<0.01	NC	NC	<0.01
Cadmium	mg/L	-	-	0.0001	A, r	90	89	99	<0.000005	<0.000005	NC	NC	<0.00001
Calcium	mg/L	-	-	-	-	90	0	0	16	NC	18	19	19
Chromium	mg/L	-	-	-	-	90	90	100	<0.0005	<0.0005	NC	NC	<0.0005
Cobalt	mg/L	-	-	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Copper	mg/L	0.5	A	-	-	90	7	7.8	<0.0005	NC	0.00071	0.001	0.002
Iron	mg/L	-	-	0.35	A, Max	90	90	100	<0.03	<0.03	NC	NC	<0.03
Lead	mg/L	0.05	A	-	-	90	33	37	<0.00005	NC	0.00011	0.00028	0.00071
Lithium	mg/L	-	-	-	-	90	64	71	0.00069	<0.001	NC	0.0011	0.0013
Magnesium	mg/L	-	-	-	-	90	0	0	1.9	NC	2	2.1	2.3
Manganese	mg/L	-	-	-	-	90	2	2.2	0.000086	NC	0.00034	0.00099	0.0028
Mercury	mg/L	-	-	-	-	10	10	100	<0.000005	<0.000005	NC	NC	<0.000005
Molybdenum	mg/L	0.25	A	-	-	90	0	0	0.00026	NC	0.00032	0.00037	0.00045
Nickel	mg/L	-	-	-	-	90	90	100	<0.0005	<0.0005	NC	NC	<0.0005
Potassium	mg/L	-	-	-	-	90	0	0	0.43	NC	0.48	0.52	0.53
Selenium	mg/L	0.01	A	-	-	90	10	11	0.000059	NC	0.00014	<0.0005	<0.0005
Silicon	mg/L	-	-	-	-	90	0	0	1.4	NC	1.7	1.8	2
Silver	mg/L	-	-	-	-	90	90	100	<0.00001	<0.00001	NC	NC	<0.00001
Sodium	mg/L	-	-	-	-	90	0	0	0.82	NC	0.94	0.99	1.2
Strontium	mg/L	-	-	-	-	90	0	0	0.11	NC	0.13	0.14	0.14
Thallium	mg/L	0.002	A	-	-	90	90	100	<0.00001	<0.00001	NC	NC	<0.00001
Tin	mg/L	-	-	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Titanium	mg/L	-	-	-	-	90	90	100	<0.01	<0.01	NC	NC	<0.01
Uranium	mg/L	-	-	-	-	90	0	0	0.00013	NC	0.00015	0.00016	0.00017
Vanadium	mg/L	-	-	-	-	90	90	100	<0.0005	<0.0005	NC	NC	<0.001
Zinc	mg/L	5	A	-	-	90	89	99	<0.003	<0.003	NC	NC	<0.0031

Notes:

A = approved guideline, W = working guideline, Max = maximum guideline used, Min = Minimum concentration requirement based on life stage, WW = wildlife water supply guidelines

NC = not calculated, "<" reported value is less than method detection limit (MDL)

Underlined value	= exceeds maximum BC Drinking Water Quality Guidelines
Shaded value	= exceeds 30-day average BC Water Quality Guidelines

a) BC WQ guideline for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs do not exist

b) BC Water Quality Guidelines (BC WQG). Fresh Water Aquatic Life 30-day Guidelines used, except where noted (e.g., molybdenum, total aluminum). Maximum (Max) guidelines substituted where 30-d guidelines do not exist.

c) For guideline comparison, Quesnel Lake background turbidity is assumed equal to 1 NTU and background TSS is equal to the MDL of 3.0 mg/L.

d) Waterbody is highly sensitive to acid inputs when alkalinity <10 mg/L (dissolved calcium <4 mg/L); moderately sensitive to acid acid inputs when alkalinity is 10-40 mg/L (dissolved calcium 4-8 mg/L); has low sensitivity to acid inputs when alkalinity >40 mg/L (dissolved calcium >8 mg/L). The more restrictive of calcium or alkalinity applies.

e) Hardness dependent fluoride guideline: BC Max WQG (mg/L) = (-51.73+(92.57log10(hardness))*0.01), 0.4 at hardness 10 mg/L.

f) Hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, 218 at hardness 31-75 mg/L, 309 at hardness 76-180 mg/L, 429 at hardness 181-250 mg/L, determined based on site water at hardness >250 mg/L.

g) pH and temperature dependent ammonia guideline: values selected from Table 4 in BC WQG based on maximum temperature and pH.

h) Chloride (Cl) dependent nitrite guideline: BC 30-d WQG (mg/L) = 0.02 at Cl <2 mg/L, 0.04 at Cl 2-4 mg/L, 0.06 at Cl 4-6 mg/L, 0.08 at Cl 6-8 mg/L, 0.10 at Cl 8-10 mg/L, 0.20 at Cl >10 mg/L.

i) Max guideline is for hexavalent chromium.

j) Hardness dependent copper guideline: BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L, (0.04*hardness/1000) at hardness >50 mg/L.

k) Hardness dependent lead guideline: BC 30-d WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) - 4.704)) / 1000 at hardness >8 mg/L.

l) Hardness dependent manganese guideline: BC 30-d WQG (mg/L) = 0.0044*hardness+0.605.

m) Mercury BC 30-d WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

n) Hardness dependent nickel guideline: BC 30-d WQG (mg/L) = 0.025 at hardness <60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness >180 mg/L.

o) Hardness dependent silver guideline: BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, 0.0015 at hardness >100 mg/L.

p) Hardness dependent zinc guideline: BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

q) pH dependent dissolved aluminum guideline: BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, exp(1.6-3.327*(median pH)+0.402*(median pH2)) at pH <6.5.

r) Hardness dependent dissolved cadmium guideline: BC 30-d WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

s) Minimum, maximum, and median were calculated using absolute values; that is, when the summary statistic corresponded to a non-detect (ND) value in the dataset, the MDL was reported.

t) Mean was not calculated for parameters with greater than 50% non-detect values. A median was reported where a mean was not calculated.

u) 95th percentile was not calculated for parameters with less than 10 samples.

v) 95th percentile was not calculated for parameters with greater than 95% non-detect values.

3.4.2 Bootjack Lake

Bootjack Lake has a surface area of 268 ha, a mean depth of 7.5 m, and a maximum depth of 18 m (IMC 1990). A summary of water quality based on the available data record during mine operations (2001 to 2015) is presented in Table 3-17. This summary indicates that Bootjack Lake is a clear (mean turbidity of 0.92 NTU), circumneutral (mean pH of 7.6) lake with soft water (mean hardness of 43 mg/L as calcium carbonate [$CaCO_3$]). Bootjack Lake can be characterized as a mesotrophic lake with a mean total phosphorus concentration of 0.015 mg/L. Bootjack Lake thermally stratifies during the summer months, with well oxygenated conditions above the thermocline and a progressive decrease in dissolved oxygen with depth below the thermocline (MPMC 2016a). There is no indication that Bootjack Lake water quality was affected by the TSF foundation failure, as water quality data from August 2014 and November 2014 (post-TSF foundation failure), were similar to data collected prior to and including May 2014 (pre-TSF foundation failuire) (MPMC 2016a).

With respect to existing conditions, mean concentrations of all constituents listed in Table 3-17 were below applicable BC WQGs, with the exception of total copper and total phosphorus. The 2001 to 2015 mean total copper concentration in Bootjack Lake (0.0027 mg/L) was marginally above the 30-day BC WQG for total copper (0.002 mg/L) protective of aquatic life. The mean dissolved copper concentration (0.0021 mg/L) was also marginally above this total copper guideline. Bootjack Lake was documented to have total copper concentrations naturally elevated above the BC WQG before the mine was constructed (IMC 1990). The mean total phosphorus concentration exceeded the BC drinking water guideline aesthetic value, but was within the limits of the BC aquatic life guideline (i.e., 0.005 to 0.015 mg/L).

Table 3-17. Summary of Water Quality Statistics for Bootjack Lake: 2001 to 2015

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Bootjack Lake							
		Maximum	Notes	30-day Average	Notes	Number of Samples	Number of Samples < MDL	Percent of Samples < MDL	Minimum[t]	Median[t]	Mean[u]	95th[v,w]	Maximum[t]
Physical Parameters													
pH (field)	pH units	6.5 - 8.5	A	6.5 - 9.0	A	166	0	0	6.4	NC	7.6	8.4	9.3
Temperature (field)	°C	-	-	-	-	138	0	0	0.29	NC	12	21	23
Conductivity (field)	µs/cm	-	-	-	-	162	0	0	51	NC	90	134	218
Turbidity	NTU	+5 NTU	A	+2 NTU from background	A, c	16	0	0	0.3	NC	0.92	2.0	2.3
Hardness (Dissolved)	mg/L	-	-	-	-	100	0	0	32	NC	43	54	65
Total Dissolved Solids	mg/L	-	-	-	-	97	0	0	3.8	NC	63	82	217
Total Suspended Solids	mg/L	-	-	+5 mg/L from background	A, c	104	80	77	<3.0	<3.0	NC	4.5	158
Major Ions													
Alkalinity, Total (as $CaCO_3$)	mg/L	-	-	see note	W, d	104	0	0	23	NC	41	47	57
Chloride	mg/L	250	A	150	A	70	0	0	0.94	NC	1.4	1.7	2.0
Fluoride	mg/L	1.5	A	0.9 - 1.2	A, Max, e	47	0	0	0.051	NC	0.065	0.12	0.13
Sulphate	mg/L	-	-	218 - 218	A, f	104	0	0	2.2	NC	4.0	5.5	6.0
Nutrients													
Ammonia	mg/L (as N	-	-	1.8	A, g	104	57	55	<0.005	<0.005	NC	0.040	0.078
Nitrate	mg/L (as N	10	A	3	A	93	59	63	<0.005	<0.005	NC	0.077	0.12
Nitrite	mg/L (as N	1	A	0.02 - 0.02	A, h	93	84	90	<0.001	<0.001	NC	0.0018	0.006
Total Phosphorus	mg/L	0.01	A, lakes	0.005 - 0.015 in lakes	A	102	0	0	0.0036	NC	0.015	0.027	0.063
Total Metals													
Aluminum	mg/L	-	-	5	A, WW, Max	100	0	0	0.0044	NC	0.026	0.052	0.23
Antimony	mg/L	0.014	W	0.0009	W	100	60	60	0.00009	<0.0001	NC	0.00013	0.00019
Arsenic	mg/L	0.025	Interim	0.005	A	100	0	0	0.00024	NC	0.00038	0.00068	0.0012
Barium	mg/L	-	-	1	W	100	0	0	0.013	NC	0.018	0.023	0.028
Beryllium	mg/L	0.004	W	0.00013	W	100	100	100	<0.00005	<0.0001	NC	NC	<0.0005
Boron	mg/L	5	A	1.2	A	97	0	0	0.039	NC	0.047	0.059	0.067
Cadmium	mg/L	-	-	no total WQG, see dissolved	A	100	93	93	<0.000005	<0.00001	NC	<0.00005	0.000051
Calcium	mg/L	-	-	see note	W, d	100	0	0	9.8	NC	13	17	20
Chromium	mg/L	-	-	0.001	W, i	100	98	98	<0.0002	<0.0005	NC	NC	0.0013
Cobalt	mg/L	-	-	0.004	A	100	97	97	<0.00002	<0.0001	NC	NC	0.00013
Copper	mg/L	0.5	A	0.002 - 0.003	A, j	100	0	0	0.0016	NC	0.0027	0.0041	0.010
Iron	mg/L	-	-	1	A, Max	100	13	13	<0.03	NC	0.097	0.27	0.42
Lead	mg/L	0.05	A	0.004 - 0.005	A, k	100	80	80	<0.00005	<0.00005	NC	0.00012	0.00077
Lithium	mg/L	-	-	-	-	100	97	97	<0.0002	<0.001	NC	NC	<0.005
Magnesium	mg/L	-	-	-	-	99	0	0	1.8	NC	2.4	3	3.7
Manganese	mg/L	-	-	0.74 - 0.89	A, l	100	0	0	0.0015	NC	0.086	0.44	1.4
Mercury	mg/L	0.001	A	0.00001	A, m	3	3	100	*<0.00005*	*<0.00005*	NC	NC	*<0.00005*
Molybdenum	mg/L	0.25	A	1	A	100	0	0	0.00078	NC	0.0011	0.0013	0.002
Nickel	mg/L	-	-	0.03 - 0.07	W, n	100	94	94	<0.0005	<0.0005	NC	0.00053	0.0045
Selenium	mg/L	0.01	A	0.002	A, s	10	0	0	0.00016	NC	0.00018	0.00020	0.00020
Silicon	mg/L	-	-	-	-	100	0	0	0.47	NC	1.6	3.1	3.5
Silver	mg/L	-	-	0.0001	A, o	100	96	96	<0.00001	<0.00001	NC	NC	0.000018
Sodium	mg/L	-	-	-	-	100	0	0	2.1	NC	2.5	3.1	3.8
Strontium	mg/L	-	-	-	-	100	0	0	0.096	NC	0.12	0.15	0.18
Thallium	mg/L	0.002	A	0.0008	W	100	100	100	<0.00001	<0.00001	NC	NC	<0.0001
Tin	mg/L	-	-	-	-	100	99	99	<0.00005	<0.0001	NC	NC	0.00011
Titanium	mg/L	-	-	-	-	100	97	97	0.00046	<0.01	NC	NC	<0.01
Uranium	mg/L	-	-	0.0085	W	100	0	0	0.000025	NC	0.00004	0.000053	0.000066
Vanadium	mg/L	-	-	-	-	100	96	96	0.00026	0.001	NC	NC	<0.001
Zinc	mg/L	5	A	0.0075	A, p	100	77	77	<0.001	<0.003	NC	0.0045	0.037
Dissolved Metals													
Aluminum	mg/L	0.2	A	0.05	A, q	71	18	25	<0.001	NC	0.0043	0.013	0.017
Antimony	mg/L	0.014	W	-	-	71	51	72	0.00009	0.0001	NC	0.00012	0.00019
Arsenic	mg/L	0.025	Interim	-	-	71	0	0	0.0002	NC	0.00034	0.00074	0.00086
Barium	mg/L	-	-	-	-	71	0	0	0.0097	NC	0.017	0.020	0.023
Beryllium	mg/L	0.004	W	-	-	71	71	100	<0.00005	<0.00005	NC	NC	<0.0005
Boron	mg/L	5	A	-	-	68	0	0	0.039	NC	0.045	0.051	0.065
Cadmium	mg/L	-	-	0.000091 - 0.00015	A, r	71	67	94	<0.000005	<0.000017	NC	0.00005	<0.00005
Calcium	mg/L	-	-	-	-	71	0	0	11	NC	13	15	17
Chromium	mg/L	-	-	-	-	71	71	100	<0.0002	<0.0005	NC	NC	<0.0005
Cobalt	mg/L	-	-	-	-	71	70	99	<0.00002	0.0001	NC	NC	0.0001
Copper	mg/L	0.5	A	-	-	71	0	0	0.0013	NC	0.0021	0.003	0.004
Iron	mg/L	-	-	0.35	A, Max	71	61	86	<0.005	<0.03	NC	0.037	0.21
Lead	mg/L	0.05	A	-	-	71	62	87	0.00004	<0.00005	NC	0.00014	0.00047
Lithium	mg/L	-	-	-	-	71	66	93	0.0002	<0.005	NC	0.005	<0.005
Magnesium	mg/L	-	-	-	-	71	0	0	2.0	NC	2.3	2.5	3.2
Manganese	mg/L	-	-	-	-	71	0	0	0.00018	NC	0.017	0.044	0.61
Mercury	mg/L	-	-	-	-	nm	-	-	-	-	-	-	-
Molybdenum	mg/L	0.25	A	-	-	71	0	0	0.00072	NC	0.001	0.0012	0.0015
Nickel	mg/L	-	-	-	-	71	71	100	<0.0005	<0.0005	NC	NC	<0.0005
Potassium	mg/L	-	-	-	-	71	0	0	0.40	NC	0.47	0.55	0.68
Selenium	mg/L	0.01	A	-	s	10	0	0	0.00013	NC	0.00016	0.00017	0.00017
Silicon	mg/L	-	-	-	-	71	0	0	0.38	NC	1.5	2.3	3.5
Silver	mg/L	-	-	-	-	71	70	99	<0.00001	<0.00001	NC	NC	0.00002
Sodium	mg/L	-	-	-	-	71	0	0	2.2	NC	2.5	3.3	3.7
Strontium	mg/L	-	-	-	-	71	0	0	0.095	NC	0.12	0.14	0.15
Thallium	mg/L	0.002	A	-	-	71	71	100	<0.00001	<0.00001	NC	NC	<0.0001
Tin	mg/L	-	-	-	-	71	67	94	0.00007	<0.0001	NC	0.0001	0.00089
Titanium	mg/L	-	-	-	-	71	68	96	0.00033	<0.01	NC	NC	<0.01
Uranium	mg/L	-	-	-	-	71	0	0	0.00002	NC	0.000035	0.000046	0.000053
Vanadium	mg/L	-	-	-	-	71	68	96	0.00022	<0.001	NC	NC	0.001
Zinc	mg/L	5	A	-	-	71	55	77	<0.001	0.0027	NC	0.0038	0.0261

Notes:

A = approved guideline, W = working guideline, Max = maximum guideline used, Min = Minimum concentration requirement based on life stage, WW = wildlife water supply guidelines

NC = not calculated, "<" reported value is less than method detection limit (MDL)

Underlined value = exceeds maximum BC Drinking Water Quality Guidelines

Shaded value = exceeds 30-day average BC Water Quality Guidelines

italics = MDL > water guideline

a) BC WQ guideline for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs do not exist

b) BC Water Quality Guidelines (BC WQG). Fresh Water Aquatic Life 30-day Guidelines used, except where noted (e.g., molybdenum, total aluminum). Maximum (Max) guidelines substituted where 30-d guidelines do not exist.

c) For guideline comparison, Bootjack Lake background turbidity is assumed equal to the mean value of 1 NTU and background TSS is equal to the MDL of 3.0 mg/L.

d) Waterbody is highly sensitive to acid inputs when alkalinity <10 mg/L (dissolved calcium <4 mg/L); moderately sensitive to acid acid inputs when alkalinity is 10-40 mg/L (dissolved calcium 4-8 mg/L); has low sensitivity to acid inputs when alkalinity >40 mg/L (dissolved calcium >8 mg/L). The more restrictive of calcium or alkalinity applies.

e) Hardness dependent fluoride guideline: BC Max WQG (mg/L) = (-51.73+(92.57log10(hardness))*0.01), 0.4 at hardness 10 mg/L.

f) Hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, 218 at hardness 31-75 mg/L, 309 at hardness 76-180 mg/L, 429 at hardness 181-250 mg/L, determined based on site water at hardness >250 mg/L.

g) pH and temperature dependent ammonia guideline: values selected from Table 4 in BC WQG based on maximum temperature and pH.

h) Chloride (Cl) dependent nitrite guideline: BC 30-d WQG (mg/L) = 0.02 at Cl <2 mg/L, 0.04 at Cl 2-4 mg/L, 0.06 at Cl 4-6 mg/L, 0.08 at Cl 6-8 mg/L, 0.10 at Cl 8-10 mg/L, 0.20 at Cl >10 mg/L.

i) Max guideline is for hexavalent chromium.

j) Hardness dependent copper guideline: BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L, (0.04*hardness/1000) at hardness >50 mg/L.

k) Hardness dependent lead guideline: BC 30-d WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) - 4.704)) / 1000 at hardness >8 mg/L.

l) Hardness dependent manganese guideline: BC 30-d WQG (mg/L) = 0.0044*hardness+0.605.

m) Mercury BC 30-d WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

n) Hardness dependent nickel guideline: BC 30-d WQG (mg/L) = 0.025 at hardness <60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness >180 mg/L.

o) Hardness dependent silver guideline: BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, 0.0015 at hardness >100 mg/L.

p) Hardness dependent zinc guideline: BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

q) pH dependent dissolved aluminum guideline: BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, exp(1.6-3.327*(median pH)+0.402*(median pH2)) at pH <6.5.

r) Hardness dependent dissolved cadmium guideline: BC 30-d WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

s) A total of 90 total selenium and 61 dissolved selenium samples were collected between 2001 and 2014. All samples during this time period were below the MDLs of 0.001 mg/L and 0.0005 mg/L, which are higher than the current MDL of 0.0005 mg/L and all 2015 measured values. Only the 2015 selenium values were used in the calculation of baseline water quality.

t) Minimum, maximum, and median were calculated using absolute values; that is, when the summary statistic corresponded to a non-detect (ND) value in the dataset, the MDL was reported.

u) Mean was not calculated for parameters with greater than 50% non-detect values. A median was reported where a mean was not calculated.

v) 95th percentile was not calculated for parameters with less than 10 samples.

w) 95th percentile was not calculated for parameters with greater than 95% non-detect values.

3.4.3 Polley Lake

Polley Lake has a surface area of 453 ha, a mean depth of 18 m, and a maximum depth of approximately 35 m. The lake has an estimated hydraulic residence time of approximately 16.2 years (Minnow 2014). Polley Lake is a dimictic lake that mixes from surface to bottom twice each year. It stratifies thermally during the summer months, with well-oxygenated conditions above the thermocline and a progressive decrease in dissolved oxygen with depth below the thermocline to values below the BC WQG (Minnow 2014; Golder 2016c). Lake trophic status changed from oligotrophic/mesotrophic prior to mine development to mesotrophic/eutrophic in 2012 (Minnow 2014).

Levels of TSS, turbidity, and total metals elevated in Polley Lake as a result of the TSF foundation failure had decreased to below BC WQGs by early 2015 and water quality was similar to pre-TSF foundation failure concentrations for most parameters (Golder 2015h, 2016c). In 2015, only mean concentrations of total phosphorus were above applicable BC WQGs (Table 3-18). Although mean total phosphorus in 2015 was above the BC WQG range, the mean value was similar to values measured prior to the TSF foundation failure.

Long-term chronic exposure in laboratory toxicity tests to water collected from Polley Lake in 2015 did not result in adverse effects on fish or invertebrates (Minnow 2014; Golder 2016c,e). The current water hardness of Polley Lake (mean of 130 mg/L), an important modifier of metal toxicity, has remained higher than mean values pre-TSF foundation failure (92 mg/L; Golder 2015h).

Table 3-18. Summary of Water Quality Statistics for Polley Lake: Existing Conditions (2015)

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Polley Lake							
		Maximum	Notes	30-day Average	Notes	Number of Samples	Number of Samples <MDL	Percent of Samples <MDL	Minimum[s]	Median[s]	Mean[t]	95th[u,v]	Maximum[s]
Physical Parameters													
pH (field)	pH units	6.5 - 8.5	A	6.5 - 9.0	A	89	0	0	7.2	NC	7.7	8.8	9.1
Temperature (field)	°C	-	-	-	-	89	0	0	0.2	NC	10	19	22
Conductivity (field)	µs/cm	-	-	-	-	89	0	0	278	NC	316	395	410
Turbidity	NTU	+5 NTU	A	+2 NTU from background	A, c	89	0	0	0.14	NC	0.9	1.8	3.5
Hardness (Dissolved)	mg/L	-	-	-	-	90	0	0	124	NC	130	135	137
Total Dissolved Solids	mg/L	-	-	-	-	90	0	0	172	NC	189	209	218
Total Suspended Solids	mg/L	-	-	+5 mg/L from background	A, c	90	80	89	<3.0	<3.0	NC	4.1	8
Major Ions													
Alkalinity, Total (as $CaCO_3$)	mg/L	-	-	see note	W, d	90	0	0	74	NC	97	104	106
Chloride	mg/L	250	A	150	A	90	0	0	1.28	NC	1.3	1.4	1.7
Fluoride	mg/L	1.5	A	1.4 - 1.5	A, Max, e	90	0	0	0.08	NC	0.087	0.089	0.098
Sulphate	mg/L	-	-	309	A, f	90	0	0	0.68	NC	46	48	52
Nutrients													
Ammonia	mg/L (as N)	-	-	1.8	A, g	90	31	34	<0.005	NC	0.017	0.071	0.31
Nitrate	mg/L (as N)	10	A	3	A	90	16	18	<0.005	NC	0.2	0.43	0.46
Nitrite	mg/L (as N)	1	A	0.02	A, h	90	54	60	<0.001	<0.001	NC	0.0096	0.017
Total Phosphorus	mg/L	0.01	A, lakes	0.005 - 0.015 in lakes	A	90	0	0	0.0062	NC	0.036	0.076	0.1
Total Metals													
Aluminum	mg/L	-	-	5	A, WW, Max	90	0	0	0.0065	NC	0.028	0.06	0.2
Antimony	mg/L	0.014	W	0.0009	W	90	0	0	0.00012	NC	0.00017	0.00025	0.00026
Arsenic	mg/L	0.025	Interim	0.005	A	90	0	0	0.00088	NC	0.00099	0.001	0.0012
Barium	mg/L	-	-	1	W	90	0	0	0.0098	NC	0.0124	0.013	0.015
Beryllium	mg/L	0.004	W	0.00013	W	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Boron	mg/L	5	A	1.2	A	90	0	0	0.027	NC	0.03	0.033	0.034
Cadmium	mg/L	-	-	no total WQG, see dissolved	A	90	86	96	<0.000005	<0.000005	NC	NC	0.00016
Calcium	mg/L	-	-	see note	W, h	90	0	0	40	NC	42	44	45
Chromium	mg/L	-	-	0.001	W, i	90	90	100	<0.0005	<0.0005	NC	NC	<0.0005
Cobalt	mg/L	-	-	0.004	A	90	88	98	<0.0001	<0.0001	NC	NC	0.00012
Copper	mg/L	0.5	A	0.005	A, j	90	10	11	0.0022	NC	0.0031	0.004	0.007
Iron	mg/L	-	-	1	A, Max	90	76	84	<0.03	<0.03	NC	0.043	0.12
Lead	mg/L	0.05	A	0.007 - 0.008	A, k	90	37	41	<0.00005	NC	0.000096	0.00025	0.00066
Lithium	mg/L	-	-	-	-	90	56	62	0.00076	<0.001	NC	0.0012	0.0013
Magnesium	mg/L	-	-	-	-	90	0	0	5.3	NC	5.7	5.9	6.2
Manganese	mg/L	-	-	1.15 - 1.21	A, l	90	0	0	0.0031	NC	0.05	0.16	0.3
Mercury	mg/L	0.001	A	0.00001	A, m	12	12	100	<0.000005	<0.000005	NC	NC	<0.000005
Molybdenum	mg/L	0.25	A	1	A	90	0	0	0.010	0.011	0.011	0.012	0.013
Nickel	mg/L	-	-	0.11 - 0.12	W, n	90	90	100	<0.0005	<0.0005	NC	NC	<0.0005
Selenium	mg/L	0.01	A	0.002	A	90	0	0	0.00069	NC	0.0009	0.001	0.0011
Silicon	mg/L	-	-	-	-	90	0	0	3.1	NC	3.8	4.3	4.6
Silver	mg/L	-	-	0.0015	A, o	90	90	100	<0.00001	<0.00001	NC	NC	<0.00001
Sodium	mg/L	-	-	-	-	90	0	0	8.4	NC	9.5	10	11
Strontium	mg/L	-	-	-	-	90	0	0	0.30	NC	0.32	0.33	0.35
Thallium	mg/L	0.002	A	0.0008	W	90	89	99	<0.00001	<0.00001	NC	NC	0.00003
Tin	mg/L	-	-	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Titanium	mg/L	-	-	-	-	90	89	99	<0.01	<0.01	NC	NC	0.012
Uranium	mg/L	-	-	0.0085	W	90	0	0	0.00026	NC	0.00029	0.00032	0.00034
Vanadium	mg/L	-	-	-	-	90	0	0	0.00062	NC	0.001	0.0013	0.0013
Zinc	mg/L	5	A	0.033-0.043	A, p	90	88	98	<0.003	<0.003	NC	NC	0.018
Dissolved Metals													
Aluminum	mg/L	0.2	A	0.05	A, q	90	40	44	<0.003	NC	0.0038	0.0061	0.0095
Antimony	mg/L	0.014	W	-	-	90	0	0	0.0001	NC	0.00014	0.00016	0.00017
Arsenic	mg/L	0.025	Interim	-	-	90	0	0	0.00083	NC	0.00095	0.001	0.0012
Barium	mg/L	-	-	-	-	90	0	0	0.0087	NC	0.012	0.013	0.014
Beryllium	mg/L	0.004	W	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Boron	mg/L	5	A	-	-	90	0	0	0.025	NC	0.027	0.03	0.031
Cadmium	mg/L	-	-	0.0003	A, r	90	85	94	<0.000005	<0.000005	NC	<0.00001	0.00013
Calcium	mg/L	-	-	-	-	90	0	0	41	NC	43	44	45
Chromium	mg/L	-	-	-	-	90	89	99	<0.0005	<0.0005	NC	NC	0.00095
Cobalt	mg/L	-	-	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Copper	mg/L	0.5	A	-	-	90	0	0	0.0017	NC	0.0024	0.003	0.003
Iron	mg/L	-	-	0.35	A, Max	90	90	100	<0.03	<0.03	NC	NC	<0.03
Lead	mg/L	0.05	A	-	-	90	29	32	<0.00005	NC	0.00011	0.00031	0.00072
Lithium	mg/L	-	-	-	-	90	66	73	<0.001	<0.0010	NC	0.0011	0.0012
Magnesium	mg/L	-	-	-	-	90	0	0	5.4	NC	5.7	5.9	6.1
Manganese	mg/L	-	-	-	-	90	0	0	0.00019	NC	0.02	0.12	0.21
Mercury	mg/L	-	-	-	-	34	34	100	<0.000005	<0.000005	NC	NC	<0.000005
Molybdenum	mg/L	0.25	A	-	-	90	0	0	0.0096	NC	0.0106	0.011	0.012
Nickel	mg/L	-	-	-	-	90	90	100	<0.0005	<0.0005	NC	NC	<0.0005
Potassium	mg/L	-	-	-	-	90	0	0	1.1	NC	1.4	1.5	1.5
Selenium	mg/L	0.01	A	-	-	90	0	0	0.0007	NC	0.00088	0.001	0.0011
Silicon	mg/L	-	-	-	-	90	0	0	3.1	NC	3.8	4.2	4.3
Silver	mg/L	-	-	-	-	90	90	100	<0.00001	<0.00001	NC	NC	<0.00001
Sodium	mg/L	-	-	-	-	90	0	0	8.3	NC	9.5	10	11
Strontium	mg/L	-	-	-	-	90	0	0	0.29	NC	0.32	0.33	0.34
Thallium	mg/L	0.002	A	-	-	90	90	100	<0.00001	<0.00001	NC	NC	<0.00001
Tin	mg/L	-	-	-	-	90	90	100	<0.0001	<0.0001	NC	NC	<0.0001
Titanium	mg/L	-	-	-	-	90	90	100	<0.010	<0.010	NC	NC	<0.010
Uranium	mg/L	-	-	-	-	90	0	0	0.00024	NC	0.00027	0.00029	0.00032
Vanadium	mg/L	-	-	-	-	90	2	2	<0.0005	NC	0.0008	0.0011	0.0012
Zinc	mg/L	5	A	-	-	90	86	96	<0.003	<0.003	NC	NC	0.020

Notes:

A = approved guideline, W = working guideline, Max = maximum guideline used, Min = Minimum concentration requirement based on life stage, WW = wildlife water supply guidelines

NC = not calculated, "<" reported value is less than method detection limit (MDL)

Underlined value = exceeds maximum BC Drinking Water Quality Guidelines

Shaded value = exceeds 30-day average BC Water Quality Guidelines

italics = MDL > water guideline

a) BC WQ guideline for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs do not exist.

b) BC Water Quality Guidelines (BC WQG). Fresh Water Aquatic Life 30-day Guidelines used, except where noted (e.g., molybdenum, total aluminum). Maximum (Max) guidelines substituted where 30-d guidelines do not exist.

c) For guideline comparison, Polley Lake background turbidity is assumed equal to 1 NTU and background TSS is equal to the MDL of 3.0 mg/L.

d) Waterbody is highly sensitive to acid inputs when alkalinity <10 mg/L (dissolved calcium <4 mg/L); moderately sensitive to acid acid inputs when alkalinity is 10-40 mg/L (dissolved calcium 4-8 mg/L); has low sensitivity to acid inputs when alkalinity >40 mg/L (dissolved calcium >8 mg/L). The more restrictive of calcium or alkalinity applies.

e) Hardness dependent fluoride guideline: BC Max WQG (mg/L) = (-51.73+(92.57log10(hardness))*0.01), 0.4 at hardness 10 mg/L.

f) Hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, 218 at hardness 31-75 mg/L, 309 at hardness 76-180 mg/L, 429 at hardness 181-250 mg/L, determined based on site water at hardness >250 mg/L.

g) pH and temperature dependent ammonia guideline: values selected from Table 4 in BC WQG based on maximum temperature and pH.

h) Chloride (Cl) dependent nitrite guideline: BC 30-d WQG (mg/L) = 0.02 at Cl <2 mg/L, 0.04 at Cl 2-4 mg/L, 0.06 at Cl 4-6 mg/L, 0.08 at Cl 6-8 mg/L, 0.10 at Cl 8-10 mg/L, 0.20 at Cl >10 mg/L.

i) Max guideline is for hexavalent chromium.

j) Hardness dependent copper guideline: BC 30-d WQG (mg/L) = 0.002 at hardness≤50 mg/L, (0.04*hardness/1000) at hardness >50 mg/L.

k) Hardness dependent lead guideline: BC 30-d WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) - 4.704)) / 1000 at hardness > 8 mg/L.

l) Hardness dependent manganese guideline: BC 30-d WQG (mg/L) = 0.0044*hardness+0.605.

m) Mercury BC 30-d WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

n) Hardness dependent nickel guideline: BC 30-d WQG (mg/L) = 0.025 at hardness < 60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness > 180 mg/L.

o) Hardness dependent silver guideline: BC 30-d WQG (mg/L) = 0.00005 at hardness≤100 mg/L, 0.0015 at hardness >100 mg/L.

p) Hardness dependent zinc guideline: BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

q) pH dependent dissolved aluminum guideline: BC 30-d WQG (mg/L) = 0.05 at pH≥6.5, exp(1.6-3.327*(median pH)+0.402*(median pH2)) at pH <6.5.

r) Hardness dependent dissolved cadmium guideline: BC 30-d WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

s) Minimum, maximum, and median were calculated using absolute values; that is, when the summary statistic corresponded to a non-detect (ND) value in the dataset, the MDL was reported.

t) Mean was not calculated for parameters with greater than 50% non-detect values. A median was reported where a mean was not calculated.

u) 95th percentile was not calculated for parameters with less than 10 samples.

v) 95th percentile was not calculated for parameters with greater than 95% non-detect values.

3.4.4 Hazeltine Creek

Hazeltine Creek flows from Polley Lake into the West Basin of Quesnel Lake, a distance of approximately 9.2 km. As a result of the debris flow from the TSF foundation failure, Hazeltine Creek was scoured along its length. The exposed banks were susceptible to continual erosion, so erosion control and creek rehabilitation efforts have been undertaken that included removal of deposited tailings material and stabilization/armouring of a new creek channel. The works carried out to date have largely prevented further bank erosion and the water in Hazeltine Creek is now relatively low in turbidity. This reduction in suspended particulate matter has resulted in lower total metal concentrations in samples collected from Hazeltine Creek (Golder 2016c,d).

With respect to existing conditions, mean concentrations of all constituents listed in Table 3-19 were below applicable BC WQGs, with the exception of turbidity, total phosphorus, and copper.

The mean turbidity of 6.4 NTU is expected to improve as vegetation is re-established along the creek banks. Of note, however, is that the mouth of Hazeltine/Edney Creeks formed a delta prior to the TSF foundation failure, which indicates that material transport occured, and by inference, turbidity in the process of that transport was likely during (and most probably associated with) seasonal high flow.

Mean total phosphorus was above the BC WQG range for lake environments, but was within the range documented prior to the TSF foundation failure (Minnow 2014). The mean total copper concentration of 0.024 mg/L remained approximately an order of magnitude above the pre-TSF foundation failure mean concentration (0.0031 mg/L; Golder 2015h). Copper concentrations above the BC WQG were reported for this creek prior to the construction of the mine, consistent with the geology of the area that is naturally rich in copper and other metals. Total copper was documented at mean concentrations above the BC WQG prior to mine development in 1989 (0.005 mg/L [range 0.001 to 0.019 mg/L]; IMC 1990) and 1995/1996 (0.003 mg/L [range 0.002 to 0.006 mg/L]; Minnow 2014).

Laboratory toxicity tests conducted on water collected from lower Hazeltine Creek in November 2015, prior to the discharge of treated effluent from Springer Pit, did not result in adverse effects on fish or invertebrates (MPMC 2016a). The current water hardness of Hazeltine Creek (mean of 174 mg/L), a modifier of metal toxicity, has remained higher than mean values pre-TSF foundation failure (90 mg/L; Golder 2015h).

Table 3-19. Summary of Water Quality Statistics for Hazeltine Creek: Existing Conditions (June to November 2015 and upstream of discharge December 2015 to April 2016)

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Hazeltine Creek							
		Maximum	Notes	30-day Average	Notes	Number of Samples	Number of Samples <MDL	Percent of Samples <MDL	Minimum[s]	Median[s]	Mean[t]	95th[u,v]	Maximum[s]
Physical Parameters													
pH (field)	pH units	6.5 - 8.5	A	6.5 - 9.0	A	75	0	0	7.4	NC	8.0	8.5	8.7
Temperature (field)	°C	-	-	-	-	75	0	0	-0.21	NC	7.7	21	23
Conductivity (field)	µs/cm	-	-	-	-	75	0	0	166	NC	352	530	812
Turbidity	NTU	+5 NTU	A	+2 NTU from background	A, c	77	0	0	0.15	NC	6.4	21	139
Hardness (Dissolved)	mg/L	-	-	-	-	56	0	0	122	NC	174	276	420
Total Dissolved Solids	mg/L	-	-	-	-	56	0	0	151	NC	247	415	615
Total Suspended Solids	mg/L	-	-	+5 mg/L from background	A, c	56	17	30	<1	NC	13	62	185
Major Ions													
Alkalinity, Total (as $CaCO_3$)	mg/L	-	-	see note	W, d	56	0	0	84	NC	123	168	175
Chloride	mg/L	250	A	150	A	56	0	0	1.2	NC	1.6	2.7	4.1
Fluoride	mg/L	1.5	A	1.4 - 1.9	A, Max, e	56	0	0	0.08	NC	0.11	0.15	0.18
Sulphate	mg/L	-	-	309 - 429	A, f	56	0	0	43	NC	67	158	288
Nutrients													
Ammonia	mg/L (as N)	-	-	1.8	A, g	56	33	59	<0.005	<0.005	NC	0.02	0.042
Nitrate	mg/L (as N)	10	A	3	A	56	5	9	<0.005	NC	0.11	0.25	0.3
Nitrite	mg/L (as N)	1	A	0.02 - 0.06	A, h	56	37	66	<0.001	<0.001	NC	0.0028	<0.005
Total Phosphorus	mg/L	0.01	A, lakes	0.005 - 0.015 in lakes	A	56	0	0	0.0038	NC	0.033	0.12	0.26
Total Metals													
Aluminum	mg/L	-	-	5	A, WW, Max	56	0	0	0.017	NC	0.39	1.9	3.8
Antimony	mg/L	0.014	W	0.0009	W	56	0	0	0.00012	NC	0.00019	0.00032	0.00039
Arsenic	mg/L	0.025	Interim	0.005	A	56	0	0	0.00079	NC	0.0013	0.0023	0.0042
Barium	mg/L	-	-	1	W	56	0	0	0.011	NC	0.03	0.071	0.082
Beryllium	mg/L	0.004	W	0.00013	W	56	54	96	<0.0001	<0.0001	NC	NC	0.00011
Boron	mg/L	5	A	1.2	A	56	0	0	0.021	NC	0.031	0.038	0.051
Cadmium	mg/L	-	-	no total WQG, see dissolved	A	56	11	20	<0.000005	NC	0.000019	0.000066	0.00011
Calcium	mg/L	-	-	see note	W, h	56	0	0	39	NC	54	85	130
Chromium	mg/L	-	-	0.001	W, i	56	46	82	<0.0005	<0.0005	NC	0.0016	0.0049
Cobalt	mg/L	-	-	0.004	A	56	12	21	<0.0001	NC	0.00041	0.0022	0.0036
Copper	mg/L	0.5	A	0.005 - 0.017	A, j	56	1	2	0.0038	NC	0.024	0.077	0.21
Iron	mg/L	-	-	1	A, Max	56	2	4	<0.03	NC	0.49	2.4	5.1
Lead	mg/L	0.05	A	0.007 - 0.023	A, k	56	24	43	0.00005	NC	0.00019	0.00084	0.0016
Lithium	mg/L	-	-	-	-	56	14	25	0.001	NC	0.0017	0.0049	0.0059
Magnesium	mg/L	-	-	-	-	56	0	0	5.5	NC	9.1	14	21
Manganese	mg/L	-	-	1.1 - 2.5	A, l	56	0	0	0.0053	NC	0.098	0.44	0.7
Mercury	mg/L	0.001	A	0.00001	A, m	12	10	83	<0.000005	<0.000005	NC	0.000010	0.000012
Molybdenum	mg/L	0.25	A	1	A	56	0	0	0.010	NC	0.015	0.033	0.069
Nickel	mg/L	-	-	0.11 - 0.15	W, n	56	24	43	<0.0005	NC	0.00094	0.0025	0.0054
Selenium	mg/L	0.01	A	0.002	A	56	0	0	0.00063	NC	0.001	0.0019	0.0023
Silicon	mg/L	-	-	-	-	56	0	0	2.9	NC	4.5	8.5	12
Silver	mg/L	-	-	0.0015	A, o	56	45	80	<0.00001	<0.00001	NC	0.000037	0.000073
Sodium	mg/L	-	-	-	-	56	0	0	8.1	NC	12	18	27
Strontium	mg/L	-	-	-	-	56	0	0	0.3	NC	0.44	0.72	1.2
Thallium	mg/L	0.002	A	0.0008	W	56	52	93	<0.00001	<0.00001	NC	0.000011	0.000029
Tin	mg/L	-	-	-	-	56	54	96	<0.0001	<0.0001	NC	NC	0.00014
Titanium	mg/L	-	-	-	-	56	27	48	<0.01	NC	0.025	0.1	0.2
Uranium	mg/L	-	-	0.0085	W	56	0	0	0.00027	NC	0.00071	0.0015	0.0023
Vanadium	mg/L	-	-	-	-	56	0	0	0.00078	NC	0.0021	0.0061	0.011
Zinc	mg/L	5	A	0.032 - 0.26	A, p	56	37	66	<0.003	<0.003	NC	0.011	0.014
Dissolved Metals													
Aluminum	mg/L	0.2	A	0.05	A, q	56	5	8.9	<0.003	NC	0.013	0.043	0.094
Antimony	mg/L	0.014	W	-	-	56	0	0	0.00011	NC	0.00015	0.00023	0.00027
Arsenic	mg/L	0.025	Interim	-	-	56	0	0	0.00068	NC	0.0011	0.0015	0.0018
Barium	mg/L	-	-	-	-	56	0	0	0.011	NC	0.025	0.041	0.049
Beryllium	mg/L	0.004	W	-	-	56	56	100	<0.0001	<0.0001	NC	NC	<0.0001
Boron	mg/L	5	A	-	-	56	0	0	0.021	NC	0.029	0.034	0.039
Cadmium	mg/L	-	-	0.00024 - 0.00061	A, r	56	15	27	<0.000005	NC	0.000013	0.000051	0.000094
Calcium	mg/L	-	-	-	-	56	0	0	40	NC	55	88	134
Chromium	mg/L	-	-	-	-	56	56	100	<0.0005	<0.0005	NC	NC	<0.0005
Cobalt	mg/L	-	-	-	-	56	42	75	<0.0001	<0.0001	NC	0.00065	0.0011
Copper	mg/L	0.5	A	-	-	56	0	0	0.0031	NC	0.013	0.037	0.077
Iron	mg/L	-	-	0.35	A, Max	56	40	71	<0.03	<0.03	NC	0.29	0.66
Lead	mg/L	0.05	A	-	-	56	52	93	<0.00005	<0.00005	NC	0.000064	0.00015
Lithium	mg/L	-	-	-	-	56	19	34	<0.001	NC	0.0014	0.0027	0.0036
Magnesium	mg/L	-	-	-	-	56	0	0	5.5	NC	9.0	14	20
Manganese	mg/L	-	-	-	-	56	0	0	0.00046	NC	0.082	0.41	0.68
Mercury	mg/L	-	-	-	-	12	12	100	<0.000005	<0.000005	NC	NC	<0.000005
Molybdenum	mg/L	0.25	A	-	-	56	0	0	0.0093	NC	0.014	0.031	0.067
Nickel	mg/L	-	-	-	-	56	49	88	<0.0005	<0.0005	NC	0.0012	0.0013
Potassium	mg/L	-	-	-	-	56	0	0	1.2	NC	1.6	2.3	3.1
Selenium	mg/L	0.01	A	-	-	56	0	0	0.00066	NC	0.001	0.0017	0.0024
Silicon	mg/L	-	-	-	-	56	0	0	2.7	NC	3.8	4.8	5.2
Silver	mg/L	-	-	-	-	56	54	96	<0.00001	<0.00001	NC	NC	0.000015
Sodium	mg/L	-	-	-	-	56	0	0	7.9	NC	12	18	28
Strontium	mg/L	-	-	-	-	56	0	0	0.29	NC	0.43	0.69	1.2
Thallium	mg/L	0.002	A	-	-	56	55	98	<0.00001	<0.00001	NC	NC	0.000012
Tin	mg/L	-	-	-	-	56	56	100	<0.0001	<0.0001	NC	NC	<0.0001
Titanium	mg/L	-	-	-	-	56	51	91	<0.01	<0.01	NC	0.013	0.014
Uranium	mg/L	-	-	-	-	56	0	0	0.00024	NC	0.00067	0.0014	0.0022
Vanadium	mg/L	-	-	-	-	56	0	0	0.00061	NC	0.00097	0.0014	0.0017
Zinc	mg/L	5	A	-	-	56	44	79	<0.003	<0.003	NC	0.0053	0.008

Notes:

A = approved guideline, W = working guideline, Max = maximum guideline used, Min = Minimum concentration requirement based on life stage, WW = wildlife water supply guidelines

NC = not calculated, "<" reported value is less than method detection limit (MDL)

Underlined value	= exceeds maximum BC Drinking Water Quality Guidelines
Shaded value	= exceeds 30-day average BC Water Quality Guidelines

a) BC WQ guideline for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs do not exist.

b) BC Water Quality Guidelines (BC WQG). Fresh Water Aquatic Life 30-day Guidelines used, except where noted (e.g., molybdenum, total aluminum). Maximum (Max) guidelines substituted where 30-d guidelines do not exist.

c) For guideline comparison, Hazeltine Creek background turbidity is assumed equal to 1.5 NTU and background TSS is equal to the MDL of 3.0 mg/L.

d) Waterbody is highly sensitive to acid inputs when alkalinity <10 mg/L (dissolved calcium <4 mg/L); moderately sensitive to acid acid inputs when alkalinity is 10-40 mg/L (dissolved calcium 4-8 mg/L); has low sensitivity to acid inputs when alkalinity >40 mg/L (dissolved calcium >8 mg/L). The more restrictive of calcium or alkalinity applies.

e) Hardness dependent fluoride guideline: BC Max WQG (mg/L) = (-51.73+(92.57log10(hardness))*0.01), 0.4 at hardness 10 mg/L.

f) Hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, 218 at hardness 31-75 mg/L, 309 at hardness 76-180 mg/L, 429 at hardness 181-250 mg/L, determined based on site water at hardness >250 mg/L.

g) pH and temperature dependent ammonia guideline: values selected from Table 4 in BC WQG based on maximum temperature and pH.

h) Chloride (Cl) dependent nitrite guideline: BC 30-d WQG (mg/L) = 0.02 at Cl <2 mg/L, 0.04 at Cl 2-4 mg/L, 0.06 at Cl 4-6 mg/L, 0.08 at Cl 6-8 mg/L, 0.10 at Cl 8-10 mg/L, 0.20 at Cl >10 mg/L.

i) Max guideline is for hexavalent chromium.

j) Hardness dependent copper guideline: BC 30-d WQG (mg/L) = 0.002 at hardness≤50 mg/L, (0.04*hardness/1000) at hardness >50 mg/L.

k) Hardness dependent lead guideline: BC 30-d WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) - 4.704)) / 1000 at hardness >8 mg/L.

l) Hardness dependent manganese guideline: BC 30-d WQG (mg/L) = 0.0044*hardness+0.605.

m) Mercury BC 30-d WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

n) Hardness dependent nickel guideline: BC 30-d WQG (mg/L) = 0.025 at hardness <60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness >180 mg/L.

o) Hardness dependent silver guideline: BC 30-d WQG (mg/L) = 0.00005 at hardness≤100 mg/L, 0.0015 at hardness >100 mg/L.

p) Hardness dependent zinc guideline: BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

q) pH dependent dissolved aluminum guideline: BC 30-d WQG (mg/L) = 0.05 at pH≥6.5, exp(1.6-3.327*(median pH)+0.402*(median pH2)) at pH <6.5.

r) Hardness dependent dissolved cadmium guideline: BC 30-d WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

s) Minimum, maximum, and median were calculated using absolute values; that is, when the summary statistic corresponded to a non-detect (ND) value in the dataset, the MDL was reported.

t) Mean was not calculated for parameters with greater than 50% non-detect values. A median was reported where a mean was not calculated.

u) 95th percentile was not calculated for parameters with less than 10 samples.

v) 95th percentile was not calculated for parameters with greater than 95% non-detect values.

3.5 Sediment Quality

This section provides a characterization of sediment quality with respect to existing conditions in the four waterbodies (i.e., Quesnel Lake, Bootjack Lake, Hazeltine Creek, and Polley Lake). A description and rationale of the study design for each sediment survey, including sampling locations, collection methods, analytical laboratories used, analytical methods, and QA/QC procedures are in the original reports, listed in Table 3-20. The synthesis is largely based on the most recent evaluations of sediment quality by Minnow (2015a,b) that discuss and reference previous studies. The purpose of this sediment characterization is to describe the existing conditions in receiving environments that could potentially receive effluent discharge either during operations or during mine closure.

Table 3-20: Sediment Quality Existing Condition Characterization: Location of Supporting Detailed Information Required by MoE (2014a,b)

Information	Quesnel Lake	Bootjack Lake	Hazeltine Creek	Polley Lake
Baseline study design – description and rationale [(a,b)]	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein
Identity of certified laboratories that analyzed the samples	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein
Summary table of sample site locations, sample dates, sample size, and rationale/purpose for each site	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein	Minnow (2015a,b) and reports cited therein
Identification of which data reflect un-impacted baseline versus conditions influenced by development	Pre-mine baseline data are not available (Minnow 2015a); impacted conditions determined by comparisons to in-lake reference area	Minnow (2015a,b) – Bootjack Lake, used as a reference lake for Polley Lake	Minnow (2015a,b) – based on comparison to pre-TSF foundation failure and reference	Minnow (2015a,b) – based on comparison to pre-TSF foundation failure and reference
Detailed map of sampling locations	Figures 4.4 and 4.5 in Minnow (2015a)	Figures 3.3 and 4.3 in Minnow (2015a)	Figures 3.1 and 4.2 in Minnow (2015a)	Figures 3.2 and 4.3 in Minnow (2015a)
Illustration of spatial and temporal variance in key parameters using graphs	Figures 7.1 and 7.3 for littoral areas and Figures 8.1, 8.3, and 8.4 for profundal areas in Minnow (2015a)	Figure 6.1 in Minnow (2015a)	Figures 5.1 and 5.2 in Minnow (2015a)	Figure 6.1 in Minnow (2015a)
Summary of available baseline data and comparison to sediment quality guidelines	Pre-mine baseline data are not available (Minnow 2015a); impacted conditions determined by comparisons to in-lake reference area	Table 3.7 and Appendix A in Minnow (2015a); Table 1 in Minnow (2015b)	Tables 3.2 and 3.3 and Appendix A in Minnow (2015a); Table 2 in Minnow (2015b)	Table 3.5 and Appendix A in Minnow (2015a); Table 1 in Minnow (2015b)
Identification of spatial and/or temporal gaps in database	Minnow (2015a)	Minnow (2015a)	Minnow (2015a)	Minnow (2015a)

(a) = Unless otherwise stated, baseline study design description and rationale includes parameters analyzed, field instrumentation, sampling frequency and period, sampling locations, statistical considerations, and sample collection methods and quality assurance/quality control protocols.

(b) = Sampling sites that appear to be influenced by groundwater discharge, or may be in the future, were not identified in any of the baseline reports.

MoE = Ministry of Environment; TSF = tailings storage facility.

Baseline sediment data collected prior to commencement of mining operations indicated that concentrations of some metals were naturally elevated in these waterbodies relative to current sediment quality guidelines (SQGs) (Minnow 2015a; MoE 2015a). These SQGs are numerical criteria that are protective of long-term exposure of sediment-dwelling organisms, and include lowest effect levels (LELs), and probable effect levels (PELs). The LEL represents concentrations below which adverse biological effects are expected to rarely occur, whereas the PEL represents concentrations above which adverse biological effects are expected to occur frequently (CCME 1999). While the LELs are useful for identifying concentrations below which adverse effects are unlikely, they are not predictive of in situ toxicity, particularly where background concentrations are naturally elevated and geochemical characteristics of the sediment used to derive the criteria are different from that near the mine. Therefore, in the following characterization of existing conditions, more emphasis should be placed on the identification of PEL rather than LEL exceedances.

Prior to mine operations, sediment copper concentrations in all four waterbodies were reported above the PEL, indicating naturally elevated concentrations within the study area. The same was true for manganese and iron but to a lesser extent (Minnow 2015b). Sediment concentrations of a larger number of metals were above LELs prior to mine operations.

3.5.1 Quesnel Lake

Minnow (2015a,b) characterized sediment quality in near-field littoral and profundal areas of the West Arm of Quesnel Lake. As stated in Table 3-20, pre-mine baseline data were not available for Quesnel Lake; therefore, sediment chemistry data collected in 2014 and 2015 after the TSF foundation failure were compared to BC SQGs and within-lake reference data. Reference data from areas of Quesnel Lake unlikely to be impacted by the TSF foundation failure indicated that concentrations of metals (e.g., chromium, iron, nickel) in the less than 63 µm fine sediment fractions were naturally elevated above BC SQGs (Minnow 2015a). The following observations were made by Minnow (2015b) with respect to sediments sampled in both littoral and profundal stations in the West Basin.

- At littoral near-field stations sampled in 2014 following the TSF foundation failure, mean concentrations of arsenic, copper, iron, and manganese were higher than SQGs and also higher than reference area 95th percentile concentrations (Minnow 2015a). Arsenic and manganese concentrations were higher than LELs, with copper and iron greater than PELs.
- In deeper water at the profundal near-field station, the mean copper concentration was higher than the PEL and the corresponding 95th percentile reference concentration (Minnow 2015a).

This characterization of sediment quality based on 2014 data was similar to the 2015 data collected in a follow-up study (Minnow 2015b).

3.5.2 Bootjack Lake

Sediment quality in Bootjack Lake was characterized during the pre-mine baseline studies in 1989 (IMC 1990), 1995 (HKP 1996), and 1996 (HKP 1997), as well as following initiation of mine operations (i.e., in 1999 [Beak 2000], 2009 [Minnow 2011], and 2012 [Minnow 2013a]). Bootjack Lake was also used as a reference for the post-TSF foundation failure impact assessment (Minnow 2015a,b), as the lake was not considered to be impacted by either the mine or by the TSF foundation failure. Depositional sediment samples have been collected throughout the lake at approximate depths of 3 to 12 m, although sampling efforts have generally focused on the deepest area within the lake (Minnow 2015a).

Several metals in the 1989 to 2012 sediment dataset were reported to be above the respective LELs, with a fewer number present at concentrations above the PELs (Minnow 2015a). No obvious spatial or temporal trends were observed in the dataset, which suggests that metal concentrations, while naturally elevated in Bootjack Lake sediments, have not changed appreciably over time as a result of the mine. The following BC WQG exceedances were documented by Minnow (2015a) at two different depths within the lake.

- **Deep stations**—Mean concentrations of arsenic, chromium, copper, iron, manganese, mercury, and nickel exceeded the relevant LELs, with mean copper concentrations also exceeding PEL (Minnow 2015a). The 95th percentile concentrations of cadmium and selenium exceeded the relevant LELs. The 95th percentile manganese concentration exceeded the PEL.
- **Mid-depth stations**—Mean concentrations of copper, iron, mercury, nickel, and selenium exceeded the relevant LELs, with mean copper concentrations also exceeding the PEL (Minnow 2015a). The 95th percentile concentrations of chromium exceeded the LEL.

Sediment samples were collected by Minnow (2015a,b) from one of the deep stations in 2014 and 2015. Mean and 95th percentile concentrations were similar to pre-TSF foundation failure concentrations; with arsenic, chromium, iron, mercury, nickel, and selenium exceeding LELs and copper and manganese exceeding PEL at concentrations similar to those previously reported (Minnow 2015b).

3.5.3 Polley Lake

Sediment quality in Polley Lake has been monitored prior to mine development (i.e., 1989 to 1996; IMC 1990; HKP 1996, 1997), during operations (i.e., 1999, 2009, 2012; Beak 2000; Minnow 2011, 2013a), and after the TSF foundation failure (i.e., 2014 and 2015; Minnow 2015a,b).

The two deepest areas of Polley Lake (Stations P1, P2, and L; 30 to 36 m depth) were the focus of baseline sampling prior to mine development, whereas during operations, both deep and mid-depth (approximately 0.5 to 20 m depth) stations throughout the lake were sampled (Minnow 2015a). A gravity corer was used to collect sediment samples during operations as opposed to a grab sampler that was used for the pre-mine baseline studies. A gravity corer was also used most recently by Minnow (2015a,b) to sample sediment from the deep Station P2 following the TSF foundation failure.

Sediment quality data from these studies suggest a similar pattern of SQG exceedances throughout the sampling period, in that arsenic, chromium, copper, iron, manganese, nickel, and selenium commonly exceeded LELs, with copper and manganese commonly exceeding PELs (Minnow 2015b). Historically (i.e., 1989 to 2012), 95th percentile concentrations of cadmium and mercury in deep stations exceeded LELs (Minnow 2015a,b). The most recent sediment sampling by Minnow (2015b) documented higher mean concentrations of arsenic and copper in deep stations relative to concentrations previously reported for this lake. Mean arsenic concentrations remained below the PEL.

3.5.4 Hazeltine Creek

Although Hazeltine Creek is primarily an erosional creek, depositional areas have been sampled during pre-mine baseline studies (i.e., 1995 and 1996; HKP 1996, 1997), during operations (i.e., 1999, 2007, 2009, 2012, 2013; Beak 2000; Minnow 2009, 2011, 2013a,b), and after the TSF foundation failure (i.e., 2014 and 2015; Minnow 2015a,b). Minnow (2015a) did not consider the pre-mine 1996 baseline data to be reliable due to the non-standard collection method used and abnormally high metal concentrations. Therefore, Minnow (2015a) excluded these data from their sediment assessment.

In lower Hazeltine Creek, 95th percentile concentrations of arsenic, chromium, copper, iron, manganese, nickel, and selenium in this 1995 to 2013 dataset exceeded LELs, with manganese also exceeding the PEL. In upper Hazeltine Creek, 95th percentile concentrations of arsenic, copper, iron, manganese, and nickel exceeded the LELs, with manganese also exceeding the PEL (Minnow 2015a).

More recently in 2014 and 2015, sediment quality data were collected from Hazeltine Creek by Minnow (2015a,b) to evaluate changes in sediment chemistry since the TSF foundation failure and after reconstruction of the creek channel. With the exception of copper and iron, metal concentrations in the less than 63 µm fraction were similar in 2014 and 2015 compared to those measured previously. Mean concentrations of arsenic, copper, iron, manganese, and nickel in 2014 and 2015 exceeded LELs, with copper and iron exceeding PELs (Minnow 2015b).

3.6 Fisheries and Aquatic Resources

The description of fisheries and aquatic resources focussed on assessing existing conditions (i.e., 2015) for Quesnel Lake and Polley Lake. Bootjack Lake was not impacted by mine operations or the TSF foundation failure, so pre-mine to current conditions were considered for this lake. The aquatic habitat of Hazeltine Creek was altered as a result of the TSF foundation failure and has been undergoing reconstruction. It is anticipated that fish will continue to be excluded from the portion of Hazeltine Creek that receives treated effluent until sometime after November 2017, unless a water discharge pipe is installed and commissioned prior to that date and depending on the status of reconstruction activities. The reach upstream of the point of discharge is undergoing rehabilitation to restore fish habitat in 2016 and 2017.

3.6.1 Quesnel Lake

Plankton Communities

Available information on plankton in Quesnel Lake is limited to sampling conducted weekly in the months immediately following the TSF foundation failure (September to November 2014; Golder 2015h) and every month between May and September 2015 (Golder 2016f). Because plankton communities exhibit inherent variability related to temperature, daylight, and depth sampled, and because the same months were not sampled in both 2014 and 2015, the data between years are not directly comparable. Thus, the following summary of plankton communities in Quesnel Lake focuses on the most recent plankton survey conducted between May and September 2015.

In 2015, plankton communities were sampled at three stations in Quesnel Lake (one near-field exposure station and two far-field reference stations) during the open water period from May to September. Spatial and temporal trends in phytoplankton biomass (as chlorophyll *a*), and zooplankton abundance and biomass were qualitatively examined by plotting the data. Trophic status of Quesnel Lake was determined through comparison of chlorophyll *a*, nutrient concentrations, and water transparency (Secchi depths). The evaluation of trophic status indicated that Quesnel Lake is oligotrophic (nutrient-poor, unproductive system). Chlorophyll *a* in Quesnel Lake was low and seasonally variable, with concentrations generally increasing through the open water period from May to September. Historical chlorophyll *a* data reported by Nidle et al. (1994) also indicated that Quesnel Lake is a nutrient-poor, unproductive system.

Total zooplankton biomass and abundance in Quesnel Lake were also seasonally variable from May to September 2015, with a general increasing trend in biomass and decreasing trend in abundance. Limited spatial variability was observed among stations with similar trends observed near the mouth of Hazeltine Creek and at reference stations (Horsefly [located west of Cariboo Island in the West Arm] and Junction [located in the Main Basin where the East and North arms meet]). Zooplankton communities were generally dominated by either cyclopoid copepods or cladocerans. Seasonal differences in community composition were observed throughout the open water period of 2015, with cyclopoid copepods generally dominant in spring and early summer, and cladocerans dominant in late summer and fall. Limited spatial variability was observed among stations with similar trends observed at the Hazeltine (near-field exposure), Horsefly (reference), and Junction (reference) stations.

Benthic Invertebrate Communities

Analysis of the benthic invertebrate community in Quesnel Lake was conducted in 2014 to assess the initial impacts of the TSF foundation failure (Minnow 2015b). The benthic invertebrate community assessment was based on comparison of community metrics (e.g., diversity, richness, evenness) to reference areas in Quesnel Lake.

In littoral areas of Quesnel Lake, taxa richness and density were lower at near-field stations located close to the mouth of Hazeltine Creek compared to comparable reference areas. Within the littoral areas, dominant taxa were Chironomidae (non-biting midges), Oligochaeta (oligochaete worms), and Amphipoda (amphipods), with lesser representation (5% to 10%) by Bivalvia (clams and mussels), Gastropoda (snails), Hirudinae (leaches), Acari (mites), and the Ephemeroptera, Plecoptera, and Trichoptera (EPT) group (consisting of mayflies, stoneflies and caddisflies) (Minnow 2015b).

Benthic communities sampled in profundal areas differed to a greater degree from reference areas than littoral communities did, with far lower taxa richness and density at both near- and far-field stations. Dominant taxa in the profundal areas were Chironomidae, Oligochaeta, and Amphipoda, with lesser representation by Ceratopogonidae (biting midges), Gastropoda, and Bivalvia (Minnow 2015b).

Fish and Fish Habitat

The following characterization of fish and fish habitat is primarily based on information provided in SNC-Lavalin (2015a). This report was part of the Post-Event Environmental Impact Assessment Report (PEEIAR) (MPMC 2015c) that evaluated the impact of the TSF foundation failure on the aquatic receiving environment.

Quesnel Lake supports a varied fish community, with approximately 20 documented fish species that include migratory salmonids (coho, chinook, and sockeye), resident salmonids (kokanee, rainbow trout, bull trout, and lake trout), and benthic and forage fish species (Table 3-21). The majority of these fish species inhabit the littoral and limnetic zones of the lake:

- Migratory salmonids typically use both the littoral and limnetic zones as rearing and foraging habitat for young-of-year and juvenile life stages until they smolt and migrate downstream towards the marine environment.
- Sockeye salmon are known to shoreline spawn in select littoral zone areas where suitable gravels and groundwater upwelling occurs.
- Resident salmonids may spawn in the littoral zone (with the exception of bull trout) and typically rely on littoral and limnetic habitat for rearing young-of-year and juveniles and foraging.
- Benthic and forage fish typically rely on littoral and benthic habitat for spawning, rearing, and foraging. Benthic species are usually only present in the limnetic zone for a short period of time after hatching and consequently rear in the pelagic column until settling to the benthic zone. Forage species may be present in the limnetic zone during foraging activities. Adult burbot will make vertical migrations from the benthic zone to the open water column in search of food (SNC-Lavalin 2015a).

Bull trout is a Blue-listed species of special concern and is the only fish species at risk listed in the Cariboo region, based on the MoE Species and Ecosystems Explorer (CDC 2014). Coho salmon present in Quesnel Lake are part of the Interior Fraser Coho population that has been identified as “endangered” by the Committee on the Status of Endangered Wildlife in Canada. Coho is a species under consideration for addition to the *Species at Risk Act* (SNC-Lavalin 2015a). A small subset of the Interior Fraser coho population spawns in Quesnel River and several other tributaries to Quesnel Lake (Cariboo Envirotech Ltd. 2009).

Table 3-21: Documented Fish Species in Quesnel Lake

Fish Group	Common Name	Scientific Name
Migratory salmonids	Sockeye salmon	*Oncorhynchus nerka*
	Coho salmon	*O. kisutch*
	Chinook salmon	*O. tshawytscha*
Resident salmonids	Kokanee	*O. nerka*
	Rainbow trout	*O. mykiss*
	Bull trout	*Salvelinus confluentus*
	Lake trout	*S. namaycush*
	Pygmy whitefish	*Prosopium coulteri*
	Mountain whitefish	*P. williamsoni*
	Lake whitefish	*Coregonus clupeaformis*
Benthic species	Burbot	*Lota lota*
	Largescale sucker	*Catostomus macrocheilus*
	Longnose sucker	*C. catostomus*
	Slimy sculpin	*Cottus cognatus*
Forage species	Northern pikeminnow	*Ptychocheilus oregonensis*
	Peamouth chub	*Mylocheilus caurinus*
	Lake chub	*Couesius plumbeus*
	Leopard dace	*Rhinichthys falcatus*
	Longnose dace	*R. cataractae*
	Redside shiner	*Richardsonius balteatus*

Notes: Adapted from SNC-Lavalin (2015a)

Foreshore inventory and mapping characterized the shore type near the mouth of Edney Creek as predominantly gravel beach (49% of the study area) and rocky shore (more than 35%), and aquatic vegetation, dominated by emergent grasses and herbaceous vegetation, covered 36% of the shoreline. Approximately 50% of the shoreline was ranked as high or very high value, 48% as moderate value, and less than 2% as low or very low value (Ecoscape 2012). High juvenile rearing values were identified along 20% of the shoreline (Ecoscape 2012).

3.6.2 Bootjack Lake

Plankton

Plankton communities in Bootjack Lake were monitored during baseline studies in 1989, 1995, and 1996 (IMC 1990; HKP 1996, 1997). Master lists of species in Bootjack Lake are provided for phytoplankton and zooplankton in HKP 1996; monthly comparisons from May to October were made for the plankton communities between Bootjack Lake and Polley Lake. Similar types of data were presented by IMC (1990) for sampling events in August and October 1989. Highlights from these early baseline studies are as follows:

- Chlorophyll *a* in Bootjack Lake ranged from 0.7 to 4.2 µg/L in 1995 (HKP 1996), which indicates the lake was oligotrophic according to the trophic classification scheme of Vollenweider (1970).

- The number of phytoplankton species identified in Bootjack Lake was 19 in August and 23 in October 1989, with the chryptophyte species *Chroomonas acuta* being the dominant species in both sampling events (IMC 1990).
- The small chrysophytes (*Ochromonas* and *Chromulina* species) dominated the phytoplankton species in Bootjack Lake from May to October 1995 (HKP 1996).
- Zooplankton samples showed considerable variation between sampling locations and seasons (IMC 1990; HKP 1996). For example, the cyclops species *Cyclops bicuspidatus thomasi* dominated the zooplankton population of Bootjack Lake in May; the rotifers, *Kellicottia* species and *Keratella cochlearis* dominated in June and August, respectively; and the cladocerians *Daphnia rosea* and *D. longiremis* were the dominant species in both September and October (HKP 1996).

Benthic Invertebrate Communities

A benthic invertebrate community assessment was conducted as part of the post-event investigations for the PEEIAR (Minnow 2015b). A description and rationale of the study design, the certified benthic taxonomist who analyzed the 2014 samples, maps of sampling locations within Bootjack Lake (the reference lake) and Polley Lake, an evaluation and description of baseline data including changes from pre-mine conditions, and a detailed summary and discussion of the 2014 data are provided in Minnow (2015b). A summary of statistical comparisons between 2014 data from Bootjack Lake and Polley Lake is provided in Section 3.6.4. Dominant invertebrate taxon groups at mid-depth and deep stations in Bootjack Lake during the 2014 sampling included Oligochaeta (worms), Chironomidae (midges), Acari (mites), Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies).

Benthic invertebrate communities were monitored by the mine during baseline studies in 1989, 1995, and 1996 (IMC 1990; HKP 1996; HKP 1997, respectively). Monitoring continued during mine operations in 1999, 2002, and 2012 (Beak 2000; Morrow 2003; Minnow 2013a, respectively). The benthic communities tended to be dominated by Chironomidae with other identified species including Hydracarina, Chaoborinae, Nematoda, and Oligochaeta (IMC 1990; HKP 1996).

Fish and Fish Habitat

Past studies in Bootjack Lake have identified three fish species within the lake: bridgeslip sucker (*Catastomus columbianus*), longnose sucker, and rainbow trout (MPMC 2009).

Bootjack Lake is home to a sport fishery for a small-bodied population of native rainbow trout (Dolighan and Zirnhelt 2015). Aerial survey data of the sport fishery indicate that angler effort in the past has ranged between 400 to 2,400 days per year (Dolighan and Zirnhelt 2015). Survey data indicated that 12 inlet streams draining into Bootjack Lake contribute to the production of rainbow trout to Bootjack Lake (Dolighan and Zirnhelt 2015). Very low numbers of adult rainbow trout, ranging between 5 and 30, were observed in most tributaries, and only one stream (Tributary 10) had higher numbers of spawning trout. Survey results also indicated that the Morehead Creek outlet provides spawning habitat for rainbow trout to this lake.

3.6.3 Hazeltine Creek

Periphyton

Periphyton was sampled in upper Hazeltine Creek during the baseline studies (HKP 1996). Three replicate periphyton samples were collected in August 1995. Samples were split into two vials for species identification and chlorophyll *a* analysis. The samples consisted of diatoms (99% to 100%) with the dominant species being *Nitzschia* spp, *Synedra ulna*, and *Navicula* spp. (HKP 1996). Mean chlorophyll *a* concentrations ranged from 2.59 to 5.88 µg/500 mL (HKP 1996).

Benthic Invertebrate Community

No benthic invertebrate community sampling was conducted in Hazeltine Creek in 2014 due to the absence of appropriate erosional habitat following the TSF foundation failure (i.e., substrates were fine materials derived from the tailings and scoured creek bed). Benthic invertebrate sampling was undertaken in 2015 following reconstruction of the creek channel to track recovery, but the results of these surveys were not available when this TAR was prepared.

Benthic invertebrate community surveys were conducted during pre-mine baseline studies in 1995 and 1996 (HKP 1996, 1997) and during mine operations in 1999 and 2007 (Beak 2000; Minnow 2009). The data were re-evaluated by Minnow (2015b) to allow for comparisons to 2014 data. Benthic invertebrate community characteristics were relatively stable from 1995 to 2007, with the exception of lower densities in 1996, which may have been related to differences in sampling methods (Minnow 2015b). The proportion of EPT (Ephemeroptera, Plecoptera, Trichoptera) taxa were high in both upper and lower Hazeltine Creek (43% to 76%) compared to other taxa, indicative of good ecosystem health (Minnow 2015b).

Fish and Fish Habitat

Prior to the TSF foundation failure, rainbow trout, longnose sucker, and redside shiner appeared to be the only species inhabiting upper Hazeltine Creek (Minnow 2014). A steep section of the creek located 5.8 to 7.0 km downstream of Polley Lake presents a barrier to fish passage, such that fish from Quesnel Lake cannot access upper Hazeltine Creek and Polley Lake (Minnow 2014). Fish species found in lower Hazeltine Creek included sockeye salmon, chinook salmon, coho salmon, kokanee, rainbow trout, mountain whitefish, burbot, largescale sucker, longnose sucker, longnose dace, peamouth chub, and redside shiner (SNC-Lavalin 2015a). Hazeltine Creek was characterized as having moderate gradient, riffle-run stream morphology with flow typically confined within a well-defined, meandering channel containing predominantly cobble-gravel substrate and bordered by relatively steep banks (MPMC 2009).

Erosion control and creek remediation efforts have been undertaken including removal of deposited tailings material, excavation and stabilization of a new creek channel, re-grading of the floodplain, and re-vegetation. The works carried out to date have markedly controlled erosion. Fish access to Hazeltine Creek has been restricted with temporary fish exclusion barriers and the creek is presently not used by fish.

3.6.4 Polley Lake

Plankton

In terms of current conditions, plankton communities were sampled at two stations in Polley Lake during the open water period from May to September 2015 (Golder 2016f). This sampling event was an update to the *Quesnel and Polley Lakes Aquatic Productivity Impact Assessment* (Golder 2015i) that was submitted as part of the PEEIAR in June 2015 (MPMC 2015c). In general, the sampling procedures in 2015 were consistent with those used in 2014 by the MoE. Details on sampling locations and timing, together with methods for field sampling, laboratory analysis, data analysis, and QA/QC for this sampling event are reported in Golder (2016e).

A brief summary of the findings for the 2015 Polley Lake plankton sampling is as follows:

- Trophic status of Polley Lake was classified as ranging from oligotrophic to mesotrophic based on nutrients measured close to the surface, Secchi depth, and chlorophyll *a* concentrations reported during the 2015 period from May to September. The nutrient data represented a sub-set of the nutrient data evaluated in the 2015 Surface Water Quality Assessment from April to November at both surface and deep water sampling locations (Golder 2016d). Evaluation of the entire 2015 total phosphorus dataset concluded that phosphorus concentrations in Polley Lake were similar to those reported by Minnow (2014) that reported the lake had changed from oligotrophic/mesotrophic to mesotrophic/eutrophic by 2012, two years prior to the TSF foundation failure.
- Total zooplankton abundance in Polley Lake increased from May to June followed by a decline in abundance from June to August. In September, zooplankton abundance at one sampling location (P1) increased, while the other location (P2) had a slight decline from August. Total zooplankton abundance ranged from approximately 5,000 to 25,000 organisms/m^3 among stations and sampling event in 2015, which is within the range observed in baseline samples collected between 1989 to 1996 (1,394 to 559,437 organisms/m^3; reported in Minnow 2014).
- Similar community composition was observed at the two stations in Polley Lake. Copepod nauplii made up the greatest proportion of total zooplankton abundance in Polley Lake between May and July, whereas cyclopoid copepods were generally dominant in August and September. Cladocerans, rotifers, and calanoid copepods were generally present in smaller numbers at both stations through the open water period.

Historical data for the plankton community in Polley Lake can be found in baseline studies conducted in 1989 (IMC 1990), 1995 (HKP 1996), and 1996 (HKP 1997).

Benthic Invertebrates Communities

A benthic invertebrate community assessment was conducted as part of the post-event investigations for the PEEIAR (Minnow 2015b). A description and rationale of the study design, the certified benthic taxonomist who analyzed the 2014 samples, maps of sampling locations within Polley Lake and the reference lake (Bootjack Lake), an evaluation and description of baseline data including changes from pre-mine conditions, and a detailed summary and discussion of the 2014 data are provided in Minnow (2015b). A brief summary of the results is provided below.

Samples were collected in mid-depth and deep stations in Polley Lake and the reference lake (Bootjack Lake) in 2014; mid-depth station results in Polley Lake were compared to reference conditions using a control-impact statistical design and deep station results were compared to baseline (1999) and reference conditions using a before-after-control-impact statistical design. Overall, the results suggested a potential impact of the TSF foundation failure to benthic invertebrate communities at mid-depth stations and deep stations in the north basin.

Dominant invertebrate taxon groups at the Polley Lake mid-depth and deep stations included Oligochaeta (worms), Chironomidae (midges), Acari (mites), Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). Although no statistically significant differences in proportions of key benthic taxa were found, the reference lake appeared to have a higher proportion of Chaoboridae, which were not present or only had a small presence in Polley Lake. In addition, community composition in the deep stations in the north basin differed from that observed in 1999, with more oligochaetes and fewer Chironomidae, which was not observed in the reference lake.

The benthic invertebrate community assessment in Polley Lake was based on samples collected within a few months after the TSF foundation failure and therefore, the benthic invertebrates would not have had sufficient time to recover from the physical disturbance. Benthic invertebrate community samples were collected in 2015 to track the recovery but the results of these surveys were not available when this TAR was prepared.

Fish and Fish Habitat

The following summary of fish and fish habitat in Polley Lake is based primarily on Minnow (2014), with additional information provided by Lirette (2015) and SNC-Lavalin (2015a). Rainbow trout, longnose sucker, and redside shiner have been confirmed to be present in Polley Lake based on fish surveys conducted pre-mine and during operations (i.e., 1989 [IMC 1990], 1995 [HKP 1996], 1999 [Beak 2000], 2009/2010 [Minnow 2011], 2012 [Minnow 2013a], and 2014 [Lirette 2015]). No provincially or federally listed species are known to occur in Polley Lake (SNC-Lavalin 2015a).

Polley Lake supports a recreational fishery for rainbow trout with catch-per-unit-effort of rainbow trout suggesting that the fish population has remained fairly consistent between 1995 and 2012 (Minnow 2014). SNC-Lavalin did not find any specific information describing the fish habitat in Polley Lake during their post-event fish impact assessment for the PEEIAR (SNC-Lavalin 2015a).

Rainbow trout spawning and rearing habitat is present in several of the small drainages that enter Polley Lake; however, their contribution to productivity is not known. Hazeltine Creek is the only outlet for the lake and outlet spawning by rainbow trout was known to occur (SNC-Lavalin 2015a).

3.6.5 Biological Tissue Sampling

A brief summary of the biological tissue sampling in the study waterbodies (Quesnel Lake, Bootjack Lake, Hazeltine Creek, and Polley Lake) with respect to a characterization of baseline conditions is presented in this section. Tissue sampling was conducted as part of monitoring programs to determine environmental impacts following the TSF foundation failure and have been reported in detail elsewhere.

2014/2015 Fish Tissue Collection

Fish tissue samples were collected in 2014 and in 2015 from Quesnel Lake, Polley Lake, and Bootjack Lake, as well as a second reference lake (Trio Lake). Golder (2016g) consolidated and summarized the available fish tissue data, characterizing the data by exposure and reference sites, species, tissue type, and collection year to conduct a high-level exploratory analysis. In summary, the preliminary findings are:

- Selenium concentrations in ovary tissue of Polley Lake rainbow trout collected in 2015 were elevated and appeared anomalous relative to other species, locations, and years. This increase was not present in rainbow trout samples collected in 2016. Additional monitoring is ongoing to address this residual uncertainty. Regardless, measured concentrations in a number of ovary samples from Polley Lake rainbow trout have exceeded the applicable guideline of 11 mg/kg dw. Whole-body and/or muscle concentrations have also exceeded the applicable guideline of 4 mg/kg dw in several instances in this lake.
- Increased arsenic concentrations were observed in some organ-specific samples that could be a precursor for accumulation in muscle tissue over time; however, there were no exceedances of the applicable guideline observed in tissue samples that would typically be consumed by humans (e.g., muscle samples).
- For other metals, the pattern of accumulation in tissues was inconsistent and data were not further evaluated by Golder (2016g) relative to tissue guidelines.

Although a sizeable number of fish were collected in 2014 and 2015, sampling was generally opportunistic. Data are currently limited to two years of sampling, and tissue concentrations may change over time for different metals as water quality is expected to improve with rehabilitation of aquatic systems such as Hazeltine Creek.

Zooplankton Tissue Chemistry

Detailed results for tissue chemistry measured in zooplankton collected monthly from May through September 2015 from Quesnel Lake and Polley Lake are provided in Golder (2016f). In summary:

Quesnel Lake

- An increasing trend in arsenic concentrations was observed in zooplankton tissue at all three stations sampled in Quesnel Lake, but was not correlated with aqueous arsenic concentrations at comparable water sampling stations.
- No consistent trends were observed in zooplankton tissue concentrations of copper or mercury.
- Tissue selenium concentrations showed a general increasing trend at all three stations over the summer, but was not correlated with aqueous selenium concentrations. Tissue selenium concentrations were generally below the BC interim dietary guideline for tissue consumption by fish (MoE 2016a), but some concentrations reported for the Hazeltine and Junction stations were at or above this guideline during some sampling events.

Polley Lake

- Zooplankton tissue concentrations of arsenic, copper, mercury, and selenium were generally similar between sampling stations in Polley Lake. An increasing trend in tissue concentrations of these parameters was observed at station P1 over the summer, but was not correlated with aqueous concentrations with the exception of copper, which also exhibited a slight increase in aqueous concentrations.
- Tissue selenium concentrations were at or above the BC interim dietary guideline for tissue consumption by fish (MoE 2016a) at both stations.

Benthic Invertebrate Tissue Chemistry

Detailed results for tissue chemistry measured in benthic invertebrates collected in 2015 from Quesnel Lake, Polley Lake, Bootjack Lake, and Hazeltine Creek are provided in Minnow (2015b). In summary:

Quesnel Lake

- Littoral samples were composed mainly of chironomids, mayflies, leeches, amphipods, and pea clams. Tissue concentrations of all metals, including copper, in benthic invertebrates from the far-field area of Quesnel Lake did not differ from the reference area. Concentrations of selenium in invertebrates were less than the wildlife dietary guideline of 4 µg/g dw.
- Profundal samples were composed mainly of chironomids. Copper was the only metal for which tissue concentrations significantly were greater in the near-field compared to the reference area, but it was not considered to be biomagnifying in that area based on a comparison of copper concentrations in co-located sediment and benthic invertebrate samples (Golder 2016g). Tissue selenium concentrations for the near-field area were slightly greater than the dietary guideline of 4 µg/g dw, but were significantly less than reference area concentrations, indicating influences other than the mine which was supported by regional historic sediment data. (e.g., Jackaman 2008).

Polley and Bootjack Lakes

- Polley and Bootjack lake samples were composed mainly of chironomids and oligochaetes. Concentrations of copper, manganese, molybdenum, selenium, tin, and titanium in benthic invertebrates from Polley Lake were more variable and were significantly higher than those from Bootjack Lake (reference area).
- For all these metals, except selenium, concentrations were lower in benthic invertebrates compared to sediment concentrations in Polley Lake and Bootjack Lake, indicating accumulation factors of less than 1. For selenium, tissue concentrations were approximately two times higher than sediment concentrations, indicating that benthic invertebrates in Polley Lake may be accumulating selenium. However, benthic invertebrates were not depurated prior to analysis, so sediment in the gut may have contributed to the metal content.

Hazeltine Creek

- Concentrations of several metals in benthic invertebrates from both upper and lower Hazeltine Creek were significantly higher compared to samples from Edney Creek, the corresponding reference area.
- Tissue concentrations of several metals, including selenium, were lower in 2015 compared to samples collected in Hazeltine Creek prior to the TSF foundation failure. Only copper and vanadium were higher in tissue from 2015.

3.7 Vegetation and Wildlife

3.7.1 Vegetation

Based on a search undertaken by SNC-Lavalin (2015b) of the provincial vegetation database, no records of ground-based vegetation surveys were found for the assessed study area (i.e., the Hazeltine Creek Corridor). Instead, SNC-Lavalin (2015b) used terrestrial ecosystem mapping and post-TSF foundation failure field surveys to assess the vegetation characteristics within the Hazeltine Creek Corridor.

The terrestrial study area for the TAR is located within the Quesnel Highland Ecosection, a highland area characterized by Wet Interior Cedar–Hemlock forests in the valleys and low slopes, and cold-tolerant Engelmann Spruce–Subalpine Fir forests on the upper slopes and lower mountain summits (Demarchi 2011). The terrestrial study area is characterized by two biogeoclimatic subzones: the Horsefly moist cool (ICHmk3) and the Quesnel wet cool (ICHwk2). The ICHmk3 subzone is dominated by Douglas fir (*Pseudotsuga menziesii*), western redcedar (*Thuja plicata*), and hybrid white spruce (*Picea glauca x engelmannii*); the understory includes falsebox (*Paxistima myrsinites*) and moss species. The ICHwk2 is dominated by western redcedar, western hemlock (*Tsuga heterophylla*), and hybrid white spruce (*Picea glauca x engelmannii*). The understory for this variant includes bunchberry (*Cornus canadensis*), oval-leaved blueberry (*Vaccinium ovalifolium*), step moss (*Hylocomium splendens*), and pipecleaner moss (*Rhytidiopsis robusta*).

SNC-Lavalin (2015b) identified one Red-listed (endangered or threatened) and two Blue-listed (special concern) communities within the ICHmk3 zone of the Hazeltine Creek Corridor. The Red-listed community was a fen/wetland (scrub birch/sedges/peat-mosses), while the Blue–listed included the forested communities of western redcedar/oak fern/electrified cat's-tail moss and the western redcedar/falsebox. No listed communities were identified in the ICHwk2 subzone.

3.7.2 Wildlife and Wildlife Habitat

Based on a search undertaken by SNC-Lavalin (2015b) of the provincial wildlife database, no records of ground-based wildlife surveys were found for the assessed study area (i.e., the Hazeltine Creek Corridor). SNC-Lavalin (2015b) used field data collected during post-TSF foundation failure field surveys, as well as regional species checklists and known species occurrences to assess wildlife in the Hazeltine Creek Corridor.

Wildlife species documented in the vicinity during fieldwork conducted after the TSF foundation failure (e.g., during reconnaissance terrestrial survey, soil monitoring surveys, construction monitoring) are provided in Table 3-22. Table 3-22 also includes wildlife species observed by mine staff in 2014 and 2015 (Litke 2016, pers. comm.; Hughes 2016, pers. comm.). This is not an exhaustive list of species expected to occur but likely represents the more common species that use the area throughout the year.

Table 3-22: Wildlife Species Detected in the Vicinity of the Mine, 2014 to 2015

Mammals	Birds	Herpetofauna
Moose (*Alces americanus*)	Mallard (*Anas platyrhynchos*)	Common gartersnake (*Thamnophis sirtalis*)
Mule deer (*Odocoileus hemionus*)	Bufflehead (*Bucephala albeola*)	Pacific treefrog (*Pseudacris regilla*)
Beaver (*Castor canadensis*)	Ring-necked duck (*Aythya collaris*)	Western toad (*Anaxyrus boreas*)
Gray wolf (*Canis lupis*)	Common goldeneye (*Bucephala clangula*)	Columbia spotted frog (*Rana luteiventris*)
Black bear (*Ursus americanus*)	Northern pygmy-owl (*Glaucidium gnoma*)	
Cougar (*Puma concolor*)	Hairy woodpecker (*Picoides villosus*)	
Lynx (*Lynx canadensis*)	Pileated woodpecker (*Dryocopus pileatus*)	
Red fox (*Vulpes vulpes*)	Ruffed grouse (*Bonasa umbellus*)	
River otter (*Lontra canadensis*)	Spruce grouse (*Falcipennis canadensis*)	
Red squirrel (*Tamiasciurus hudsonicus*)	Bald eagle (*Haliaeetus leucocephalus*)	
Snowshoe hare (*Lepus americanus*)	Common loon (*Gavia immer*)	
Coyote (*Canis latrans*)	Steller's jay (*Cyanocitta stelleri*)	
Bobcat (*Lynx rufus*)	Osprey (*Pandion haliaetus*)	
Skunk (*Mephitis mephitis*)	Golden eagle (*Aquila chrysaetos*)	
Muskat (*Ondatra zibethicus*)	Killdeer (*Charadrius vociferus*)	
Packrat (*Neotoma* sp.)	Great blue heron (*Ardea herodias*)	
Ermine (*Mustela erminea*)	Sandhill crane (*Grus canadensis*)	
Pine marten (*Martes americana*)	Hooded merganser (*Lophodytes cucullatus*)	
Fisher (*Martes pennanti*)	Common merganser (*Mergus merganser*)	
	Belted kingfisher (*Megaceryle alcyon*)	
	American dipper (*Cinclus mexicanus*)	
	Northern harrier (*Circus cyaneus*)	
	Red-tailed hawk (*Buteo jamaicensis*)	
	Canada goose (*Branta canadensis*)	
	Trumpeter swan (*Cygnus buccinator*)	

Source: SNC-Lavalin 2015b; Litke 2016, pers. comm; Hughes 2016, pers. comm.

At-risk terrestrial wildlife potentially present in the Hazeltine Creek Corridor includes eight Blue-listed species (special concern: three mammals, two birds, one amphibian, two invertebrates) and two Yellow-listed species (secure, not at risk: one mammal and one bird; Table 3-23). Regionally important species that may occur within the Hazeltine Creek Corridor, but are not listed species, include moose (*Alces americanus*), mule deer (*Odocoileus hemionus*), and bald eagle (*Haliaeetus leucocephalus*). Economically important species that may occur within the study area include furbearers, black bear (*Haliaeetus leucocephalus*), waterfowl, and game birds. A list of the bird species expected to occur within the Cariboo region is provided in Appendix 2 of SNC-Lavalin (2015b).

Table 3-23: At-Risk Terrestrial Wildlife Species Potentially Present in the Hazeltine Creek Corridor

Common Name	Scientific Name	BC Conservation Status Rank[(a)]
Hagen's bluet	*Enallagma hageni*	Blue
Magnum mantleslug	*Magnipelta mycophaga*	Blue
Western toad	*Anaxyrus boreas*	Blue
Great blue heron	*Ardea herodias*	Blue
Common nighthawk	*Chordeiles minor*	Yellow
Olive-sided flycatcher	*Contopus cooperi*	Blue
Wolverine	*Gulo luscus*	Blue
Little brown myotis	*Myotis lucifugus*	Yellow
Northern myotis	*Myotis septentrionalis*	Blue
Fisher	*Pekania pennanti*	Blue

(a) Source: http://www.env.gov.bc.ca/atrisk/red-blue.html

4.0 RECLAMATION PLANNING AND EFFECTIVE MINE CLOSURE

As discussed in Section 1.0, in addition to its procedural role in applying for an effluent permit amendment, an objective of this TAR is to develop a Long-Term Water Management Plan that is adaptable to mine development, including during the closure and post-closure conditions. Therefore, water quantity and quality predictions (Appendix B and D) have also been developed for these mining periods based on the proposed closure plan provided in the RCP (MPMC 2015d). The following subsections provide an overview of the closure plan. The reader is referred to MPMC (2015d) for additional details.

4.1 Approach to Reclamation Planning

An updated RCP has been prepared by MPMC (2015d). The overarching reclamation objectives for the mine, as detailed in the RCP, are:

- long-term preservation of water quality within and downstream of decommissioned operations
- long-term geotechnical stability of constructed works
- removal of all access roads, ponds, ditches, pipelines, structures, and equipment not required following mine closure
- long-term stabilization of all exposed materials that are susceptible to erosion
- establishment of a self-sustaining vegetative cover consistent with existing forestry, grazing and wildlife needs (i.e., end land use objectives)
- natural integration of disturbed lands into the surrounding landscape and restoration of the natural appearance of the area

The following sections provide a summary of the RCP for the waste rock dumps, the TSF, ore stockpiles and the open pits. The reader is referred to the RCP (MPMC 2015d) for additional detail on the closure strategies for the mine.

4.1.1 Waste Rock

The following waste rock dumps will be present at the mine at the cessation of operations (Figure 2-1):

- Temporary NW PAG Stockpile
- North Bell Dump
- Boundary Dump
- NEZ Dump
- East RDS
- SERDS

Waste rock that is identified as PAG during mining is trucked to the Temporary NW PAG Stockpile. Geochemical testing (Appendix C) indicates that, while this material is PAG, there is sufficient neutralization potential to buffer acid production for decades. At closure, PAG waste rock will be re-handled and placed in the mined-out Phase 4 Cariboo-Springer Pit and covered with water, and the Temporary NW PAG Stockpile will cease to exist. The PAG waste rock will be fully submerged following flooding of the pit, and these materials are not expected to become acid generating in the long term.

The North Bell Dump, Boundary Dump, NEZ Dump, East RDS, and SERDS contain NAG waste rock. NAG waste rock mined during full operations and not required for projects or TSF construction will be placed in the SERDS. The waste rock stored in existing waste rock dumps is a mixture of waste rock mined from different pits (Appendix C) and, based on an inventory of the of the operational waste rock characterization, the amount of PAG rock outside of the Temporary NW PAG Stockpile is low (Section 3.1.3) and the drainage from NAG rock is expected to be neutral in perpetuity (Appendix C).

At closure, waste rock dumps will be re-sloped to maximum steepness of 2:1 and vegetated with the objective of creating functioning terrestrial habitat consistent with end land use objectives, and returning the surface runoff to as close to a natural runoff water quality as practicable. Following closure, drainage from the re-vegetated waste rock dumps will consist of surface runoff and seepage through the facilities.

4.1.2 Tailings Storage Facility

At closure, MPMC proposes to reclaim the surface of the TSF into a forested and wetlands site. Approximately 15% of the surface area of the TSF basin is proposed to be covered with water, with the remainder of the area being vegetated with indigenous species of trees, shrubs, and grasses. The pond level within the TSF will be controlled by an overflow spillway constructed at an abutment. The spillway will be sized to manage the probable maximum flood. The downstream embankment slopes will be pushed down to a slope of 2H:1V and the buttress will be sloped 3H:1V. The embankment and the buttress slopes will be covered with selected overburden materials and seeded with grasses and legumes to provide a stable vegetation mat that resists erosion. The seepage collection ponds and recycle pumps will be retained after closure until monitoring results indicate that the water quality from the TSF is suitable for direct release to the environment.

The tailings deposition plan will be to maintain the supernatant pond at the centre of the facility, against the natural topography. Within the last year of deposition, prior to closure, the deposition plan will change to push the pond closer to the northern corner (Corner 5) where the spillway is located, and at the same time reduce the pond volume. The operational spillway will limit the size of the pond and leave the majority of the TSF surface area without water cover.

The tailings conveyance system will be removed immediately following cessation of operations. The reclaim barge, pumps, and pipeline will be used for supplementary flooding of the open pits, as required, and will then be removed. Once open pit flooding is complete, the surface water diversion channel will be regraded to allow natural runoff through the tailings area.

4.1.3 Ore Stockpiles

Ore is currently stockpiled in the following locations at the mine:

- #1 Ore Stockpile
- Cariboo Ore Stockpile
- High Oxide Stockpile

Mining of the Phase 4 Cariboo-Springer Pit is expected to produce an additional 3.5 Mt of stockpiled ore (MPMC 2015a). MPMC proposes to process 5.3 Mt of stockpile ore during full operations; however, the total volume of stockpiled ore that will be processed will be evaluated based on the available storage capacity in the TSF at the cessation of mining in the Cariboo-Springer Pit and economic conditions at the end of the four-year mine plan. It is estimated that 6.0 Mt of stockpiled ore will be stored at surface during closure.

4.1.4 Pit Lakes

Passive flooding of the following pits will commence at closure:

- Cariboo-Springer Pit
- Wight Pit
- Boundary Pit

The pits will be fully flooded during post-closure, and will discharge at surface.

4.2 End Land Use and Capability Objectives

The primary land uses prior to the mine development were commercial forestry and wildlife habitat. In addition, some portion of the area was also used for cattle grazing, recreational activities, and hunting and trapping prior to the mine being developed. The land was not used for agriculture. The main objective of MPMC reclamation program is to return all areas that have been altered by the mine disturbance, with the exception of the pit walls, back to equivalent or greater land capability than existed prior to the mine being developed. The primary end land uses are wildlife habitat and forestry. The reader is referred to the RCP (MPMC 2015d) for details of the end land use and capability objectives.

5.0 DISCHARGES AND TREATMENT

5.1 Summary

As is common for developed mines in BC, the mine has a positive water balance, and, as such, discharge will be required during operations, closure, and post-closure to prevent the stored accumulation of water. The location and number of discharges is anticipated to vary throughout these periods. During operations, contact water from within the mine site and the outlet location (Section 5.3) can be actively managed. Water will be discharged from the Springer Pit and the PETBP, and amended EMA Permit 11678 limits are proposed (Section 5.4) for these discharges. While not proposed, a No Discharge scenario has been considered to account for unforeseen circumstances, assuming site water would be stored in the Springer Pit and discharge cannot occur for an extended period. Hydrogeological modelling (Appendix B) indicates water would exfiltrate from the Springer Pit and migrate towards Bootjack Lake as the pit lake elevation rises above 1,030 masl. Proposed discharge limits for Springer Pit seepage are also included in this TAR (Section 5.4).

As discussed in Section 4.0, the objectives of the RCP are to return the mine to pre-mining land capability. Because the mine is constructed in a watershed divide, it is desired that during the post-closure period, drainages will be distributed back to their natural watersheds (Bootjack Lake, Polley Lake, and Hazeltine Creek), provided that this can be achieved in an environmentally appropriate manner. The focus of this TAR is on the evaluation of discharge, which is a necessary component of water management during operations for the four-year mine plan; however, the technical information included in this TAR has incorporated conceptual long-term water management and discharge plans, including during the post-closure phase.

At present, MPMC is applying to amend EMA Permit 11678 effluent limits for the currently authorized operations period, and the modelling that was applied to establish these limits has been extended into the closure and post-closure periods. The modelling carried out as part of the impact assessment and setting of proposed permit limits reflects current plans in the four-year mine plan detailed in the *Mount Polley Return to Full Operations Permit Amendment Application* (MPMC 2015a), and the closure and post-closure modelling reflects plans in the 2015 RCP update (MPMC 2015d), both as filed with MEM on November 6, 2015. Closure and post-closure discharge permit amendments will be sought at a later stage in the mine life as directly measurable data and additional information becomes available during operations. As an example, some of this information includes:

- validation of source terms though site water quality monitoring
- updated water quality and water balance predictions based on the results of ongoing monitoring and model validation
- intervening changes to the mine plan (which, if contemplated, would be permitted separately)
- refinements and optimizations to the RCP, if they significantly affect water quality, water quantity, or the site water management system (which may be included in the 15 January 2017 update)
- refinements and optimizations to the site water management system
- passive water treatment research and pilot testing (which may be advanced in the 15 January 2017 update)

The following sections provide a summary of the discharge quantity and quality, as well as a description of how treatment, using BAT, will be applied. Proposed amended EMA Permit 11678 effluent limits for operations are also provided.

5.2 Description of Discharges

To evaluate the quantity and quality of discharges from the mine, the site-wide water balance model (SWWBM) and the WQM, developed in GoldSim® were updated to reflect the four-year mine plan. Details of the model calibration, inputs, assumptions, and results of the SWWBM and the WQM are provided in Appendix B and Appendix D, respectively.

The SWWBM and the WQM simulated concentrations for the following periods:

- **operations**—January 2016, to June 2020
- **closure**—July 2020, to June 2022
- **post-closure**—July 2022, to December 2100

The model was run stochastically for 500 realizations. For each realization, a unique time series was calculated based on values that were randomly sampled from within a statistical probability distribution that was derived for each input. Following each simulation, mean, 90th, and 99.5th percentile volumes were calculated from the 500 realizations to assess a range of conditions and their associated probability in the SWWBM. Median and 95th percentile concentrations were calculated for each discharge source in the WQM. To put the results in context, a 95th percentile prediction indicates the maximum concentration that is likely to be reached over the duration of the simulation, with a 95% likelihood that concentrations will be at or below that concentration (it does not suggest that concentrations will exceed this value 5% of the time).

The set of water quality constituents included in the model is provided in Table 5-1. This constituent list was carried forward to predict concentrations at all points of interest, including concentrations in the downstream receptors (e.g., Quesnel Lake and Bootjack Lake).

Table 5-1: Water Quality Model Constituent List

Category	Constituent
Physical parameters	TDS, hardness (calculated)
Major ions	Calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate
Nutrients	Ammonia, nitrate, nitrite, total phosphorus
Total and dissolved metals and metalloids	Aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silicon, silver, strontium, thallium, tin, uranium, vanadium, zinc

Note: Other water quality parameters such as pH and temperature were assumed based on historical site monitoring data. TSS concentrations are assumed to be treated to the permit limit (i.e., 15 mg/L monthly mean, 30 mg/L maximum).

MPMC maintains a robust database of site water quality monitoring results that extend over a decade. The results of this monitoring are therefore considered to represent the most probable drainage water quality from mine site facilities. The source terms provided by SRK (Appendix C) represent a conservative estimate of mine site facility drainage water quality under the assumption that the sources are at their solubility limits and they provide a conservative estimate of how the site drainage could change in the long term. Because it is not possible to know at what point in time the source term method may become a better predictor of water quality (if indeed it does), and because that time may vary for different sources and constituents, the following two scenarios were included in the WQM:

- Scenario 1—discharge water quality evaluated using site monitoring data as inputs
- Scenario 2—discharge water quality evaluated using source terms developed by SRK (Appendix C)

Within the context of the TAR, Scenario 1 results are used as the design basis for the WTP, as well as to provide inputs into the impact assessment. Concentrations modelled in this scenario are thought to be more representative of operations water quality than Scenario 2 because the main conditions driving source water chemistry (e.g., mill operations, water management practices, pH, and redox state of mine materials) are not expected to change for the remainder of operations. The model does account for the main drivers that are expected to change, such as mining and milling of specific ore bodies and deposition and transfer of tailings to the TSF. Therefore, Scenario 1 results were used for deriving EMA Permit 11678 limits that are proposed for operations. The Scenario 2 results provide trajectories for monitoring as part of MPMC's CEMP (Section 8.0) to identify when adaptive management may be required. Future water quality monitoring data can be used to validate the model and will provide an early indication of whether site drainage is tending toward solubility limits, which may indicate the need for additional management during operations or to inform closure planning activities.

5.2.1 Operations

MPMC is currently authorized to discharge up to 0.3 m^3/s per EMA Permit 11678. Site water requiring discharge is managed through the Springer Pit and/or the PETBP (Figure 2-1) before being treated and discharged. The existing Veolia Actiflo® treatment plant (Appendix E) has a design treatment capacity of 0.23 m^3/s, which may be exceeded depending on feed water quality. The authorization for the current discharge was received on 30 November 2015, following amendment of EMA Permit 11678. Between December 2015 and June 2016 the WTP operated at its 0.23 m^3/s design capacity part of the time, and at approximately 75% of design capacity on average, with water levels in the Springer Pit continuing to rise. Monitoring of water stored in the Springer Pit indicated this water contains constituent concentrations below than the approved EMA Permit 11678 limits and is suitable for direct discharge. Based on the influent feed water quality monitoring and recognizing the need to lower water elevations in the Springer Pit, the WTP was programmed to include a passive treatment mode based on influent water quality as determined by online instrumentation whereby reagents are not added and mechanical mixing is not active. This passive treatment mode increases the effective discharge rate, while all water continues to pass through the WTP (including lamella), and is monitored by online instrumentation. If water quality deteriorates, the WTP enters "active" treatment mode. In any of these situations, attainment of permit limits remains a legal requirement. Between July 2016 and August 2016, while operating in passive treatment mode, the average effluent discharge rate was 0.28 m^3/s (approximately 93% of the maximum authorized discharge rate), and the Springer Pit water level was lowered by 8.5 m from its peak elevation.

MPMC proposes to continue to discharge treated water, sourced from the PETBP, TSF, and/or water stored in the Springer Pit via the WTP during operations. The following sub-sections provide the details of the quantity and quality of these discharges.

5.2.1.1 Quantity of Discharge

The daily variation in the total mine water discharge for the mean, 90th, and 99.5th percentiles[1] during operations is shown in Figure 5-1. Estimated annual discharge volumes during full operations are shown in Table 5-2. Until the end of full operations (June 2020), discharge modelling is limited to 0.33 m^3/s (0.30 m^3/s before 1 July 2016), which accounts for a 10% increase in presently permitted flows.

MPMC has applied for a maximum annual discharge rate of 10 Mm^3 in the EMA Permit 11678 amendment. Although this EMA Permit 11678 amendment application has yet to be processed by the MoE; for the purpose of water balance modelling (Appendix B), a maximum discharge rate of 0.33 m^3/s was selected to represent the discharge under normal operating conditions after 1 July 2016 in the model. However, to balance larger flows that occur during freshet, MPMC is applying for a maximum instantaneous discharge rate of 0.6 m^3/s as part of this Long-Term Water Management Plan. This will allow water levels in the Springer Pit and peak flows during freshet to be managed, minimizing the volume of surplus water required to be stored on site. The average discharge rate of 0.33 m^3/s reflects the constant rate required to discharge the maximum annual volume of 10 Mm^3. Since no more than 10 Mm^3 of water will be discharged annually, the discharge rate may be less than 0.33 m^3/s during months with lower precipitation depths. Additional details on the proposed effluent limits are provided in Section 5.4 and assessment of impact in Section 6.3.

Notable points during operations include:

- During dewatering of the Springer Pit (2016 and 2017), the mean annual discharge is approximately 7.5 Mm^3.
- During full operations after the Springer Pit is dewatered (2018 to 2020), the mean annual discharge is reduced to approximately 5.9 Mm^3.
- The maximum annual discharge for 99.5th percentile extreme wet conditions is 9.9 Mm^3 in 2017 (year anticipated to have highest discharge needs in order to dewater the Springer Pit).

Therefore, while actual discharge rates are predicted to be lower than the maximum rate sought in this TAR, 10 Mm^3/yr is considered adequate to manage water under a wide range of foreseeable climate conditions.

[1] 90th and 99.5th percentiles correspond approximately to the 1:10-year wet and 1:200-year wet return periods, respectively.

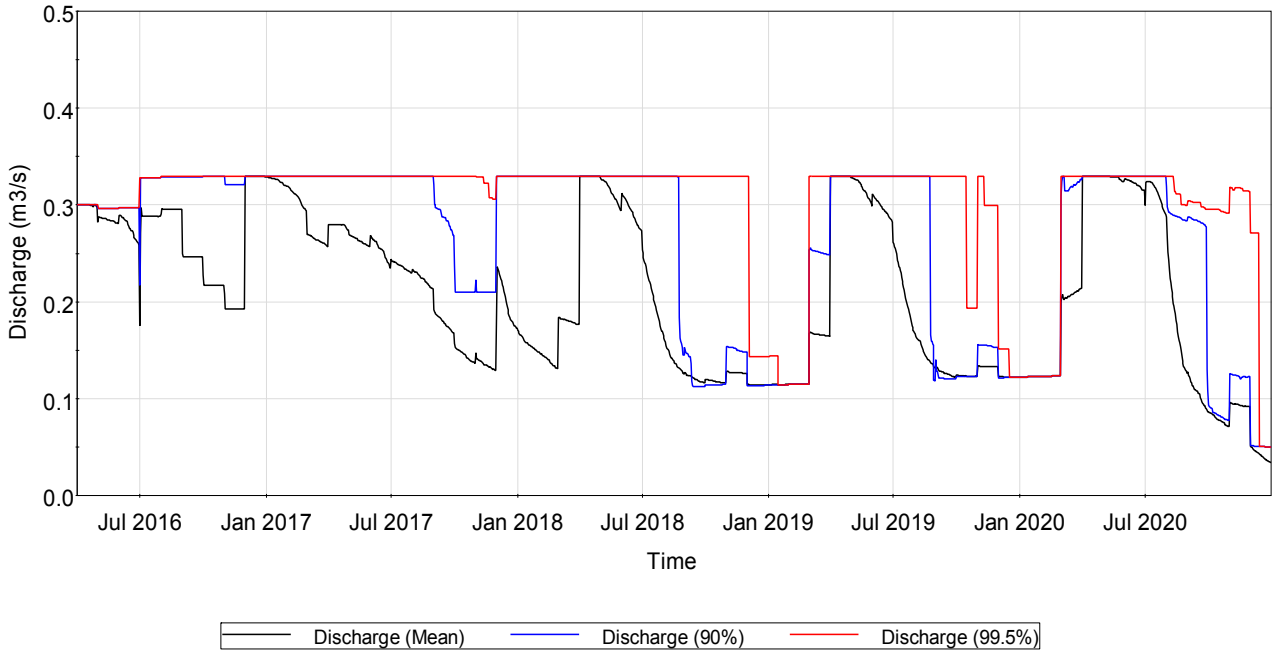


Figure 5-1: Discharge of Mine Water during Full Operations

Table 5-2: Estimated Annual Discharge (treated plus bypass) of Mine Water during Operations

Year	Annual Discharge (m^3)		
	Mean	90th Percentile	99.5th Percentile
2016	7,662,800	8,470,300	8,765,300
2017	7,379,300	8,864,200	9,914,100
2018	5,896,800	7,181,000	9,128,500
2019	5,805,000	6,573,600	7,912,900
2020	5,904,300	6,800,700	8,105,100

5.2.1.2 Quality of Discharge

The predicted quality of discharges for the Springer Pit and the PETBP are provided in Table 5-3. These predictions present the range of water quality between the two discharge sources that can be directed to the WTP. Predictions are shown assuming no treatment, so that water treatment can be added or optimized if necessary. The concentrations provided in Table 5-3 represent the maximum of the daily median and 95th percentile concentrations modelled during operations. Time series results for selected parameters, including TDS, sulphate, nitrate, dissolved copper, molybdenum, and selenium, are presented in Figure 5-2 (Springer Pit) and Figure 5-3 (PETBP). To illustrate ranges, box and whisker plots showing the range of concentrations observed in the Springer Pit and the PETBP are also presented. The total concentrations presented in Table 5-3 assume that TSS have been settled to less than 15 mg/L, which meets the maximum monthly average concentration and the instantaneous TSS limits in the current EMA Permit 11678 and the MMER.

Predicted Springer Pit concentrations generally remain stable (e.g., have similar concentrations to current conditions) until the end of 2017, when stored contact water in the Springer Pit has been pumped out. This occurs because the pit lake accounts for the largest component of water in the pit during this period, in comparison to other inflows (e.g., pit wall rock runoff, Temporary NW PAG Stockpile drainage). As the Springer Pit Lake elevation is drawn down, the pit water quality becomes more variable as a result of the inflows accounting for a larger percentage of the water stored in the Springer Pit (i.e., less equalization). At this time, water quality follows a stronger seasonal trend, with peak concentrations occurring during freshet as a result of increased loadings from pit wall rock runoff and the Temporary NW PAG Stockpile.

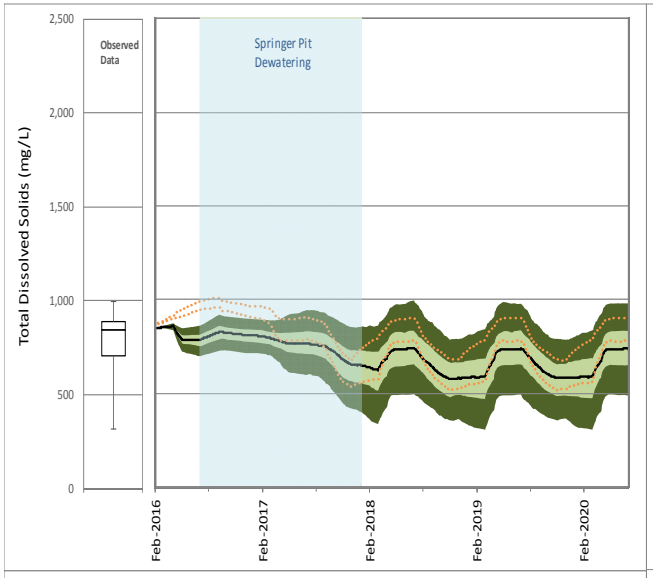
The PETBP is used to manage mine water prior to it being discharged via the WTP when water is not being discharged directly from the Springer Pit. The PETBP collects drainage from several mine facilities including the TSF and, therefore, the quality in the PETBP is a function of the constituent concentrations in several sources. Water quality is predicted to have seasonal trends in the PETBP after the Springer Pit is dewatered in January 2018 (i.e., when the PETBP would become the influent source for the WTP).

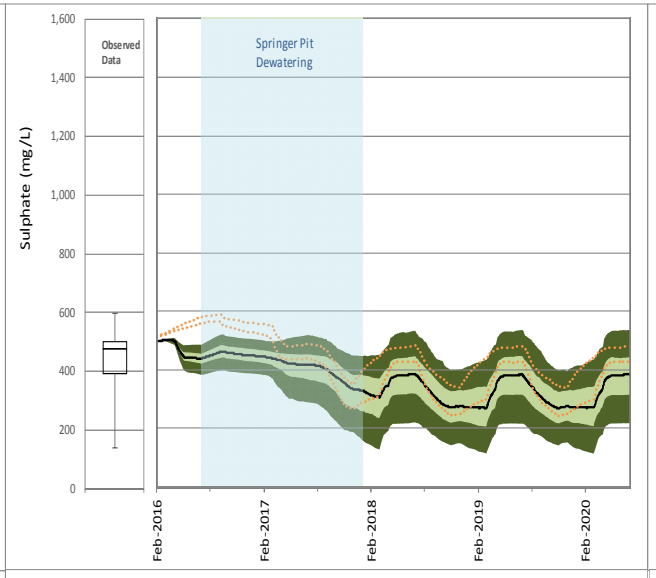
Table 5-3: Summary of Predicted Springer Pit and Perimeter Embankment Till Borrow Pond Water Quality - Operations

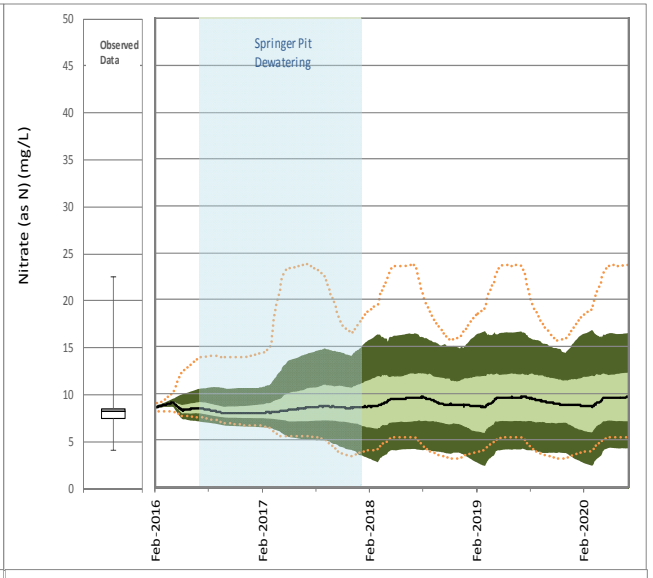
Parameter	Units	Scenario 1				Scenario 2			
		Springer Pit		Perimeter Embankment Till Borrow Pond		Springer Pit		Perimeter Embankment Till Borrow Pond	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters									
Hardness[a]	mg $CaCO_3$/L	571	697	593	677	695	712	864	901
Total Dissolved Solids	mg/L	865	1002	883	998	1002	1017	1173	1205
Major Ions									
Calcium	mg/L	174	212	183	207	213	217	264	272
Chloride	mg/L	9.3	9.4	11	13	16	18	17	19
Fluoride	mg/L	2.5	2.8	8.2	9.7	5.3	5.3	17	17
Magnesium	mg/L	33	41	33	39	39	42	50	54
Potassium	mg/L	9.3	9.3	10.0	13	9.8	9.8	15	15
Sodium	mg/L	43	43	45	49	45	45	51	54
Sulphate	mg/L	505	541	515	556	584	592	695	708
Nutrients									
Ammonia	mg/L (as N)	0.21	0.54	0.53	0.64	0.33	0.33	1.0	1.0
Nitrate	mg/L (as N)	9.8	17	9.3	14	22	24	21	22
Nitrite	mg/L (as N)	0.08	0.43	0.057	0.23	0.3	0.31	0.29	0.3
Total Phosphorus	mg/L	0.023	0.044	0.032	0.036	0.06	0.069	0.064	0.072
Total Metals									
Aluminum	mg/L	0.56	0.59	0.82	0.88	0.69	0.74	1.3	1.4
Antimony	mg/L	0.0014	0.0016	0.0018	0.0022	0.0016	0.0018	0.0033	0.0035
Arsenic	mg/L	0.0024	0.0033	0.012	0.014	0.0046	0.0047	0.024	0.025
Barium	mg/L	0.086	0.087	0.11	0.12	0.097	0.098	0.19	0.2
Beryllium	mg/L	0.00034	0.00048	0.00095	0.0012	0.0007	0.00079	0.0021	0.0022
Boron	mg/L	0.16	0.3	0.15	0.2	0.26	0.39	0.25	0.3
Cadmium	mg/L	0.000061	0.00023	0.00013	0.00026	0.00021	0.00031	0.00039	0.0005
Chromium	mg/L	0.0012	0.0013	0.0018	0.002	0.0016	0.0017	0.0032	0.0034
Cobalt	mg/L	0.00097	0.0049	0.00084	0.0023	0.007	0.0072	0.0058	0.0058
Copper	mg/L	0.018	0.048	0.025	0.049	0.033	0.044	0.083	0.096
Iron	mg/L	0.59	0.76	0.63	0.69	0.63	0.72	0.82	0.99
Lead	mg/L	0.00023	0.00024	0.00039	0.00041	0.00032	0.00032	0.00065	0.00069
Lithium	mg/L	0.014	0.016	0.013	0.018	0.016	0.019	0.025	0.028
Manganese	mg/L	0.98	2.2	0.33	1.0	2.6	2.6	2.4	2.4
Mercury	mg/L	0.0000025	0.0000026	0.0000032	0.0000035	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.15	0.17	0.15	0.18	0.21	0.23	0.34	0.36
Nickel	mg/L	0.0016	0.002	0.002	0.0024	0.0028	0.0029	0.0048	0.0051
Selenium	mg/L	0.044	0.087	0.054	0.079	0.14	0.14	0.19	0.2
Silver	mg/L	0.000034	0.000049	0.000094	0.00012	0.000073	0.000083	0.00021	0.00022
Strontium	mg/L	3.0	3.4	2.8	3.5	3.7	4.1	6.4	6.9
Thallium	mg/L	0.000091	0.0001	0.00021	0.00026	0.00014	0.00015	0.00042	0.00043
Tin	mg/L	0.000071	0.00025	0.000064	0.00019	0.000098	0.00025	0.000091	0.00021
Titanium	mg/L	0.031	0.035	0.03	0.033	0.036	0.038	0.039	0.042
Uranium	mg/L	0.0026	0.0051	0.0024	0.0031	0.0032	0.0038	0.0043	0.0052
Vanadium	mg/L	0.0051	0.0057	0.031	0.036	0.0094	0.0096	0.061	0.062
Zinc	mg/L	0.0093	0.011	0.022	0.026	0.022	0.022	0.057	0.058
Dissolved Metals									
Aluminum	mg/L	0.075	0.098	0.33	0.39	0.2	0.25	0.8	0.86
Antimony	mg/L	0.0014	0.0014	0.0017	0.002	0.0016	0.0016	0.0033	0.0034
Arsenic	mg/L	0.0023	0.0031	0.012	0.014	0.0044	0.0046	0.024	0.024
Barium	mg/L	0.081	0.082	0.1	0.12	0.092	0.093	0.19	0.19
Beryllium	mg/L	0.00034	0.0004	0.00095	0.0012	0.0007	0.00071	0.0021	0.0021
Boron	mg/L	0.16	0.27	0.15	0.16	0.26	0.36	0.25	0.27
Cadmium	mg/L	0.000057	0.00014	0.00012	0.00017	0.00021	0.00022	0.00039	0.0004
Chromium	mg/L	0.00055	0.00061	0.0012	0.0014	0.00098	0.001	0.0026	0.0027
Cobalt	mg/L	0.00065	0.0046	0.00051	0.002	0.0067	0.0069	0.0055	0.0055
Copper	mg/L	0.014	0.032	0.021	0.034	0.028	0.029	0.079	0.08
Iron	mg/L	0.041	0.22	0.086	0.15	0.086	0.17	0.27	0.45
Lead	mg/L	0.000083	0.000095	0.00024	0.00026	0.00017	0.00018	0.00051	0.00054
Lithium	mg/L	0.013	0.013	0.012	0.015	0.016	0.016	0.025	0.025
Manganese	mg/L	0.96	2.2	0.32	1.0	2.6	2.6	2.3	2.4
Mercury	mg/L	0.0000025	0.0000026	0.0000032	0.0000035	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.15	0.15	0.15	0.16	0.21	0.21	0.34	0.35
Nickel	mg/L	0.001	0.0014	0.0014	0.0018	0.0022	0.0023	0.0042	0.0045
Selenium	mg/L	0.044	0.083	0.054	0.074	0.14	0.14	0.19	0.19
Silver	mg/L	0.000034	0.000039	0.000094	0.00011	0.000073	0.000073	0.00021	0.00021
Strontium	mg/L	3.0	3.0	2.8	3.1	3.7	3.7	6.4	6.5
Thallium	mg/L	0.000091	0.000094	0.00021	0.00025	0.00014	0.00014	0.00042	0.00042
Tin	mg/L	0.000071	0.00015	0.000064	0.000085	0.000098	0.00015	0.000091	0.00011
Titanium	mg/L	0.0087	0.013	0.0078	0.011	0.014	0.015	0.017	0.02
Uranium	mg/L	0.0025	0.0044	0.0023	0.0024	0.0031	0.0032	0.0043	0.0046
Vanadium	mg/L	0.0038	0.0044	0.029	0.035	0.0081	0.0083	0.06	0.06
Zinc	mg/L	0.0078	0.0095	0.02	0.025	0.021	0.021	0.056	0.057

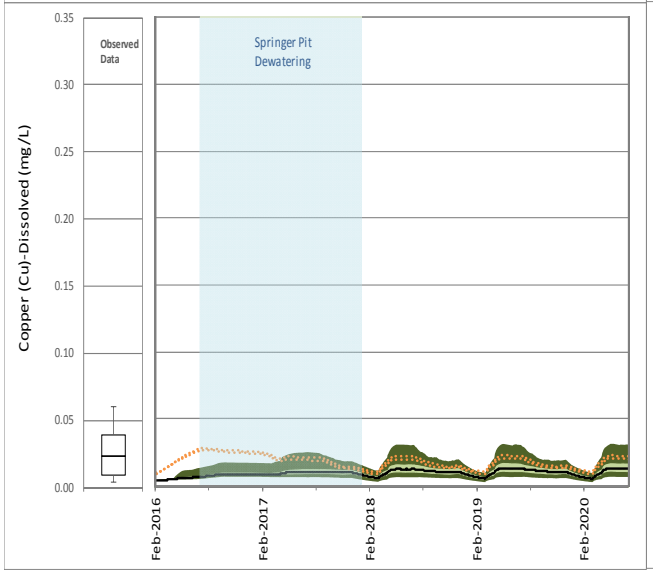
NOTES:

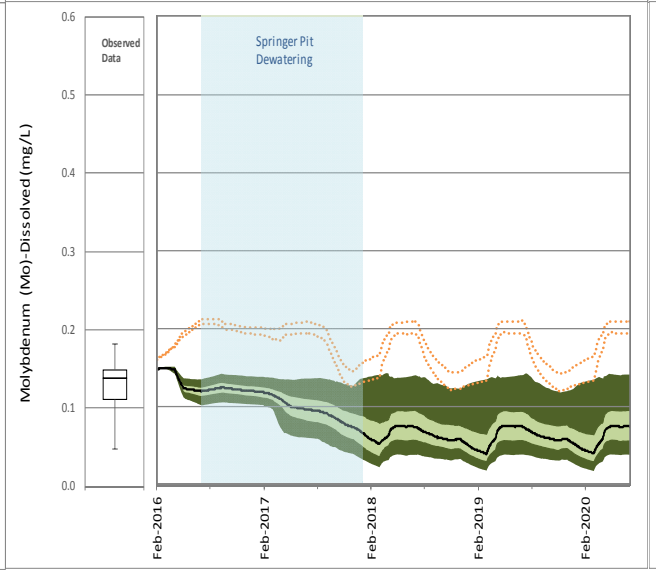
a) Calculated based on predicted calcium and magnesium concentrations

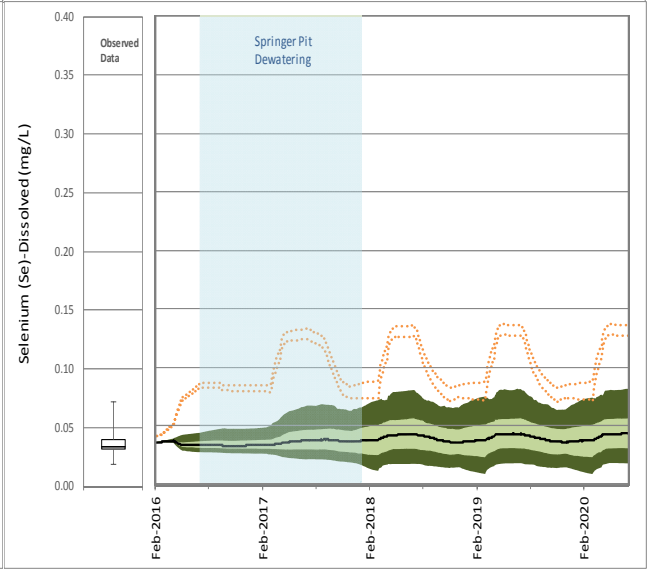


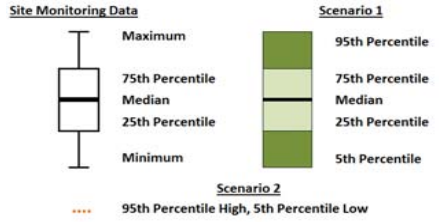












Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

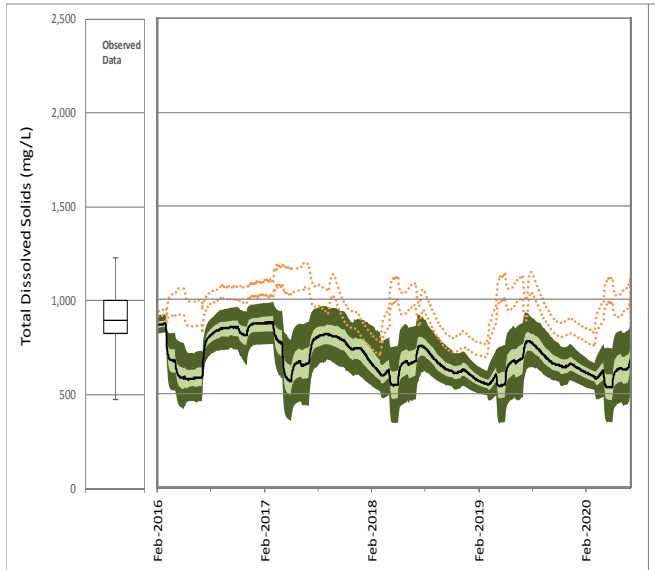
PROJECT No. 1411734 / 16000

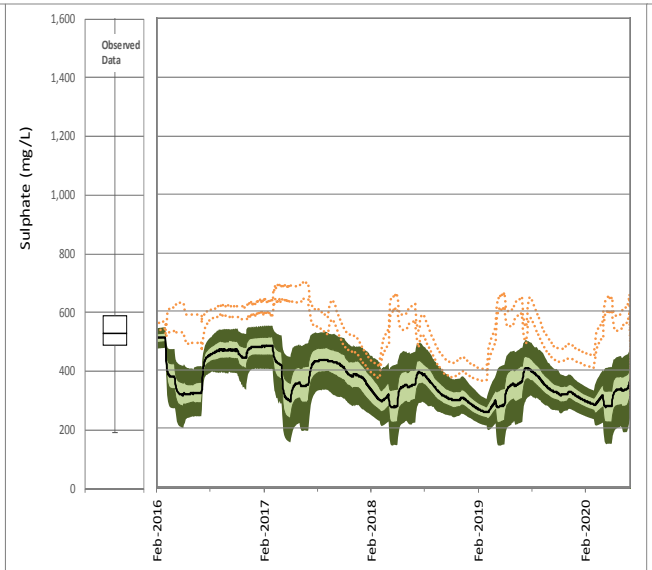
TITLE

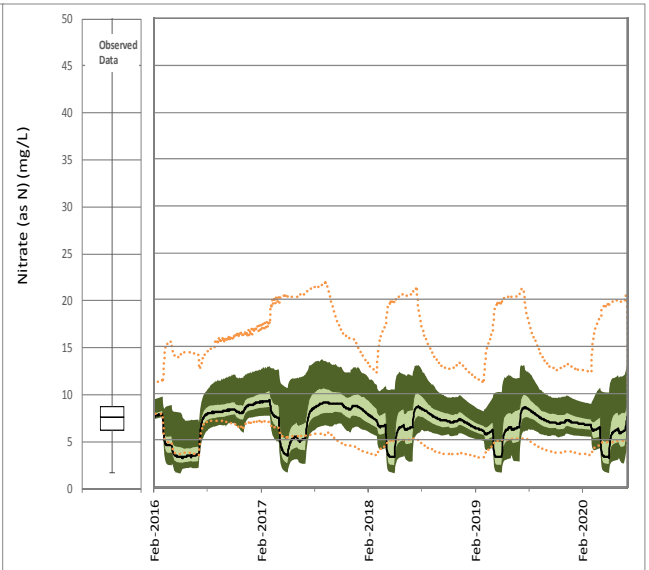
Springer Pit - Time Series Plots for Selected Parameters Operations

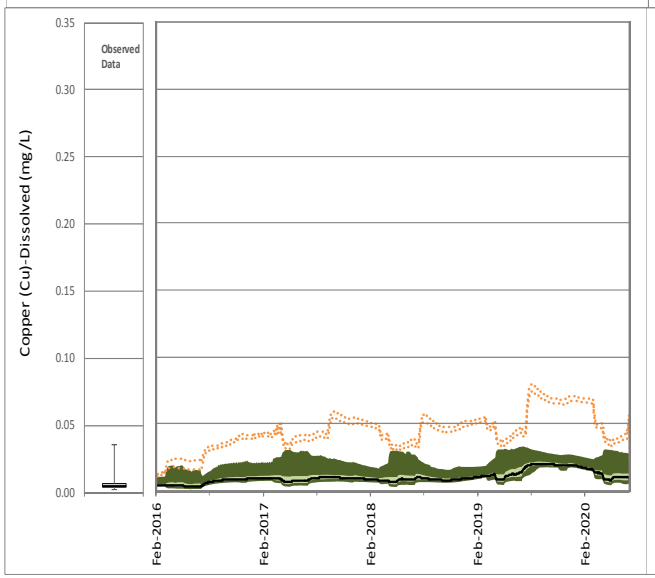
FIGURE No. 5 - 2

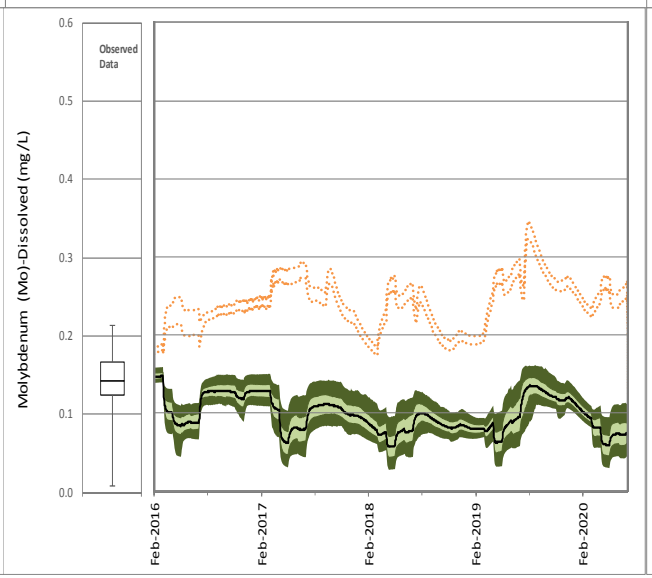
REVISION 0

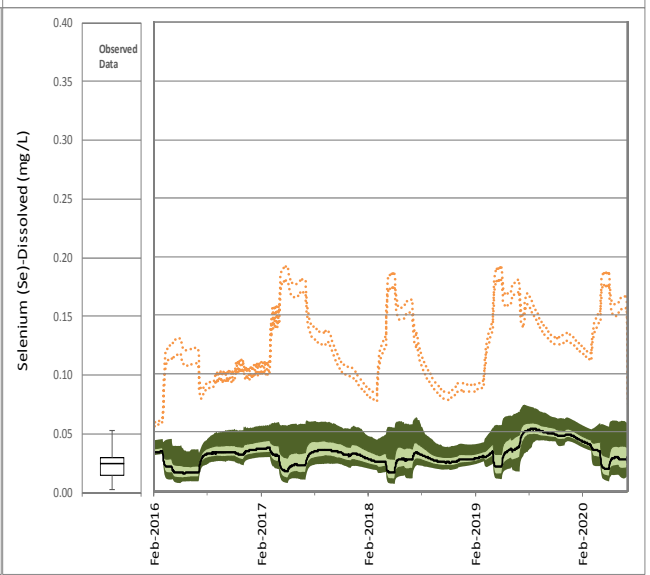


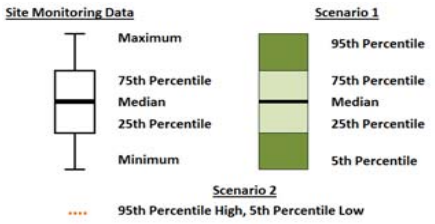












Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

PROJECT No. 1411734 / 16000

TITLE

Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters Operations

FIGURE No. 5 - 3

REVISION 0

5.2.2 No Discharge Scenario

As discussed in Section 5.1, seepage from the Springer Pit to Bootjack Lake is considered to be an operational discharge in the event that MPMC is unable to discharge water from the mine and is required to store mine contact water in the Springer Pit. This is referred to as the No Discharge scenario. This scenario is included in the TAR as a contingency scenario. The quality of the seepage from the Springer Pit to Bootjack Lake under a No Discharge scenario is dependent on when such a scenario would occur during operations. Within the context of this TAR, the No Discharge scenario is defined by the following assumptions:

- the mine is unable to discharge beginning in March 2017 just prior to the freshet
- all water is managed through the Springer Pit until it reaches an elevation of 1,050 masl

Maximum daily median and 95th percentile Springer Pit concentrations during the No Discharge scenario are presented in Table 5-4.

Hydrogeological modelling (Appendix B) indicates that seepage from the Cariboo-Springer Pit to Bootjack Lake will increase to a maximum of 420 m^3/d under average conditions when the pit lake elevation is at 1,050 masl. The influence of the seepage on Bootjack Lake water quality was evaluated at the edge of the IDZ of 100 m assuming the maximum daily median and 95th percentile concentrations would be maintained throughout the No Discharge scenario. The predicted Bootjack Lake water quality at the edge of the IDZ is presented in Section 6.0. The proposed effluent limits for Springer Pit seepage are presented in Section 5.4.

Table 5-4: Summary of Predicted Springer Pit Seepage Water Quality - No Discharge Scenario

Parameter	Units	Scenario 1		Scenario 2	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters					
Hardness[a]	mg $CaCO_3$/L	489	616	767	815
Total Dissolved Solids	mg/L	723	903	1045	1100
Major Ions					
Calcium	mg/L	150	188	235	248
Chloride	mg/L	5.0	6.7	14	15
Fluoride	mg/L	2.4	2.9	4.8	5.7
Magnesium	mg/L	28	36	44	48
Potassium	mg/L	4.5	5.9	6.9	7.4
Sodium	mg/L	23	29	32	35
Sulphate	mg/L	388	499	605	627
Nutrients					
Ammonia	mg/L (as N)	0.18	0.29	0.34	0.39
Nitrate	mg/L (as N)	7.5	13	20	22
Nitrite	mg/L (as N)	0.044	0.23	0.28	0.3
Total Phosphorus	mg/L	0.02	0.028	0.055	0.062
Total Metals					
Aluminum	mg/L	0.083	0.12	0.26	0.32
Antimony	mg/L	0.00073	0.00096	0.0016	0.0017
Arsenic	mg/L	0.0025	0.0032	0.0053	0.0065
Barium	mg/L	0.053	0.072	0.088	0.096
Beryllium	mg/L	0.00038	0.00048	0.00064	0.00075
Boron	mg/L	0.1	0.13	0.2	0.22
Cadmium	mg/L	0.000065	0.00013	0.00022	0.00024
Chromium	mg/L	0.00052	0.00063	0.0011	0.0013
Cobalt	mg/L	0.00047	0.002	0.0052	0.0056
Copper	mg/L	0.01	0.027	0.036	0.04
Iron	mg/L	0.052	0.14	0.13	0.2
Lead	mg/L	0.000086	0.0001	0.0002	0.00023
Lithium	mg/L	0.0069	0.0083	0.012	0.013
Manganese	mg/L	0.39	0.99	2.1	2.3
Mercury	mg/L	0.0000025	0.0000025	0.0000023	0.0000024
Molybdenum	mg/L	0.088	0.13	0.26	0.27
Nickel	mg/L	0.0008	0.0013	0.0024	0.0029
Selenium	mg/L	0.033	0.061	0.15	0.16
Silver	mg/L	0.000034	0.00004	0.000072	0.000083
Strontium	mg/L	1.3	2.1	4.4	4.7
Thallium	mg/L	0.00011	0.00012	0.00013	0.00015
Tin	mg/L	0.000062	0.000084	0.000081	0.000096
Titanium	mg/L	0.0075	0.01	0.014	0.016
Uranium	mg/L	0.0015	0.0019	0.0033	0.0035
Vanadium	mg/L	0.0048	0.0064	0.0097	0.013
Zinc	mg/L	0.0081	0.013	0.021	0.024
Dissolved Metals					
Aluminum	mg/L	0.083	0.12	0.26	0.32
Antimony	mg/L	0.00073	0.00096	0.0016	0.0017
Arsenic	mg/L	0.0025	0.0032	0.0053	0.0065
Barium	mg/L	0.053	0.072	0.088	0.096
Beryllium	mg/L	0.00038	0.00048	0.00064	0.00075
Boron	mg/L	0.1	0.13	0.2	0.22
Cadmium	mg/L	0.000065	0.00013	0.00022	0.00024
Chromium	mg/L	0.00052	0.00063	0.0011	0.0013
Cobalt	mg/L	0.00047	0.002	0.0052	0.0056
Copper	mg/L	0.01	0.027	0.036	0.04
Iron	mg/L	0.052	0.14	0.13	0.2
Lead	mg/L	0.000086	0.0001	0.0002	0.00023
Lithium	mg/L	0.0069	0.0083	0.012	0.013
Manganese	mg/L	0.39	0.99	2.1	2.3
Mercury	mg/L	0.0000025	0.0000025	0.0000023	0.0000024
Molybdenum	mg/L	0.088	0.13	0.26	0.27
Nickel	mg/L	0.0008	0.0013	0.0024	0.0029
Selenium	mg/L	0.033	0.061	0.15	0.16
Silver	mg/L	0.000034	0.00004	0.000072	0.000083
Strontium	mg/L	1.3	2.1	4.4	4.7
Thallium	mg/L	0.00011	0.00012	0.00013	0.00015
Tin	mg/L	0.000062	0.000084	0.000081	0.000096
Titanium	mg/L	0.0075	0.01	0.014	0.016
Uranium	mg/L	0.0015	0.0019	0.0033	0.0035
Vanadium	mg/L	0.0048	0.0064	0.0097	0.013
Zinc	mg/L	0.0081	0.013	0.021	0.024

NOTES:

a) Calculated based on predicted calcium and magnesium concentrations

5.2.3 Closure/Post-closure

During closure, mining infrastructure, including pipelines and pumps that are not required for ongoing water management, will be decommissioned. Closure drainage will be implemented such that mine facilities drain to their natural watersheds, including flooded open pits, once they have passively filled during post-closure and subject to meeting limits for such discharge. It is desired that during post-closure, there would be individual site discharges (Section 4.0) to the following waters:

- Bootjack Lake
- Polley Lake
- Hazeltine Creek
- Edney Creek

The objective of the RCP is to return the areas of mining disturbance to equal or better land capability than that which existed prior to the mine being developed. This includes treatment of discharges that are above the proposed closure effluent limits. The operations water treatment and discharge system is considered a viable option for continued use in the closure and post-closure phases; however, it is MPMC's preference to eventually return flows to pre-development watersheds using passive water treatment. This preference reflects the input expressed by local First Nations and by members of the local community during advance consultation. A 30-day consultation period will also occur once the application is submitted, during which additional concepts for water management may develop based on information obtained from consultation.

MPMC developed a *Roadmap to Long-Term Water Management* (Golder 2015j), which outlines the conceptual approach to distributed passive or semi-passive treatment at the mine during post-closure. It is recognized that the transition to distributed passive or semi-passive treatment systems will be completed over a period of time and that, prior to the transition being completed, it must be demonstrated that the proposed treatment technology is suitable for treating each site drainage source. To provide the basis for developing a piloting plan for a conceptual passive treatment system (Appendix F), it was assumed that all discharges would continue to be managed through the PETBP during the closure and post-closure periods. This is the first step in the design process, which allows a treatment concept to be developed that can manage all of the load from site during the post-closure period. The second stage in the design process is to pilot smaller-scale water treatment system(s) during operations to evaluate the empirical efficiency of the system, which can then be used to refine the WQM for the purposes of evaluating post-closure impacts, optimizing the passive treatment system(s), establishing effluent criteria, and testing to confirm that the proposed criteria will meet environmental requirements. This second stage will be combined with ongoing development of the RCP in an iterative process to refine and optimize water management planning for the closure and post-closure phases.

The following sections provide the estimated discharge water quantity and quality from the PETBP assuming all site water is managed through this facility. Predicted water qualities are also presented for the Springer Pit, since this represents a discharge during post-closure. Following piloting of the passive or semi-passive treatment system(s) and refinement of the RCP, model predictions will be refined to evaluate the discharge water quality reporting to each downstream receiving waterbody.

5.2.3.1 Quantity of Discharge

The daily variation in the total mine water discharge for the mean, 90th, and 99.5th percentiles during closure and post-closure to 2050 is shown in Figure 5-4. Estimated annual discharge volumes are shown in Table 5-5. The total annual discharge for the 99.5th percentile is 8.5 Mm^3 in 2050 after the Springer Pit is flooded.

The main conclusions during closure/post-closure are as follows:

- During closure (2021 and 2022), the mean annual discharge will be approximately 3.8 Mm^3.
- During closure (July 2020 onwards) the instantaneous discharge flows will increase due largely to direct freshet flows from the TSF through the spillway and the lower equalization provided by smaller on-site storage volumes. Conversely, low flows will become lower at closure compared to operations for the same reason.
- During post-closure, the discharge volume will generally increase with time as the mine area is reclaimed.
- By approximately 2045, the Cariboo-Springer Pit will have reached the spillway elevation of 1,050 masl, and the mean annual discharge will have increased to approximately 5.0 Mm^3.

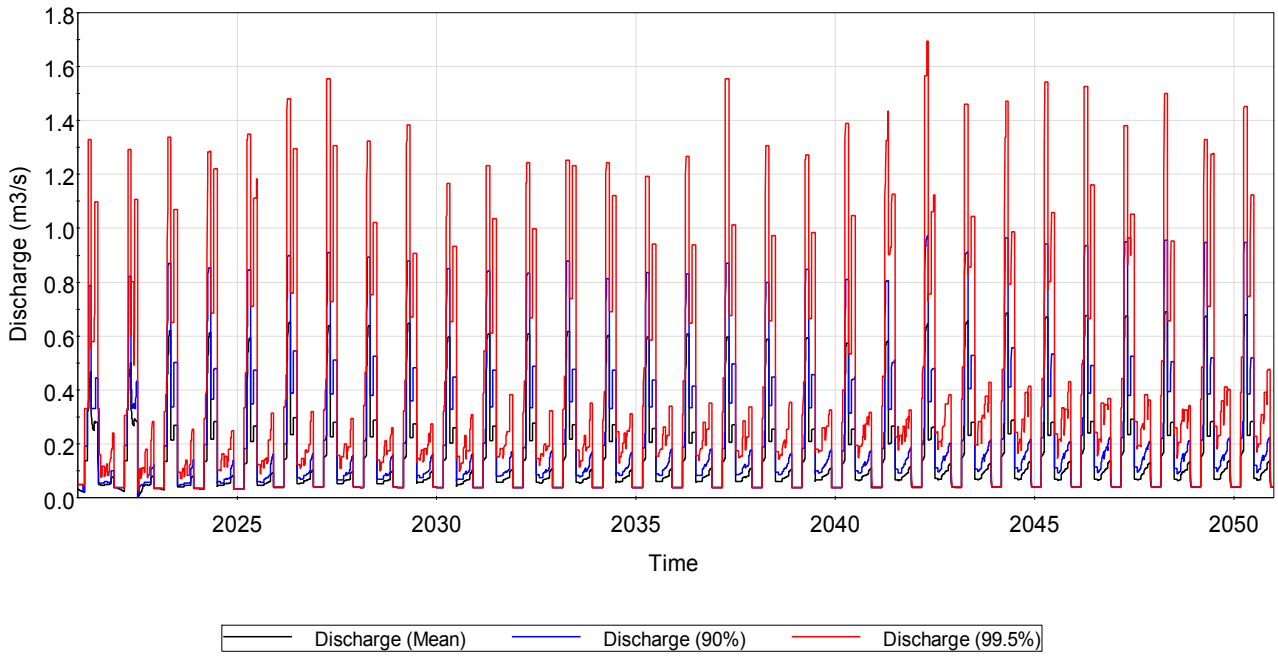


Figure 5-4: Discharge of Mine Water during Closure and Post-closure Phases

Table 5-5: Estimated Annual Discharge of Mine Water during Closure and Post-closure

Year	Annual Discharge (m^3)		
	Mean	90th Percentile	99.5th Percentile
2021	3,853,100	4,889,900	6,534,800
2022	3,821,900	4,913,900	6,491,600
2023	4,003,800	4,999,400	6,945,300
2024	4,109,800	5,164,400	6,709,100
2025	4,049,100	5,269,700	6,908,200
2030	4,213,500	5,201,100	6,349,700
2035	4,356,600	5,315,600	6,932,800
2040	4,303,400	5,241,600	6,592,300
2045	5,009,500	6,198,500	7,755,800
2050	5,034,500	6,184,400	8,447,000

5.2.3.2 Quality of Discharge

The qualities of before-treatment waters to be discharged for the Springer Pit and the PETBP are provided in Table 5-6 and Table 5-7, respectively. In the case of the PETBP, the concentrations provided in Table 5-7 represent the maximum of the daily median and 95th percentile concentrations modelled during closure and post-closure. The predicted Springer Pit water qualities represent the maximum of the median and 95th percentile concentrations when the pit lake elevation is greater than 1,030 masl, which corresponds to the elevation at which it is modelled that seepage may exfiltrate from the pit. Time series results for TDS, sulphate, nitrate, dissolved copper, molybdenum, and selenium are presented in Figure 5-5 (Springer Pit) and Figure 5-6 (PETBP). Total concentrations presented in Table 5-6 and Table 5-7 assume that TSS have been settled to less than 15 mg/L.

During post-closure, the PAG waste rock will be stored subaqueously in the Springer Pit. The waste rock dumps and the TSF will re-sloped and re-vegetated. The runoff from the TSF and waste rock dumps is expected to evolve to a natural runoff water quality as the vegetation establishes in these facilities. As a result, predicted concentrations decrease in the PETBP (Figure 5-6) as this closure strategy is implemented.

Modelled concentrations in the PETBP are seasonal, with peak concentrations occurring during the winter months. This occurs because there is no surface runoff and only seepage from the waste rock dumps and TSF, assigned waste rock or tailings chemical profiles (Appendix D), is draining to the PETBP. Although the seepage produced during this period represents a small percentage of the total annual volume (less than 5%), in the absence of any other drainages to the PETBP, concentrations increase in this facility. During freshet and all other non-winter months, concentrations decrease (Figure 5-6). There is also a small increase in modelled concentrations in 2055 (Figure 5-6). This occurs when the Cariboo-Springer Pit is full and begins to report to the PETBP during post-closure.

Constituent concentrations in the Cariboo-Springer Pit are predicted to increase as the pit initially fills from flushing of weathering products in the exposed pit walls. As the proportion of exposed wall rock decreases in post-closure, concentrations subsequently decrease to steady-state concentrations as the water is replaced by catchment runoff (Figure 5-5).

Wall rock in the Springer Pit is expected to contain approximately 18% PAG rock. No acidic drainage has been observed at the mine, though a conservative (cautious) source term was developed based on humidity cell tests that had their neutralization potential removed (Appendix C). This conservative source term was incorporated into the Scenario 2 predictions (Appendix D), under the assumption that the PAG component of the pit wall would become acid generating following refilling. If this occurs, several parameter concentrations are predicted to increase in the Springer Pit, most notably copper (Figure 5-5). Since acidic drainage has not been observed at the mine and is not reflected in the Scenario 1 water quality inputs, this increasing trend is not observed in the Scenario 1 results (Figure 5-5).

There is uncertainty in the PAG wall source term because acidic drainage has not been observed to date. MPMC will evaluate the composition of acidic drainage through further study during operations and update the model as required to reduce the uncertainty in the post-closure predictions.

Table 5-6: Summary of Predicted Springer Pit Water Quality - Closure and Post-closure

Parameter	Units	Closure (7/1/2020 - 7/1/2022)				Post-Closure (7/1/2022 - 1/1/2050)				Long Term Post-Closure (1/1/2050 - 1/1/2100)			
		Scenario 1		Scenario 2		Scenario 1		Scenario 2		Scenario 1		Scenario 2	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters													
Hardness[a]	mg $CaCO_3$/L	519	695	652	697	522	709	711	756	296	404	343	388
Total Dissolved Solids	mg/L	746	984	863	904	751	1005	932	978	439	575	462	506
Major Ions													
Calcium	mg/L	158	212	200	211	159	216	217	229	89	121	105	117
Chloride	mg/L	3.1	5.2	15	17	3.1	5.9	17	18	2.3	4.2	15	17
Fluoride	mg/L	0.22	0.34	0.43	0.46	0.26	0.42	0.48	0.51	0.23	0.32	0.42	0.45
Magnesium	mg/L	30	40	37	41	30	42	41	45	18	25	20	23
Potassium	mg/L	2.2	3.0	4.3	4.6	2.2	3.0	4.4	4.7	1.2	1.8	2.1	2.4
Sodium	mg/L	16	21	18	20	16	22	20	22	12	16	11	13
Sulphate	mg/L	389	547	458	482	392	561	509	542	211	294	208	240
Nutrients													
Ammonia	mg/L (as N)	0.19	0.44	0.13	0.14	0.22	0.55	0.13	0.14	0.16	0.39	0.031	0.036
Nitrate	mg/L (as N)	9.6	17	22	24	9.6	17	22	24	4.2	8.3	1.5	3.6
Nitrite	mg/L (as N)	0.074	0.36	0.3	0.31	0.081	0.37	0.59	0.6	0.051	0.13	0.27	0.29
Total Phosphorus	mg/L	0.02	0.031	0.059	0.067	0.02	0.032	0.068	0.075	0.014	0.023	0.34	0.35
Total Metals													
Aluminum	mg/L	0.5	0.53	0.68	0.74	0.52	0.56	0.68	0.74	0.54	0.59	0.72	0.77
Antimony	mg/L	0.0007	0.0013	0.0009	0.0011	0.00087	0.0017	0.0012	0.0014	0.00073	0.0013	0.00065	0.00084
Arsenic	mg/L	0.0012	0.0018	0.0026	0.0032	0.0013	0.0021	0.0028	0.0034	0.0013	0.0021	0.0036	0.0043
Barium	mg/L	0.055	0.077	0.074	0.076	0.055	0.077	0.077	0.08	0.032	0.044	0.075	0.078
Beryllium	mg/L	0.00016	0.0003	0.000083	0.00017	0.00021	0.00033	0.000084	0.00017	0.00023	0.00031	0.00034	0.00042
Boron	mg/L	0.11	0.18	0.22	0.28	0.12	0.21	0.23	0.3	0.11	0.19	0.2	0.27
Cadmium	mg/L	0.000056	0.00023	0.00021	0.00031	0.000056	0.00025	0.00021	0.00031	0.000041	0.00018	0.00018	0.00028
Chromium	mg/L	0.00084	0.00092	0.0013	0.0014	0.00094	0.001	0.0013	0.0014	0.001	0.0012	0.0014	0.0015
Cobalt	mg/L	0.00097	0.004	0.0067	0.0067	0.00096	0.0037	0.0067	0.0068	0.00051	0.001	0.018	0.018
Copper	mg/L	0.018	0.047	0.027	0.038	0.02	0.061	0.03	0.041	0.016	0.038	0.32	0.33
Iron	mg/L	0.58	0.71	0.63	0.7	0.6	0.71	0.63	0.7	0.61	0.68	0.67	0.73
Lead	mg/L	0.00018	0.00019	0.00027	0.00029	0.00018	0.0002	0.00027	0.00029	0.00017	0.00019	0.00035	0.00038
Lithium	mg/L	0.0033	0.0073	0.0053	0.0084	0.0037	0.0081	0.0066	0.0095	0.003	0.0069	0.0075	0.011
Manganese	mg/L	0.78	1.7	2.5	2.6	0.76	1.7	2.6	2.7	0.065	0.47	0.74	0.78
Mercury	mg/L	0.0000025	0.0000026	0.0000025	0.0000025	0.0000025	0.0000027	0.0000025	0.0000025	0.0000022	0.0000022	0.0000022	0.0000022
Molybdenum	mg/L	0.077	0.16	0.21	0.22	0.087	0.16	0.23	0.24	0.058	0.1	0.099	0.12
Nickel	mg/L	0.0011	0.0018	0.0022	0.0026	0.0011	0.0019	0.0023	0.0026	0.0011	0.0016	0.0051	0.0055
Selenium	mg/L	0.044	0.087	0.13	0.14	0.045	0.088	0.15	0.16	0.018	0.043	0.067	0.075
Silver	mg/L	0.0000068	0.00002	0.000029	0.000042	0.0000068	0.00002	0.000029	0.000042	0.0000055	0.000018	0.00005	0.000063
Strontium	mg/L	1.1	2.4	2.8	3.3	1.2	2.9	4.2	4.6	0.85	1.8	2.0	2.5
Thallium	mg/L	0.000045	0.000059	0.000011	0.000024	0.000047	0.000062	0.000011	0.000024	0.000023	0.000035	0.000023	0.000036
Tin	mg/L	0.00007	0.00019	0.000096	0.00022	0.000071	0.0002	0.000099	0.00022	0.000052	0.00018	0.00035	0.00047
Titanium	mg/L	0.031	0.035	0.036	0.037	0.031	0.036	0.036	0.038	0.028	0.031	0.031	0.032
Uranium	mg/L	0.0023	0.0045	0.0024	0.0033	0.0028	0.0056	0.003	0.0038	0.0023	0.0043	0.0016	0.0024
Vanadium	mg/L	0.0024	0.0032	0.0044	0.0051	0.0024	0.0035	0.0044	0.0054	0.0023	0.0034	0.0038	0.0049
Zinc	mg/L	0.0042	0.0092	0.012	0.013	0.0042	0.011	0.012	0.013	0.0033	0.0063	0.068	0.069
Dissolved Metals													
Aluminum	mg/L	0.012	0.04	0.19	0.25	0.035	0.067	0.19	0.25	0.047	0.098	0.23	0.28
Antimony	mg/L	0.00068	0.0012	0.00088	0.0009	0.00085	0.0015	0.0012	0.0013	0.00071	0.0011	0.00063	0.00066
Arsenic	mg/L	0.00098	0.0016	0.0025	0.003	0.0011	0.0019	0.0026	0.0032	0.0011	0.0019	0.0034	0.0041
Barium	mg/L	0.05	0.071	0.068	0.07	0.05	0.071	0.071	0.075	0.026	0.039	0.069	0.073
Beryllium	mg/L	0.00016	0.00022	0.000083	0.000085	0.00021	0.00025	0.000084	0.000086	0.00023	0.00023	0.00034	0.00034
Boron	mg/L	0.1	0.15	0.22	0.25	0.12	0.17	0.23	0.26	0.1	0.15	0.2	0.24
Cadmium	mg/L	0.000051	0.00014	0.00021	0.00021	0.000052	0.00016	0.00021	0.00021	0.000036	0.000083	0.00018	0.00018
Chromium	mg/L	0.00019	0.00028	0.00064	0.0008	0.0003	0.0004	0.00064	0.0008	0.00038	0.00053	0.00071	0.00087
Cobalt	mg/L	0.00064	0.0037	0.0063	0.0064	0.00064	0.0034	0.0064	0.0064	0.00018	0.00072	0.018	0.018
Copper	mg/L	0.013	0.032	0.022	0.023	0.016	0.046	0.025	0.026	0.011	0.023	0.32	0.32
Iron	mg/L	0.036	0.16	0.085	0.15	0.053	0.17	0.085	0.15	0.068	0.13	0.12	0.19
Lead	mg/L	0.000032	0.000049	0.00012	0.00014	0.000032	0.00005	0.00012	0.00014	0.000026	0.00005	0.0002	0.00023
Lithium	mg/L	0.003	0.0044	0.005	0.0055	0.0034	0.0052	0.0063	0.0066	0.0027	0.004	0.0072	0.0077
Manganese	mg/L	0.76	1.7	2.5	2.5	0.74	1.7	2.6	2.7	0.05	0.45	0.72	0.77
Mercury	mg/L	0.0000025	0.0000026	0.0000025	0.0000025	0.0000025	0.0000027	0.0000025	0.0000025	0.0000022	0.0000022	0.0000022	0.0000022
Molybdenum	mg/L	0.077	0.14	0.21	0.21	0.087	0.15	0.23	0.23	0.058	0.087	0.099	0.1
Nickel	mg/L	0.00057	0.0012	0.0017	0.002	0.00057	0.0013	0.0017	0.0021	0.00055	0.0010	0.0045	0.0049
Selenium	mg/L	0.044	0.082	0.13	0.14	0.045	0.083	0.15	0.15	0.018	0.039	0.067	0.07
Silicon	mg/L	6.8	8.4	10	11	6.9	8.8	11	11	5.7	7.4	16	17
Silver	mg/L	0.0000068	0.00001	0.000029	0.000032	0.0000068	0.00001	0.000029	0.000032	0.0000055	0.000008	0.00005	0.000053
Strontium	mg/L	1.1	1.9	2.8	2.8	1.2	2.4	4.2	4.2	0.83	1.4	2.0	2.1
Thallium	mg/L	0.000045	0.00005	0.000011	0.000015	0.000047	0.000053	0.000011	0.000015	0.000023	0.000025	0.000023	0.000026
Tin	mg/L	0.00007	0.000093	0.000096	0.00012	0.000071	0.000095	0.000099	0.00012	0.000052	0.000078	0.00035	0.00037
Titanium	mg/L	0.0087	0.013	0.014	0.015	0.0088	0.013	0.014	0.015	0.006	0.009	0.0084	0.0097
Uranium	mg/L	0.0023	0.0039	0.0024	0.0026	0.0027	0.0049	0.003	0.0032	0.0022	0.0037	0.0015	0.0018
Vanadium	mg/L	0.0011	0.0019	0.0031	0.0038	0.0012	0.0022	0.0032	0.0041	0.00099	0.0021	0.0025	0.0036
Zinc	mg/L	0.0026	0.0076	0.01	0.011	0.0027	0.0093	0.01	0.011	0.0018	0.0048	0.066	0.067

NOTES:

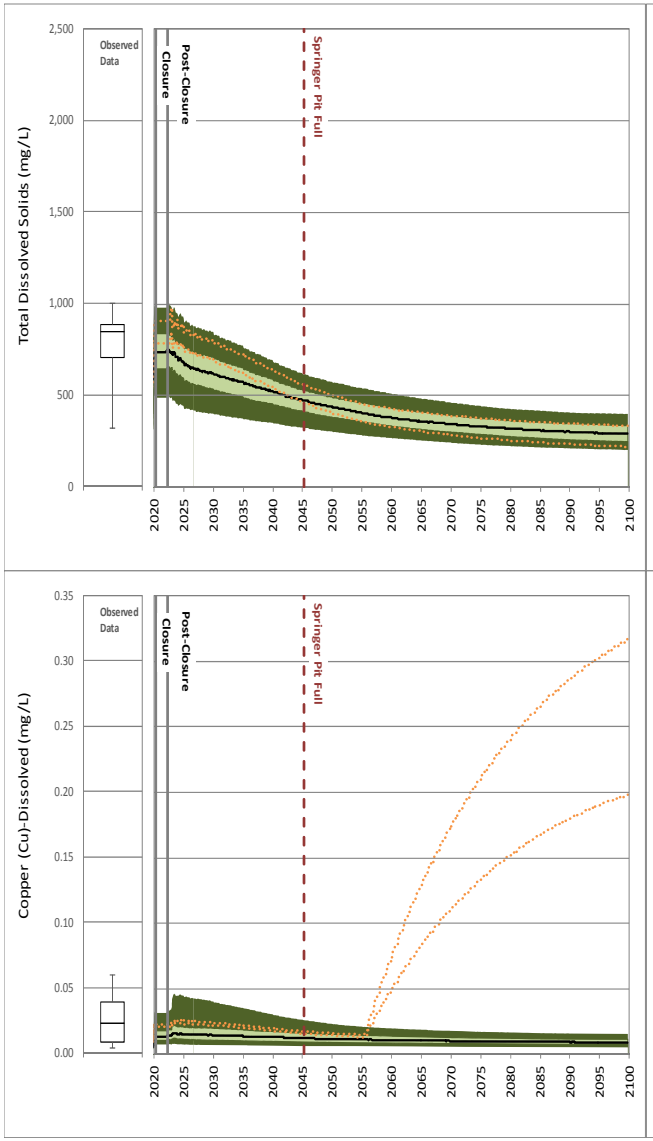
a) Calculated based on predicted calcium and magnesium concentrations

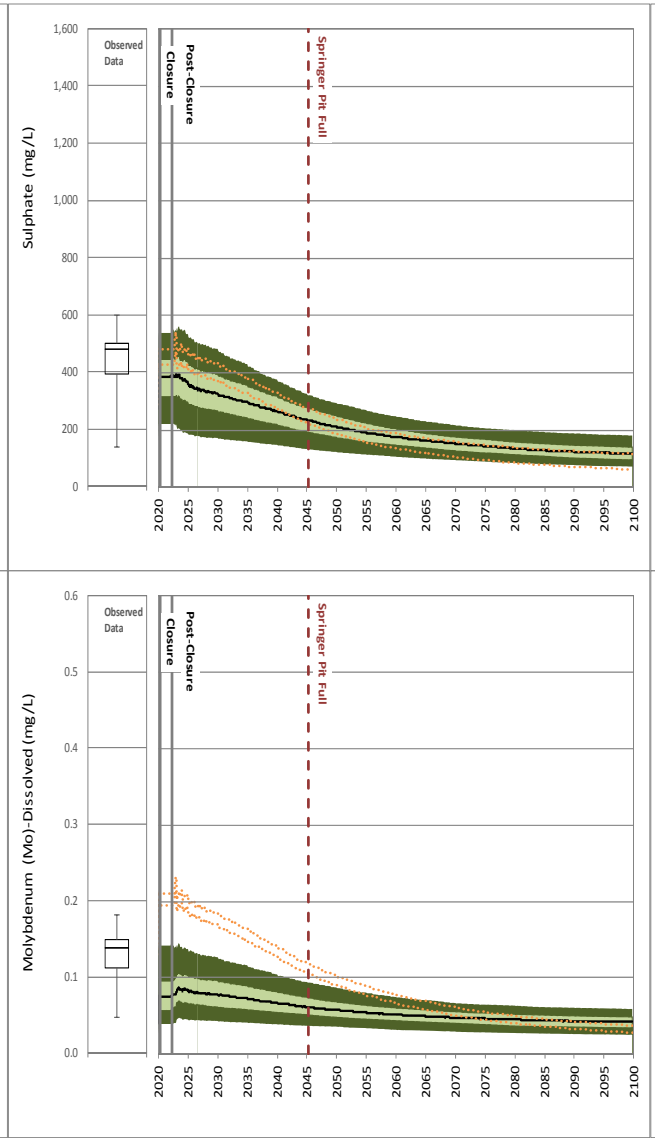
Table 5-7: Summary of Predicted Perimeter Embankment Till Borrow Pond Water Quality - Closure and Post-Closure

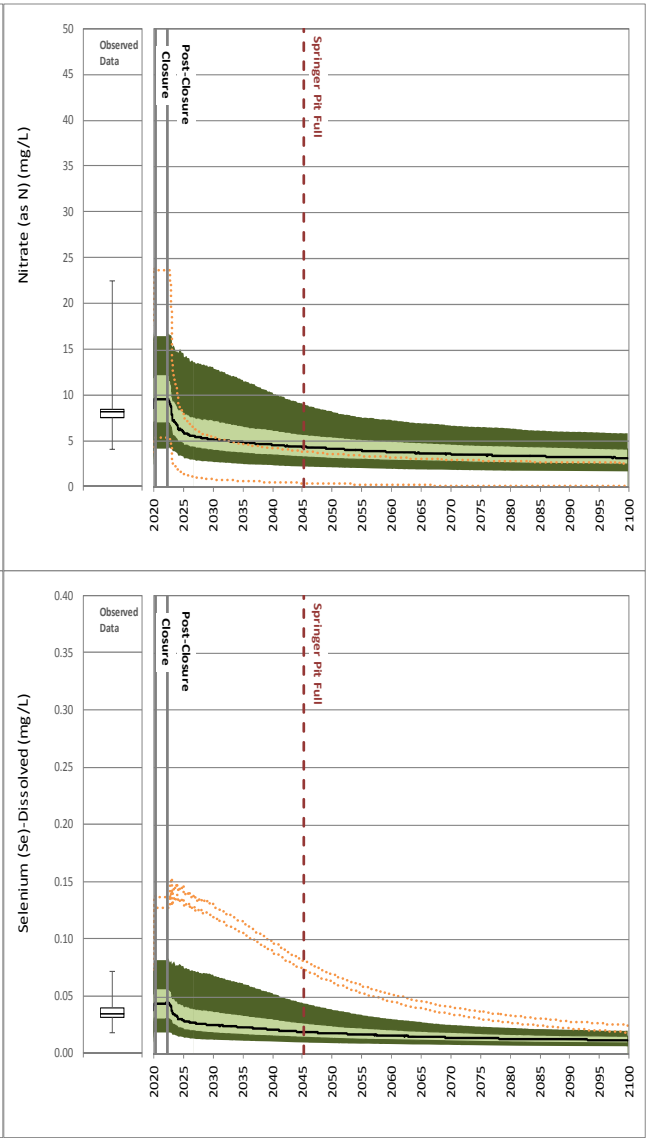
Parameter	Units	Closure (7/1/2020 - 7/1/2022)				Post-Closure (7/1/2022 - 1/1/2050)				Long Term Post-Closure (1/1/2050 - 1/1/2100)			
		Scenario 1		Scenario 2		Scenario 1		Scenario 2		Scenario 1		Scenario 2	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters													
Hardness[a]	mg $CaCO_3$/L	697	1029	1143	1189	462	612	720	775	429	577	587	632
Total Dissolved Solids	mg/L	1005	1510	1479	1530	687	912	949	1011	634	849	804	860
Major Ions													
Calcium	mg/L	214	311	350	362	142	184	219	232	132	173	179	192
Chloride	mg/L	3.5	8.6	15	17	3.9	6.6	9.8	13	3.2	5.8	10	13
Fluoride	mg/L	0.14	0.35	0.46	0.47	0.19	0.32	0.4	0.42	0.19	0.32	0.38	0.4
Magnesium	mg/L	40	61	65	69	26	37	42	48	24	35	34	37
Potassium	mg/L	2.7	4.6	6.5	6.8	2.1	3.2	4.2	4.7	1.8	2.9	3.5	3.9
Sodium	mg/L	17	25	30	32	15	19	23	27	14	17	19	21
Sulphate	mg/L	554	906	907	935	372	531	576	617	339	495	471	502
Nutrients													
Ammonia	mg/L (as N)	0.029	0.25	0.16	0.16	0.075	0.18	0.11	0.11	0.075	0.18	0.093	0.095
Nitrate	mg/L (as N)	9.4	25	4.7	4.7	9.3	17	3.0	3.5	7.8	16	2.7	3.5
Nitrite	mg/L (as N)	0.041	0.5	1.7	1.7	0.034	0.32	1.1	1.1	0.034	0.26	0.93	0.93
Total Phosphorus	mg/L	0.02	0.037	0.08	0.088	0.022	0.034	0.059	0.071	0.02	0.034	0.16	0.17
Total Metals													
Aluminum	mg/L	0.57	0.65	0.62	0.7	0.58	0.68	0.62	0.69	0.58	0.67	0.64	0.72
Antimony	mg/L	0.00025	0.00057	0.0018	0.002	0.00039	0.00076	0.0014	0.0016	0.00039	0.00077	0.0012	0.0013
Arsenic	mg/L	0.00071	0.0011	0.0026	0.0029	0.00097	0.0014	0.0023	0.0025	0.00097	0.0015	0.0024	0.0028
Barium	mg/L	0.063	0.12	0.12	0.12	0.04	0.065	0.07	0.072	0.037	0.063	0.06	0.065
Beryllium	mg/L	0.000074	0.00035	0.000099	0.00023	0.00012	0.00035	0.000075	0.00021	0.00013	0.00026	0.00017	0.00027
Boron	mg/L	0.051	0.11	0.2	0.24	0.088	0.15	0.14	0.18	0.089	0.15	0.14	0.19
Cadmium	mg/L	0.000062	0.00036	0.00024	0.00034	0.000046	0.00025	0.00017	0.00027	0.000046	0.00024	0.00015	0.00025
Chromium	mg/L	0.0012	0.0014	0.0013	0.0016	0.0013	0.0016	0.0013	0.0016	0.0013	0.0016	0.0013	0.0016
Cobalt	mg/L	0.0012	0.0052	0.011	0.011	0.00063	0.0018	0.0053	0.0053	0.00051	0.0017	0.0088	0.0088
Copper	mg/L	0.014	0.072	0.037	0.049	0.013	0.053	0.059	0.07	0.013	0.051	0.14	0.16
Iron	mg/L	0.65	0.78	0.66	0.78	0.66	0.77	0.66	0.78	0.66	0.77	0.66	0.78
Lead	mg/L	0.00018	0.0002	0.00023	0.00024	0.00018	0.00021	0.00021	0.00023	0.00018	0.00021	0.00025	0.00028
Lithium	mg/L	0.002	0.007	0.0081	0.011	0.0026	0.0069	0.007	0.01	0.0026	0.0063	0.0067	0.01
Manganese	mg/L	0.98	2.5	4.5	4.5	0.24	1.0	2.3	2.3	0.064	0.96	1.3	1.3
Mercury	mg/L	0.0000023	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000021	0.0000022	0.0000021	0.0000021
Molybdenum	mg/L	0.093	0.22	0.38	0.4	0.064	0.12	0.26	0.3	0.064	0.12	0.21	0.24
Nickel	mg/L	0.0014	0.0027	0.0031	0.0034	0.0014	0.002	0.0028	0.0032	0.0014	0.0019	0.0033	0.0038
Selenium	mg/L	0.05	0.14	0.25	0.26	0.017	0.069	0.17	0.17	0.017	0.066	0.12	0.13
Silver	mg/L	0.00001	0.000025	0.000019	0.000032	0.000012	0.000025	0.000015	0.000029	0.000010	0.000022	0.000025	0.000039
Strontium	mg/L	1.4	4.0	6.8	7.3	1.5	3.2	5.2	5.7	1.4	3.0	3.8	4.3
Thallium	mg/L	0.00011	0.00012	0.00005	0.000062	0.00011	0.00012	0.000042	0.000054	0.000045	0.000062	0.000037	0.000049
Tin	mg/L	0.000067	0.0002	0.000093	0.0002	0.000063	0.00019	0.000075	0.00019	0.00006	0.00018	0.00017	0.00029
Titanium	mg/L	0.033	0.04	0.044	0.045	0.029	0.033	0.036	0.038	0.029	0.032	0.034	0.035
Uranium	mg/L	0.0011	0.0026	0.0049	0.0057	0.0013	0.0025	0.0035	0.0045	0.0013	0.0026	0.0026	0.0034
Vanadium	mg/L	0.0019	0.0026	0.0039	0.004	0.002	0.0025	0.0032	0.0036	0.002	0.0026	0.0032	0.0036
Zinc	mg/L	0.005	0.017	0.011	0.012	0.0046	0.011	0.015	0.016	0.0044	0.011	0.032	0.033
Dissolved Metals													
Aluminum	mg/L	0.079	0.16	0.13	0.21	0.092	0.19	0.13	0.2	0.09	0.18	0.15	0.23
Antimony	mg/L	0.00023	0.00039	0.0018	0.0018	0.00037	0.00058	0.0014	0.0014	0.00037	0.00059	0.0011	0.0011
Arsenic	mg/L	0.00052	0.00093	0.0024	0.0027	0.00078	0.0012	0.0021	0.0023	0.00078	0.0013	0.0022	0.0026
Barium	mg/L	0.057	0.11	0.11	0.12	0.034	0.059	0.065	0.067	0.031	0.057	0.054	0.059
Beryllium	mg/L	0.000074	0.00027	0.000099	0.00015	0.00012	0.00027	0.000075	0.00013	0.00013	0.00018	0.00017	0.00019
Boron	mg/L	0.048	0.074	0.2	0.21	0.085	0.12	0.14	0.15	0.086	0.12	0.14	0.15
Cadmium	mg/L	0.000058	0.00026	0.00024	0.00024	0.000042	0.00015	0.00016	0.00018	0.000042	0.00015	0.00015	0.00016
Chromium	mg/L	0.00053	0.00078	0.00068	0.00097	0.00065	0.00095	0.00066	0.00096	0.00064	0.00093	0.00066	0.00095
Cobalt	mg/L	0.0009	0.0049	0.011	0.011	0.0003	0.0015	0.005	0.005	0.00018	0.0013	0.0084	0.0085
Copper	mg/L	0.0097	0.057	0.033	0.034	0.0089	0.037	0.054	0.055	0.0088	0.035	0.14	0.14
Iron	mg/L	0.11	0.24	0.11	0.23	0.11	0.23	0.11	0.23	0.11	0.23	0.11	0.23
Lead	mg/L	0.000033	0.000059	0.00008	0.000096	0.000034	0.000063	0.000066	0.00009	0.000031	0.000062	0.00011	0.00013
Lithium	mg/L	0.0017	0.0041	0.0078	0.0085	0.0023	0.004	0.0067	0.0076	0.0023	0.0033	0.0064	0.0071
Manganese	mg/L	0.96	2.5	4.5	4.5	0.23	1.0	2.3	2.3	0.049	0.94	1.3	1.3
Mercury	mg/L	0.0000023	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000021	0.0000022	0.0000021	0.0000021
Molybdenum	mg/L	0.093	0.2	0.38	0.38	0.064	0.11	0.26	0.29	0.064	0.11	0.21	0.22
Nickel	mg/L	0.00085	0.0021	0.0026	0.0028	0.00081	0.0015	0.0023	0.0027	0.0008	0.0013	0.0028	0.0032
Selenium	mg/L	0.05	0.14	0.25	0.26	0.017	0.064	0.17	0.17	0.017	0.062	0.12	0.13
Silver	mg/L	0.00001	0.000015	0.000019	0.000022	0.000012	0.000015	0.000015	0.000019	0.000010	0.000012	0.000025	0.000029
Strontium	mg/L	1.4	3.6	6.8	6.9	1.5	2.8	5.2	5.3	1.4	2.6	3.8	3.9
Thallium	mg/L	0.00011	0.00011	0.00005	0.000052	0.00011	0.00011	0.000042	0.000045	0.000045	0.000052	0.000037	0.00004
Tin	mg/L	0.000067	0.0001	0.000093	0.0001	0.000063	0.000093	0.000075	0.000087	0.00006	0.000079	0.00017	0.00019
Titanium	mg/L	0.01	0.018	0.021	0.023	0.0071	0.011	0.014	0.016	0.0067	0.010	0.011	0.013
Uranium	mg/L	0.0011	0.0019	0.0048	0.0051	0.0013	0.0019	0.0035	0.0038	0.0013	0.0019	0.0026	0.0028
Vanadium	mg/L	0.00058	0.0014	0.0026	0.0027	0.00073	0.0012	0.0019	0.0023	0.00072	0.0013	0.0019	0.0023
Zinc	mg/L	0.0035	0.015	0.0097	0.011	0.003	0.010	0.014	0.015	0.0029	0.0093	0.03	0.031

NOTES:

a) Calculated based on predicted calcium and magnesium concentrations







Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

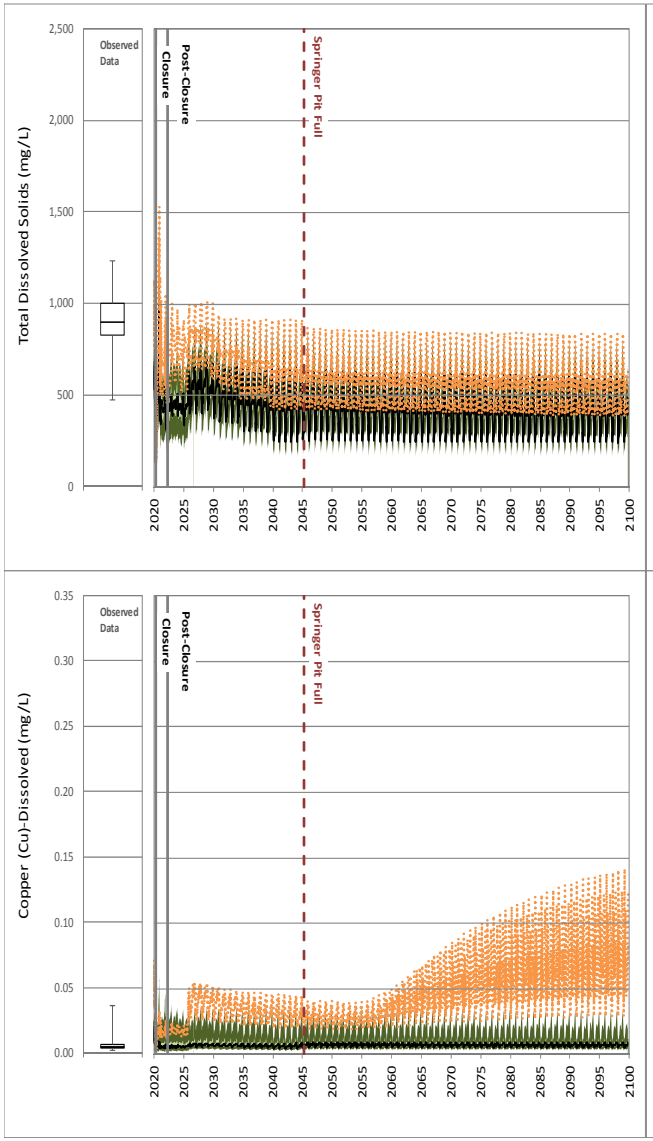
PROJECT No. 11411734 / 16000

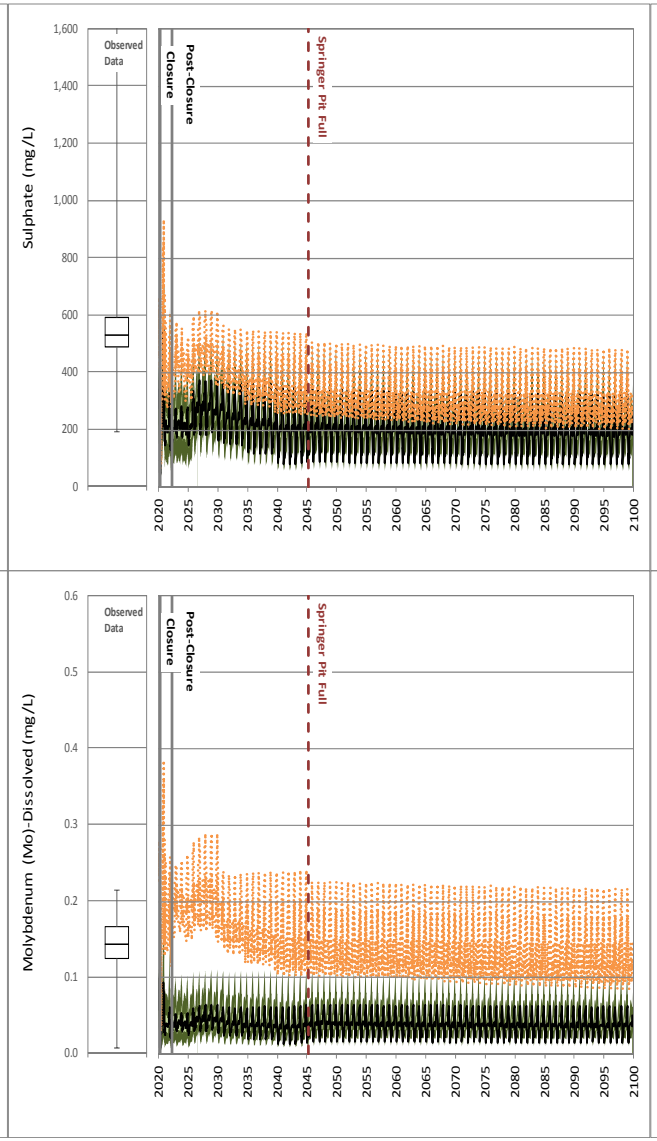
TITLE

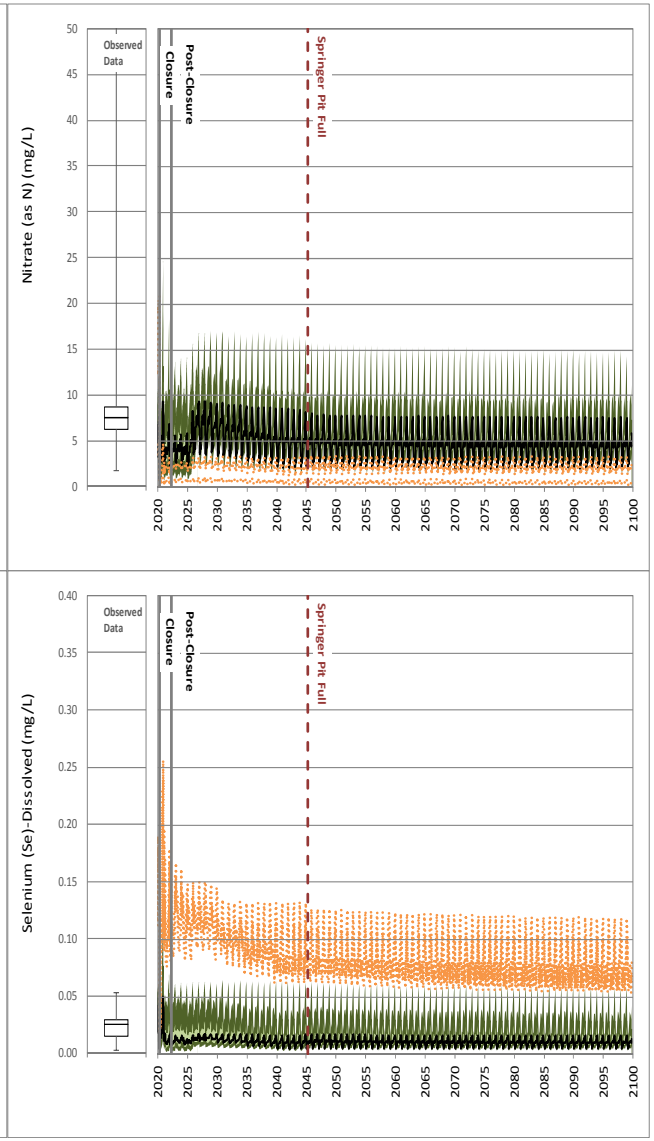
Springer Pit – Time Series Plots for Selected Parameters Closure – Post Closure

FIGURE No. 5 - 5

REVISION 0







Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

PROJECT No. 11411734 / 16000

TITLE

Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters Closure – Post Closure

FIGURE No. 5 - 6

REVISION 0

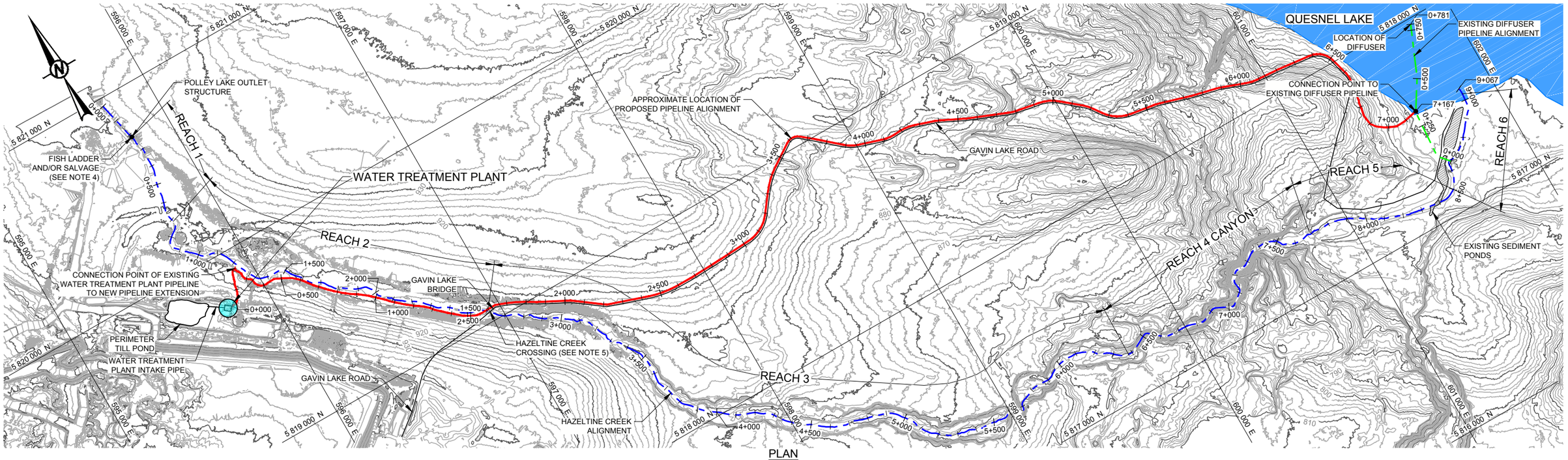
5.3 Discharge Location

Under EMA Permit 11678, MPMC is currently discharging treated effluent to Quesnel Lake via the Hazeltine Creek channel. As MPMC plans to return Hazeltine Creek to functioning aquatic habitat, discharge via the Hazeltine Channel as currently authorized is considered a temporary discharge management strategy. An options analysis was completed to evaluate the most appropriate discharge location for the operations phase that ranked the following options according to social, economic, environmental, and technological criteria:

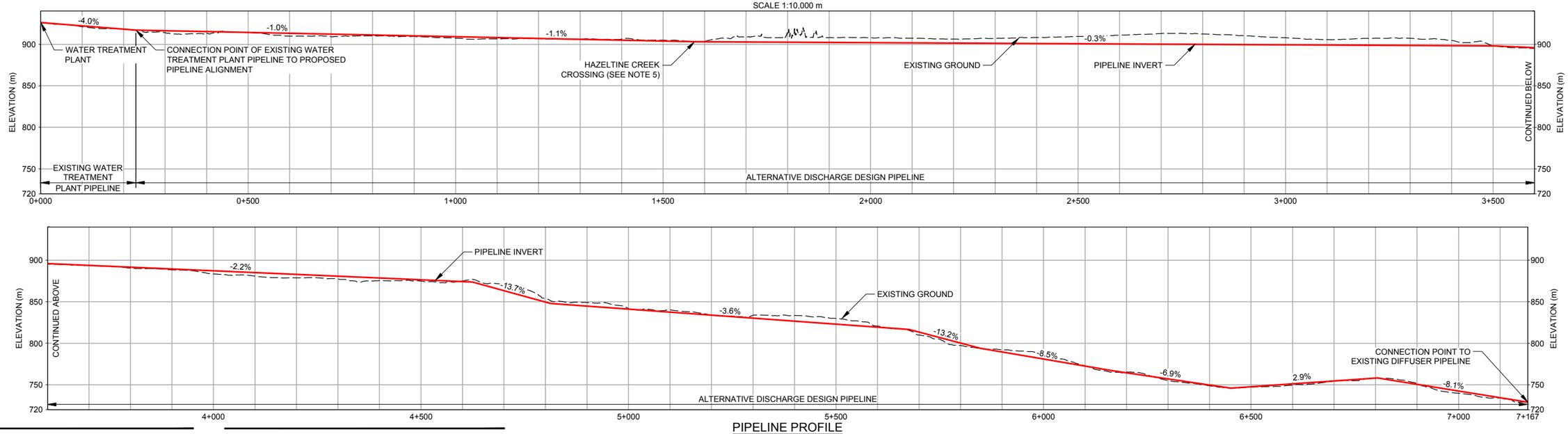
- **Option 1**—pipeline to Quesnel Lake.
- **Option 2**—relocating the Hazeltine Creek discharge point further downstream.
- **Option 3**—pipeline to Quesnel River.
- **Option 4**—distribution of discharge to Bootjack Lake, Polley Lake, and Hazeltine Creek.
- **Option 5**—use of science-based environmental benchmarks to determine assimilative capacity in Hazeltine Creek to allow discharge in the creek concurrent with fish habitat rehabilitation.

Criteria for the above options were weighted based on their technical merits and with the input from local communities and government, First Nations, the MoE, the MEM, and MPMC. Following the weighting of the criteria, each option was ranked and, based on the outcomes of this quantitative approach, a pipeline to Quesnel Lake was selected as the overall preferable discharge option for operations (Figure 5-7). Option 5 was subsequently rejected based on discussions with MoE staff, but it is retained in this document to show the options analysis as presented to communities. Additional details of the options analysis are presented in Appendix G.

MPMC's existing EMA Permit 11678 authorizes discharge to Quesnel Lake via the Hazeltine Channel until 30 November 2017. Based on the outcomes of the options analysis, which considered social, economic, environmental, and technological criteria for each discharge option, MPMC proposes to construct a pipe from the outlet of the WTP directly to Quesnel Lake (Figure 5-7), where it will be connected to the existing diffusers (Appendix H). During construction of the pipe, discharge will be directed to Quesnel Lake via the Hazeltine Channel per the current design. If approved, the pipe will be constructed and operational prior to 30 November 2017.



PLAN
SCALE 1:10,000 m



PIPELINE PROFILE
HORIZ. SCALE 1:5,000 m
VERT. EXAGGERATION 2x

LEGEND

- PROPOSED PIPELINE ALIGNMENT
- HAZELTINE CREEK ALIGNMENT
- EXISTING DIFFUSER PIPE ALIGNMENT
- GAVIN LAKE ROAD
- EXISTING SEDIMENT PONDS

REFERENCES

1. BASE TOPOGRAPHY PROVIDED BY MPMC, FILE NAME: "MtPolley_20140805_1m_LiDAR_Contour.dwg", RECEIVED: SEPTEMBER 3, 2014.
2. TOPOGRAPHY PROVIDED BY MPMC, SURFACE CREATED USING MULTIPLE DATA FILES, RECEIVED: NOVEMBER 27, 2014.

NOTES

1. PROPOSED PIPELINE ALIGNMENT WILL CONNECT TO OUTLET OF EXISTING WATER TREATMENT PLANT DISCHARGE PIPELINE.
2. PROPOSED PIPELINE ALIGNMENT WILL CONNECT TO EXISTING DIFFUSER PIPELINE AT QUESNEL LAKE.
3. PROPOSED PIPELINE ALIGNMENT GRADE, ALIGNMENT AND BURIAL DEPTH WILL BE CONFIRMED DURING DETAILED DESIGN.
4. FISH LADDER DESIGN AND/OR FISH SALVAGE PROCEDURE WILL BE CONFIRMED DURING DETAILED DESIGN.
5. PROPOSED PIPELINE ALIGNMENT CROSSING AT HAZELTINE CREEK WILL BE CONFIRMED DURING DETAILED DESIGN.

0 200 400
1:5,000 METRES

0 500 1,000
1:10,000 METRES

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-10-17
DESIGNED	SH
PREPARED	TAK
REVIEWED	JD
APPROVED	JV

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
PROPOSED PIPELINE ALIGNMENT PLAN AND PROFILE

PROJECT NO.	PHASE/DOC.	REV.	FIGURE
1411734	16000/162	0	5-7

Path: \\golder.gds\gal\burnaby\CAD-GIS\Cien\1413803\141173A\Phase 16000\Task 1000\ | File Name: 1411734-16000-1000_ 162 - 5-7.dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D
0 25 mm

5.4 Proposed Effluent Limits

5.4.1 Quality of Discharge

The typical effluent quality of the discharge during operations is expected to reflect predicted median concentrations shown in Table 5-3. It is, however, normal for effluent volume and quality to fluctuate based on conditions of mining operations, weather, and other natural factors. Additionally, the model and input data carry inherent uncertainty (Appendix D). Accordingly, a margin of safety between expected quality and enforceable limits has been incorporated into the proposed limits. This allowance prevents the administrative burden with non-compliance events that are above permit limits, but are not environmentally disruptive, while providing firm and enforceable limits that are protective of the environment. To support those proposed permit limits, an impact assessment (Section 6.0) has evaluated whether a discharge at those limits would cause pollution (as per the EMA definition of pollution).

Effluent limits were established for surface discharges to Quesnel Lake and seepage from the Springer Pit to Bootjack Lake using the following approach:

- Surface water quality objectives were identified at the edge of the IDZ. Objectives were set as the BC WQGs for the Protection of Freshwater Aquatic Life, which are considered the most conservative values.
- The minimum 30-day dilution factor at the edge of the IDZ during operations was estimated using a hydrodynamic model for Bootjack Lake (Appendix I) and both a near-field dispersion model (Appendix H) and a far-field hydrodynamic model (Appendix J) for Quesnel Lake.
- Effluent targets were calculated at the discharge point using the minimum 30-day dilution factors to determine discharge concentrations that would meet the BC WQGs at the edge of the IDZ.
- The proposed end-of-pipe effluent discharge targets were screened against MMER limits where available and for the potential for acute toxicity by comparison to short-term maximum BC WQGs and acute screening values derived in the effluent assessment presented in Section 6.0.
- Proposed effluent discharge targets were reduced to a concentration not considered to have the potential for acute lethality at end-of-pipe.
- Where relevant, effluent targets were further refined by lowering them to the maximum of 1) double the Scenario 1 maximum predicted 95th percentile discharge water quality or 2) the maximum of the 95th percentile predicted discharge water quality in Scenario 2 (Section 5.2).

The proposed effluent limits for discharges to Quesnel Lake and Bootjack Lake are provided in Section 6.3.2 along with further details regarding the justification for each limit.

The proposed limits for the potential Springer Pit seepage to Bootjack Lake were derived for the No Discharge scenario. This scenario assumes the Springer Pit will be filled to a capacity of 1,050 masl within the four-year mine life, and so the dilution factor in Bootjack Lake has been calculated for operations (Appendix I).

A selenium effluent limit is not proposed for the Springer Pit seepage to Bootjack Lake. If the hypothetical No Discharge scenario is realized during operations, MPMC proposes to manage Bootjack Lake selenium concentrations through monitoring selenium at the edge of the IDZ, as well as in the Springer Pit. If selenium concentrations approach the chronic guideline value of 2 µg/L at the edge of the IDZ in Bootjack Lake, and it is identified that these increases are related to increases of in-pit selenium concentrations, this transport pathway would be further evaluated for risk to ecological receptors and as necessary mitigated, through such options as grouting, in-pit lake selenium treatment, and/or other methods as appropriate.

5.4.2 Quantity of Discharge

Water balance modelling (Appendix B) indicates that the maximum 99.5th percentile annual discharge occurs during 2017 (Table 5-2) during operations. Therefore, MPMC proposes that EMA Permit 11678 be amended with an annual discharge rate of 10 Mm^3. To balance larger flows that occur during freshet, MPMC proposes amending EMA Permit 11678 with a maximum instantaneous discharge rate of 0.6 m^3/s. Note that future permit amendment applications for closure and post-closure are expected to have lower annual and instantaneous discharge rates, as discussed in Section 5.2.3.1.

A near-field mixing model (Appendix H) indicates a dilution factor greater than 40 times can be achieved in the existing Quesnel Lake diffusers at an instantaneous discharge rate of 0.6 m^3/s, considering over one hundred scenarios of different effluent and ambient conditions. This dilution factor is greater than the conservative dilution factor used to establish the proposed effluent targets for discharge to Quesnel Lake (Section 5.4.1) and, therefore, discharging water with concentrations less than the proposed effluent targets at a rate of 0.6 m^3/s will result in concentrations below the BC WQGs at the edge of the 100 m IDZ. During the detailed design stage, the configuration of the diffusers will be evaluated to determine if the dilution factor can be further optimized. This will be confirmed through monitoring at the discharge point and in Quesnel Lake during operations (Section 8.0).

5.5 Treatment Options Assessment

In developing a treatment approach for operations and post-closure, Golder conducted water treatment assessments (Appendices E, F, and K). The assessments included a review of potential treatment approaches using active or passive components, or elements of both, defined as hybrid or semi-passive systems. Both centralized treatment, where all the site water would be combined before treatment, and distributed (or decentralized) treatment, where treatment systems would be located at and tailored for specific mine water sources, were evaluated for operations and closure. The following sections discuss the operations and closure water treatment plans.

5.5.1 Operations

5.5.1.1 Plan Overview

As part of the water treatment assessment, modelled discharge water qualities (Section 5.2.1.2) were compared to the proposed effluent limits (Section 5.4.1) to identify parameters that may require treatment during operations (Table 5-8). In addition to suspended solids, total copper and selenium were the only parameters identified that may require treatment during operations.

An options analysis was completed as part of the Short-Term TAR (Golder 2015k) to identify a water treatment approach for restricted operations. Following the option analysis, MPMC installed and commissioned the existing Actiflo treatment plant. This plant has been successfully operated to manage suspended solids from the water since it was commissioned.

MPMC is currently carrying out bench scale testing to evaluate the performance of trimercaptotriazine (TMT) and higher dosages of polyaluminum chloride (PAC) in removing copper to low concentrations (e.g., to below the Permit limit). Depending on the results of the bench scale test, MPMC proposes to optimize the existing WTP to enhance its copper removal capabilities. It is expected that the TMT and PAC process can be carried out in conjunction and within the existing treatment process and infrastructure, with minor equipment additions, for the removal of fine or colloidal sediments and other metals. The process is referred to as the "optimized Actiflo" process. Additional information regarding the proposed optimization is described in the Operations Treatment Plan (Appendix E).

The maximum of the 95th percentile modelled selenium concentration (87 µg/L) was marginally higher than the proposed effluent limit of 75 µg/L (see Section 6.3.2, Effluent Permit Limits). The modelled values, however, are conservative (Appendix D); concentrations in the current discharge have remained closer to 30 µg/L, and median long-term predictions are also in this range. It is therefore considered possible, but unlikely, that selenium treatment will be required. If operational monitoring data indicate that selenium concentrations in the discharge trend towards the maximum value of the modelled 95th percentile concentration, additional mitigation, such as reducing selenium concentrations prior to discharge using pit lake treatment, would be implemented.

Table 5-8. Operations Treatment Screening

Parameter	Units	Proposed Effluent Discharge Limit	Springer Pit	Perimeter Embankment Till Borrow Pond
Major Ions				
Sulphate	mg/L	1100	541	556
Nutrients				
Ammonia	mg/L (as N)	1.3	0.54	0.64
Nitrate	mg/L (as N)	34	17	14
Total Phosphorus	mg/L	0.09	0.044	0.036
Total Metals				
Arsenic	mg/L	0.028	0.0033	0.014
Chromium	mg/L	0.004	0.0013	0.002
Copper	mg/L	0.033	**0.048**	**0.049**
Iron	mg/L	1	0.76	0.69
Lead	mg/L	0.00082	0.00024	0.00041
Molybdenum	mg/L	0.36	0.17	0.18
Nickel	mg/L	0.0051	0.002	0.0024
Selenium	mg/L	0.075	**0.087**	**0.079**
Zinc	mg/L	0.059	0.011	0.026

Note:

Maximum 95th percentile predicted concentrations presented for Scenario 1

5.5.1.2 Treatment Plant Information

The Actiflo plant is a flocculation/clarifier system, patented under the Actiflo name by Veolia Water Solutions & Technologies, which makes use of sand-ballasted lamella settling to remove suspended solids present in water. It consists of a high-rate coagulation, flocculation, and sedimentation process that utilizes microsand as seed material for floc ballast, which can be optimized to remove metal constituents. The resulting floc settles fast, allowing compact clarifier designs compared to conventional clarifiers, with high overflow rates and short detention times.

The system installed at the mine has a maximum design treatment capacity of 0.23 m^3/s, with a typical retention time of between 7 and 12 minutes. The Actiflo plant uses the following reagents: PAC, chelating agent (if necessary), polymer, and ballast sand. The reagents are removed along with the settled solids during the sedimentation process and ultimately discharged as a waste sludge to a separate pond. The waste sludge production at maximum flow is estimated to be 60 m^3/h. The total installed power requirement for the Actiflo plant is approximately 50 kW (excluding feed pumps). The plant is typically staffed with one dedicated operator per shift. The material and reagent usage based on active treatment mode and the maximum flow rate are estimated and provided in Table 5-9.

Table 5-9: Material and Reagent Usage

Description	Average Dosage	Consumption
Liquid polyaluminum chloride	150 µg/L	1,095 m^3/yr
Dry polymer	1.50 mg/L	10,950 kg/yr
Microsand	2 mg/L	14,600 kg/yr

The water balance model (Appendix B) predicts that an operational treatment rate of 0.23 m^3/s would be sufficient to meet overall discharge requirements. Nonetheless, in March 2016, MPMC received authorization to operate the plant in passive mode, as long as all the water quality targets are met. In passive mode, coagulant/polymer is not added and mechanical mixing is not active, allowing the effective discharge rate to increase. MPMC is seeking an amendment to increase the maximum annual discharge by 10% to 0.33 m^3/s.

5.5.2 No Discharge Scenario

A comparison of the predicted Springer Pit water qualities during a No Discharge scenario is provided in Table 5-10. No parameters were screened to be greater than the proposed effluent limits and therefore treatment of Springer Pit water during this scenario is not expected. As discussed in Section 5.4.1, a selenium effluent limit is not proposed for the Springer Pit seepage, and MPMC proposes to manage selenium concentrations through monitoring selenium at the edge of the IDZ in Bootjack Lake. If selenium concentrations approach the chronic guideline value of 2 µg/L and it is identified that these increases are related to increases of in-pit selenium concentrations, this transport pathway will be mitigated, through such options as grouting, in-lake selenium treatment, or other method as appropriate.

Table 5-10: No Discharge Scenario Treatment Screening

Parameter	Units	Proposed Effluent Discharge Limit	Springer Pit - Refilling (above 1030 masl)
Major Ions			
Sulphate	mg/L	1545	499
Nutrients			
Ammonia	mg/L (as N)	1	0.29
Nitrate	mg/L (as N)	84	13
Total Phosphorus	mg/L	0.16	0.028
Total Metals			
Arsenic	mg/L	0.13	0.0032
Chromium	mg/L	0.015	0.00063
Copper	mg/L	0.037	0.027
Iron	mg/L	1	0.14
Lead	mg/L	0.12	0.0001
Molybdenum	mg/L	2	0.13
Nickel	mg/L	0.5	0.0013
Zinc	mg/L	0.13	0.013

Note:

Maximum 95th percentile predicted concentrations presented for Scenario 1

5.5.3 Closure/Post-closure

5.5.3.1 Overview

As discussed in Section 5.2.3, the objective of the RCP is to return the areas of mining disturbance to equal or better land capability than what existed prior to the mine being developed. This includes treatment of any discharges that are above the proposed closure/post-closure effluent limits. While at present, MPMC is applying for effluent limits for operations for the four-year mine plan, a closure/post-closure water treatment BAT assessment (Appendix K) and passive treatment conceptual design (Appendix F) were also prepared to provide confidence that a practicable transition can be made between operations and closure/post-closure.

As part of the closure/post-closure BAT assessment, modelled discharge water qualities (Section 5.2.3) for the Springer Pit were compared to the proposed effluent limits assuming a dilution ratio of 40:1 (Section 5.4) to identify parameters that may require treatment during closure/post-closure (Table 5-11).

Table 5-11. Closure/Post-closure Water Quality

Parameter	Units	Proposed Effluent Discharge Limit	Closure		Post-closure	
			Springer Pit	Perimeter Embankment Till Borrow Pond	Springer Pit	Perimeter Embankment Till Borrow Pond
Major Ions						
Sulphate	mg/L	1100	547	906	561	531
Nutrients						
Ammonia	mg/L (as N)	1.3	0.44	0.25	0.55	0.18
Nitrate	mg/L (as N)	34	17	25	17	17
Total Phosphorus	mg/L	0.09	0.031	0.037	0.032	0.034
Total Metals						
Arsenic	mg/L	0.028	0.0018	0.0011	0.0021	0.0014
Chromium	mg/L	0.004	0.00092	0.0014	0.001	0.0016
Copper	mg/L	0.033	**0.047**	**0.072**	**0.061**	**0.053**
Iron	mg/L	1	0.71	0.78	0.71	0.77
Lead	mg/L	0.00082	0.00019	0.0002	0.0002	0.00021
Molybdenum	mg/L	0.36	0.16	0.22	0.16	0.12
Nickel	mg/L	0.0051	0.0018	0.0027	0.0019	0.002
Selenium	mg/L	0.075	**0.087**	**0.14**	**0.088**	0.069
Zinc	mg/L	0.059	0.0092	0.017	0.011	0.011

Note:

Maximum 95th percentile predicted concentrations presented for Scenario 1

As indicated in Table 5-11, total copper and selenium (in addition to suspended solids) were the only parameters identified that may require treatment during closure/post-closure.

Mine closure brings new opportunities for passive and hybrid treatment systems not afforded during operations due to the nature of the site and the mine plan. In the closure/post-closure BAT assessment, two treatment options were developed that would be best suited for water treatment: passive or hybrid systems applied to selected sources where most appropriate; or a system based on hybrid and pit lake treatment elements followed by the optimized Actiflo treatment.

It is MPMC's preference to return flows to pre-development watersheds using passive water treatment systems, subject to the performance limits of such systems. A passive system may have advantages, including the ability to discharge directly to pre-development watersheds and waterways such as Hazeltine Creek, and it requires low long-term maintenance. Therefore, a conceptual design for a conventional passive water treatment system is included in this TAR (Appendix F). However, a conventional, fully centralized, passive system is not presently deemed to be a proven system, so further work is required to evaluate decentralized passive and hybrid systems and to demonstrate the performance of such systems. Additionally, uncertainties related to the feed water quality, flows, and target qualities for the receiving environment for closure and post-closure need to be addressed through updates to the closure planning, before this option can be further assessed.

Therefore, closure BAT deemed that the most viable option at present is the option using pit lake treatment, involving passive and hybrid technologies, combined with the optimized Actiflo systems, through closure and post-closure phases. The pit lake treatment, which would take place in the Springer Pit, upstream of the Actiflo system, would allow selenium removal and partial solids settlement, and could be facilitated by the addition of a carbon source such as molasses. Any optimization required for copper removal would have been implemented during operations (Section 5.5.1).

5.5.3.2 Alternative Water Treatment Systems

A conventional passive treatment system based on a biochemical reactor is deemed to be impractical for treating the total flow from the mine. Some of the issues identified with the passive system could potentially be mitigated through the refinement of reclamation and closure planning or introduction of active components, making it a hybrid system; however, the latter also requires further testing.

As part of future studies, MPMC may also consider other types of active systems identified in the closure/post-closure BAT assessment if use of semi-passive or passive treatment systems are not proven to be feasible through future research or piloting studies.

6.0 ENVIRONMENTAL EFFECTS PREDICTIONS

This section contains an overview of groundwater and surface water quantity and quality on the mine site, followed by an effects assessment at locations in the receiving environment where mine contact waters are predicted to report to, whether through passive seepage or active treatment and discharge. The points of contact are seepage from the Springer Pit to Bootjack Lake, and to Hazeltine Creek and Quesnel Lake following treatment during operations, followed by passive treatment and distribution to local waterbodies at closure. Qualities and quantities of operational discharges are proposed for amendments to EMA Permit 11678.

6.1 Groundwater Quantity and Quality

The following section discusses estimates of groundwater quantity and quality for the mine facilities during operations and closure. These estimates were included in the SWWBM and WQM for the mine (Section 5.0), and the results of these models were then used to evaluate potential effects to the environment (Section 6.3).

6.1.1 Groundwater Quantity

The estimates of groundwater quantity for mine facilities were made using a combination of numerical and analytical hydrogeological models that were based on the conceptual understanding of the mine groundwater conditions, as summarized in Section 3.3.1. Details of these models, model assumptions, and associated uncertainty are provided in Appendices B and D, whereas the text in the following subsections summarizes the predicted groundwater quantities. Table 6-1 provides a summary of how each of the seepage sources is accounted for in the environmental effects predictions.

Table 6-1: Summary of Seepage Components and Method of Effects Assessment

Seepage Component	Method of Effects Assessment	Section
Cariboo-Springer Pit	Incorporated into site WQM and the Bootjack Lake hydrodynamic model	6.2
Wight Pit and Boundary Pit	Accounted for in SWWBM as a surface discharge from the mine. Any seepage losses to Polley Lake are captured as part of CEMP within adaptive management framework	6.2
TSF to Hazeltine Creek	Incorporated into site WQM	6.2
TSF to Edney Creek and tributaries	Part of CEMP within adaptive management framework	8.0
Other facilities (i.e., NEZ Soil Stockpile, NEZ Dump, SERDS, and Temporary NW PAG Stockpile)	Accounted for in SWWBM as a surface discharge from the mine. Any seepage losses from site are captured as part of CEMP within adaptive management framework	8.0

WQM = water quality model; SWWBM = site-wide water balance model; CEMP = Comprehensive Environmental Monitoring Plan; TSF = tailings storage facility; NEZ = Northeast Zone; SERDS = Southeast Rock Disposal Site; NW = northwest; PAG = potentially acid generating.

6.1.1.1 Open Pits

During operations, groundwater inflows to the Springer Pit and Cariboo Pit were predicted to increase to approximately 520 m^3/day (6.0 L/s) and 600 m^3/day (6.9 L/s), respectively, when these pits reach their ultimate configuration. When fully dewatered, both pits would act as strong groundwater sinks that would reverse groundwater flow between Bootjack Lake and the pits so that the seepage from Bootjack Lake to the underlying bedrock would occur. During closure, when both open pits are flooded and the pit lake level reaches the spillway elevation of 1,050 masl, groundwater inflow to both pits was predicted to decrease to approximately 270 m^3/day (3.1 L/s) for the Springer Pit and 320 m^3/day (3.7 L/s) for the Cariboo Pit. In addition, model results indicated that when both open pits are flooded to 1,050 masl elevation, seepage from the pit lakes towards Bootjack Lake would occur (i.e., the pit lakes would act as "flow-through" lakes). Seepage from the Springer Pit Lake and Cariboo Pit Lake was predicted at approximately 400 m^3/day (4.6 L/s) and 20 m^3/day (0.2 L/s), respectively. Results of sensitivity analyses that were used to quantify the uncertainty in predicted groundwater quantities showed that the actual groundwater inflow to the open pits could vary between approximately 0.7 and 1.6 times the base case values provided above, whereas the actual seepage from the pit lakes towards Bootjack Lake could range between approximately 0.5 to 2.3 times the base case predictions.

During operations, groundwater inflow of approximately 2,600 m^3/day (30.1 L/s) was estimated for the Wight Pit. When fully dewatered, this pit would also act as a strong groundwater sink that would reverse the groundwater flow direction along the shoreline of Polley Lake so that the seepage from Polley Lake towards the Wight Pit would occur. During closure, when the Wight Pit is flooded and the pit lake level reaches the spillway elevation of 926 masl, groundwater inflow to the pit lake was predicted to decrease to approximately 600 m^3/day (6.9 L/s). The Wight Pit Lake was also predicted to act as a flow-through lake, with seepage towards Polley Lake estimated at approximately 500 m^3/day (5.8 L/s). Considering the uncertainty in hydrogeological conditions near the Wight Pit, the actual groundwater inflow to the Wight Pit Lake could vary between approximately 0.7 and 1.2 times the base case value provided above, whereas the actual seepage from the pit lake towards Polley Lake could range between approximately 0.6 to 1.6 times the base case predictions.

Due to its relatively shallow depth and lack of observed seepage, significant inflow of groundwater to the Boundary Pit during operations is not expected. This pit could, however, provide seepage to the subsurface in response to direct precipitation and surface water runoff from the surrounding catchment, and such seepage could occur during operations and closure. For the range of possible depth of flooding, this seepage was estimated to range between less than 10 m^3/day (0.1 L/s) and approximately 60 m^3/day (0.7 L/s) and be directed towards the Wight Pit. Considering the uncertainty in hydrogeological conditions near the Boundary Pit, this seepage could vary for a fully flooded pit between approximately 0.6 and 3.0 times the base case value provided above.

6.1.1.2 Tailings Storage Facility

The total seepage collected from the TSF prior to the dam foundation failure in 2014 was approximately 7,344 m^3/day (85 L/s). This seepage rate was considered representative of the operational flows from the TSF. This flow rate is considered to be a conservative upper bound estimate of the operations seepage because the lateral extent of the pond during operations will be significantly smaller compared to conditions prior to the tailings dam foundation failure, when, at times, the pond extended over a significant portion of the surface of the TSF. An additional seepage loss of 190 m^3/day (2.2 L/s), not captured by the seepage collection system for the TSF, was estimated for operational conditions based on previous estimates in design reports (KP 2005).

Following closure, the seepage from the TSF was predicted to decrease from an average flow of approximately 4,080 m^3/day (47.2 L/s) in the first year of closure to about 1,290 m^3/day (14.9 L/s) after 70 years, which is considered representative of long-term steady-state conditions. Of this long-term flow, approximately 160 m^3/day (1.8 L/s) was predicted to bypass the seepage collection system and migrate to Hazeltine Creek, and less than 10 m^3/day (0.1 L/s) was estimated to flow towards Edney Creek and/or Edney Creek tributaries. The remainder of the seepage, in combination with a small component of groundwater originating upgradient of the TSF, was predicted to be intercepted by the seepage collections systems (1,130 m^3/day or 13.1 L/s).

Considering the uncertainty in the groundwater hydrogeological conditions near the TSF and in engineered components of the facility (e.g., tailings hydraulic conductivity), the predicted seepage from the TSF under long-term conditions was predicted to range between 890 m^3/day (10.3 L/s) and 2,390 m^3/day (27.7 L/s), or approximately 31% lower and 86% higher than the base case value of 1,290 m^3/day (14.9 L/s). The predicted range in seepage loss to downgradient creeks was predicted to range between 40 m^3/day (0.5 L/s) and 350 m^3/day (4 L/s), or approximately 72% lower or 122% higher than the base case value of 160 m^3/day (1.8 L/s).

6.1.1.3 Other Facilities

Potential seepage from the NEZ Soil Stockpile, NEZ Dump, SERDS, and Temporary NW PAG Stockpile to the subsurface was estimated based on the footprint of each facility at closure and an estimate of the groundwater recharge rate. Predicted seepage from the NEZ Soil Stockpile was estimated to be approximately 20 m^3/day (0.2 L/s). Considering the uncertainty in the assumed recharge rate, this seepage could range between 10 m^3/day (0.1 L/s) and 40 m^3/day (0.5 L/s). Based on the site-wide interpretation of hydrogeological conditions, groundwater in the vicinity of this facility was inferred to flow east-northeast in the direction of Polley Lake.

Predicted seepage from the NEZ Dump was estimated to be 110 m^3/day (1.3 L/s). Considering the uncertainty in the rate of infiltration to this facility, the predicted flow rate could range between 80 m^3/day (0.9 L/s) and 190 m^3/day (2.2 L/s). Based on the site-wide interpretation of hydrogeological conditions, groundwater in the vicinity of this facility was inferred to flow east in the direction of Polley Lake.

Predicted seepage from the SERDS was estimated to be 420 m^3/day (4.9 L/s). Considering uncertainty in the rate of infiltration to this facility, the predicted flow rate could range between 290 m^3/day (3.3 L/s) and 710 m^3/day (8.2 L/s). Based on the site-wide interpretation of hydrogeological conditions, groundwater in the vicinity of this facility was inferred to flow southeast in the direction of Polley Lake and/or the drainage channel between the mine site and the TSF.

Predicted seepage from the Temporary NW PAG Stockpile was estimated to be 340 m^3/day (3.9 L/s). Considering uncertainty in the rate of infiltration to this facility, the predicted flow rate could range between 220 m^3/day (2.6 L/s) and 570 m^3/day (6.6 L/s). Based on the site-wide interpretation of hydrogeological conditions, groundwater in the vicinity of this facility was inferred to flow towards the northwest and west, in the direction of Bootjack Lake with a small component of flow towards the Springer Pit while the pit is dewatered.

The seepage estimates presented above do not account for seepage that may be collected in drainage ditches downgradient of each facility and/or for reduced infiltration along steeper slopes of the facilities due to higher surface water runoff. Therefore, actual seepage from the storage facilities to the subsurface may be lower than these estimates.

6.1.2 Groundwater Quality

Water quality data for the monitoring wells across the mine site have been collected and analyzed by MPMC since the beginning of development. These analyses include physical parameters, anions, nutrients, and dissolved metals (MPMC 2016b) and are reported on an annual basis. This information has been reviewed by AMEC (2013) and Golder (2015d, 2016b), and recommendations were provided for refinements of the groundwater monitoring network.

There are no exposure pathways between water users and groundwater. Therefore, changes along the groundwater pathway were not evaluated as part of this TAR. Seepage losses from the Cariboo-Springer Pit and the TSF were accounted for in the receiving environment water quality predictions (Section 6.2). A chemical load from these facilities was calculated by assigning the predicted water qualities for facilities seeping to the receiving environments (Appendix D) to the predicted groundwater flows (Section 6.1.1). Seepage loads from the Cariboo-Springer Pit and the TSF were conservatively added to the Bootjack Lake and Quesnel Lake models, respectively, during operations.

An increasing trend in sulphate concentrations was observed in monitoring well GW12-2b in mid-2015. As part of its review of the *Mines Act* Permit M-200 amendment application (MPMC 2015a), MEM requested MPMC conservatively account for all groundwater sources that are draining to Bootjack Lake in the Long-Term TAR water quality model to ensure the observed constituent concentration increases in GW12-2b were accounted for in the modelling. In the case of Bootjack Lake, the maximum of the predicted median and 95th concentrations in the Cariboo-Springer Pit from the No Discharge scenario (Appendix D) were assigned to the seepage draining towards Bootjack Lake. This approach is considered conservative for the following reasons:

- A comparison of the regulated parameters under EMA Permit 11678 (Figure 6-1) indicates, with the exception of arsenic, the concentrations of all parameters in groundwater monitoring wells are less than the maximum of the predicted median and 95th percentile concentrations.
- Instantaneous transport of seepage load from the Springer Pit to Bootjack Lake were assumed.
- Dilution of the seepage from the Springer Pit along the flow pathway is not considered.

This approach is particularly conservative since MPMC is currently discharging water stored in the Springer Pit via the WTP and lake levels are decreasing (from approximately 1,038 masl to 1,025 masl from mid-July to mid-October 2016). As such, the general groundwater flow direction in the vicinity of GW12-2b will be towards the Springer Pit and not towards Bootjack Lake. Therefore, any influence of seepage losses from other mine facilities (e.g., from the Temporary NW PAG Stockpile) on the increases observed in monitoring well GW12-2b will inherently be accounted for in the model.

In the case of arsenic, there is variability among wells and no clear source or temporal pattern evident. One well had concentrations slightly above the most stringent BC WQG of 5 µg/L, whereas the concentrations in all other wells were below the guideline in all samples. However, based on both the measured and modelled concentrations, the potential for adverse impacts to Bootjack Lake water quality are very low and will be confirmed through ongoing monitoring.

Figure 6-1
Groundwater Quality Results

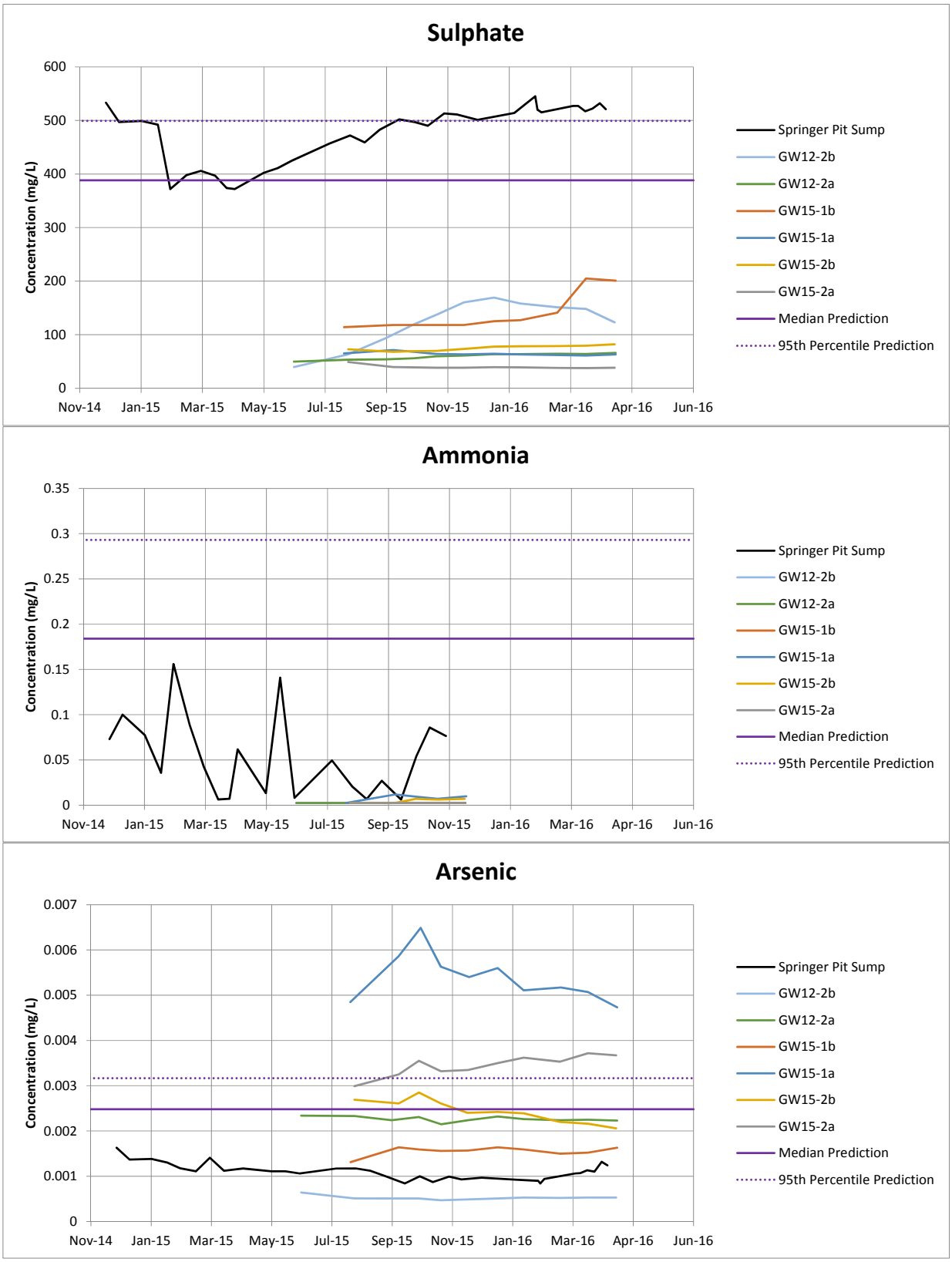
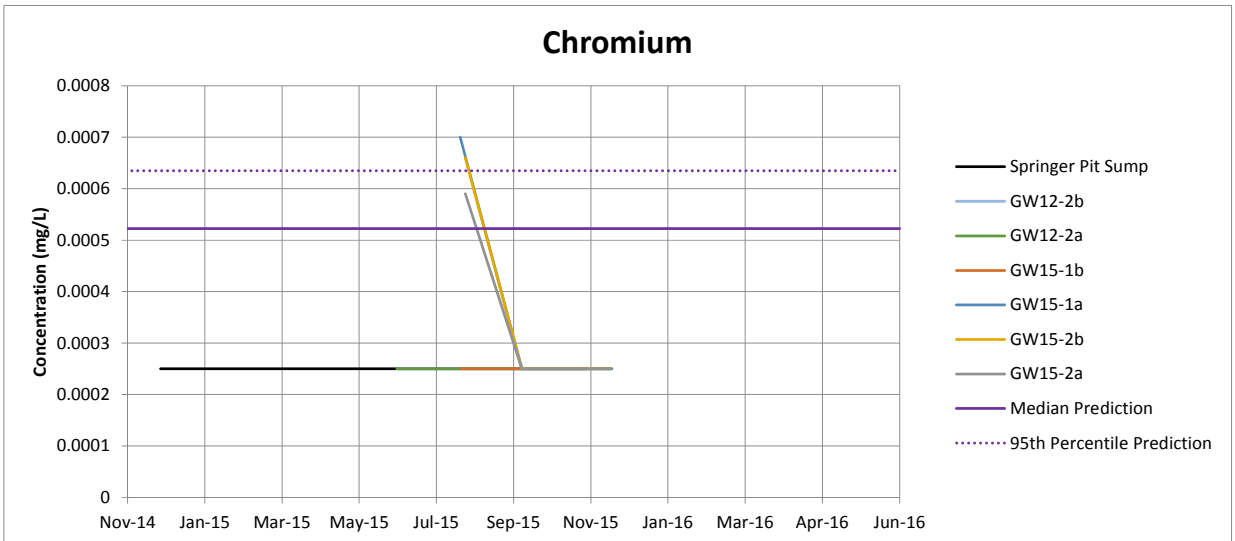
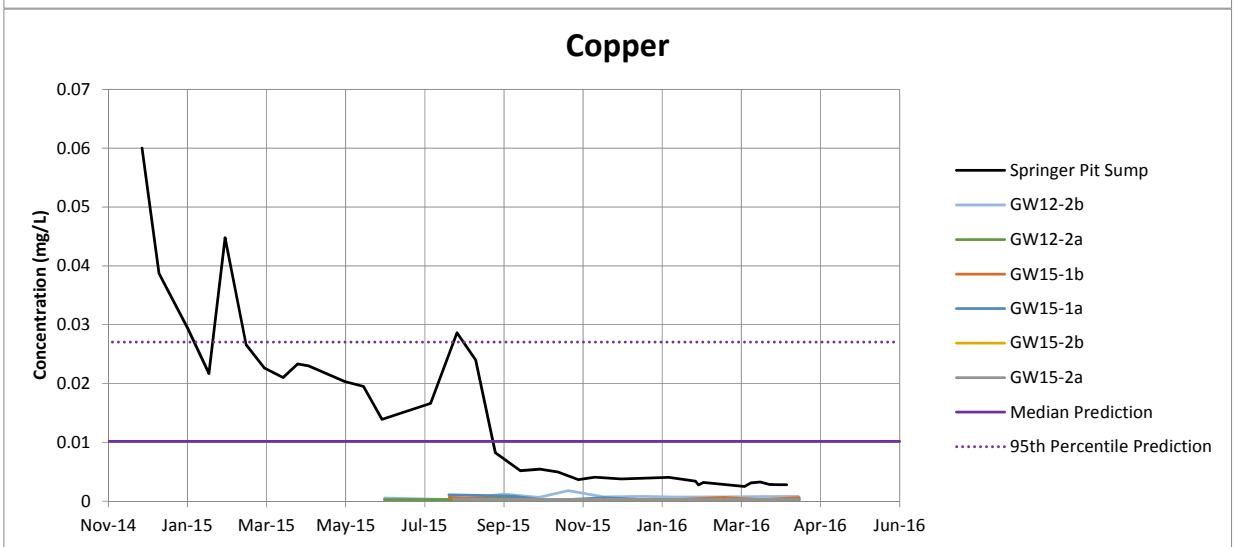


Figure 6-1
Groundwater Quality Results





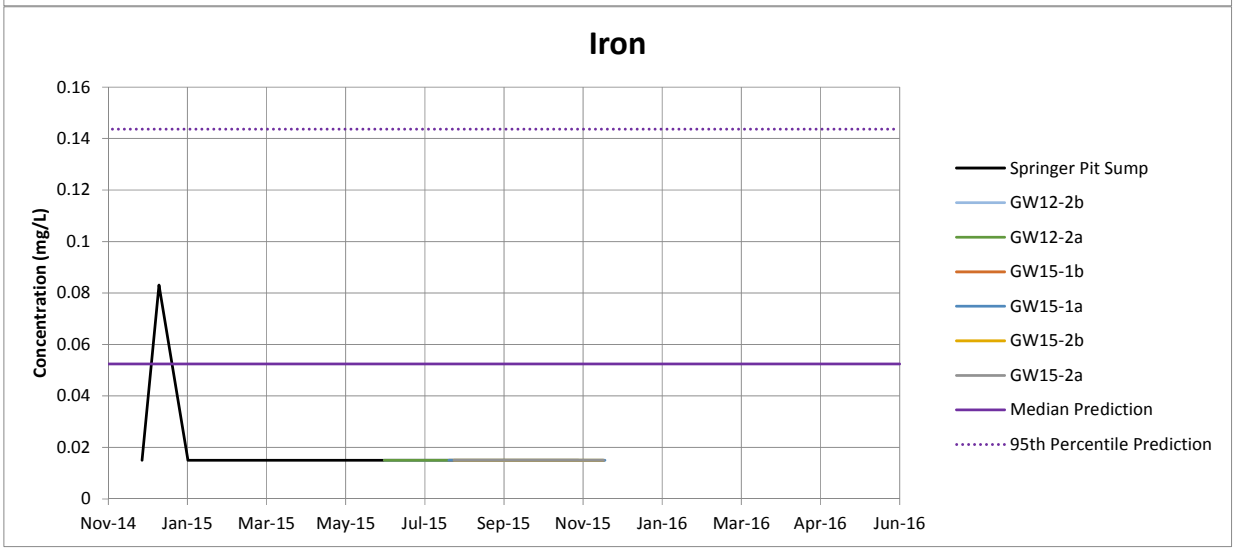
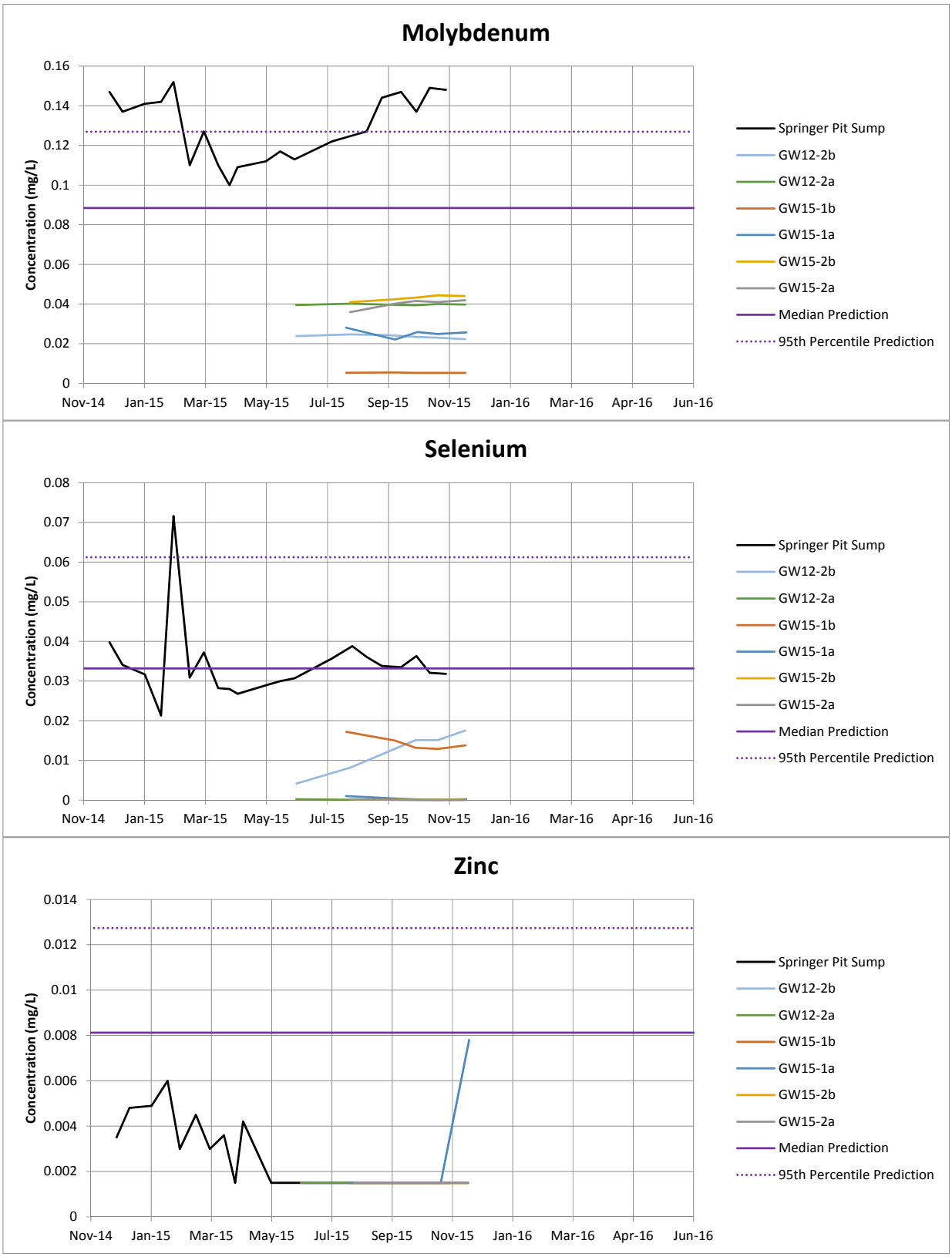


Figure 6-1
Groundwater Quality Results



As noted in Section 6.1.1.2, a small amount of seepage from the TSF bypasses the collection system. Until the rehabilitation of Hazeltine Creek is completed, this waterbody is not considered the receiving environment and was not assessed as part of this TAR. However, this small amount of seepage accounts for approximately 1% of the annual average outflow from Hazeltine Creek and the influence of the seepage on this watercourse is expected to be negligible. Within the current assessment, it is assumed that the rehabilitation will be ongoing during the period when water is discharged directly to Quesnel Lake from the WTP, and the TSF seepage load was directly added to the Quesnel Lake model for the purposes of evaluating surface water impacts to this waterbody during operations (Section 6.2).

A water and load representing 20 L/s of seepage from the tailings along Hazeltine Creek was added to the model as a preliminary estimate of loading of tailings water, and this value will be refined through ongoing monitoring and risk assessment work being completed under Pollution Abatement Order 107461.

Seepage losses from other site facilities described in Section 6.1.1 were not accounted for in the effects assessment. These volumes are accounted for in the SWWBM and are considered in the surface discharges from the mine. This approach is considered appropriate for the following reasons:

- These sources represent a small component of the total discharge from the mine.
- Mine discharges are mixed with baseline (current) water quality in Bootjack Lake and Quesnel Lake, and the influence of site seepage on downstream receptors will be inherently accounted for in the model baseline inputs.
- Seepage to other waterbodies will continue to be monitored in downgradient wells and in the receiving environment as described in Section 8.0 and in the CEMP. Water quality and quantity in those systems will be tracked and adaptively managed as appropriate.

Predicted receiving environment water qualities, accounting for the above groundwater losses, are presented in Section 6.2.

6.2 Surface Water Quantity and Quality

As discussed in Section 5.0, a site WQM was developed to predict the discharge water quality from the mine during operations, closure, and post-closure. In the model, each source that could influence the mine discharge water quality was assigned an input chemical profile based on geochemical testing (Appendix C) or site water quality monitoring data to calculate chemical loadings from each mine facility. Chemical loads were coupled with volumes calculated in the SWWBM (Appendix B) to calculate the concentration of each discharge. Mine facilities that will store water (e.g., Springer Pit, CCS) were treated as reservoirs in the model, and the concentration of each facility was calculated by tracking the mass and volume in the cell at each time step. Additional details on the site WQM are provided in Appendix D.

During operations, site discharges will report to Quesnel Lake and Bootjack Lake as follows:

- Treated effluent that meets EMA Permit 11678 water quality limits will be discharged to Quesnel Lake via the Hazeltine Channel until the end of November 2017 or until an alternative discharge system is established.
- These waters will be discharged directly to Quesnel Lake via a pipeline from the WTP after November 2017, if permitted.
- Seepage from the Springer Pit may discharge to Bootjack Lake should water levels in the pit rise above 1,030 masl.

To evaluate mine-related impacts to surface water quality in Quesnel and Bootjack lakes, three-dimensional hydrodynamic models were developed for these waterbodies. Details of the model development, inputs, and assumptions are provided in Appendices I (Bootjack Lake) and J (Quesnel Lake). The hydrodynamic models were used to develop daily and monthly dilution time series at the edge of the IDZ in each lake (Section 5.0). Daily maximum and monthly average concentrations of all modelled parameters were predicted at the edge of the IDZ as described in Appendix D.

Daily maximum and monthly average concentrations were calculated for both the maximum mean and maximum 95th percentile discharge concentrations (Section 5.0), which were screened against the BC WQGs (Section 6.3).

Closure and post-closure water quality predictions of site discharges were produced since an objective of this TAR is to develop a Long-Term Water Management Plan that is adaptable to mine development through operations, closure, and post-closure. However, as noted in Section 5.0, EMA Permit 11678 amendments are only being sought for the remainder of operations because, as described in Section 5.2.3, closure water treatment systems that are suitable for returning the water to pre-development watersheds require further research and testing through piloting.

6.3 Impact Assessment – Operations

This section presents an impact assessment of the operations time period from July 2016 to July 2020 to support permitting of operations. The impact assessment is composed of the following components:

- assessment of untreated mine effluent to determine the need for additional treatment through the existing WTP (Section 6.3.1)
- derivation of effluent permit limits to update those in the current EMA Permit 11678 based on the protection goal of meeting BC WQGs at the edge of the IDZ in Quesnel Lake (Section 6.3.2)
- derivation of effluent permit limits for Springer Pit seepage based on the protection goal of meeting BC WQGs at the edge of the IDZ in Bootjack Lake (Section 6.3.2)
- modelling of conditions under proposed quantity and quality limits at points of discharge to Quesnel Lake and Bootjack Lake (Section 6.3.3)
- impact assessment of aquatic resources and other receptors at the IDZ assessment nodes in Quesnel Lake and Bootjack Lake, considering the modelled conditions (Section 6.3.4)

The impact assessment considered permitting of a treated water discharge to Quesnel Lake during operations, whereby site water discharge quality was evaluated for the potential to result in acute toxicity and the need for further water treatment prior to discharge. Effluent permit limits are proposed to update those currently specified in EMA Permit 11678 and to inform safe discharge planning as part of the MWMP (Section 7.0) to protect downgradient or downstream water uses and receptors.

Effluent permit limits are also proposed for a scenario where potential seepage to Bootjack Lake from the Springer Pit may occur, such as under a No Discharge scenario. As described in Section 5.2.2, seepage from the Springer Pit to Bootjack Lake would be considered an operational discharge in the event that MPMC is unable to discharge water from site and is required to store site contact water in the Springer Pit. The quality of the seepage from the Springer Pit to Bootjack Lake is dependent on when such a scenario would occur during operations. However, for the purposes of the TAR, this scenario is considered a reasonable “worst-case” condition that is applicable to any foreseeable circumstance that would lead to similar or lower rates of seepage from Springer Pit during the remainder of operations and is the basis for the proposed permit limits. Additional details on the seepage water quality predictions for the No Discharge scenario can be found in Section 5.2.2 and Appendix D.

The impact assessment presented in Section 6.3 assessed potential residual effects on downstream receiving environment water uses identified for Quesnel Lake as a result of the proposed discharge and Bootjack Lake as a result of the potential for seepage from the Springer Pit. These water uses relate to the protection of human health and the protection of aquatic resources and wildlife (e.g., drinking water, protection of aquatic health, protection of wildlife water users). Impairment of the uses of the receiving environment are prevented through an appropriate level of controls at source and demonstrated through impact assessment, which is the focus of the present report.

6.3.1 Effluent Assessment

The numeric limits contained in the MMER (Schedule 4 of the regulation) relate to the metals arsenic, copper, lead, nickel, and zinc in addition to pH and TSS. Specific to the mine, SRK (2013) noted that in addition to some metals (i.e., selenium and molybdenum), concentrations of nitrate and sulphate also showed increasing trends in the TSF supernatant in the years following the restart of mine operations in 2005. Therefore, the main constituents of interest of the untreated effluent discharge were identified as metals, pH, TSS, nitrate, and sulphate.

6.3.1.1 Main Constituents of Interest

This section provides a general overview of the main constituents of interest in site waters, such as the Springer Pit and the PETBP, and their potential environmental effects on receptors in the receiving environment.

Metals

Metals occur naturally in the environment in water, sediments, soils, and rocks, and metal concentrations in the aquatic environment can be variable, particularly in mineralized areas. Metals may enter the aquatic environment from natural weathering processes as well as from anthropogenic sources, such as those related to building and road construction, agriculture, forestry, mining operations, fossil fuel combustion, and industrial emissions.

Certain metals are essential for maintaining good health because of their importance as components of enzymes or other biologically important proteins, and a shortage of those metals can result in adverse effects. Excess concentrations of these essential metals and concentrations of non-essential metals can result in toxicity-related effects on aquatic life (Chapman and Wang 2000; Campbell et al. 2006). The toxicity of metals to aquatic organisms ranges widely from slight reductions in growth rates to mortality, and may be acute (after a short-term exposure) or chronic (over a longer term). Uptake of metals from aqueous exposure occurs independently of uptake from dietary sources, and toxicity from one route of exposure cannot be predicted from the other.

Metals in the aquatic environment can exist in dissolved form, adhered to particulates, as part of organic and/or inorganic complexes, and in various oxidation states (Campbell et al. 2006). Metal accumulation and toxicity is dependent on metal bioavailability, which is influenced by exposure and toxicity modifying factors that include environmental exposure conditions, as well as physiological and biological characteristics of aquatic organisms (e.g., regulation of metal uptake and internal partitioning of metals). Environmental exposure conditions that can influence metal toxicity and accumulation include pH, water hardness, and dissolved organic carbon (DOC).

pH

pH is an environmental factor that affects physiological processes such as enzyme activity, ionic regulation, and the speciation (chemical form) of substances present in water. pH is also an important exposure and toxicity modifying factor affecting the bioavailability and toxicity of metals and nutrients. In freshwater systems, the pH is typically in the range of 6.5 to 9. High pH (greater than 9) can disrupt the waste excretion processes across the epithelium of fish gills, whereas low pH can result in behavioural effects on fish and can result in a reduced oxygen uptake from the gills. These effects have been observed in some fish below a pH of approximately 5 (McKean and Nagpal 1991). Metals are typically more bioavailable to aquatic organisms under low pH exposure conditions and less bioavailable under mildly alkaline conditions because of the effects that pH can have on metal solubility and speciation. The waters of Quesnel Lake and Bootjack Lake are slightly alkaline.

Total Suspended Solids

There are several reviews on the effects of suspended sediments in freshwater ecosystems (Birtwell 1999; Caux et al. 1997; EIFAC 1964; Newcombe and Jensen 1996; Newcombe and MacDonald 1991). Suspended solids are not usually associated with lethal effects on fish except when the TSS concentration is very high. In studies on the acutely lethal concentrations of TSS on juvenile salmon, it was found that 31,000 mg/L and 17,600 mg/L caused mortality to 50% of juvenile chinook and sockeye salmon, respectively, over a 96-hour test period (Servizi and Gordon 1990; Servizi and Martens 1987). These concentrations are not commonly encountered in waterbodies. Suspended sediment also can cause changes in behaviour such as avoidance, which has been observed at turbidity levels on the order of 35 to 70 NTU (Bisson and Bilby 1982; Robertson et al. 2006), and physiological trauma such as gill damage, which has been observed at TSS concentrations on the order of hundreds to thousands of milligrams per litre (Servizi and Martens 1987; Birtwell 1999; Muck 2010).

Nitrate

Inorganic nitrogen occurs naturally in the aquatic environment and exists predominantly in three forms: nitrate, nitrite, and ammonia (CCME 2012a). The relative concentrations of these three forms depend on biotic processes within the nitrogen cycle (e.g., assimilation, nitrogen fixation, nitrification, denitrification, ammonification, and decomposition of organic matter), the rates of which are biologically mediated and dependent upon pH, temperature, and dissolved oxygen levels (CCME 2012a). Although nitrate occurs naturally in the aquatic environment, elevated concentrations of nitrate in surface waters can originate from the leaching of residual blasting reagents present in waste rock piles and tailings (CCME 2012a). Recent studies have demonstrated an ameliorative effect from increased water hardness on nitrate toxicity to sensitive species, suggesting that water hardness influences the toxicity of nitrate (e.g., Nautilus 2011a,b, 2013). However, the mechanisms of action by which hardness influences nitrate toxicity are not fully known, and at present water hardness is not considered in the derivation or application of WQGs in Canada. Exposure to elevated concentrations of these nitrogen forms can result in a variety of effects from slight reductions in growth rates to mortality, and may be acute or chronic (CCME 2012b).

Sulphate

Sulphate occurs naturally in the environment and is an essential nutrient for all biota (Meays and Nordin 2013). Mining activities can increase environmental levels of sulphate through the oxidation of sulphide minerals, and these exposures tend to co-occur with increased levels of conductivity, hardness, and other major ions (Soucek 2007; Weber-Scannell and Duffy 2007; Meays and Nordin 2013). There are three potential mechanisms by which sulphate toxicity may occur: specific ion toxicity, perturbation of trans-membrane potential, and osmotic stress. These mechanisms are not mutually exclusive (Davies and Hall 2007). Sulphate toxicity to aquatic biota has been shown to be dependent on water hardness with a general decrease in toxicity with increasing hardness up to a hardness of 250 mg/L (Meays and Nordin 2013). The nature of the relationship between sulphate toxicity and water hardness is more uncertain in waters with hardness greater than 250 mg/L.

6.3.1.2 Comparison to Metal Mining Effluent Regulation Limits

Treated effluent pH is expected to be within the range deemed acceptable by MMER (6.0 to 9.5), TSS levels will meet the MMER limits, and permit limits proposed in Section 6.3.2 for arsenic, copper, lead, nickel, and zinc are predicted to be lower than their respective MMER Schedule 4 limits. MMER limits are not effects-based, and so attainment of these limits does not imply environmental consequences or lack of such consequences. As discussed in Section 2.4, MMER also contains a requirement to undertake an EEM program to provide assurances that the technology-based effluent limits specified in the MMER are sufficient to protect the aquatic receiving environment. This requirement is discussed further in Section 8.0. Given that the majority of effluent constituents considered in this TAR do not have MMER limits, the MMER limits are viewed here as a minimal compliance requirement; however, the assessment of impacts in Section 6.3.4 has been broader as necessitated by the requirements of provincial legislation.

The MMER (S.4(1)(c)) also states that the effluent must not be acutely lethal[2]. This non-toxicity requirement is also required by the MoE. Specifically, in determining toxicity of wastewater, a discharger must determine toxicity in accordance with:

- EC's *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout* (Reference Method EPS 1/RM/13) (EC 2000a).
- If applicable, EC's *Procedure for pH Stabilization during the Testing of Acute Lethality of Wastewater Effluent to Rainbow Trout* (Reference Method EPS 1/RM/50) (EC 2008).

Standard 96-hour rainbow trout toxicity tests on treated effluent discharged to Hazeltine Creek under the existing EMA Permit 11678 from December 2015 to present have shown no acute toxicity to rainbow trout.

The MMER also refers to *D. magna* effluent monitoring (but not compliance) tests whereby the operator of a mine is required to conduct *D. magna* monitoring tests in accordance with Reference Method EPS 1/RM/14 EC (2000b) at the same time that the acute lethality tests (i.e., rainbow trout 96-hour bioassay tests) are undertaken. *D. magna* is a sensitive test organism for metals toxicity. Standard 48-hour toxicity tests on treated effluent discharged to Hazeltine Creek under the existing EMA Permit 11678 from December 2015 to present have shown no acute toxicity to *D. magna*.

6.3.1.3 Untreated Effluent Assessment

The following assessment of untreated effluent was undertaken to demonstrate through a weight of evidence approach that the discharge to Quesnel Lake or the Springer Pit seepage to Bootjack Lake would not be acutely toxic. The assessment also served to identify the need for treatment should the potential for acute toxicity be identified, in order to maintain compliance with the *Fisheries Act* and the EMA. Mine discharges being applied for in this TAR are a discharge to Quesnel Lake and Springer Pit seepage to Bootjack Lake, described in more detail in Section 5.2.

Effluent discharge permit limits for the Quesnel Lake discharge and the Springer Pit seepage to Bootjack Lake proposed in Section 5.4 were also assessed for the potential for acute toxicity in Section 6.3.2.

While the existing discharge of treated water authorized under EMA Permit 11678 has been tested and found not to be acutely lethal, the potential for acute lethality must also consider effluent quality based on the permit conditions being applied for. During the four-year operations period, effluent toxicity testing will be carried out to confirm predictions and is expected to be a requirement of any EMA Permit 11678 amendment.

For the purposes of the TAR, the following risk-based assessment of the potential for acute toxicity of the Quesnel Lake discharge and the Springer Pit seepage to Bootjack Lake was undertaken based on predicted untreated effluent chemistry presented in Sections 5.2.1 and 5.2.2, reflective of the mine site water chemistry.

[2] ***Acutely lethal effluent*** means an effluent at 100% concentration that kills more than 50% of a test population of Rainbow Trout (Reference Method EPS 1/RM/13: Environment Canada's *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*).

Approach to Assess the Potential for Acute Toxicity

Predicted concentrations of constituents from the Springer Pit and the PETBP (Quesnel Lake discharge) and Springer Pit seepage (to Bootjack Lake) reflect untreated water quality and are therefore a conservative representation of the expected water quality at the points of release.

The highest of the 95th percentile predictions for these untreated effluents were compared to maximum BC WQGs as an initial screening step to identify constituents requiring further investigation in the next step of the assessment. Phosphorus parameters (i.e., total phosphorus and dissolved orthophosphate) were not included in the screening assessment because phosphorus is considered "non-toxic to aquatic organisms at levels and forms present in the environment" (EC 2004). The potential for phosphorus to have adverse effects in the receiving environment is discussed in Section 6.3.4. Calcium, hardness, magnesium, potassium, and sodium are components of TDS mixtures, and would be adequately evaluated in a TDS acute toxicity assessment. There was not sufficient toxicity information available to evaluate predicted lithium and titanium concentrations. Tin was not assessed because it is the organic form of tin that is toxicologically relevant, not the inorganic form (CCME 2008).

The following step-wise process was followed to determine the potential for acute toxicity.

- **Initial screening step**—Comparison of predicted 95th percentile concentrations relevant to the discharge or seepage were compared to maximum BC WQGs for the protection of aquatic life (MoE 2015a). Maximum BC WQGs are intended to protect aquatic organisms from harmful effects based on a short exposure and the 30-day average guidelines are intended to be applied for ongoing exposure by aquatic organisms. The maximum (short exposure duration) guidelines were used a conservative screening of the effluent. WQGs are not intended to be applied to effluents, so their use in this manner is an application of those values based on caution. If predicted site water concentrations are lower than the maximum BC WQG, there is confidence that neither the effluent nor the waters inside the IDZ would result in acute toxicity. If the predicted effluent concentration was above this value, then further toxicity evaluation was deemed to be necessary in the next step of the assessment described below.

  For determining variable BC WQG values, a conservative approach was taken that assumed lowest predicted median site water concentrations of water hardness and chloride as well as maximum pH and temperature measured values.

- **Assessment of predicted untreated mine site water concentrations**—Acute toxicity screening values were developed from acute toxicity data for rainbow trout, where available. Although the MoE and EC specify the 96-hour rainbow trout toxicity test method for compliance purposes, potential acute toxicity to other sensitive aquatic species was also considered for the purpose of *a priori* evaluating the potential for acute toxicity in the effluent. Specifically, toxicity results associated with aquatic invertebrates, including 48-hour lethality tests on *D. magna* (Reference Methods EPS 1/RM/11 and EPS 1/RM/14 [EC 1996, 2000b] or similar), where available, were considered to evaluate potential acute effects on sensitive invertebrate taxa. Toxicity data were obtained from supporting documents for guidelines or criteria from BC and other jurisdictions, and the scientific literature.

Initial Screening against Maximum BC Water Quality Guidelines

The following constituents were identified for the Quesnel Lake discharge and the Springer Pit seepage as requiring further evaluation to check for effluent non-toxicity. As shown in Table 6-2, predicted upper-bound concentrations for the following constituents were higher than either maximum BC WQGs or 30-day BC WQGs (where a maximum guideline was not available):

- **Quesnel Lake discharge**—fluoride, sulphate, nitrite, total metals (antimony, arsenic, beryllium, chromium, copper, selenium), dissolved aluminum.
- **Springer Pit seepage**—fluoride, sulphate, total metals (antimony, beryllium, selenium), dissolved aluminum.

Table 6-2: Comparison of Predicted Untreated Mine Site Water Chemistry Relevant to the Quesnel Lake Discharge and Springer Pit Seepage to Maximum BC Water Quality Guidelines and Metal Mining Effluent Regulation Limits

Parameter	Units	BC Water Quality Guidelines[a]		Metal Mining Effluent Regulation Limits[b]	Predicted Site Water Concentration (highest 95th percentile concentration)
		Maximum (or 30-day in lieu of maximum) based on effluent hardness	Notes		
Discharge to Quesnel Lake - Operations from July 2016 to July 2020					
Physical Parameters					
Hardness	mg/L	-		-	697[p]
Total Dissolved Solids	mg/L	-		-	1002
Major Ions					
Chloride	mg/L	600	A	-	13.1
Fluoride	mg/L	1.8	A, c	-	**9.7**
Sulphate	mg/L	429	A, 30-d, d	-	**556**
Nutrients					
Ammonia	mg/L (as N)	5.7	A, e	-	0.64
Nitrate	mg/L (as N)	32.8	A	-	17
Nitrite	mg/L (as N)	0.12	A, f	-	**0.43**
Total Metals					
Aluminum	mg/L	-		-	0.88
Antimony	mg/L	0.0009	W, 30-d	-	**0.0022**
Arsenic	mg/L	0.005	A, 30-d	0.5	**0.014**
Barium	mg/L	1	W, 30-d	-	0.12
Beryllium	mg/L	0.00013	W, 30-d	-	**0.0012**
Boron	mg/L	1.2	A, 30-d	-	0.30
Cadmium	mg/L	-		-	0.00026
Chromium	mg/L	0.001	W, 30-d, CrVI	-	**0.0020**
Cobalt	mg/L	0.11	A	-	0.0049
Copper	mg/L	0.033	A, g	0.3	**0.049**
Iron	mg/L	1	A	-	0.76
Lead	mg/L	0.38	A, h	0.2	0.00041
Lithium	mg/L	-		-	0.018
Manganese	mg/L	3.4	A, i	-	2.2
Mercury	mg/L	0.00001	A, 30-d, j	-	0.0000035
Molybdenum	mg/L	2	A	-	0.18
Nickel	mg/L	0.15	W, 30-d, k	0.5	0.0024
Selenium	mg/L	0.002	A, 30-d	-	**0.087**
Silver	mg/L	0.003	A, l	-	0.00012
Strontium	mg/L	-		-	3.5
Thallium	mg/L	0.0008	W, 30-d	-	0.00026
Tin	mg/L	-		-	0.00025
Titanium	mg/L	-		-	0.035
Uranium	mg/L	0.0085	W, 30-d	-	0.0051
Vanadium	mg/L	-		-	0.036
Zinc	mg/L	0.22	A, m	0.5	0.026
Dissolved Metals					
Aluminum	mg/L	0.1	A, n	-	**0.39**
Cadmium	mg/L	0.0020	A, o	-	0.00017
Iron	mg/L	0.35	A	-	0.22
Seepage to Bootjack Lake - Operations from July 2016 to July 2020 and No Discharge Scenario					
Physical Parameters					
Hardness	mg/L	-		-	616[p]
Total Dissolved Solids	mg/L	-		-	903
Major Ions					
Chloride	mg/L	600	A	-	6.7
Fluoride	mg/L	1.8	A, c	-	**2.9**
Sulphate	mg/L	429	A, 30-d, d	-	**499**
Nutrients					
Ammonia	mg/L (as N)	1.0	A, e	-	0.29
Nitrate	mg/L (as N)	32.8	A	-	13
Nitrite	mg/L (as N)	0.12	A, f	-	**0.23**
Total Metals					
Aluminum	mg/L	-		-	0.12
Antimony	mg/L	0.0009	W, 30-d	-	**0.00096**
Arsenic	mg/L	0.005	A, 30-d	0.5	0.0032
Barium	mg/L	1	W, 30-d	-	0.072
Beryllium	mg/L	0.00013	W, 30-d	-	**0.00048**
Boron	mg/L	1.2	A	-	0.13
Cadmium	mg/L	-		-	0.00013
Chromium	mg/L	0.001	W, 30-d, CrVI	-	0.00063
Cobalt	mg/L	0.11	A	-	0.0020
Copper	mg/L	0.033	A, g	0.3	0.027
Iron	mg/L	1	A	-	0.14
Lead	mg/L	0.37	A, h	0.2	0.00010
Lithium	mg/L	-		-	0.0083
Manganese	mg/L	3.4	A, i	-	0.99
Mercury	mg/L	0.00001	A, 30-d, j	-	0.0000025
Molybdenum	mg/L	2	A	-	0.13
Nickel	mg/L	0.15	W, 30-d, k	0.5	0.0013
Selenium	mg/L	0.002	A, 30-d	-	**0.061**
Silver	mg/L	0.003	A, l	-	0.000040
Strontium	mg/L	-		-	2.1
Thallium	mg/L	0.0008	W, 30-d	-	0.00012
Tin	mg/L	-		-	0.000084
Titanium	mg/L	-		-	0.0102
Uranium	mg/L	0.0085	W, 30-d	-	0.0019
Vanadium	mg/L	-		-	0.0064
Zinc	mg/L	0.21	A, m	0.5	0.013
Dissolved Metals					
Aluminum	mg/L	0.1	A, n	-	**0.12**
Cadmium	mg/L	0.0023	A, o	-	0.00013
Iron	mg/L	0.35	A	-	0.14

Notes:

mg/L = milligram per litre; N = nitrogen; A = approved guideline; CrVI = hexavalent chromium; W = working guideline

For hardness-dependent BC WQGs the minimum of median predicted site water hardness of 334 mg/L and 328 mg/L was used for Quesnel Lake and Bootjack Lake, respectively.

For chloride-dependent guidelines, the minimum of median predicted chloride concentration in site water of 2.6 mg/L and 3.7 mg/L was used for Quesnel Lake and Bootjack Lake, respectively.

a) British Columbia Water Quality Guideline (BC WQG) for the protection of freshwater aquatic life.

b) Metal Mining Effluent Regulations (MMER) Schedule 4, maximum authorized monthly mean concentration.

c) Hardness dependent fluoride guideline: BC Max WQG (mg/L) = 0.4 mg/L if hardness <10, otherwise use -51.73+(92.57*log(hardness))*0.01 mg/L.

d) Hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, 218 at hardness 31-75 mg/L, 309 at hardness 76-180 mg/L, 429 at hardness 181-250 mg/L, determine based on site water at hardness >250 mg/L.

e) pH and temperature dependent ammonia guideline: values selected from Table 3 in BC WQG based on maximum temperature (20 degrees Celsius) and pH (8.7).

f) Chloride (Cl) dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, 0.12 at Cl 2-4 mg/L, 0.18 at Cl 4-6 mg/L, 0.24 at Cl 6-8 mg/L, 0.30 at Cl 8-10 mg/L, 0.60 at Cl >10 mg/L.

g) Hardness dependent copper guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000.

h) Hardness dependent lead guideline: BC Max WQG (mg/L) = 0.003 mg/L if hardness <8, otherwise use e^(1.273*ln(hardness)-1.46)/1000 mg/L.

i) Hardness dependent manganese guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54. The hardness was capped at 259 mg/L.

j) Mercury BC 30-d WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

k) Hardness dependent nickel guideline: BC 30-d WQG (mg/L) = 0.025 at hardness <60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness >180 mg/L.

l) Hardness dependent silver guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, 0.003 at hardness >100 mg/L; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, 0.0015 at hardness >100 mg/L.

m) Hardness dependent zinc guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000.

n) pH dependent dissolved aluminum guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = EXP(1.209-2.426*(pH)+0.286*(pH^2)). The minimum effluent pH of 6.8 and 7.1 was used for Quesnel Lake and Bootjack Lake, respectively.

o) Hardness dependent dissolved cadmium guideline: max BC WQG (mg/L) = (exp(1.03*ln(hardness)-5.274))/1000.

p) Predicted hardness; not used for calculation of hardness-dependent BC WQGs.

Bold and shaded cells indicate the predicted site water concentration is greater than the maximum BC WQG.

Assessment of Predicted Untreated Mine Site Water Concentrations

The next stage of the assessment involved further assessment of constituents predicted to be above maximum BC WQGs. For constituents without BC WQGs, predicted site water concentrations were also evaluated for the potential to result in acute toxicity at the point of discharge (i.e., TDS, vanadium).

Fluoride

The rainbow trout 96-hour LC50 (concentration that is lethal to 50% of test population) value of 107.5 mg/L tested in soft water (Carmargo and Tarazona 1991), cited by the Canadian Council of Ministers of the Environment (CCME 2002) in support of derivation of the CCME fluoride WQG for the protection of aquatic life, was selected as the acute screening value. The highest 95th percentile concentrations of 9.7 mg/L (Quesnel Lake discharge) and 2.9 mg/L (Springer Pit seepage) were more than an order of magnitude lower than this screening value, indicating fluoride in the discharge and the seepage would be non-acutely toxic.

Sulphate

There are no BC or CCME WQGs specific to protection against sulphate effects from acute exposures (MoE 2016a). Rescan (2012) compiled short-term toxicity data for sulphate from the literature and related the endpoint data to water hardness. The review indicated that short-term toxicity to sulphate decreased with increasing hardness, although the slope flattens for hardness levels between 200 and 700 mg/L as calcium carbonate ($CaCO_3$). A 96-hour LC50 of 9,900 mg/L sulphate was reported for rainbow trout at 250 mg/L hardness as $CaCO_3$ (Rescan 2012). Based on this single study, a rainbow trout acute screening value of 4,950 mg/L was used based on applying a 2x safety factor. Given that only one toxicity value was available for rainbow trout and *D. magna* toxicity values cited by Rescan (2012) were below the rainbow trout screening value, the equation derived by Rescan (2012) for a hardness-adjusted HC5 (the concentration that is considered to be protective of at least 95% of species) was adopted as the acute screening value for the Quesnel Lake discharge (1,476 mg/L) and the Springer Pit seepage (1,545 mg/L). The acute dataset compiled by Rescan (2012) met the requirements of CCME for establishing a Type A water quality guideline using a species sensitivity distribution, as well as the requirements of US Environmental Protection Agency (US EPA) for incorporating water hardness into water quality benchmarks for metals.

The highest 95th percentile concentrations of 556 mg/L (Quesnel Lake discharge) and 499 mg/L (Springer Pit seepage) are several fold lower than the respective acute screening values for each lake, indicating sulphate in the discharge and the seepage is not expected to be acutely toxic.

Nitrite

The BC WQG for nitrite increases with increasing concentrations of chloride to reflect the influence of chloride on nitrite toxicity (MoE 2016a). In a review of fish nitrite toxicity data, Lewis and Morris (1986) summarized available acute toxicity data for rainbow trout and other fish species. At pH conditions representative of the site waters to be discharged, the two lowest nitrite 96-hour toxicity values for rainbow trout were 0.24 mg/L (chloride = 0.35 mg/L) and 3 mg/L (chloride = 10 mg/L).

The lowest predicted median chloride values in the Quesnel Lake discharge (2.6 mg/L) and the Springer Pit seepage (3.7 mg/L) were closer to the latter value of 10 mg/L chloride than the next lowest chloride exposure condition of 0.35 mg/L cited by Lewis and Morris (1986). The highest predicted 95th percentile concentrations of nitrite for the Quesnel Lake discharge (0.43 mg/L) and the Springer Pit seepage (0.23 mg/L) were at least six times lower than the rainbow trout value of 3 mg/L cited by Lewis and Morris (1986) under chloride conditions of 10 mg/L. By comparison, the relative difference between the BC WQG nitrite values of 0.12 mg/L at 2 to 4 mg/L chloride and 0.6 mg/L at more than 10 mg/L chloride is five times. Furthermore, a study by Eddy et al. (1983) cited by Lewis and Morris (1986) reported a 96-hour toxicity value for rainbow trout of 3.9 mg/L at pH 7 and a chloride exposure condition of 1 mg/L. In consideration of the rainbow trout toxicity data cited in Lewis and Morris (1986), nitrite would not be toxic to rainbow trout under the minimum chloride conditions predicted for the discharges within a pH range of 7 to 8.

Aluminum

The species mean acute value for rainbow trout of greater than 7.5 mg/L calculated by GEI Consultants, Inc. (GEI 2011) was selected as the acute screening value assuming a hardness of 50 mg/L $CaCO_3$ and a pH range of 6.5 to 9.0. The highest 95th percentile concentrations of total aluminum for the Quesnel Lake discharge (0.88 mg/L) and the Springer Pit seepage (0.12 mg/L) are over an order of magnitude lower than this screening value. This indicates that aluminum in the discharge and the seepage would not be acutely toxic providing the seepage and discharge pH conditions are maintained above 6.5. This conclusion is supported by comparison to the species mean acute value calculated for aluminum by GEI (2011) for *D. magna* of 4.7 mg/L that assumed a hardness of 50 mg/L $CaCO_3$ and a pH range of 6.5 to 9.0.

Antimony

The highest 95th percentile concentrations of total antimony for the Quesnel Lake discharge (0.0022 mg/L) and the Springer Pit seepage (0.00096 mg/L) were below acute lethality endpoints summarized by the Australia and New Zealand Environment and Conservation Council (ANZECC 2000), which ranged from 0.76 to 920 mg/L. This comparison indicated that antimony in the discharge and the seepage would not be acutely lethal.

Arsenic

No provincial or federal short-term guidelines are available for arsenic but the US EPA criterion maximum concentration value of 0.34 mg/L (US EPA 2016a) is an order of magnitude higher than the highest 95th percentile concentration predicted for the Quesnel Lake discharge (0.014 mg/L). This concentration is also an order of magnitude lower than the lowest sub-acute toxicity value for fish cited by the CCME (2001) in the derivation of the long-term CCME WQG for the protection of aquatic life (i.e., 28-day LC50 of 0.55 mg/L for rainbow trout; Birge et al. [1979]). Therefore, predicted arsenic concentrations for the Quesnel Lake discharge would not be acutely lethal as per the regulatory definition described in Section 6.3.1.2. Predicted concentrations of arsenic in the Springer Pit seepage are below the chronic BC WQG and therefore would not result in acute lethality.

Beryllium

The only rainbow trout toxicity value listed in a recent search of the US EPA ECOTOX database was a 28-day LC50 value of 0.38 mg/L reported by Birge et al. (1980). More daphnid data were available, with 48-hour LC50 values that ranged from 1 to 3.46 mg/L. The highest 95th percentile concentrations predicted for the Quesnel Lake discharge and the Springer Pit seepage are several orders of magnitude below these toxicity estimates, and as such, predicted beryllium concentrations in these effluents are not likely to be acutely toxic.

Chromium

The lowest acute toxicity value for fish was 0.22 mg/L for hexavalent chromium (72-hour median tolerance limit with rainbow trout; Hogendoorn-Roozemond et al. 1978 as cited in Pawlisz et al. 1997) in the dataset summarized by Pawlisz et al. (1997) to support of the derivation of the CCME chromium WQG for the protection of aquatic life. This value was selected as the acute screening value. By setting a hexavalent chromium acute screening value, a conservative approach was taken because hexavalent chromium is more toxic to aquatic life than trivalent chromium (Pawlisz et al. 1997).

As stated by Pawlisz et al. (1997), the higher oxidizing potential, higher solubility, and relative ease of permeation of biological membranes make hexavalent chromium more toxic to aquatic life than trivalent chromium. Therefore, setting the effluent treatment target using the hexavalent chromium toxicity dataset yields a lower (and therefore more conservative) target.

The highest 95th percentile concentration predicted for the Quesnel Lake discharge (0.002 mg/L) for total chromium is several orders of magnitude below this toxicity value, indicating chromium in the discharge would not be acutely lethal. This conclusion is supported by comparison to the lowest *D. magna* toxicity value included in the dataset used to derive the CCME long-term WQG, that is, 48-hour LC50 for *D. magna* of 0.020 mg/L (Oikari et al. 1992 as cited in Pawlisz et al. 1997). Predicted concentrations of chromium in the Springer Pit seepage are below the chronic BC WQG and therefore would not result in acute lethality.

Copper

The highest predicted 95th percentile total concentration for the effluent to be discharged to Quesnel Lake (0.049 mg/L) was above the maximum BC WQG of 0.033 mg/L. As described in Section 6.3.2, the effluent target based on meeting the 30-day BC WQG at the edge of the IDZ (0.053 mg/L) was also above the maximum BC WQG. Acute toxicity values for copper compiled in the development of the US EPA biotic ligand model (US EPA 2007) for rainbow trout, as well as rainbow trout toxicity values available in recent studies (e.g., Welsh et al. 2008; Vardy et al. 2013; Calfee et al. 2014) suggest that copper could be acutely lethal at the maximum predicted site water concentrations. Predicted median DOC concentrations in the site waters to be discharged to Quesnel Lake and the Springer Pit seepage were less than 3.5 mg/L, indicating they were not elevated in DOC. As shown in Appendix F (Figure 1 of Attachment B), as DOC approaches 2 mg/L, toxicity values derived using the biotic ligand model and the US EPA hardness based equation are more similar. Therefore, the maximum BC WQG of 0.033 mg/L, calculated using a minimum median predicted site water hardness of 334 mg/L, was identified as an operations treatment target for copper to be treated using the existing WTP, with modifications to improve copper removal as described in Appendix E.

To confirm that acute toxicity would be not be expected within the IDZ, copper and hardness concentrations were predicted in various combinations of effluent (0.033 mg/L total copper and hardness of 334 mg/L) and site water (Quesnel Lake mean baseline total copper concentration of 0.00085 mg/L and hardness of 54 mg/L). Combinations were consistent with dilution series used in rainbow trout and *D. magna* toxicity tests conducted per EC (2000a,b). The combinations were 50% effluent and 50% site water, 25% effluent and 75% site water, 12.5% effluent and 87.5% site water, and 6.25% effluent and 93.75% site water. Consistent with predictions, as hardness decreased in the mixed effluent and site water combinations, the maximum BC WQG decreased per the hardness-dependent equation. Total copper concentrations also decreased. The ratio of total copper to maximum BC WQG remained below 1 for all combinations, indicating that total copper concentrations within the IDZ would remain below the maximum BC WQG and no acute toxicity would be expected inside the IDZ.

Selenium

There is no aquatic life WQG specific to protection against selenium effects from acute exposures. Based on findings from a 2009 Pellston Workshop on Ecological Assessment of Selenium in the Aquatic Environment, the US EPA (2016b) concluded that diet is the primary pathway of selenium exposure to aquatic vertebrates and invertebrates and that traditional methods for predicting toxicity on the basis of exposure to dissolved concentrations are not appropriate for selenium. However, for the purposes of this assessment, acute toxicity data compiled in the technical report by Beatty and Russo (2014) to support the derivation of the 30-day BC WQG were reviewed.

The lowest rainbow trout acute toxicity value documented by Beatty and Russo (2014) of 4.5 mg/L as selenite was selected as the acute screening value (values ranged from 4.5 to 9 mg/L). The highest predicted 95th percentile concentrations of total selenium for the Quesnel Lake discharge (0.087 mg/L) and the Springer Pit seepage (0.061 mg/L) are below this screening value, and therefore acute toxicity due to dissolved selenium concentrations is not expected. This conclusion is supported by comparison to the lowest acute toxicity value for *D. magna* documented by Beatty and Russo (2014) of 0.21 mg/L (values ranged from 0.21 to 0.66 mg/L).

Strontium

The highest 95th percentile concentrations of total strontium for the Quesnel Lake discharge (3.5 mg/L) and the Springer Pit seepage (2.1 mg/L) were below the strontium chronic effects benchmark of 10.7 mg/L recently proposed by McPherson et al. (2014) for freshwater environments. This comparison indicates that strontium in the Quesnel Lake discharge and the Springer Pit seepage would not be acutely lethal.

Total Dissolved Solids

The highest 95th percentile concentrations of TDS for the Quesnel Lake discharge (1,002 mg/L) and the Springer Pit seepage (903 mg/L) are below the most sensitive endpoint reported in the literature (*D. magna* LC50 of 1,692 mg/L TDS [Tietge et al. 1996 cited in Weber-Scannell and Duffy 2007]). Reviews by Weber-Scannell and Duffy (2007) and Mount et al. (1997) found that most acute LC50 values to fall in the range of 5,300 to 20,000 mg/L TDS. A published TDS LC50 for rainbow trout was not located for this assessment.

Vanadium

The highest 95th percentile concentrations of total vanadium for the Quesnel Lake discharge (0.036 mg/L) and the Springer Pit seepage (0.0064 mg/L) were below acute lethality endpoints summarized by EC and Health Canada (2010), which ranged from 0.211 to 30.8 mg/L. This comparison indicates that vanadium in the discharge and the seepage would not be acutely lethal.

6.3.1.4 Summary

The evaluation concluded that concentrations predicted for the Quesnel Lake discharge and the Springer Pit seepage are expected to meet the end-of-pipe rainbow trout non-toxicity requirements, based on the following lines of evidence.

- With the exception of copper in the Quesnel Lake discharge, the highest 95th percentile concentrations of constituents with BC WQGs are either below these guidelines, below acute screening values developed for rainbow trout, or are below other suitable acute toxicity benchmarks. Copper will be treated so that discharge concentrations meet an effluent permit limit set as the maximum BC WQG; therefore, acute toxicity would not be expected in the Quesnel Lake discharge as a result of copper.
- Effluent temperatures are not expected to change substantially during treatment, so the effluent temperature will be similar to the temperature of the Springer Pit waters, PETBP waters, and natural open-surface waterbodies in the region. Temperature is expected to vary with ambient seasonal temperatures.
- The treated effluent currently being discharged to Quesnel Lake has not resulted in acute toxicity to rainbow trout or the water flea *D. magna*. As described in Section 5.5 and Appendix E, the current treatment technology will be optimized to improve copper removal in order to attain the operations treatment target for copper. The treatment technology would not be expected to result in acute lethality at the point of discharge due to treatment-related changes to effluent composition but this will be verified during the implementation of the upgrade to the WTP.

Based on the evaluation of predicted effluent quality:

- The Quesnel Lake discharge and Springer Pit seepage to Bootjack Lake would not be regarded as deleterious substances as defined in the federal *Fisheries Act* and specifically as defined in the MMER.
- Discharge of the effluent or the seepage is unlikely to cause pollution as defined in the EMA.

Toxicity bioassays are an important tool to determine the effects of a complex effluent on aquatic organisms. Combined effects of effluent constituents that may otherwise be difficult to ascertain can be established using a variety of toxicological tests. Confirmatory acute toxicity testing of the treated effluent (rainbow trout 96-hour LC50 and *D. magna* 48-hour LC50 tests) will be conducted prior to discharge to address the potential uncertainty inherent in the prediction of toxicity from chemical predictions. Toxicity testing is also expected to be part of the monitoring program during the proposed discharge. Confirmatory and compliance monitoring is proposed in Section 8.0.

6.3.2 Effluent Permit Limits

As part of the application to amend the current discharge permit (EMA Permit 11678), effluent permit limits are proposed in Table 6-3 for the Quesnel Lake discharge (to update those in the current EMA Permit 11678) and for the Springer Pit seepage to Bootjack Lake. Effluent permit limits are proposed for parameters listed in Schedule 4 of MMER and for parameters with existing permit limits under EMA Permit 11678 with the exception of vanadium, which no longer has a BC WQG. Vanadium concentrations will nevertheless be assessed in the receiving environment impact assessment in Section 6.3.4 of this TAR, along with other constituents, and will be included in the monitoring program.

The approach used to derive the permit limits proposed in Table 6-3 is composed of the following steps.

- As described in Section 5.4.1, effluent targets were calculated at the discharge points using minimum 30-day dilution factors to determine discharge concentrations to achieve the protection goals of meeting BC WQGs for drinking water and the most sensitive receiving environment use at the edge of the IDZ in Quesnel Lake. The same was true for Bootjack Lake with the exception of the copper target. Bootjack Lake is currently not influenced by mining activity, and the baseline data show that mean copper concentrations exceed the hardness-dependent BC WQG (Section 3.4.2). In accordance with provincial guidance (MoE 2013a), it was therefore appropriate to use the background correction procedure to propose that the copper target be back-calculated in order to meet 0.004 mg/L at the edge of the IDZ, representing the 95th percentile of the pre-mine baseline dataset (Table 3-16).
- Proposed effluent discharge targets were screened against MMER limits (where available) and for the potential for toxicity, first by a conservative comparison to short-term maximum BC WQGs and acute screening values derived in the effluent assessment presented in Section 6.3.1.
- Constituents identified to have the potential for acute toxicity at target concentrations shown in Table 6-3 were reduced in the proposed permit limits to a concentration that is predicted, based on chemistry, that acute lethality would not occur at the discharge point (i.e., either equal to or below an acute screening value or the BC maximum WQG for the protection of aquatic life).
- Where relevant for the Quesnel Lake discharge, effluent targets were further refined by lowering them to the maximum of either:
  - Two times the highest predicted 95th percentile discharge concentration evaluated using site monitoring data as inputs (referred to as Scenario 1 in Section 5.2).
  - The highest 95th predicted discharge concentration evaluated using source terms developed by SRK (Appendix C) (referred to as Scenario 2 in Section 5.2).

Table 6-3: Derivation of Proposed Effluent Discharge Limits

Parameter	Units	Back-Calculated Effluent Target to Meet BC WQGs at the Edge of the IDZ[(a)]	Metal Mining Effluent Regulation Limits[(b)]	BC WQGs or Acute Screening Value[(c)]		Predicted Maximum Effluent Concentration	Proposed Effluent Discharge Limit
				Maximum (based on effluent hardness)	Notes		
Discharge to Quesnel Lake - Operations							
Physical Parameters							
TSS	mg/L	-	**15**	-	-	-	15
pH	pH units	-	**6-9.5**	-	-	-	6-9.5
Major Ions							
Sulphate	mg/L	8474	-	1476	ASV	**1112i**	1100
Nutrients							
Ammonia	mg/L (as N)	6.8	-	5.7	A, d	**1.3i**	1.3
Nitrate	mg/L (as N)	118	-	33	A	**34i**	34
Total Phosphorus	mg/L	0.12	-	0.005 - 0.015	A, in lakes	**0.09i**	0.09
Total Metals							
Arsenic	mg/L	0.2	0.5	0.55	ASV	**0.028i**	0.028
Chromium	mg/L	0.021	-	0.22	ASV	**0.004i**	0.004
Copper	mg/L	0.053	0.3	**0.033**	A, e	0.098i	0.033
Iron	mg/L	39	-	**1.0**	A	1.52i	1.0
Lead	mg/L	0.19	0.2	0.38	A, f	**0.00082i**	0.00082
Molybdenum	mg/L	40	-	2	A	**0.36j**	0.36
Nickel	mg/L	0.5	0.5	0.26	ASV, g	**0.0051j**	0.0051
Selenium	mg/L	**0.075**	-	4.5	ASV	0.2j	0.075
Zinc	mg/L	0.18	0.5	0.22	A, h	**0.059j**	0.059
Seepage to Bootjack Lake - No Discharge Scenario							
Physical Parameters							
TSS	mg/L	-	**15**	-	-	-	15
pH	pH units	-	**6-9.5**	-	-	-	6-9.5
Major Ions							
Sulphate	mg/L	5996	-	**1545**	ASV	n/a	1545
Nutrients							
Ammonia	mg/L (as N)	4.8	-	**1.0**	A, d	n/a	1.0
Nitrate	mg/L (as N)	**84**	-	**33**	A	n/a	33
Total Phosphorus	mg/L	**0.16**	-	0.005 - 0.015	A, in lakes	n/a	0.16
Total Metals							
Arsenic	mg/L	**0.13**	0.5	0.55	ASV	n/a	0.13
Chromium	mg/L	**0.015**	-	0.22	ASV	n/a	0.015
Copper	mg/L	0.039	0.3	**0.033**	A, e	n/a	0.033
Iron	mg/L	25	-	**1.0**	A	n/a	1.0
Lead	mg/L	**0.12**	0.2	0.38	A, f	n/a	0.12
Molybdenum	mg/L	28	-	**2.0**	A	n/a	2.0
Nickel	mg/L	0.5	0.5	**0.26**	ASV,g	n/a	0.26
Zinc	mg/L	**0.13**	0.5	0.21	A, h	n/a	0.13

Notes:

BC WQGs = British Columbia Water Quality Guidelines; IDZ = initial dilution zone; mg/L = milligram per litre; N = nitrogen; A = approved guideline; ASV = acute screening value

n/a - Predicted site water not considered in derivation of effluent permit limits for seepage to Bootjack Lake

Bold indicates the candidate value selected as proposed effluent permit limit (grey highlight).

For hardness-dependent BC WQGs the minimum of median predicted site water hardness of 334 mg/L and 328 mg/L was used for Quesnel Lake and Bootjack Lake, respectively.

a) Based on 40:1 dilution for Quesnel Lake and 28:1 dilution for Bootjack Lake. The back-calculated targets in Table 6-3 were based on WQGs calculated from mean baseline toxicity modifying concentrations for Quesnel Lake (i.e., BC WQGs shown in Table 6-6).

b) Metal Mining Effluent Regulations (MMER) Schedule 4, maximum authorized monthly mean concentration.

c) British Columbia Water Quality Guideline (BC WQG) for the protection of freshwater aquatic life or acute screening value where no maximum WQG (See Section 6.3.1.3).

d) pH and temperature dependent ammonia guideline: values selected from Table 3 in BC WQG based on maximum temperature (20 degrees Celsius) and pH (8.7).

e) Hardness dependent copper guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000.

f) Hardness dependent lead guideline: BC Max WQG (mg/L) = 0.003 mg/L if hardness <8, otherwise use exp^(1.273*ln(hardness)-1.46)/1000 mg/L.

g) Short-term acute toxicity benchmark for nickel based on US EPA (2016) acute aquatic life criteria and hardness of 50 mg/L; US EPA (2016) National Recommended Water Quality Criteria - Aquatic Life Criteria Table. Available at: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table.

h) Hardness dependent zinc guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000.

i) Based on two times Scenario 1 maximum 95th percentile water quality predictions using site monitoring data as inputs.

j) Based on Scenario 2 predicted discharge water quality using source terms developed by SRK (2016).

The resultant effluent permit limits proposed in Table 6-3 were derived to allow a margin of safety between expected quality and enforceable limits, to prevent the administrative burden of non-compliance events that are above permit limits, but are not environmentally disruptive, while providing clear and enforceable limits protective of the environment. As shown in Table 6-3, the proposed limits are equal to or below maximum BC WQGs or acute screening values derived in Section 6.3.1 and so are not expected to result in acutely lethal effects at the point of discharge. These limits will inform safe discharge planning as part of the MWMP (Section 7.0) to protect downgradient or downstream water uses and receptors. The findings of the impact assessment presented in Section 6.3.4 also indicate that the adoption of the proposed permit criteria will be protective of the receiving environment. Toxicity testing to confirm this expectation is anticipated to be part of the permit requirements and monitoring program during the proposed discharge. Confirmatory and compliance monitoring is proposed in Section 8.0.

A selenium effluent limit is not proposed for the Springer Pit seepage to Bootjack Lake. MPMC proposes to manage Bootjack Lake selenium concentrations through monitoring selenium at the edge of the IDZ, as well as in the Springer Pit, and in wells downgradient of the Springer Pit. If selenium concentrations approach the chronic guideline value of 2 µg/L, and it is identified that these increases are related to increases of in-pit selenium concentrations, this transport pathway will be further evaluated for risk to ecological receptors and as necessary mitigated through such options as grouting, in-pit lake selenium treatment, and/or other methods.

With respect to the discharge to Quesnel Lake, the maximum of the 95th percentile modelled selenium concentration (0.087 mg/L) was marginally higher than the proposed effluent limit of 0.075 mg/L. However, at present, selenium is not identified as a parameter that will require treatment since the model predictions are based on several conservative assumptions (Appendix D) and historical concentrations have remained well below these levels. If operational monitoring indicates that selenium concentrations in the discharge are trending towards the maximum value of the modelled 95th percentile concentration, additional mitigation, such as reducing selenium concentrations prior to discharging, will be implemented.

6.3.3 Modelled Conditions Assuming Proposed Permit Limits

To evaluate potential effects in the receiving environment, the treated effluent predictions presented in Section 6.3.1 were carried forward in water quantity and water quality models simulating discharges to Quesnel Lake and Bootjack Lake. In Quesnel Lake, separate models were used to determine the near-field and far-field transport of the discharge. The models were selected to reflect the physical characteristics and hydraulic properties within the near-field and far-field. This approach is consistent with modelling practices applied to predicting the effects of mine effluent discharges to complex receiving environments for regulatory applications (Vandenberg et al. 2015), and was consistent with the approach and models applied in the Short-term TAR (Golder 2015k). In Bootjack Lake, a similar approach was adopted, except a near-field dispersion model was not applied because the discharge would not be a point-source input. Instead, a three-dimensional hydrodynamic was applied, and it was discretized (gridded) to represent an IDZ at the expected location where the discharge would report to Bootjack Lake, as described below.

6.3.3.1 Quesnel Lake Near-Field Model

In Quesnel Lake, concentrations at the edge of the 100 m IDZ were estimated using Cornell Mixing Zone Expert System (CORMIX) (Doneker and Jirka 2007). This model was used to develop an outfall design that maximizes dispersion at the IDZ under a variety of seasonal and wind-driven current conditions. CORMIX provides predictions within the near-field (i.e., at the scale of metres to hundreds of metres, including the edge of the IDZ). A number of individual scenarios were simulated within CORMIX to estimate the dilution factor under a range of expected conditions. Conditions that were varied include discharge rate, ambient water current, temperature, and thermocline depth (Appendix H). The lowest dilution factor achieved at the edge of the IDZ under these conditions was applied within the GoldSim receiving environment water quality model (Appendix D).

The inputs to the near-field model were largely consistent with those applied in the Short-Term TAR (Golder 2015k), with updates to constituent concentrations and discharge rates as presented in this TAR, as well as slight modifications to the diffuser characteristics, to reflect “as-built” conditions rather than pre-built designs.

Basin-wide increases in constituent concentrations, and corresponding decreases in dilution factor beyond the IDZ, as well as “re-dosing” within the IDZ, are not represented by the CORMIX model. Therefore, a far-field model was also used to simulate these processes.

6.3.3.2 Quesnel Lake Far-Field Model

Far-field transport within Quesnel Lake was modelled using H3D, a proprietary three-dimensional hydrodynamic model maintained by Tetra Tech. The model is derived from GF8 (Stronach et al. 1993) developed for DFO. It simulates temporally and spatially varying conditions throughout the lake based on external drivers such as inflows and atmospheric processes. The model has been calibrated and verified based on historical and recent conditions in Quesnel Lake (Tetra Tech 2015). Tetra Tech used the US EPA Visual Plumes UM3 model, embedded in H3D, to evaluate the behaviour of the outfall plume in Quesnel Lake. UM3 is a near-field numerical dilution model for outfall discharge into marine and freshwater environments. Its near-field results were consistent with those produced by the CORMIX near-field modelling. The salient difference between the long-term three-dimensional approach (H3D-UM3) and the near-field approach (CORMIX) is the possibility of building up a background concentration of effluent in the three-dimensional model of the lake, which accounts for periods of reduced diffuser effectiveness regardless of near-field hydraulic performance.

The H3D model was used to simulate far-field transport over 10 years of varying meteorological conditions to evaluate potential accumulation of effluent in the West Basin of Quesnel Lake and transport to the Quesnel River. This model dynamically simulates circulation and vertical stratification over the modelled time frame. The spatial discretization of the model setup (grid cells approximately 100 m in width near discharge location) limits the model’s ability to simulate near-field conditions, which was instead modelled using CORMIX. However, it has been shown to accurately reproduce Quesnel Lake hydrodynamic conditions at the far-field points of interest (Tetra Tech 2015). The model setup, assumptions and results of the discharge modelling are detailed in Appendix J.

The dilution ratio at any point in time in the far-field is predicted to remain above the level predicted at the IDZ (40:1). Therefore, concentrations due to the discharge to Quesnel Lake are expected to remain below the predicted concentrations at the IDZ and below levels assessed in Section 6.3.4 throughout Quesnel Lake and throughout the operations phase. As shown in Appendix J, concentrations in the far-field of Quesnel Lake approach a quasi-steady state condition after approximately two years, so an extension of the period of discharge (i.e., if the mine life is extended beyond the approved four years), would not significantly change the results of this assessment, provided quantity and quality limits are not increased.

As described in Section 8.0, monitoring is proposed to confirm attainment of WQGs at the IDZ. Monitoring at the edge of the IDZ since the authorized discharge began in December 2015 has validated the models applied in 2015 and updated herein, insofar as 1) WQGs have been consistently met, and 2) dilution has consistently exceeded the predicted dilution factor.

6.3.3.3 Bootjack Lake Model

In Bootjack Lake, concentrations at the edge of the IDZ and in the far-field were estimated using the Generalized Environmental Modeling System for Surface waters (GEMSS) model (Edinger and Buchak 1980, 1985, 1995). This model has similar numerical underpinnings, atmospheric and hydrologic boundary conditions, dimensionality and capabilities as the H3D model described above. The model was set up and calibrated to existing conditions in Bootjack Lake, then used to simulate a non-point source input of seepage from Springer Pit (Appendix I). Dilution within the IDZ (28:1) was predicted and carried forward to the GoldSim receiving environment water quality model (Appendix D).

6.3.4 Impact Assessment: Aquatic Resources and other Receptors

This section presents an impact assessment for the Quesnel Lake and Bootjack Lake receiving environments to support permitting of an effluent discharge to Quesnel Lake during operations and to permit a contingency scenario where seepage from the Springer Pit may enter Bootjack Lake. The assessment characterizes potential impacts on water uses associated with predicted changes in water quality at identified assessment nodes in the receiving environments of each lake. The impact assessment is based on predicted water quality reported in Section 6.2 and followed the approach outlined below.

6.3.4.1 Approach

The approach to the impact assessment comprised the following tasks:

- describe study boundaries and assessment nodes (Section 6.3.4.2)
- identify receiving environment water uses and summarize BC WQGs applicable to those water uses (Section 6.3.4.3)
- identify baseline conditions for aquatic receptors relevant to the assessment of potential effects (Section 3.6)

- identify constituents of potential concern (COPCs) by comparing predicted water quality concentrations at the assessment nodes in Quesnel Lake and Bootjack Lake to the most sensitive BC WQGs applicable for receiving environment water uses (typically but not exclusively for the protection of aquatic health) and BC drinking water guidelines (Section 6.3.4.4)
- evaluate the potential for adverse effects on aquatic resources and other receptors including wildlife, livestock, and human health, through an assessment of the potential for impairment of identified water uses (Section 6.3.4.5)

Identification of data gaps and uncertainties associated with the impact assessment are provided in Section 6.5. How these will be addressed in an adaptive management approach through environmental monitoring is provided in Sections 7.0 and 8.0.

6.3.4.2 Study Boundaries and Assessment Nodes

Spatial boundaries for the impact assessment are the West Basin of Quesnel Lake west of Cariboo Island for the Quesnel Lake discharge, and Bootjack Lake for potential seepage from the Springer Pit (Figures 6-2 and 6-3).

Assessment nodes for the impact assessment are the edge of the IDZ in Quesnel Lake for the site discharge and the edge of the IDZ in Bootjack Lake for the Springer Pit seepage.

LEGEND

- OUTFALL LOCATION
- INITIAL DILUTION ZONE (100 m RADIUS)
- PIPELINE ROUTE (APPROXIMATE)
- ROAD
- WATERCOURSE
- HAZELTINE CREEK SEDIMENTATION POND 1
- HAZELTINE CREEK SEDIMENTATION POND 2

0 0.1 0.2
1:5,000 KILOMETRES

REFERENCES
1. ROADS OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. ORTHOPHOTO OBTAINED FROM SNC LAVALIN 2014
3. PROJECTION: UTM ZONE 10; DATUM: NAD 1983

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGMENT PLAN

TITLE
INITIAL DILUTION ZONE IN QUESNEL LAKE

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-06-16
DESIGNED	EI
PREPARED	RH/CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	PHASE/DOC	REV.	FIGURE
1411734	16000/162	0	**6-2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734-PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\TAR1411734_12000_FIG_6_2_IDZ_QUESNEL_LAKE.mxd

LEGEND

INITIAL DILUTION ZONE

0 300 600

1:14,000 METRES

REFERENCES

1. PROJECT IMAGERY OBTAINED FROM SNC LAVALIN (2014) 2. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION

PROJECT
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

TITLE
INITIAL DILUTION ZONE IN BOOTJACK LAKE

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-06-27
DESIGNED	EI
PREPARED	RH / CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	PHASE/DOC	REV.	FIGURE
1411734	12000/162	0	**6-3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1in

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\TAR1411734_12000_FIG_6_3_IDZ_BOOTJACK_LAKE.mxd

6.3.4.3 Receiving Environment Uses and Relevant Water Quality Guidelines

Known environmental uses of Quesnel Lake water, particularly with respect to the West Basin, were identified to determine the most sensitive water use for the receiving environment. The following environmental uses were identified for Quesnel Lake by Golder (2015j) in the Short-Term TAR approved in 2015 for the currently permitted effluent discharge:

- commercial, recreational, and aboriginal fisheries
- recreational uses such as scenery and wildlife viewing, swimming, boating, kayaking, canoeing, and waterskiing/tubing/wakeboarding, and in the winter, snowmobiling, and ice fishing when ice conditions allow
- drinking and residential water use for domestic purposes[3]

Although agriculture, especially cattle ranching, is an economic driver in the local area (Cariboo Envirotech Ltd. 2009), there are no water licences (current or pending) for stock watering or irrigation use for Quesnel Lake. More detailed information regarding these uses is provided in Golder (2015j). With respect to Bootjack Lake, the above water uses also apply, including residential water use for domestic purposes because there is one cabin situated next to the lake that may use the lake as a drinking water source. There is also a campground located on Bootjack Lake, and campers visiting that site could potentially use lake water for consumptive purposes.

The BC WQGs applicable to those water uses are described below.

BC Water Quality Guidelines for End Uses

WQGs have been developed by the MoE to be protective of different water uses, including aquatic life, wildlife, drinking water sources, recreational contact, and agriculture (livestock watering and irrigation). Based on the above uses identified for Quesnel Lake and Bootjack Lake, guidelines protective of aquatic life, wildlife, drinking water sources, and recreational contact are applicable to these receiving environments.

For the purpose of the impact assessment, BC WQGs protective of the most sensitive receiving environment use were selected as well as BC drinking water guidelines. With the exception of total aluminum, pH, and molybdenum, the most sensitive receiving environment use was the protection of aquatic life (Table 6-4)—if that use is protected, then the remaining water uses are also protected. For total aluminum, the most conservative maximum BC WQG was adopted (i.e., water for wildlife) because aquatic life guidelines are based only on dissolved aluminum. For pH, the drinking water guideline range of pH 6.5 to 8.5 was adopted. That range is slightly narrower than the one specified for aquatic life. For molybdenum, the most conservative 30-day BC WQG value was for irrigation, assuming the copper: molybdenum ratio is less than 2:1 in lieu of a 30-day value for wildlife. Because this molybdenum guideline is not based on toxicological effects, a literature review on the toxicity of molybdenum to livestock and wildlife was conducted to develop a screening value (Appendix L). As a result of this literature review, the aquatic life 30-day guideline of 1 mg/L was compared to predicted concentrations at the IDZ of both lakes, because, based on the available information, this guideline was considered protective of other receiving environment uses, including potential effects on livestock and wildlife.

[3] Domestic purposes as defined in the BC *Water Act* means the use of water for household requirements, sanitation and fire prevention, the watering of domestic animals and poultry, and the irrigation of a garden not exceeding 1,012 m^2 adjoining and occupied with a dwelling house.

Recreational guidelines are not shown in Table 6-4 but are similar to or less stringent than drinking water guidelines and are thus implicitly considered in the analysis described above. The aquatic life guidelines represent conservative environmental quality benchmarks with built-in safety factors that represent concentrations where adverse impacts on aquatic resources and other receptors associated with drinking water, livestock, and wildlife water uses are not expected.

Table 6-4: BC WQGs for Receiving Environment Uses Relevant to the Water Quality Impact Assessment

Parameter	Units	Maximum BC Drinking Water Guidelines	Maximum BC WQGs		Chronic BC WQGs	
			Aquatic Life	Wildlife Water	Aquatic Life	Wildlife Water
Major Ions						
Calcium	mg/L	-	-	-	see note[a]	-
Chloride	mg/L	250	**600**	600	**150**	-
Fluoride	mg/L	1.5	**1.1[b]**	1.5	-	**1.0**
Sulphate	mg/L	500	-	-	**218[c]**	-
Nutrients						
Ammonia	mg/L (as N)	-	**1.3[d]**	-	**0.18[d]**	-
Nitrate	mg/L (as N)	10	**32.8**	100	**3**	-
Nitrite	mg/L (as N)	1	**0.060[e]**	10	**0.02[e]**	-
Total Phosphorus	mg/L	0.01	-	-	**0.005–0.015 in lakes**	-
Total Metals						
Aluminum	mg/L	-	-	**5**	-	-
Antimony	mg/L	0.014[W]	-	-	**0.009[W]**	-
Arsenic	mg/L	0.025[M]	**-**	-	**0.005**	0.025[M]
Barium	mg/L	-	-	-	**1[W]**	-
Beryllium	mg/L	0.004[W]	-	-	**0.00013[W]**	-
Boron	mg/L	5	**-**	-	**1.2**	5
Chromium	mg/L	-	-	-	**0.001[W(f)]**	0.05[W(f)]
Cobalt	mg/L	-	**0.11**	-	**0.004**	-
Copper	mg/L	0.5	**0.0070[g]**	0.3	**0.0022[g]**	-
Iron	mg/L	-	**1**	-	**-**	-
Lead	mg/L	0.05	**0.037[h]**	0.1	**0.0048[h]**	-
Manganese	mg/L	-	**1.1[i]**	-	**0.84[i]**	-
Mercury	mg/L	0.001	-	-	**0.00001[j]**	**-**
Molybdenum	mg/L	0.25	**2**	0.05	**1**	-
Nickel	mg/L	**-**	-	-	**0.025[W(k)]**	-
Selenium	mg/L	0.01	-	-	**0.002**	0.002
Silver	mg/L	-	**0.0001[l]**	-	**0.00005[l]**	-
Thallium	mg/L	0.002	-	-	**0.0008[W]**	-
Zinc	mg/L	5	**0.033[m]**	-	**0.0075[m]**	-
Dissolved Metals						
Aluminum	mg/L	0.2	**0.1[n]**	-	**0.05[n]**	-
Cadmium	mg/L	-	**0.00031[o]**	-	**0.00013[o]**	-
Iron	mg/L	-	**0.35**	-	-	-

Notes: Values are taken from the approved guidelines unless otherwise noted.

W = working guideline; M = interim guideline, Min = Minimum concentration requirement based on life stage.

Hardness dependent guidelines are based on mean baseline hardness of 54 mg/L in Quesnel Lake, considered representative of average conditions in the receiving environment.

Physical parameters with WQGs such as dissolved oxygen, TSS, turbidity, and pH were not modelled.

Bold Indicates most conservative guideline of each maximum and chronic WQG for ecological receptors.

a) up to 4 - highly sensitive to acid inputs; 4 to 8 - moderately sensitive; over 8 - low sensitivity.

b) hardness dependent fluoride guideline: BC Max WQG (mg/L) = 0.4 mg/L if hardness <10, otherwise use -51.73+(92.57*log(hardness))*0.01 mg/L.

c) hardness dependent sulphate guideline: BC 30-day WQG (mg/L) = 128 at hardness <30 mg/L, at hardness 31-75 mg/L = 218, at hardness 76-180 mg/L = 309, at hardness 181-250 mg/L = 429, at hardness >250 mg/L determine base on site water.

d) pH and temperature dependent ammonia guideline: values selected from Table 3 (Max WQG) and Table 4 (30-day WQG) in BC WQG based on a temperature of 20°C and 8.7 pH.

e) chloride dependent nitrite guideline: BC Max WQG (mg/L) = 0.06 at Cl <2 mg/L, at Cl 2-4 mg/L = 0.12, at Cl 4-6 mg/L = 0.18, at Cl 6-8 mg/L = 0.24, at Cl 8-10 = 0.30, at Cl >10 = 0.6; BC 30-day WQG (mg/L) = 0.02 mg/L at Cl <2 mg/L, at Cl 2-4 mg/l = 0.04, at Cl 4-6 mg/L = 0.06, at Cl 6-8 mg/L = 0.08, at Cl 8-10 mg/L = 0.1, at Cl >10 = 0.2, determined based on Cl <2 mg/L considered representative of average conditions in the receiving environment.

f) guideline is for chromium VI (Cr(VI)).

g) hardness dependent copper guideline: BC Max WQG (mg/L) = (0.094(hardness)+2)/1000; BC 30-day WQG (mg/L) = 0.002 at hardness ≤50 mg/L, at hardness >50 mg/L = 0.04*hardness/1000.

h) hardness dependent lead guideline: BC Max WQG (mg/L) = 0.003 mg/L if hardness < 8, otherwise use exp(1.273*ln(hardness)-1.46)/1000 mg/L; BC 30-day WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) - 4.704)) / 1000 at hardness > 8 mg/L.

i) hardness dependent manganese guideline: BC Max WQG (mg/L) = 0.01102*(hardness)+0.54; BC 30-day WQG (mg/L) = 0.0044*hardness+0.605.

j) mercury BC 30-day WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

k) hardness dependent nickel guideline: BC 30-day WQG (mg/L) = 0.025 at hardness < 60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness > 180 mg/L.

l) hardness dependent silver guideline: BC Max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-day WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015.

m) hardness dependent zinc guideline: BC Max WQG (mg/L) = (33+0.75(hardness-90))/1000; BC 30-day WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

n) pH dependent dissolved aluminum guideline: BC Max WQG (mg/L) = 0.1 at pH ≥6.5, at pH <6.5 = exp(1.209-2.426*(pH)+0.286*(pH2)); BC 30-day WQG (mg/L) = 0.05 at pH ≥6.5, at pH <6.5 = exp(1.6-3.327*(median pH)+0.402*(median pH2), determined based on 7.0 pH.

o) hardness dependent dissolved cadmium guideline: BC Max WQG (mg/L) = (exp(1.03*ln(hardness)-5.274))/1000; BC 30-day WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

6.3.4.4 Identification of Constituents of Potential Concern

The identification of COPCs provides a transparent means of evaluating the data to focus on substances that either need to be evaluated and/or regulated by permit. It provides a back-check that the evaluations carried out as part of the derivation of proposed effluent permit limits did not leave out a parameter that should be evaluated for impact or that requires regulation in the permit.

The maximum predicted median and 95th percentile concentrations for Quesnel Lake and Bootjack Lake IDZs were calculated based on the daily minimum dilution and the 30-day average dilution modelled for each lake during operations. These maximum predicted median and 95th percentile concentrations were compared to BC WQGs for the most sensitive water use identified in Table 6-4. BC WQGs are conservative environmental quality benchmarks with built-in safety factors that represent concentrations where there is confidence that when water chemistry is below that benchmark, adverse impacts on water quality are not expected. A parameter was identified to be of potential concern if 95th percentile concentrations were above the lowest applicable BC WQG. For parameters with guidelines dependent on pH (i.e., ammonia-N and aluminum), chloride (i.e., nitrite-N), or hardness (i.e., sulphate, cadmium, copper, lead, manganese, nickel, and zinc), mean baseline water quality values were used.

With respect to parameters that do not have applicable 30-day BC WQGs, these parameters were evaluated further if median and 95th percentile concentrations were more than 20% higher than comparable baseline concentrations. A difference of less than or equal to 20% between predicted concentrations and baseline concentrations was not considered to be distinguishable from the baseline conditions and therefore not considered to represent a potential effect on water quality in the receiving environment. This assessment criterion is consistent with MoE (2013a), where a relative percent difference less than 20% between two duplicate water quality values is not considered to indicate a distinguishable difference between the two values. An additional screening step was applied to parameters that had predicted concentrations more than 20% higher than baseline by comparison to relevant toxicity screening values.

Tables 6-5 to 6-8 summarize the results of the comparison of predicted water quality to BC WQGs and baseline concentrations. No COPCs were identified for predicted concentrations at the edge of the IDZ in Quesnel Lake and Bootjack Lake because median and 95th percentile concentrations were below BC WQGs for those parameters with guideline values, with the exception of phosphorus in Bootjack Lake. Total phosphorus was above BC WQGs in Bootjack Lake, but was not identified as a COPC because predicted concentrations were not distinguishable from the baseline conditions (i.e., were less than 20% higher than baseline).

Table 6-5: Water Quality Screening at Edge of Initial Dilution Zone for Quesnel Lake Based on the Daily Minimum Dilution of Quesnel Lake Discharge

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Operations	
		Maximum	Notes	Maximum	Notes	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters							
Hardness (Dissolved)	mg/L	-	-	-	-	73	75
Total Dissolved Solids	mg/L	-	-	-	-	98	102
Major Ions							
Chloride	mg/L	250	A	600	A	0.86	0.89
Fluoride	mg/L	1.5	A	1.1	A, c	0.32	0.31
Sulphate	mg/L	-	-	-	-	24	25
Nutrients							
Ammonia	mg/L (as N)	-	-	1.3	A, d	0.023	0.025
Nitrate	mg/L (as N)	10	A	32.8	A	0.37	0.55
Nitrite	mg/L (as N)	1	A	0.060	A, e	0.0027	0.011
Total Phosphorus	mg/L	0.01	A, lakes	-	-	0.0031	0.0033
Total Metals							
Aluminum	mg/L	-		5	A, WW	0.047	0.045
Antimony	mg/L	0.014	W	-	-	0.00016	0.00016
Arsenic	mg/L	0.025	Interim	-	-	0.00054	0.00051
Barium	mg/L	-	-	-	-	0.0089	0.0090
Beryllium	mg/L	0.004	W	-	-	0.00013	0.00013
Boron	mg/L	5	A	-	-	0.015	0.018
Cadmium	mg/L	-	-	no total WQG, see dissolved		0.0000092	0.000013
Chromium	mg/L	-	-	-	-	0.00054	0.00054
Cobalt	mg/L	-	-	0.11	A	0.00013	0.00021
Copper	mg/L	0.5	A	0.007	A, f	0.0018	0.0026
Iron	mg/L	-	-	1	A	0.052	0.054
Lead	mg/L	0.05	A	0.037	A, g	0.000065	0.000063
Lithium	mg/L	-	-	-	-	0.0014	0.0016
Manganese	mg/L	-	-	1.1	A, h	0.023	0.053
Mercury	mg/L	0.001	A	-	-	0.0000050	0.0000050
Molybdenum	mg/L	0.25	A	2	A	0.0056	0.0063
Nickel	mg/L	-	-	-	-	0.00055	0.00056
Selenium	mg/L	0.01	A	-	-	0.0020	0.0029
Silver	mg/L	-	-	0.0001	A, i	0.000013	0.000013
Strontium	mg/L	-	-	-	-	0.23	0.25
Thallium	mg/L	0.002	A	-	-	0.000017	0.000017
Tin	mg/L	-	-	-	-	0.00010	0.00010
Titanium	mg/L	-	-	-	-	0.011	0.011
Uranium	mg/L	-	-	-	-	0.00024	0.00029
Vanadium	mg/L	-	-	-	-	0.0015	0.0015
Zinc	mg/L	5	A	0.033	A, j	0.0037	0.0037
Dissolved Metals							
Aluminum	mg/L	0.2	A	0.1	A, k	0.017	0.017
Cadmium	mg/L	-	-	0.00031	A, l	0.0000091	0.000010
Iron	mg/L	-	-	0.35	A	0.032	0.035

Notes:

mg/L = milligram per litre, N = nitrogen, A = approved guideline, W = working guideline, WW = wildlife water supply guidelines

Measurements at or below method detection limit presented as half the detection limit

Underlined value = exceeds maximum BC Drinking Water Quality Guidelines

Shaded value = exceeds maximum BC Water Quality Guidelines

a) British Columbia Water Quality Guideline (BC WQG) for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs are not available.

b) BC WQG Fresh Water Aquatic Life Maximum Guidelines. WQGs were based on mean baseline toxicity modifying factor concentrations for Quesnel Lake.

c) Hardness dependent fluoride guideline: BC max WQG (mg/L) = 0.4 mg/L if hardness <10, otherwise use -51.73+(92.57*log(hardness))*0.01 mg/L.

d) pH and temperature dependent ammonia guideline: values selected from Table 3 in BC WQG based on maximum temperature (20 degrees Celsius) and pH (8.7).

e) Chloride (Cl) dependent nitrite guideline: BC max WQG (mg/L) = 0.06 at Cl <2 mg/L, 0.12 at Cl 2-4 mg/L, 0.18 at Cl 4-6 mg/L, 0.24 at Cl 6-8 mg/L, 0.30 at Cl 8-10 mg/L, 0.60 at Cl >10 mg/L.

f) Hardness dependent copper guideline: BC max WQG (mg/L) = (0.094(hardness)+2)/1000.

g) Hardness dependent lead guideline: BC max WQG (mg/L) = 0.003 if hardness <8 mg/L, otherwise use exp(1.273*ln(hardness)-1.46)/1000.

h) Hardness dependent manganese guideline: BC max WQG (mg/L) = 0.01102*(hardness)+0.54.

i) Hardness dependent silver guideline: BC max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, at hardness >100 mg/L = 0.003; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, at hardness > 100 mg/L = 0.0015.

j) Hardness dependent zinc guideline: BC max WQG (mg/L) = (33+0.75(hardness-90))/1000.

k) pH dependent dissolved aluminum guideline: BC max WQG (mg/L) = 0.1 at pH ≥6.5, EXP(1.209-2.426*(pH)+0.286*(pH^2)) at pH <6.5.

l) Hardness dependent dissolved cadmium guideline: max BC WQG (mg/L) = (exp(1.03*ln(hardness)-5.274))/1000.

Table 6-6: Water Quality Screening at Edge of Initial Dilution Zone for Quesnel Lake Based on the 30-Day Average Dilution of Quesnel Lake Discharge

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Mean Baseline Concentration[c]	Mean Baseline Concentration + 20%	Operations	
		Maximum	Notes	30-day Average	Notes			Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters									
Hardness (Dissolved)	mg/L	-	-	-	-	54	65	**67**	**68**
Total Dissolved Solids	mg/L	-	-	-	-	69	83	**89**	**91**
Major Ions									
Chloride	mg/L	250	A	150	A	0.5	0.6	0.74	0.77
Fluoride	mg/L	1.5	A	1.1	A, d, Max	0.033	0.040	0.20	0.22
Sulphate	mg/L	-	-	218	A, e	6.3	7.6	19	19
Nutrients									
Ammonia	mg/L (as N)	-	-	0.18	A, f	0.005	0.006	0.016	0.019
Nitrate	mg/L (as N)	10	A	3	A	0.13	0.16	0.27	0.38
Nitrite	mg/L (as N)	1	A	0.02	A, g	0.001	0.0012	0.002	0.0073
Total Phosphorus	mg/L	0.01	A, lakes	0.005 - 0.015	A, lakes	0.002	0.0024	0.0027	0.0029
Total Metals									
Aluminum	mg/L	-		5	A, WW, Max	0.019	0.023	0.037	0.037
Antimony	mg/L	0.014	W	0.0009	W	0.0001	0.00012	0.00014	0.00015
Arsenic	mg/L	0.025	Interim	0.005	A	0.00012	0.00014	0.00036	0.00039
Barium	mg/L	-	-	1	W	0.0053	0.0064	0.0077	0.0079
Beryllium	mg/L	0.004	W	0.00013	W	0.0001	0.00012	0.00012	0.00012
Boron	mg/L	5	A	1.2	A	0.01	0.012	0.013	0.015
Cadmium	mg/L	-	-	no total WQG, see dissolved		0.000005	0.000006	0.0000075	0.000011
Chromium	mg/L	-	-	0.001	W, h	0.0005	0.0006	0.00053	0.00053
Cobalt	mg/L	-	-	0.004	A	0.0001	0.00012	0.00012	0.00017
Copper	mg/L	0.5	A	0.0022	A, i	0.00085	0.00102	0.0015	0.0021
Iron	mg/L	-	-	1	A, Max	0.03	0.036	0.045	0.046
Lead	mg/L	0.05	A	0.0048	A, j	0.000053	0.000064	0.000060	0.000060
Lithium	mg/L	-	-	-	-	0.001	0.0012	**0.0013**	**0.0014**
Manganese	mg/L	-	-	0.84	A, k	0.0013	0.0016	0.016	0.036
Mercury	mg/L	0.001	A	0.00001	A, l	0.000005	0.000006	0.0000050	0.0000050
Molybdenum	mg/L	0.25	A	1	A	0.00035	0.00042	0.0040	0.0044
Nickel	mg/L	-	-	0.025	W, m	0.0005	0.0006	0.00054	0.00054
Selenium	mg/L	0.01	A	0.002	A	0.00014	0.00017	0.0014	0.0020
Silver	mg/L	-	-	0.00005	A, n	0.00001	0.000012	0.000012	0.000012
Strontium	mg/L	-	-	-	-	0.13	0.16	**0.20**	**0.21**
Thallium	mg/L	0.002	A	0.0008	W	0.00001	0.000012	0.000014	0.000015
Tin	mg/L	-	-	-	-	0.0001	0.00012	0.00010	0.00010
Titanium	mg/L	-	-	-	-	0.01	0.012	0.010	0.011
Uranium	mg/L	-	-	0.0085	W	0.00016	0.00019	0.00022	0.00025
Vanadium	mg/L	-	-	-	-	0.0005	0.0006	**0.0011**	**0.0012**
Zinc	mg/L	5	A	0.0075	A, o	0.003	0.0036	0.0034	0.0035
Dissolved Metals									
Aluminum	mg/L	0.2	A	0.05	A, p	0.0063	0.0076	0.013	0.014
Cadmium	mg/L	-	-	0.00013	A, q	0.000005	0.000006	0.0000074	0.0000086
Iron	mg/L	-	-	0.35	A, Max	0.03	0.036	0.031	0.033

Notes:

mg/L = milligram per litre, N = nitrogen, A = approved guideline, W = working guideline, WW = wildlife water supply guidelines

Underlined value	= exceeds maximum BC Drinking Water Quality Guidelines
Shaded value	= exceeds 30-d BC Water Quality Guidelines
Bolded value	= exceeds baseline + 20% for parameters without BC WQGs

a) British Columbia Water Quality Guideline (BC WQG) for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs do not exist.

b) BC Water Quality Guidelines (BC WQG). Fresh Water Aquatic Life 30-day Guidelines used, except where noted (e.g., total aluminum). Maximum (Max) guidelines substituted where 30-d guidelines do not exist. WQGs were based on mean baseline toxicity modifying factor concentrations for Quesnel Lake.

c) The median baseline concentration is presented if mean is not available.

d) Hardness dependent fluoride guideline: BC max WQG (mg/L) = [-51.73 + 92.57 log10 (hardness*)] × 0.01 at hardness >10 mg/L, 0.4 mg/L at hardness ≤10 mg/L.

e) Hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, 218 at hardness 31-75 mg/L, 309 at hardness 76-180 mg/L, 429 at hardness 181-250 mg/L, determined based on site water at hardness >250 mg/L.

f) pH and temperature dependent ammonia guideline: values selected from Table 4 in BC WQG based on maximum temperature (20.0 degrees Celsius) and pH (8.7).

g) Chloride (Cl) dependent nitrite guideline: BC 30-d WQG (mg/L) = 0.02 at Cl <2 mg/L, 0.04 at Cl 2-4 mg/L, 0.06 at Cl 4-6 mg/L, 0.08 at Cl 6-8 mg/L, 0.10 at Cl 8-10 mg/L, 0.20 at Cl >10 mg/L.

h) Max guideline is for hexavalent chromium.

i) Hardness dependent copper guideline: BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L, (0.04*hardness/1000) at hardness >50 mg/L.

j) Hardness dependent lead guideline: BC 30-d WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) - 4.704)) / 1000 at hardness >8 mg/L.

k) Hardness dependent manganese guideline: BC 30-d WQG (mg/L) = 0.0044*hardness+0.605.

l) Mercury BC 30-d WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

m) Hardness dependent nickel guideline: BC 30-d WQG (mg/L) = 0.025 at hardness <60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness >180 mg/L.

n) Hardness dependent silver guideline: BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, 0.0015 at hardness >100 mg/L.

o) Hardness dependent zinc guideline: BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

p) pH dependent dissolved aluminum guideline: BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, exp(1.6-3.327*(median pH)+0.402*(median pH^2)) at pH <6.5.

q) Hardness dependent dissolved cadmium guideline: BC 30-d WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

Table 6-7: Water Quality Screening at Edge of Initial Dilution Zone for Bootjack Lake Based on the Daily Minimum Dilution of Springer Pit Seepage

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Operations (4-Year Mine Life)	
		Maximum	Notes	Maximum	Notes	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters							
Hardness (Dissolved)	mg/L	-	-	-	-	53	56
Total Dissolved Solids	mg/L	-	-	-	-	79	83
Major Ions							
Chloride	mg/L	250	A	600	A	1.5	1.5
Fluoride	mg/L	1.5	A	1.0	A, c	0.12	0.13
Sulphate	mg/L	-	-	-	-	13	16
Nutrients							
Ammonia	mg/L (as N)	-	-	0.75	A, d	0.0068	0.0095
Nitrate	mg/L (as N)	10	A	32.8	A	0.18	0.31
Nitrite	mg/L (as N)	1	A	0.060	A, e	0.0015	0.006
Total Phosphorus	mg/L	0.01	A, lakes	-	-	0.015	0.015
Total Metals							
Aluminum	mg/L	-		5	A, WW	0.027	0.028
Antimony	mg/L	0.014	W	-	-	0.000066	0.000072
Arsenic	mg/L	0.025	Interim	-	-	0.00043	0.00045
Barium	mg/L	-	-	-	-	0.019	0.019
Beryllium	mg/L	0.004	W	-	-	0.000058	0.00006
Boron	mg/L	5	A	-	-	0.048	0.049
Cadmium	mg/L	-	-	no total WQG, see dissolved		0.0000064	0.0000081
Chromium	mg/L	-	-	-	-	0.00026	0.00026
Cobalt	mg/L	-	-	0.11	A	0.00006	0.000096
Copper	mg/L	0.5	A	0.006	A, f	0.0029	0.0033
Iron	mg/L	-	-	1	A	0.097	0.098
Lead	mg/L	0.05	A	0.028	A, g	0.000026	0.000027
Lithium	mg/L	-	-	-	-	0.00065	0.00069
Manganese	mg/L	-	-	1.0	A, h	0.093	0.11
Mercury	mg/L	0.001	A	-	-	0.0000025	0.0000025
Molybdenum	mg/L	0.25	A	2	A	0.0032	0.0041
Nickel	mg/L	-	-	-	-	0.00026	0.00028
Selenium	mg/L	0.01	A	-	-	0.001	0.0016
Silver	mg/L	-	-	0.0001	A, i	0.0000057	0.0000058
Strontium	mg/L	-	-	-	-	0.15	0.17
Thallium	mg/L	0.002	A	-	-	0.0000075	0.0000079
Tin	mg/L	-	-	-	-	0.00005	0.000051
Titanium	mg/L	-	-	-	-	0.0051	0.0051
Uranium	mg/L	-	-	-	-	0.000074	0.000086
Vanadium	mg/L	-	-	-	-	0.0011	0.0011
Zinc	mg/L	5	A	0.033	A, j	0.0017	0.0018
Dissolved Metals							
Aluminum	mg/L	0.2	A	0.1	A, k	0.0062	0.0072
Cadmium	mg/L	-	-	0.00025	A, l	0.0000098	0.000012
Iron	mg/L	-	-	0.35	A	0.016	0.018

Notes:

mg/L = milligram per litre, N = nitrogen, A = approved guideline, W = working guideline, WW = wildlife water supply guidelines

Measurements at or below method detection limit presented as half the detection limit

Underlined value = exceeds maximum BC Drinking Water Quality Guidelines

Shaded value = exceeds maximum BC Water Quality Guidelines

a) British Columbia Water Quality Guideline (BC WQG) for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs are not available.

b) BC WQG Fresh Water Aquatic Life Maximum Guidelines. WQGs were based on mean baseline toxicity modifying factor concentrations for Bootjack Lake.

c) Hardness dependent fluoride guideline: BC max WQG (mg/L) = 0.4 mg/L if hardness <10, otherwise use -51.73+(92.57*log(hardness))*0.01 mg/L.

d) pH and temperature dependent ammonia guideline: values selected from Table 3 in BC WQG based on maximum temperature (20 degrees Celsius) and pH (8.7).

e) Chloride (Cl) dependent nitrite guideline: BC max WQG (mg/L) = 0.06 at Cl <2 mg/L, 0.12 at Cl 2-4 mg/L, 0.18 at Cl 4-6 mg/L, 0.24 at Cl 6-8 mg/L, 0.30 at Cl 8-10 mg/L, 0.60 at Cl >10 mg/L.

f) Hardness dependent copper guideline: BC max WQG (mg/L) = (0.094(hardness)+2)/1000.

g) Hardness dependent lead guideline: BC max WQG (mg/L) = 0.003 if hardness <8 mg/L, otherwise use exp(1.273*ln(hardness)-1.46)/1000.

h) Hardness dependent manganese guideline: BC max WQG (mg/L) = 0.01102*(hardness)+0.54.

i) Hardness dependent silver guideline: BC max WQG (mg/L) = 0.0001 at hardness ≤100 mg/L, 0.003 at hardness >100 mg/L; BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, 0.0015 at hardness >100 mg/L.

j) Hardness dependent zinc guideline: BC max WQG (mg/L) = (33+0.75(hardness-90))/1000.

k) pH dependent dissolved aluminum guideline: BC max WQG (mg/L) = 0.1 at pH ≥6.5, exp(1.209-2.426*(pH)+0.286*(pH^2)) at pH <6.5.

l) Hardness dependent dissolved cadmium guideline: max BC WQG (mg/L) = (exp(1.03*ln(hardness)-5.274))/1000.

Table 6-8: Water Quality Screening at Edge of Initial Dilution Zone for Bootjack Lake Based on the 30-Day Average Dilution of Springer Pit Seepage

Parameter	Units	BC Drinking Water Quality Guidelines[a]		BC Water Quality Guidelines[b]		Mean Baseline Concentration[c]	Mean Baseline Concentration + 20%	Operations (4-Year Mine Life)	
		Maximum	Notes	30-day Average	Notes			Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters									
Hardness (Dissolved)	mg/L	-	-	-	-	43	52	**52**	**55**
Total Dissolved Solids	mg/L	-	-	-	-	63	76	**79**	**83**
Major Ions									
Chloride	mg/L	250	A	150	A	1.4	1.68	1.5	1.5
Fluoride	mg/L	1.5	A	1.0	A, d, Max	0.065	0.078	0.12	0.13
Sulphate	mg/L	-	-	218	A, e	4.0	4.8	13	16
Nutrients									
Ammonia	mg/L (as N)	-	-	0.102	A, f	0.005	0.006	0.0068	0.0093
Nitrate	mg/L (as N)	10	A	3	A	0.005	0.01	0.18	0.3
Nitrite	mg/L (as N)	1	A	0.02 - 0.02	A, g	0.001	0.0012	0.0015	0.0059
Total Phosphorus	mg/L	0.01	A, lakes	0.005 - 0.015	A, lakes	0.015	0.018	0.015	0.015
Total Metals									
Aluminum	mg/L	-		5	A, WW, Max	0.026	0.031	0.027	0.028
Antimony	mg/L	0.014	W	0.0009	W	0.0001	0.00012	0.000066	0.000071
Arsenic	mg/L	0.025	Interim	0.005	A	0.00038	0.00046	0.00043	0.00045
Barium	mg/L	-	-	1	W	0.018	0.0216	0.019	0.019
Beryllium	mg/L	0.004	W	0.00013	W	0.0001	0.00012	0.000058	0.00006
Boron	mg/L	5	A	1.2	A	0.047	0.056	0.048	0.049
Cadmium	mg/L	-	-	no total WQG, see dissolved		0.000010	0.000012	0.0000064	0.000008
Chromium	mg/L	-	-	0.001	W, h	0.0005	0.0006	0.00026	0.00026
Cobalt	mg/L	-	-	0.004	A	0.0001	0.00012	0.00006	0.000095
Copper	mg/L	0.5	A	0.002	A, i	0.0027	0.0032	0.0029	0.0033
Iron	mg/L	-	-	1	A, Max	0.097	0.116	0.097	0.098
Lead	mg/L	0.05	A	0.0044	A, j	0.00005	0.00006	0.000026	0.000027
Lithium	mg/L	-	-	-	-	0.001	0.0012	0.00065	0.00068
Manganese	mg/L	-	-	0.79	A, k	0.086	0.1032	0.093	0.11
Mercury	mg/L	0.001	A	0.00001	A, l	0.000050	0.000060	0.0000025	0.0000025
Molybdenum	mg/L	0.25	A	1	A	0.0011	0.00132	0.0032	0.0041
Nickel	mg/L	-	-	0.025	W, m	0.0005	0.0006	0.00026	0.00027
Selenium	mg/L	0.01	A	0.002	A	0.00018	0.00021	0.00096	0.0016
Silver	mg/L	-	-	0.0001	A, n	0.00001	0.000012	0.0000057	0.0000058
Strontium	mg/L	-	-	-	-	0.12	0.14	**0.15**	**0.17**
Thallium	mg/L	0.002	A	0.0008	W	0.00001	0.000012	0.0000075	0.0000078
Tin	mg/L	-	-	-	-	0.0001	0.00012	0.00005	0.000051
Titanium	mg/L	-	-	-	-	0.01	0.012	0.0051	0.0051
Uranium	mg/L	-	-	0.0085	W	0.00004	0.00005	0.000074	0.000085
Vanadium	mg/L	-	-	-	-	0.0010	0.0012	0.0011	0.0011
Zinc	mg/L	5	A	0.0075	A, o	0.003	0.0036	0.0017	0.0018
Dissolved Metals									
Aluminum	mg/L	0.2	A	0.05	A, p	0.0043	0.0052	0.0062	0.0071
Cadmium	mg/L	-	-	0.00011	A, q	0.000017	0.0000204	0.0000098	0.000011
Iron	mg/L	-	-	0.35	A, Max	0.03	0.036	0.016	0.018

Notes:

mg/L = milligram per litre, N = nitrogen, A = approved guideline, W = working guideline, WW = wildlife water supply guidelines

Underlined value	= exceeds maximum BC Drinking Water Quality Guidelines
Shaded value	= exceeds 30-d BC Water Quality Guidelines
Bolded value	= exceeds baseline + 20% for parameters without BC WQGs

a) British Columbia Water Quality Guideline (BC WQG) for the protection of drinking water, available at http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines, accessed October 8, 2015. BC Drinking WQGs for total metals substituted where dissolved metal WQGs do not exist.

b) BC Water Quality Guidelines (BC WQG) Fresh Water Aquatic Life 30-day Guidelines used, except where noted (e.g., total aluminum). Maximum (Max) guidelines substituted where 30-d guidelines do not exist. WQGs were based on mean baseline toxicity modifying factor concentrations for Bootjack Lake

c) The median baseline concentration is presented if mean is not available.

d) Hardness dependent fluoride guideline: BC max WQG (mg/L) = [-51.73 + 92.57 log10 (hardness*)] × 0.01 at hardness >10 mg/L, 0.4 mg/L at hardness≤10 mg/L.

e) Hardness dependent sulphate guideline: BC 30-d WQG (mg/L) = 128 at hardness <30 mg/L, 218 at hardness 31-75 mg/L, 309 at hardness 76-180 mg/L, 429 at hardness 181-250 mg/L, determined based on site water at hardness >250 mg/L.

f) pH and temperature dependent ammonia guideline: values selected from Table 4 in BC WQG based on maximum temperature (23.0 degrees Celsius) and pH (9.3).

g) Chloride (Cl) dependent nitrite guideline: BC 30-d WQG (mg/L) = 0.02 at Cl <2 mg/L, 0.04 at Cl 2-4 mg/L, 0.06 at Cl 4-6 mg/L, 0.08 at Cl 6-8 mg/L, 0.10 at Cl 8-10 mg/L, 0.20 at Cl >10 mg/L.

h) Max guideline is for hexavalent chromium.

i) Hardness dependent copper guideline: BC 30-d WQG (mg/L) = 0.002 at hardness ≤50 mg/L, (0.04*hardness/1000) at hardness >50 mg/L.

j) Hardness dependent lead guideline: BC 30-d WQG (mg/L) = (3.31 + exp(1.273*ln(hardness) - 4.704)) / 1000 at hardness >8 mg/L.

k) Hardness dependent manganese guideline: BC 30-d WQG (mg/L) = 0.0044*hardness+0.605.

l) Mercury BC 30-d WQG (mg/L) = 0.0001/(MeHg/THg), where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume; assumed = 0.00001 at 1% MeHg.

m) Hardness dependent nickel guideline: BC 30-d WQG (mg/L) = 0.025 at hardness <60 mg/L, (exp(0.76*ln(hardness)+1.06))/1000 at hardness <180 mg/L, 0.15 at hardness >180 mg/L.

n) Hardness dependent silver guideline: BC 30-d WQG (mg/L) = 0.00005 at hardness ≤100 mg/L, 0.0015 at hardness >100 mg/L.

o) Hardness dependent zinc guideline: BC 30-d WQG (mg/L) = (7.5+0.75(hardness-90))/1000.

p) pH dependent dissolved aluminum guideline: BC 30-d WQG (mg/L) = 0.05 at pH ≥6.5, exp(1.6-3.327*(median pH)+0.402*(median pH^2)) at pH <6.5.

q) Hardness dependent dissolved cadmium guideline: BC 30-d WQG (mg/L) = (exp(0.736*ln(hardness)-4.943))/1000.

For parameters without BC WQGs, median and 95th percentile concentrations were not distinguishable from the baseline conditions, except as noted below:

- Alkalinity, hardness, calcium, magnesium, potassium, and sodium are components of TDS mixtures and so were not evaluated individually. Instead, TDS was identified as a COPC because predicted concentrations were higher than baseline (+20%) and so were distinguishable from the baseline conditions. However, TDS benchmarks have been established in Northwest Territories (Diavik Diamond Mine), Alaska, and Iowa from 500 to 1,000 mg/L (ADEC 2009; IDNR 2009; WLWB 2013). Predicted median and 95th percentile TDS concentrations for both Quesnel Lake and Bootjack Lake are substantially below these TDS benchmarks (maximum 95th percentile is 102 mg/L). Furthermore, 95th percentile concentrations of TDS constituents, sulphate, and chloride were below the BC WQG for the protection of aquatic life in these lakes. Therefore, TDS was not identified as a COPC.
- Lithium was not identified as a COPC because there was not sufficient toxicity information available to evaluate predicted lithium concentrations.
- Strontium was not identified as a COPC because 95th percentile concentrations in both lakes were substantially below the strontium chronic effects benchmark of 10.7 mg/L recently proposed by McPherson et al. (2014) for freshwater environments.
- Vanadium was not identified as a COPC in the receiving environment because 95th percentile concentrations were below the lowest chronic toxicity value of 0.1 mg/L documented by EC and Health Canada (2010).

6.3.4.5 Summary

The above assessment did not identify any COPCs and showed that pollution (as per the EMA definition) is unlikely to occur as a result of the proposed Quesnel Lake discharge or the potential seepage from Springer Pit to Bootjack Lake; specifically:

- Adverse effects on aquatic life and impairment of other receiving environment uses identified for the West Basin of Quesnel Lake are not expected based on predicted concentrations at the edge of the IDZ in Quesnel Lake. The treated whole effluent at the point of discharge is not expected to be acutely lethal to aquatic life. Following dilution and mixing, conditions within the IDZ would likewise not be expected to be toxic to aquatic life. Chronic toxicity is not expected beyond the IDZ boundary.
- Adverse effects on aquatic life and impairment of other receiving environment uses identified for Bootjack Lake (i.e., drinking water sources, recreational contact, wildlife) are not expected due to seepage from Springer Pit under a No Discharge contingency scenario. The seepage at the point of discharge is not expected to be acutely lethal to aquatic life and following dilution and mixing, conditions within the IDZ would likewise not be expected to be acutely toxic to aquatic life. Chronic toxicity is not expected beyond the IDZ boundary.

Based on this assessment, no additional parameters are identified for assessment or regulation in the proposed permit amendment. Monitoring is proposed in Section 8.0 to verify predictions at the end-of-pipe and at the IDZs in Quesnel Lake and Bootjack Lake during operations.

6.4 Impact Assessment – Closure

As discussed in Section 6.2, only operations phase discharges are part of the present application for a permit amendment; however, closure and post-closure discharge water qualities were developed to inform the development of the Long-Term Water Management Plan (e.g., inform the piloting of passive and semi-passive treatment designs). An impact assessment of closure and post-closure discharges was not conducted as part of this TAR. This impact assessment will be completed during the permitting process of closure discharges once the MWMP for this mining phase has been finalized and when the treatment technology can be piloted and additional information is available to support a specific assessment.

6.5 Uncertainty Assessment

The TAR conducted here was an *a priori* predictive exercise with the objective of identifying whether or not the proposed effluent will result in adverse effects to the receiving environment, and the findings indicate that adverse effects are not predicted. Assessing impact before discharge requires the use of various predictive tools such as effluent dilution modelling. While these tools are useful and provide a reasonable and commonly used prediction of likely conditions, it is appropriate to identify the main uncertainties associated with a predictive assessment and to consider the implications of these uncertainties on predictions made. Finally, if the findings of the TAR and the analysis of uncertainties provide sufficient confidence that the discharge can proceed, the identification of uncertainties will assist in identifying areas, and time periods, when additional focus needs to be given to the receiving environment monitoring program once effluent discharge commences. The main uncertainties are summarized in Table 6-9.

Table 6-9: Identified Uncertainties in the Technical Assessment Report for the Proposed Long-Term Effluent Discharge

Assumption	*Uncertainty*	*Under/over Estimate of Impact*	Rationale
Surface water quality is as predicted by the model	Low	Overestimate	Effluent predictions are based on a conservative mass balance with a comprehensive database of source water chemistry. An ongoing monitoring program will be used to verify the predictions. Maximum discharge quality predictions along with conservative dilution estimates were used for the impact assessment. Actual water quality conditions are likely to be lower in concentration than the predictions included in the impact assessment.
Quesnel Lake plume dilution is as predicted by the model	Low	Overestimate	The plume dilution predictions were carried out by experienced and accredited modellers using an established and validated modelling platform. Dilution modelling was based on combinations of a number of worst-case conditions (i.e., maximum difference in density between effluent and ambient waters, minimum and maximum lake current velocities, and strong lake stratifications). Under most conditions, the dilution factor is expected to be higher than that assumed for the assessment and modelling indicates that diffusion can be further optimized. Field monitoring on the existing water discharge (which uses this diffuser system) since December 1, 2015, has confirmed that the actual dilution factor is high.
Groundwater quantity is as predicted by the models	Low	Neutral	Groundwater seepage predictions were carried out by an experienced hydrogeologist using an established and validated modelling platform. Seepage predictions considered the uncertainty in the model input parameters and provided a range in potential flow rates based on this uncertainty. The predicted range of flow rates was a small component of the overall SWWBM and therefore uncertainty in the predicted seepage rates is not expected to significantly affect the conclusions of the impact assessment.
Groundwater quality intercepted by downgradient surface water courses is as identified in historical dataset	Moderate	Underestimate	Baseline groundwater quality was generated from water quality results for sampled monitoring wells between 1998 and 2015. One or more monitoring wells were located downgradient of the open pits, TSF, NEZ Soil Stockpile, NEZ Dump, SERDS, and NW PAG Stockpile. Sample results from these wells were assumed to be representative of expected long-term groundwater quality downgradient of these facilities. Water quality data generated by an ongoing monitoring program will be used to verify groundwater quality.
Background water quality concentrations are as identified in the post-TSF foundation failure dataset used	Low	Neutral	Background concentrations for Quesnel Lake were generated from a site-specific surface water quality dataset collected post-TSF foundation failure from 2015. Rationale is presented in Section 3.4.1 for the data selected to represent the pre-discharge background condition. Water quality data collected from far-field Quesnel Lake stations to the east of Cariboo Island, outside of the zone of impact of the event, were used to define the pre-discharge background condition. Water quality data generated by an ongoing monitoring program will be used to verify background water quality in the downstream receiving environment.
Treated effluent concentrations will meet the expectations of the proposed treatment system	Low	Overestimate	Improvements in the plant equipment and operational procedures are proposed which is expected to allow the WTP to consistently meet the discharge targets and constraints (Appendix E). The modifications include the use of TMT and PAC reagents to achieve copper removal to low levels if necessary. An 80% removal rate was assumed. This conservative estimate will be confirmed by bench testing work. The treatment will produce a copper bearing sludge.
Effluent temperatures will not change substantially during treatment	Low	Neutral	Differences in receiving environment temperature did not result in unacceptable dilution ratios, and changes in effluent temperature are not expected to have an appreciable influence on plume dilution. The 10-minute residence time of the WTP will impart minimal thermal changes. Temperature changes within the pipe were accounted for in the analysis (Appendix H).
Identification of species assemblage, habitat use, and ecological interactions are adequate	Low	Neutral	The level of knowledge presented in the report and referenced documents are sufficient for the purposes of the impact assessment. Conservative values (i.e., BC WQGs for the most sensitive end use) were used for comparison of effluent quality and receiving environment water quality predictions. These guidelines are considered to be protective of a wide assemblage of aquatic organisms.
Interaction of contaminant mixtures will not cause toxicity	Low	Neutral	The impact assessment has examined the contaminants individually; however, in reality they are discharged in a mixture. Although the most common form of interaction among contaminants is additive, it is possible that more-than-additive (synergistic) or less-than additive (antagonistic) interactions are operable. Toxicity tests conducted on untreated, undiluted water from the Springer Pit and on treated effluent that has been discharged since December 2015, showed no acute toxicity to standard test organisms including rainbow trout. Toxicity testing conducted as part of the discharge monitoring program will verify this.
Hazeltine Channel will contribute to concentrations in mixed effluent prior to discharge to Quesnel Lake until November 2017	Low	Unknown	Tailings remaining in the environment are not expected to weather or dissolve at appreciable rates. Both Polley Lake outlet and effluent flows can be regulated, and total flows in Hazeltine Channel will be maintained at rates that will not erode the reconstructed channel. An estimated load of constituents from tailings seeps has been included in the water quality model for the duration that the effluent will interact with those seeps. Field work and risk assessment will continue to apply to the seeps under the Pollution Abatement Order. Monitoring at HAC-12 has confirmed this source to be small and with negligible impact on the water quality being discharged to Quesnel Lake, and loadings are expected to decrease with further rehabilitation of the creek.
Site drainage will be similar to observed conditions at site	Low	Underestimate	Two scenarios were included in the water quality model. Scenario 1 was used to predict effluent water quality under the assumption that site water quality monitoring results would be representative of site conditions during operations. This assumption is made on the basis that the operations period is a short period and existing water quality will not change within this period. A second scenario, where site drainages were assumed to be at their solubility limits (Scenario 2) was used to evaluate the discharge water quality should the drainage concentrations increase in time. In general, discharge constituent concentrations were predicted to be higher in Scenario 2 in comparison to Scenario 1. The water quality predictions will be verified per the monitoring requirements outlined in the CEMP. Updated triggers will be included in the response framework of the CEMP, so that adaptive management can be implemented if monitoring results indicate site discharge water quality is trending towards the Scenario 2 water quality predictions.
PAG waste rock will not become acid generating	Low	Neutral	Geochemical testing of waste rock (Appendix C) indicates PAG rock will be generated during mining of the Cariboo-Springer Pit. The PAG rock will be managed in accordance with site as per the ML/ARD management considerations and placed in the Temporary NW PAG Stockpile. PAG rock will be rehandled at closure and placed in the mined-out Cariboo-Springer Pit and flooded before the onset of acid generation occurs and acid drainage from these materials is considered unlikely.
Climate change will be negligible within the applicable time frame	Low	Neutral	Climate change is not expected to play a role within the time frame of the discharge permit for operations. Potential effects of climate change during the post-closure period has been assessed in Appendix B.

SWWB = site-wide water balance; TSF = Tailings Storage Facility; NEZ = Northeast Zone; SERDS = Southeast Rock Disposal Site; WTP = water treatment plant; TMT = trimercaptotriazine; PAC = polyaluminum chloride; NW = northwest; PAG = potentially acid generating; BC WQG = BC Water Quality Guideline; CEMP = Comprehensive Environmental Monitoring Plan; ML/ARD = metal leaching / acid rock drainage.

7.0 MINE MANAGEMENT PLANS

The mine currently operates according to several approved management plans. These plans are maintained at the mine and are updated when conditions change or in concert with other regulatory updates. For example, a Contingency Water Management Plan was developed based on site conditions and was provided to MEM and other parties under separate cover in August 2016. The MWMP has been updated for this TAR as described in Section 2.3 and Appendix B.

As part of this TAR, a Selenium Management Plan was developed for the management of selenium releases from the mine (Appendix M). The plan is intended to provide a framework for proactive management of selenium releases to protect ecological receptors from adverse environmental effects. The Selenium Management Plan is intended to be a living document and will be updated as new information related to site conditions, source management and applied treatment technology becomes available. The data gathered in monitoring and investigative studies will become part of the information base for further decisions concerning selenium management at the mine. The Selenium Management Plan is provided in Appendix M and includes:

- compliance and environmental protection goals
- management, mitigation, and contingency measures
- recommended monitoring

The CEMP (MPMC 2016b) is also a living document that will be updated to detect potential changes in environmental conditions that may result due to the proposed discharge, as described in the following section.

8.0 MONITORING

A monitoring program directed at the quality and quantity of site discharges, together with a receiving environment monitoring program for the discharge, is a required component of obtaining an effluent permit (MoE 2014a,b). Monitoring will verify that BC ambient WQGs are met at the edge of the IDZ during the worst-case effluent flow and ambient current conditions, and will demonstrate that the requirements of the MMER are met (i.e., at a minimum 96-hour LC50 ≥100 and attainment of numeric limits) at the end of the pipe.

In March 2016, MPMC submitted to the MoE a CEMP (MPMC 2016b) that combined pre-existing monitoring programs into an integrated plan, as per the requirements of EMA Permit 11678. The main purpose for the development and implementation of the CEMP was for harmonization of data collection, improved data integration, identification of monitoring redundancies or gaps, and reduced duplication in reporting efforts. The CEMP contains detailed information on scheduling, field methods, matrices sampled, parameters measured, laboratory detection limits, and QA/QC measures. The CEMP includes monitoring requirements related to the current short-term effluent discharge that is approved through to 30 November 2017. This plan is intended to be updated on a regular basis as monitoring requirements at the mine change over time. The CEMP will be updated to include the monitoring requirements of the new discharge evaluated in this TAR once it is in place.

The following sections provide an overview of the discharge and receiving environment monitoring requirements for the EMA Permit 11678. Details of the discharge and receiving environment monitoring programs will be provided in an updated version of the CEMP if the discharges are approved as proposed in this TAR. The reader is directed to the CEMP for additional details of current monitoring programs and methods. The following subsections are separated into monitoring related to the proposed operations discharge and the No Discharge scenario.

8.1 Operations Monitoring

8.1.1 Compliance Monitoring

As discussed in Section 5.2, discharge water qualities were evaluated for two scenarios. Scenario 1 was considered to be more representative of operations water quality than Scenario 2 because the main conditions driving source water chemistry are not expected to change for the remainder of operations. Scenario 2 predictions are based on the assumption that site drainages are at their solubility limits and are more applicable for defining adaptive management trajectories.

Monitoring of discharges during operations has the following two objectives:

- confirm discharges meet approved operations permit limits
- identify if adaptive management is required through the response framework established within the CEMP

Monitoring will continue to be conducted on Springer Pit water or the PETBP, whichever is the main source of feed water to the WTP, at the feed line to the WTP. Compliance monitoring will also continue at the WTP end-of-pipe for the discharge to Hazeltine Creek (current discharge) or Quesnel Lake (after November 2017). These locations will be sampled on the same day when possible so that treatment efficiency can be estimated.

Routine (e.g., weekly, monthly) monitoring of treated effluent chemistry will be undertaken at the discharge point for a suite of parameters (e.g., those outlined in the CEMP) relevant to evaluating attainment of permit conditions. As required by an amended EMA Permit 11678 and the MMER, acute toxicity testing (rainbow trout and *D. magna* tests) will be conducted on treated effluent in accordance with test protocols specified in the MMER and frequency of testing as indicated in the permit and the MMER. Chronic toxicity testing will also be carried out in accordance with the test protocols and frequency of testing specified in the permit and the MMER.

8.1.2 Receiving Environment Monitoring

Receiving environment monitoring is a required component of an effluent permit to verify the predictions of this study. The scope of receiving environment monitoring is discharge specific.

8.1.3 Surface Water Quality Monitoring

MPMC proposes to discharge treated effluent to Quesnel Lake via the Hazeltine Channel until the end of November 2017. After this time, the discharge will be transitioned to a pipeline directly connecting the WTP to Quesnel Lake (Figure 5-7). During operations, the discharge will continue to be conveyed through the existing diffusers and the current monitoring program for Quesnel Lake, detailed in the CEMP, will be adapted and refined for operations under this future scenario. This monitoring includes routine (e.g., monthly) monitoring of limnological profiles and water chemistry at the edge of the IDZ in Quesnel Lake to confirm that BC WQGs are met at the edge of the IDZ. Far-field monitoring is conducted at locations eastward and westward of the diffuser outfall to monitor for potential detection of the effluent. Continued monitoring of water quality parameters used in the derivation of effluent treatment targets is recommended to support the potential refinement of targets for the receiving environment.

8.1.4 Groundwater Quality Monitoring

A groundwater monitoring program for the mine is currently presented in the CEMP. This monitoring program will be reviewed in the context of the predicted seepage pathways from the mine facilities described in this report and updated as required to assess groundwater quality downgradient of these facilities. Updates to the program will include the installation of new monitoring wells if it is determined that wells are not appropriately placed along the predicted seepage pathways or if existing wells are destroyed as part of the future operation of the mine facilities.

8.1.5 Aquatic Effects Monitoring

The mine became subject to the MMER on 10 April 2014, with the planned discharge of mine effluent into Hazeltine Creek. As such, MPMC was required to submit an EEM study design within 12 months. The study design is intended to describe biological monitoring studies in the receiving environment. Field studies are conducted to determine if aquatic biota in the receiving environment are affected by the mine discharge as follows:

- Benthic invertebrate surveys are conducted to assess differences in community structure between reference and exposed locations.

- Fish surveys are conducted if the effluent concentration is greater than 1% within 250 m of the final discharge point to assess differences in fish populations between reference and exposed locations.
- Fish tissue is collected if mercury concentrations in effluent are greater than or equal to 0.10 µg/L to assess differences in mercury accumulation between reference and exposed locations.

Details of the current (as of October 2015) EEM program are provided in the report *Mount Polley Mine – Updated Phase 1 Environmental Effects Monitoring Study Design* (Golder 2015l, appended to the CEMP). The EEM study design is expected to be updated to reflect the monitoring requirements for the new discharge once it is in place. The new discharge will have an effluent concentration of less than 1% within 250 m from the final discharge location in Quesnel Lake; therefore, fish population surveys will not be required pursuant to MMER. As predicted total mercury concentrations in the treated effluent characterized are less than 0.10 µg/L, fish tissue studies are not expected to be required pursuant to MMER. A benthic community survey will remain in the EEM study design and follow an exposure versus reference approach to determine the potential for biological effects from the effluent discharge. EEM monitoring in Quesnel Lake is expected to continue per the MMER EEM schedule. It is recognized that the provincial regulators can require additional aquatic environmental effects monitoring; as with the CEMP components related to monitoring of the existing discharge to Quesnel Lake, MPMC will incorporate monitoring of aquatic biota beyond that required under the MMER.

8.2 No Discharge Scenario Monitoring

If the No Discharge scenario is required during operations, all site water will be managed through the Springer Pit. Hydrogeological modelling (Appendix B) indicates that water will begin to exfiltrate and drain towards Bootjack Lake as the Springer Pit lake elevation rises above 1,030 masl. Additional assumptions used to define the No Discharge scenario within the context of this TAR are provided in Section 5.2.2.

During a No Discharge scenario, water quality monitoring will be conducted in the Springer Pit and at the edge of the IDZ in Bootjack Lake (Appendix I). The monitoring requirements at these locations will be specified in a future update to the CEMP if this situation were to occur. The monitoring will be consistent with other site discharge (Section 8.1.1) and surface water monitoring (Section 8.1.3) and will include routine monitoring of limnological profiles and water chemistry in the Springer Pit and at the edge of the IDZ in Bootjack Lake. These data will be suitable for reporting to the MoE with respect to attainment of EMA Permit 11678 conditions and confirmation that BC WQGs are met at the edge of the IDZ. In addition, water quality and water levels will be monitored in wells downgradient of the Springer Pit. As noted in Section 8.1, provincial regulators can require additional aquatic environmental effects monitoring. MPMC will incorporate monitoring of aquatic biota beyond that required under the MMER if a No Discharge scenario occurs.

8.3 Closure/Post-closure Monitoring

At present, MPMC is applying to amend EMA Permit 11678 effluent limits for the remainder of operations; closure and post-closure discharge permit amendments will be sought at a later stage in the mine life. Therefore, the CEMP will be updated to include closure and post-closure monitoring requirements once the closure and post-closure water management strategies are finalized. As presented in the RCP (MPMC 2015d), it is expected that water quality monitoring will occur monthly at the points of discharge and in the receiving environment and that biological monitoring will continue at a frequency of every three years. The frequency of both of these monitoring programs will be decreased as results stabilize or passive treatment systems are deemed to be sufficiently effective and not require long-term monitoring.

8.4 Quality Assurance Requirements

Per MoE (2014a) requirements, quality assurance protocols will be followed as appropriate and described in the proposed monitoring programs. For example:

- Monitoring programs will be developed by Qualified Professionals.
- Detailed monitoring plans will describe the sampling methods, sample preparation and hold times, analytical methods, QA/QC, and data analysis methods.
- Monitoring plans will be based on MoE guidance documents such as *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (MoE 2012).
- Monitoring plans will be based on methods and QA/QC procedures outlined in the 2013 BC field sampling manual (MoE 2013b) and the *Environmental Data Quality Assurance Regulation*.
- Analyses will be performed using standard analytical methods, as specified in the most recent edition of the *British Columbia Environmental Laboratory Manual* (MoE 2016b).

In March 2016, MPMC updated the *Quality Assurance/Quality Control Manual* (MPMC 2016c), which provides detailed descriptions of the QA/QC requirements for environmental monitoring at the mine. This Manual is consistent with the current MoE guidance listed above and includes revised standard operating procedures and associated work methods, where appropriate. Monitoring related to effluent discharge and the receiving environment is expected to follow the procedures outlined in the QA/QC Manual, or updated procedures approved by the MPMC Environmental Coordinator.

9.0 IMPLEMENTATION SCHEDULE

Condition 2.9 of EMA Permit 11678 requires an implementation schedule to be provided for the Long-Term Water Management Plan. Table 9-1 provides the implementation schedule for the Long-Term Water Management Plan and the proposed piloting schedule of the passive treatment system. The dates provided in Table 9-1 are dependent on issuance of permits and changes to the mine plan as additional operational information becomes available; therefore, they are subject to change. The dates related to piloting of the passive treatment system are presently being refined and will be provided in a workplan as part of the RCP update that will be submitted to MEM on or before 15 January 2017.

Table 9-1: Implementation Schedule

Activity	Estimated Date of Completion
Permitting	
Submission of final TAR	Mid-October 2016
Formal submission of EMA Permit 11678 amendment application	mid-October 2016
Stakeholder engagement/ formal consultation (TAR workshops, stakeholder comments, MPMC response)	October/November 2016
MoE approval of TAR	December, 2016
Implementation of Water Management Infrastructure	
Preliminary design	December 2016
Tendering and procurement	February 2017
Receipt of additional regulatory approval(s)	May 2017
Pipeline grade construction and pipeline fusing and staging	June 2017
Staged connection to WTP outlet pipeline	August 2017
Staged commissioning	October 2017
Connection to diffuser outfall pipeline	November 2017
Full operation of pipeline	1 December 2017
End of operations	July 2020
Implementation of RCP	July 2022
Modification to Existing WTP to Incorporate Copper Treatment	
Detailed design	fourth quarter 2016
Procurement and installation	fourth quarter 2016/first quarter 2017
Testing and commissioning	first quarter 2017
Pilot Passive Water Treatment Research, Testing, and Construction	
Research and piloting workplan	January 2017
Detailed designs	first/second quarter 2017
Construction	third/fourth quarter 2017
Operation, testing and optimization	2018 to 2019
Full-Scale Passive Water Treatment Systems (pending results of pilot program)	
Detailed design based on pilot	first /second quarter 2019
Construction	third quarter 2020 to third quarter 2021
Operation	fourth quarter 2021 to end of post-closure

TAR = Technical Assessment Report; MoE = Ministry of Environment; CEMP = Comprehensive Environmental Monitoring Plan; EMA = *Environmental Management Act*; MPMC = Mount Polley Mining Corporation; WTP = water treatment plant; RCP = Reclamation and Closure Plan.

10.0 CLOSURE

We trust that the factual information provided in this report is sufficient for your present needs. Should you have any questions regarding the above information or require additional information please contact the undersigned.

GOLDER ASSOCIATES LTD.

Jennifer Levenik, PEng
Associate, Senior Hydrogeologist

Willy Zawadzki, PGeo
Principal, Senior Hydrogeologist

Robert Millar, PhD, PGeo, PEng
Associate, Senior Water Resources Engineer

Jordana Van Geest, PhD, RPBio
Environmental Scientist

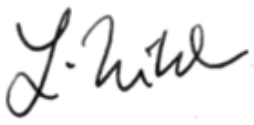
Elaine Irving, PhD, RPBio
Senior Environmental Scientist

Thalita da Silva Sympovsky, MEng, PEng
Environmental/Process Engineer

Allan Bronsro, MCIP, PEng
Associate, Senior Water Resources Engineer

Michael Herrell, MSc, PGeo
Associate, Senior Geochemist

Reviewed by:



Lee Nikl, MSc, RPBio
Principal, Senior Environmental Scientist

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

MKH/JV/it/jc/kp

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

o:\final\2014\1421\1411734\1411734-162-r-rev0-16000\1411734-162-r-rev0-16000-long term tar 17oct_16.docx

REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2009. *Water Quality Standards.* 18 AAC 70. Updated October 2009. Alaska Department of Environmental Conservation, Juneau, Alaska, USA.

AMEC (AMEC Americas Ltd.). 2013. *Mount Polley Mine Hydrogeology Assessment and Data Review*. Submitted to Mount Polley Mining Corporation on March 26, 2013.

ANZECC (Australia and New Zealand Environment and Conservation Council). 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000. Volume 2 - Aquatic Ecosystems - Rationale and Background Information.* National Water Quality Management Strategy, Australian and New Zealand Environment and Conservation. 678 pp. Available at: http://www.environment.gov.au/resource/australian-and-new-zealand-guidelines-fresh-and-marine-water-quality-volume-2-aquatic.

Beak (Beak International Incorporated). 2000. *Mount Polley Biological Monitoring Program - 1999*. Report prepared for the Mount Polley Mining Corporation. April 2000.

Beatty JM, GA Russo. 2014. *Ambient Water Quality Guidelines for Selenium. Technical Report Update*. April 2014. Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, BC Ministry of Environment (MoE).

Birge WJ, JA Black, AG Westerman, JE Hudson. 1980. *Aquatic Toxicity Tests on Inorganic Elements Occurring in Oil Shale*. In: C Gale (Ed.), EPA-600/9-80-022, Oil Shale Symposium: Sampling, Analysis and Quality Assurance, March 1979, US EPA, Cincinnati, OH: 519-534.

Birge WJ, JE Hudson, JA Black, AG Westerman. 1979. *Embryo-larval bioassays on inorganic coal elements and in situ biomonitoring of coal-waste effluents*. In: Surface mining and fish/wildlife needs in the eastern United States, DE Samuel, JR Stauffer, CH Hocutt, and WT Mason Jr. (editors), pp. 97-104. Fish and Wildlife Service, Office of Biological Services. FWS/OBS-78/81. U.S. Government Printing Office, Washington, DC. Cited in CCME 2001.

Birtwell I. 1999. *The Effects of Sediment on Fish and Their Habitat*. Fisheries and Oceans Canada, Science Branch, Marine Environment and Habitat Sciences Division, West Vancouver, BC.

Bisson P, R Bilby. 1982. *Avoidance of Suspended Sediment by Coho Salmon*. North American Journal of Fisheries Management 4: 371–74.

Butt C, R Millar. 2013. *Evaluation of the performance of frequency and chronological pairing techniques in synthesizing long term streamflow*. Minewater Solutions in Extreme Environments. Lima, Peru, April 15 – 17, 2013.

Calfee RD, EE Little, HJ Puglis, E Scott, WG Brumbaugh, CA Mebane. 2014. *Acute sensitivity of white sturgeon (Acipenser transmontanus) and rainbow trout (Oncorhynchus mykiss) to copper, cadmium, or zinc in water-only laboratory exposures*. Environmental Toxicology and Chemistry 33: 2259-2272.

Campbell PGC, PM Chapman, B Hale. 2006. *Risk Assessment of Metals in the Environment*. In: Chemicals in the Environment: Assessing and Managing Risk (Hester RE, RM Harrison [editors]). Royal Society of Chemistry, Cambridge, UK. p. 102–131.

Cariboo Envirotech Ltd. 2009. *The Horsefly River-State of the Watershed Report*. March 31, 2009.

Carmargo JA, JV Tarazona 1991. *Short-term toxicity of fluoride ion in soft water to Rainbow Trout (Salmo gairdneri) and Brown Trout (Salmo trutta Fario)*. Official Quarterly Journal of International Society for Fluoride Research. 24(2):76-83.

Caux P-Y, DRJ Moore, D MacDonald. 1997. *Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments: Technical Appendix*. Prepared for BC Ministry of Environment, Lands and Parks, Victoria, BC.

CCME (Canadian Council of Ministers of the Environment). 1999. *Canadian Environmental Quality Guidelines*. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.

CCME. 2001. *Canadian Water Quality Guidelines for the Protection of Aquatic Life: Arsenic*. Updated. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada. 4 pp.

CCME. 2002. *Canadian Water Quality Guidelines for the Protection of Aquatic Life: Inorganic Fluorides*. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada. 4 pp.

CCME. 2008. Appendix X: Canadian Water Quality Guidelines: Updates (March 1992), Section X1: *Organotins.* In: *Canadian Water Quality Guidelines*, Canadian Council of Resource and Environment Ministers, initially published 1987 and updated to 1997. Prepared by the Task Force on Water Quality Guidelines of the Canadian Council of Ministers of the Environment, Ottawa, ON, Canada. 1484 pp.

CCME. 2012a. *Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life: Nitrate Ion*. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.

CCME. 2012b. *Canadian Water Quality Guidelines for the Protection of Aquatic Life: Nitrate Ion*. Canadian Council of Ministers of the Environment, Winnipeg, MB, Canada.

CDC (BC Conservation Data Centre). 2014. *BC Species and Ecosystems Explorer*. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp. Cited in SNC-Lavalin 2015a.

Chapman PM, F Wang. 2000. *Issues in Ecological Risk Assessment of Inorganic Metals and Metalloids.* Human and Ecological Risk Assessment 6: 965–988.

Chylek P, J Li, MKM Dubey, M Wang, G Lesins. 2011. *Observed and model simulated 20th century Arctic temperature variability: Canadian Earth System Model CanESM2*. Atmos. Chem. Phys. Discuss., 11, 22893–22907.

Daley C, WP Gibson, GH Taylor, GL Johnson, P Pasteris. 2002. A Knowledge-based Approach to Statistical Mapping of Climate. Climate Research, 22, 99-113. Davies TD, KJ Hall. 2007. *Importance of calcium in modifying the acute toxicity of sodium sulphate to Hyalella azteca and Daphnia magna*. Environmental Toxicology and Chemistry, 26: 1243-1247.

Demarchi DA. 2011. *The British Columbia Ecoregion Classification* 3rd Edition. Ecosystem Information Section, BC Ministry of Environment, Victoria, BC, Canada. Available at: http://www.env.gov.bc.ca/ecology/ecoregions/index.html.

Dolighan R, N Zirnhelt. 2015. *Preliminary Summary of Rainbow Trout Production to Bootjack Lake*. Submitted to Mount Polley Mining Corporation. February 2015.

Doneker RL, GH Jirka. 2007. *CORMIX User Manual: A Hydrodynamic Mixing Zone Model and Decision Support System for Pollutant Discharges into Surface Waters*. Report EPA-823-K07-001, U.S. Environmental Protection Agency, Washington, DC.

Eaton B, M Church, D Hamm. 2002. *Scaling and regionalization of flood flows in British Columbia, Canada*. Hydrological Processes, 16, 3245 – 3263.

EC (Environment Canada). 1996. *Biological Test Method: Acute Lethality Test Using Daphnia spp*. Report EPS 1/RM/11. July 1990, with May 1996 amendments. Method Development and Applications Section, Environmental Technology Centre, Environment Canada, Ottawa, ON, Canada.

EC. 2000a. *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout.* Report EPS 1/RM/13. Second Edition. December 2000. Method Development and Applications Section, Environmental Technology Centre, Environment Canada, Ottawa, ON, Canada.

EC. 2000b. *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna.* Report EPS 1/RM/14. Second Edition. December 2000. Method Development and Applications Section, Environmental Technology Centre, Environment Canada, Ottawa, ON, Canada.

EC. 2004. *Canadian Guidance Framework for the Management of Phosphorus in Freshwater Systems.* Ecosystem Health: Science-based Solutions, National Guidelines and Standards, Report No. 1-8.

EC. 2008. *Procedure for pH Stabilization during the Testing of Acute Lethality of Wastewater Effluent to Rainbow Trout*. EPS 1/RM/50. March 2008. Environmental Science and Technology Centre, Science and Technology Branch, Environment Canada, Ottawa, ON, Canada.

EC (Environment Canada) and Health Canada. 2010. *Screening Assessment for the Challenge Vanadium Oxide (Vanadium pentoxide)*. Chemical Abstracts Service Registry Number 1314 62 1. Environment Canada and Health Canada, Ottawa, ON.

Ecoscape (Ecoscape Environmental Consultants Ltd.). 2012. *Foreshore Inventory and Mapping and Aquatic Index – West Arm of Quesnel Lake*. Prepared for Fisheries and Oceans Canada. March 2012. 62 p. Cited in SNC-Lavalin 2015a.

Edinger JE, EM Buchak. 1980. *Numerical hydrodynamics of estuaries*. In Hamilton P, Macdonald KB (eds), Estuarine and Wetland Processes with Emphasis on Modelling. Plenum Press, New York, NY, USA. pp 115-146.

Edinger JE, EM Buchak. 1985. *Numerical waterbody dynamics and small computers.* In: Waldrop WR (ed), Proceedings of ASCE 1985 Hydraulic Division Specialty Conference on Hydraulics and Hydrology in the Small Computer Age. American Society of Civil Engineers. Lake Buena Vista, FL, USA. pp 705-710.

Edinger JE, EM Buchak. 1995. *Numerical intermediate and far field dilution modelling*. Water Air Soil Pollut 83: 147-160.

Eddy FB, PA Kunzlik, RN Bath. 1983. *Uptake and loss of nitrite from the blood of rainbow trout, Salmo gairdneri Richardson, and Atlantic salmon, Salmo salar L. in fresh water and in dilute sea water*. Journal of Fisheries Biology 23: 105-116.

EIFAC (European Inland Fisheries Advisory Commission). 1964. *Water Quality Criteria for European Freshwater Fish. Report on finely divided solids and inland fisheries.* European Inland Fisheries Advisory Commission. Food and Agriculture Organization of the United Nations. Rome. EIFAC/1. 21 pp.

GEI (GEI Consultants, Inc.). 2011. *Updated Freshwater Aquatic Life Criteria for Aluminum.* Submitted to Henthorn Environmental Services, LLC. August 2011, Revision 2. 23 pp.

Golder (Golder Associates Ltd.). 2001. *Report on Cariboo Pit Hydrogeological Study, Mount Polley Mine, Likely, British Columbia.* Prepared for Mount Polley Mining Corporation. September 28, 2001.

Golder. 2004. *Report on Hydrogeological Investigation – Proposed Wishbone Open Pit – Mt. Polley Mining Corporation, Likely, B.C*. Prepared for Mount Polley Mining Corporation. October 18, 2004.

Golder. 2006. *Preliminary Review of 2005 Hydrogeological Program – Dewatering Wells DW-2 and DW-3, Wight Pit, Mount Polley Mine Site*. Prepared for Mount Polley Mining Corporation. January 24, 2006.

Golder. 2010. *Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine.* Prepared for Mount Polley Mining Corporation. August 19, 2010.

Golder. 2014. *Updated Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine*. Prepared for Mount Polley Mining Corporation. December 16, 2014.

Golder. 2015a. *Polley Lake Outlet and Hazeltine Creek Design Flows*. April 22, 2015.

Golder. 2015b. *Mount Polley Mining Corporation: Site Wide Water Balance*. May 29, 2015.

Golder. 2015c. *Mount Polley Mining Corporation: Cariboo-Springer Pit Phase 4 Water management Plan (TSF 970m Design)*. November 2, 2015.

Golder. 2015d. *Groundwater Characterization and Monitoring Program at Mount Polley Mine*. Prepared for Mount Polley Mining Corporation. September 22, 2015.

Golder. 2015e. *Geologic Overview and Identification of Geotechnical Units of Concern*. Prepared for Mount Polley Mining Corporation. April 15, 2015.

Golder. 2015f. *Tailings Storage Facility Detailed Design to Elevation 970 m*. Prepared for Mount Polley Mining Corporation. November 3, 2015.

Golder. 2015g. *Freshet Management Embankment Design Mount Polley Mine*. Prepared for Mount Polley Mining Corporation. May 8, 2015.

Golder. 2015h. *Mount Polley Tailing Dam Failure – Surface Water Quality Impact Assessment*. Prepared for Mount Polley Mining Corporation. June 2015. 330 pp. Appendix F of MPMC 2015c.

Golder. 2015i. *Quesnel and Polley Lakes Aquatic Productivity Impact Assessment*. Prepared for Mount Polley Mining Corporation. June 2015. 82 pp. Appendix H of MPMC 2015c.

Golder. 2015j. *Roadmap to Long-Term Water Management*. December 18, 2015.

Golder. 2015k. *Mount Polley Mine: Short Term Effluent Discharge*. Technical Assessment Report in Support of an Effluent Permit Amendment. Submitted to Mount Polley Mining Corporation. May 2015.

Golder. 2015l. *Mount Polley Mine – Updated Phase 1 Environmental Effects Monitoring Study Design*. Prepared for Mount Polley Mining Corporation. October 2015.

Golder. 2016a. *Alternative Discharge Design and Construction Plan*. January 27, 2016.

Golder. 2016b. *Review of Groundwater Characterization and Monitoring Program for the TSF and SERDS at Mount Polley Mine*. Prepared for Mount Polley Mining Corporation. March 28, 2016.

Golder. 2016c. *Mount Polley Surface Water Quality Impact Assessment Update, March to August 2015*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-106-TM-Rev1-10000. January 2016. 77 pp.

Golder. 2016d. *Addendum to Mount Polley Surface Water Quality Impact Assessment Update*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-135-L-Rev1. March 2016. 35 pp.

Golder. 2016e. *Update on Post-Event Aquatic Toxicity Testing – March to November 2015*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-147-TM-Rev0-10000. May 2016. 194 pp.

Golder. 2016f. *Quesnel and Polley Lakes 2015 Plankton Update Report*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-156-TM-Rev0.

Golder. 2016g. *Mount Polley Mine Tailing Storage Facility, Perimeter Embankment Breach – Update Report: Post-Event Environmental Impact Assessment Report*. Prepared for Mount Polley Mining Corporation. June 2016.

HKP (Hallam Knight Piésold Ltd.). 1996. *Mount Polley Project - Environmental Baseline and Monitoring Report: 1995*. March 1996.

HKP. 1997. *Mount Polley Project - Environmental Baseline and Monitoring Report: 1996*. June 1997.

Hogendoorn-Roozemond AS, VJHM Ten Holder, JJTWA Strik, Z Kolar, JH Koeman. 1978. *The influence of the pH on the toxicity of hexavalent chromium to rainbow trout (Salmo gairdneri),* p. 477–478. In O Hutzinger, IH Van Lelyveld, and BCJ Zoeteman (eds.), Aquatic Pollutants: Transformation and Biological Effects. Pergamon Press, Oxford, England. Cited in Pawlisz AV, RA Kent, UA Schneider, C Jefferson. 1997. Canadian Water Quality Guidelines for Chromium. Environment Canada. CCC 1053-4725/97/020123-61. 62 pp., SK. January 20, 2016.

Hogg WD, DA Carr. 1985. *Rainfall Frequency Atlas for Canada*. Environment Canada, Atmospheric Environment Service, 1985.

IDNR (Iowa Department of Natural Resources). 2009. *Water Quality Standards Review: Chloride, Sulfate and Total Dissolved Solids.* Consultation Package. Iowa Department of Natural Resources. February 2009.

IMC (Imperial Metals Corporation). 1990. *Mount Polley Project. Stage 1 Environmental and Socioeconomic Impact Assessment.* Prepared for the BC Mine Development Steering Committee by Imperial Metals Corporation. July 1990.

Inman M. 2011. *Opening the future*. Nature Climate Change, 1, 7-9.

KP (Knight Piésold Ltd.). 1990. *Geotechnical and Tailings Disposal Studies*. Appendix XI, Imperial Metals Corporation, Mount Polley Project, Williams Lake BC. Feasibility Study, Volume 3 of 5. Wright Engineers Limited June 1990.

KP. 1997. *Report on Stage Ia/Ib Construction Mount Polley Mining Corporation Mount Polley Project Tailings Storage Facility*. August 14, 1997.

KP. 2005. *Mount Polley Mine Design of the Tailings Storage Facility to Ultimate Elevation*. March 14, 2005.

KP. 2014. *Hazeltine Creek Hydrologic Analysis (Rev 1)*. Prepared for Mount Polley Mining Corporation, May 14, 2014. VA101-1/32-1.

Jackaman W. 2008. *QUEST Project Sample Reanalysis (NTS 93A, 93B, 93H, 93G, 93N).* Geoscience BC Report 2008-3.

Laval BE, J Morrison, DJ Potts, EC Carmack, S Vagle, C James, FA McLaughlin, M Foreman. 2008. *Wind-driven Summertime Upwelling in a Fjord-type Lake and its Impact on Downstream River Conditions: Quesnel Lake and River, British Columbia, Canada*. Journal of Great Lakes Research. 34:189–203.

Lewis WM, DP Morris. 1986. *Toxicity of nitrite to fish: a review*. Trans Am Fish Soc 115:183-195.

Lirette M. 2015. *Polley Lake Fish Assessment, September 2014.* Prepared for Mount Polley Mining Corporation. 25 p.

Logan JM, A Bath, MG Mihalynuk, CJ Rees, TD Ullrich, R Friedman. 2007. *Regional Geology of the Mount Polley Area, Central British Columbia.* BC Ministry of Energy, Mines and Petroleum Resources, Geological Survey of Canada, Geoscience Map 2007-1. Scale 1:50,000.

McKean CJP, NK Nagpal. 1991. *Ambient Water Quality Criteria for pH – Technical Appendix.* Prepared by CJP McKean and NK Nagpal, Water Quality Branch, Water Management Division, BC Ministry of Environment. June 1991.

McPherson CA, GS Lawrence, JR Elphick, PM Chapman. 2014. *Development of a strontium chronic effects benchmark for aquatic life in freshwater*. Environmental Toxicology and Chemistry 33(11): 2472-2478.

Meays C, R Nordin. 2013. *Ambient Water Quality Guidelines for Sulphate - Technical Appendix Update.* Prepared by C Meays and R Nordin, Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, BC Ministry of Environment. April 2013.

MEM (Ministry of Energy and Mines) and MoE (Ministry of Environment). 2016. *Joint Application Information Requirements for Mines Act and Environmental Management Act Permits*. Prepared by: British Columbia Ministry of Energy and Mines and British Columbia Ministry of Environment. February 2016.

Minnow (Minnow Environmental Inc.). 2009. *Mount Polley Mine - Aquatic Environmental Characterization of Hazeltine Creek - 2007*. Report Prepared for Mount Polley Mining Corporation. Report Prepared By Minnow Environmental Inc. July 2009.

Minnow. 2011. *Mount Polley Mine Selenium Monitoring 2009/2010*. Report Prepared for Mount Polley Mining Corporation. March 2011.

Minnow. 2013a. *Mount Polley Mine Selenium Monitoring 2012*. Report Prepared for Mount Polley Mining Corporation. March 2013.

Minnow. 2013b. *Mount Polley Mine Selenium Monitoring 2013 Update Report*. Report Prepared for Mount Polley Mining Corporation. December 2013.

Minnow. 2014. *Aquatic Environmental Description Report: Mount Polley Mine Discharge of Treated Water to Polley Lake*. Prepared for Mount Polley Mining Corporation. July 2014.

Minnow. 2015a. *Mount Polley Tailings Dam Failure Sediment Quality Impact Characterization. Report Prepared for the Mount Polley Mining Corporation*. May 2015. Appendix E in MPMC (2015) Post-Event Environmental Impact Assessment Report (PEEIAR).

Minnow. 2015b. *Sediment Quality Data Report - August 2015 Collections*. Report Prepared for the Mount Polley Mining Corporation. October 2015. Appendix E in MPMC (2016) Detailed Site Investigation (DSI) Report.

MoE (British Columbia Ministry of Environment). 2012. *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators*. Ministry of Environment. Version 2, June 2016.

MoE. 2013a. *Guidance for the Derivation and Application of Water Quality Objectives in British Columbia*. Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, Ministry of Environment. April 2013.

MoE. 2013b. *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment, and Biological Sample*. 2013 Edition. Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, BC. January 2013.

MoE. 2014a. *Technical Guidance 1. Environmental Management Act Applications*. Terms of Reference. Environmental Impact Assessment and Technical Assessment Report. Version 1. December 2014. Environmental Protection Division Regional Operations Branch.

MoE. 2014b. *Technical Guidance 2. Environmental Management Act Applications*. Table of Concordance for Mine Effluent Permit and Amendment Applications. Version 1. Environmental Protection Division Regional Operations Branch. December 2014.

MoE. 2015a. *Working Water Quality Guidelines for British Columbia*. Water Protection & Sustainability Branch. Ministry of Environment.

MoE. 2015b. *Pollution Abatement Order 107461 Requirements*. Letter from H. Bunce-BC MoE to D. Reimer-MPMC, June 15, 2015.

MoE. 2016a. *British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture*. Summary Report. Water Protection & Sustainability Branch. Ministry of Environment. March 2016.

MoE. 2016b. *British Columbia Environmental Laboratory Manual*. 2015 Edition. Environmental Monitoring, Reporting & Economics. Ministry of Environment. February 2016.

Moss RH, M Babiker, S Brinkman, E Calvo, T Carter, J Edmonds, I Elgizouli, S Emori, L Erda, K Hibbard, R Jones, M Kainuma, J Kelleher, JF Lamarque, M Manning, B Matthews, J Meehl, L Meyer, J Mitchell, N Nakicenovic, B O'Neill, R Pichs, K Riahi, S Rose, P Runci, R Stouffer, D van Vuuren, J Weyant, T Wilbanks, JP van Ypersele, and M Zurek. 2008. *Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies*. Intergovernmental Panel on Climate Change, Geneva, 132 pp.

Mount DR, DD Gulley, JR Hockett, TD Garrison, JM Evans. 1997. *Statistical Models to Predict the Toxicity of Major Ions to Ceriodaphnia dubia, Daphnia magna and Pimephales promelas (fathead minnows).* Environmental Toxicology and Chemistry 16:2009–2019.

MPMC (Mount Polley Mining Corporation). 2009. *Mount Polley Mine – Technical Assessment Report for a Proposed Discharge of Mine Effluent*. Submitted to Ministry of Energy and Mines. July 2009.

MPMC. 2015a. *Mount Polley Mine Return to Full Operations Permit Amendment Application*. Prepared for the Ministry of Energy and Mines. November 6, 2015.

MPMC. 2015b. *Post TSF-Breach Monitoring Plan – 2015, Revision 1*. Submitted to BC Ministry of Environment. April 8, 2015.

MPMC. 2015c. *Post-Event Environmental Impact Assessment Report (PEEIAR) – Key Findings Report*. Submitted to Ministry of Environment. June 5, 2015.

MPMC. 2015d. *Mine Reclamation and Closure Plan Update November 2015*. Prepared for the Ministry of Energy and Mines. November 4, 2015.

MPMC. 2016a. *2015 Annual Environmental and Reclamation Report for the Mount Polley Mine*. Submitted to BC Ministry of Energy and Mines. March 2016. 123 pp.

MPMC. 2016b. *Comprehensive Environmental Monitoring Plan*. Submitted to BC Ministry of Environment. March 2016. 79 pp + appendices.

MPMC. 2016c. *Quality Assurance/Quality Control Manual*. Prepared by Mount Polley Mining Corporation. March 2016. 153 pp.

Muck J. 2010. *Biological Effects of Sediment on Trout and Their Habitat - guidance for evaluating effects.* U.S. Fish and Wildlife Service, 57 pp.

Nautilus (Nautilus Environmental). 2011a. *Evaluation of the Role of Hardness in Modifying the Toxicity of Nitrate to Freshwater Organisms*. Prepared for the Mining Association of BC. Burnaby, BC, Canada. September 12, 2001.

Nautilus. 2011b. *Evaluation of the Role of Hardness in Modifying the Toxicity of Nitrate to Rainbow Trout.* Prepared for the Mining Association of BC. Burnaby, BC, Canada.

Nautilus. 2013. *Evaluation of the Role of Hardness in Modifying the Toxicity of Nitrate to Freshwater Organisms*. Revised Final Report. Prepared for the Mining Association of BC. Burnaby, BC, Canada. February 3, 2013.

Newcombe CP, JOT Jensen. 1996. *Channel Suspended Sediment and Fisheries: a Synthesis for Quantitative Assessment of Risk and Impact.* North American Journal of Fisheries Management. 16: 693–727.

Newcombe CP, D MacDonald. 1991. *Effects of Suspended Sediments on Aquatic Ecosystems.* North American Journal of Fisheries Management 11: 72–82.

Nidle BH, KS Shortreed, KV Masuda. 1994. *Limnological Data from the 1985-1990 Study of Quesnel Lake.* Can. Data Rep. Fish. Aquat. Sci. 940.

Oikari A, J Kukkonen, V Virtanen. 1992. *Acute toxicity of chemicals to Daphnia magna in humic waters*. Sci. Total Environ. 117/118:367–377. cited in Pawlisz, AV, RA Kent, UA Schneider, C Jefferson. 1997. Canadian Water Quality Guidelines for Chromium. Environment Canada. CCC 1053-4725/97/020123-61. 62 pp.

Pawlisz AV, RA Kent, UA Schneider, C Jefferson. 1997. *Canadian Water Quality Guidelines for Chromium.* Environment Canada. CCC 1053-4725/97/020123-61. 62 pp.

Penman HL. 1948. *Natural evaporation from open water, bare soil and grass.* Proc. Roy. Soc. London A (194), S. 120-145.

Powers JP, AB Corwin. 2007. *Construction Dewatering and Groundwater Control: New Methods and Applications.* Wiley, NY.

Rees C. 2013. *The Mount Polley Cu-Au Porphyry Deposit, south-central British Columbia, Canada; in Porphyry Systems of Central and Southern BC: Tour of Central BC Porphyry Deposits from Prince George to Princeton*. Edited by Logan, J., and Schroeter, T. Guidebook Series of the Society of Economic Geologists, Inc., Guidebook 44, pages 67-98.

Rescan (Rescan Environmental Services Ltd.). 2012. *EKATI Diamond Mine: Site-Specific Water Quality Objective for Sulphate.* Prepared for BHP Billiton Canada Inc. by Rescan Environmental Services Ltd.: Yellowknife, Northwest Territories.

Robertson M, D Scruton, RS Gregory, KD Clarke. 2006. *Effect of suspended sediment of freshwater fish and fish habitat.* Canadian Technical Report of Fisheries and Aquatic Sciences 2644: v + 37 pp.

Servizi J, R. Gordon. 1990. *Acute Lethal Toxicity of Ammonia and Suspended Sediment Mixtures to Chinook Salmon (Oncorhynchus tshawytscha).* Bulletin of Environmental Contamination and Toxicology 44: 650–56.

Servizi J, D Martens. 1987. *Some Effects of Suspended Fraser River Sediments on Sockeye Salmon (Oncorhynchus nerka).* Canadian Special Publication of Fisheries and Aquatic Sciences 96: 254–64.

SNC-Lavalin (SNC-Lavalin Inc.). 2015a. *Mount Polley Tailings Storage Facility Breach - Fisheries Impact Assessment.* Draft Report. Prepared for Mount Polley Mining Corporation. April 2015. Appendix I in MPMC (2015) Post-Event Environmental Impact Assessment Report (PEEIAR).

SNC-Lavalin. 2015b. *Post-Event Impact Assessment Report: Terrestrial Wildlife and Vegetation.* Draft Report. Prepared for Mount Polley Mining Corporation. April 2015.

Soucek DJ. 2007. *Comparison of Hardness- and Chloride-Regulated Acute Effects of Sodium Sulfate on Two Freshwater Crustaceans*. Environmental Toxicology Chemistry 26:773–779.

SRK (SRK Consulting) 2013. *Mount Polley Water and Load Balance.* Prepared for Mount Polley Mining Corporation. December 2013.

SRK. 2015. *Mount Polley Tailings Dam Failure: Geochemical Characterization of Spilled Tailings*. Prepared for Mount Polley Mining Corporation. June 2015. Appendix C of MPMC 2015.

Stronach JA, JO Backhaus, TS Murty. 1993. *An update on the numerical simulation of oceanographic processes in the waters between Vancouver Island and the mainland: the GF8 model*. Oceanography and Marine Biology: An annual review 31: 1-86.

Tetra Tech (Tetra Tech EBA Inc.). 2015. *Quesnel Lake Water Column Observations and Modelling.* Prepared for Mount Polley Mining Corporation. FILE: 704-V13203212-01. May 2015. 93 pp.

Tietge JE, JR Hockett, JM Evans. 1996. *Major Ion Toxicity of Six Produced Waters to Three Freshwater Species: Application of Ion Toxicity Models and TIE Procedures*. Environmental Toxicology and Chemistry 16: 2002–2008.

US EPA (United States Environmental Protection Agency). 2007. *Aquatic Life Ambient Freshwater Quality Criteria – Copper. Office of Water.* EPA-822-R-07-001. 204 pp.

US EPA. 2016a. *National Recommended Water Quality Criteria - Aquatic Life Criteria Table.* Available at: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table.

US EPA. 2016b. *Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016*. EPA 822-R-16-006. June 2016. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology. Washington, D.C. 807 pp.

Vandenberg JA, M Herrell, JW Faithful, AM Snow, J Lacrampe, C Bieber, S Dayyani, V Chisholm. 2015. *Multiple Modeling Approach for the Aquatic Effects Assessment of a Proposed Northern Diamond Mine Development*. Mine Water and Environment. 1-9. http://dx.doi.org/10.1007/s10230-015-0337-5.

Vardy DW, J Oellers, JA Doering, H Hollert, JP Giesy, M Hecker. 2013. *Sensitivity of early life stages of white sturgeon, rainbow trout, and fathead minnow to copper.* Ecotoxicology, 22: 139-147.

Vollenweider RA. 1970. *Scientific Fundamentals of the Eutrophication of Lakes and Flowing Waters, with Particular Reference to Nitrogen and Phosphorus as Factors in Eutrophication*. OECD, Paris, France. Tech. Rpt. DA 5/SCI/68.27. 250 pp.

Wang T, A Hamaan, D Spittlehouse, S Aitken. 2012. *Climate BC/WNA/NA*. Centre for Forest Conservation Genetics, Faculty of Forestry, University of British Columbia. Available at http://cfcg.forestry.ubc.ca/projects/climate-data/climatebcwna.

WaterSmith (WaterSmith Research Inc.). 2016a. *Hazeltine & Edney Creek hydrometric monitoring – 2015 year-end report*. Prepared for Mount Polley Mining Corporation. March 28, 2016.

WaterSmith. 2016b. *Summary of the 2015 MPMC hydrometric monitoring program*. Prepared for Mount Polley Mining Corporation. March 28, 2016.

Weber-Scannell PK, LK Duffy. 2007. *Effects of Total Dissolved Solids on Aquatic Organisms: A Review of Literature and Recommendation for Salmonid Species.* American Journal of Environmental Sciences 3: 1–6.

Welsh PG, J Lipton, CA Mebane, JCA Marr. 2008. *Influence of Flow-Through and Renewal Exposures on the Toxicity of Copper to Rainbow Trout.* Ecotoxicology and Environmental Safety. 69: 199-208.

WLWB (Wek'èezhìi Land and Water Board). 2013. *Aquatic Effects Monitoring Program (AEMP) Design Version 3.1*. File W2007L2-0003.Letter to Diavik Diamond Mine Inc., Yellowknife, NWT, Canada.

Personal Communications

Hughes C. 2016. Environmental Coordinator. Mount Polley Mining Corporation. Likely, BC. Electronic mail to Kerrie Serben, Golder Associates Ltd. Saskatoon, SK. January 20, 2016.

Litke S. 2016. Environmental Technologist, Mount Polley Mining Corporation, Likely, BC. Electronic mail to Kerrie Serben, Golder Associates Ltd. Saskatoon, SK. January 19, 2016.

STUDY LIMITATIONS

This report was prepared for the exclusive use of MPMC. The inferences concerning the data, site and receiving environment conditions contained in this report are based on information obtained during investigations conducted at the site by Golder, other consultants and MPMC, and are based solely on the condition of the site at the time of the site studies and subsequent investigations and remediation and other information obtained by Golder, as described in this report. Soil, surface water and groundwater conditions may vary with location, depth, time, sampling methodology, analytical techniques and other factors.

In evaluating the subject site and water quality data, Golder has relied in good faith on information provided. The factual data, interpretations and recommendations pertain to a specific project as described in this report, based on the information obtained during the assessment by Golder on the dates cited in the report, and are not applicable to any other project or site location. Golder accept no responsibility for any deficiency or inaccuracy contained in this report as a result of reliance on the aforementioned information.

The findings and conclusions documented in this report have been prepared for the specific application to this project, and have been developed in a manner consistent with that level of care normally exercised by environmental professionals currently practising under similar conditions in the jurisdiction. Golder makes no other warranty, expressed or implied and assumes no liability with respect to the use of the information contained in this report at the subject site, or any other site, for other than its intended purpose.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or action based on this report. All third parties relying on this report do so at their own risk. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely upon the electronic media versions of Golder's report or other work product. Golder is not responsible for any unauthorized use or modifications of this report.

MPMC may rely on the information contained in this report subject to the above limitations.

Golder makes no other representation whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations and the regulations themselves may change over time, thus MPMC should review these issues.

If new information is discovered during future work, including excavations, sampling, soil boring, predictive geochemistry or other investigations, Golder should be requested to re-evaluate the conclusions of this report and to provide amendments, as required, prior to any reliance upon the information presented herein. The validity of this report is affected by any change of site conditions, purpose, development plans or significant delay from the date of this report in initiating or completing the project.

APPENDIX A

Table of Concordance

APPENDIX A
Detailed Concordance Table

Table 1-1 of the Technical Assessment Report (TAR) is a high-level concordance table that aligns content in the TAR with the major headings of the generic Terms of Reference listed in the BC Ministry of Environment (MoE) document *Technical Guidance 1: Environmental Management Act Applications* and the Joint Application Information Requirements for *Mine's Act and Environmental Management Act* Permits (MEM and MoE 2016). Table A-1 of this appendix provides a concordance table as listed in *Technical Guidance 2: Environmental Management Act Applications*. Because this table is more detailed, many cross-references refer to the supporting documents to the TAR, which are themselves more detailed than the main body of the report.

As mentioned in Section 1.3 of the TAR, the BC Ministry of Energy and Mines (MEM) has also issued a table of information requests as part of their review of the *Mines Act* Permit M-200 amendment application for the Return to Full Operations at the Mount Polley Mine. This table of information requirements was issued as a table of concordance for additional information that was required as part of this TAR to satisfy *Mines Act* permitting requirements. The location of the information required by MEM is provided in Table A-2 of this appendix.

Technical Guidance 2: Environmental Management Act Applications also states that "*All assessments are to be completed and supported by an appropriately qualified professional*". The TAR and supporting documents are all prepared and/or reviewed by qualified professionals as noted on the signature pages of each document. A list of qualified professionals is provided below. The sections listed for each qualified professional include subsections. Except where noted, the qualified professionals are employed at Golder Associates Ltd. and professional accreditations are in BC.

Name	Accreditation and Number	Section of TAR Responsible for
Michael Herrell	PGeo, 31209	Sections 1, 2.1, 2.2, 4, 5.1, 5.2, 5.3, 5.2.1, 5.2.1.2, 5.2.3, 5.2.3.2, 5.4.1, 6.1.2, 6.4, 6.5, 7, 8, 9; Appendix D
Jerry Vandenberg	PChem, 2013342	Sections 6.3.3; Appendices D, G, I; Global Review of TAR
Steve Day (SRK)	PGeo, 18467	Section 3.1; Appendix C
Elaine Irving	RPBio, 2685	Sections 2.4, 3.4, 3.5, 3.6, 5.4, 6.2, 6.3, 6.31, 6.3.2, 6.3.4, 6.5, 8; Appendices K and L; Appendices B and C of Appendix F
Robert Millar	PGeo, PEng, 25722	Sections 2.3, 3.2, 5.2.1.1, 5.2.3.1, 5.4.2; Appendix B
Lee Nikl	RPBio, 601	Global Review of TAR
Daniel Potts (Tetra Tech EBA)	PEng, 137852	Appendix J
Allan Bronsro	PEng, 108567	Section 5.5; Appendices E and F
Shouhong Wu	PEng, (APEGA), 69874	Appendix H
Jennifer Levenick	PEng, 35959	Sections 3.3, 6.1 and 6.1.1; Attachments C, D, E and F of Appendix B; Attachment A of Appendix D
Willy Zawadzki	PGeo, 25898	Sections 3.3, 6.1 and 6.1.1; Attachments C, D, E and F of Appendix B; Attachment A of Appendix D

Table A-1 Table of Concordance for Mine Effluent Permit Applications - Environmental Protection Division, ENV

Table A-1: TABLE OF CONCORDANCE

The "***Information Requested***"-column lists information required as per the guidance documents identified above.
In the "**Information**"-column the proponent can select between, **'*provided*', '*partially provided*'** or **'*not provided*'**.
If **'*provided*' or '*partially provided*'** are selected, the proponent can then identify within the "***Location***"-column where this information is primarily covered in the TAR and/or EIA, including the appropriate section and page number. Any secondary locations in the TAR and/or EIA, where this information may also be summarized, can be added into the ***"Comments"***-column.
If the proponent selects '***partially provided***' or **'*not provided*'** they should provide rationale in the "**Comments**"-column for excluding this information. Without sufficient rationale a missing item may result in permit application rejection.

Information Requested	**Information**			**Location**	**Comments** Return to Full Operations Application (RFOA) Technical Assessment Report (TAR)
	Provided	**Partially Provided**	**Not Provided**		
1.0 Project Description and Overview - *This section is an introduction to the application and provides background information on the project and the proponent.*					
1.1 Introduction					
a) Describe the application including proposed facilities and processes (including mining and milling processes, maps and flowsheets if applicable).	X			2.0	
b) Provide company overview.	X			1.2	
c) Identify the project location including site and surrounding land uses, watershed and water uses.	X			1.0, 6.0	
d) Describe relevant regulatory processes outside of EMA (Environmental Assessment, concurrent applications, etc).	X			2.4	
1.2 Project Description (may use existing EA project description if applicable)					
a) Describe the project history and list related reports.	X			1.1	
b) Describe the products and markets.		X		1.0	RFOA
c) Describe major activities, infrastructure and waste management related to:	X			2.0	RFOA
i. Site preparation and construction			X		RFOA
ii. Operations, and	X			2.0	
iii. Closure and post-closure	X			2.0	
c2.0 Baseline Information - *This section describes in detail the baseline conditions of the site, how, when and where the data was collected, and all analyses based on these data necessary to have an adequate understanding of the existing pre-development site conditions.*					
2.1 Meteorology and Climate					
a) Provide a detailed map showing the location of all site-specific and regional climate stations in relation to project facilities.	X			Section 3 of Appendix B	
b) Describe relevant meteorological and climate information sources for parameters such as wind speed and direction, precipitation, temperature and evaporation.	X			Section 3 of Appendix B	

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
c) Submit all climate data in an appendix (electronic preferred) including site photos, precipitation, temperature, snow water equivalent, etc. and provide monthly and annual summaries of relevant climatic parameters in this chapter.	☒	☐	☐	Attachment B of Appendix B and 3.2	
d) Provide recurrence interval analysis of annual precipitation, short-term rainfall and/or snowmelt events (as appropriate).	☒	☐	☐	Section 3 of Appendix B and 3.2	
e) Identify information gaps and describe site-specific meteorological data collection methods proposed to augment existing regional data.	☒	☐	☐	Section 3 of Appendix B and 3.2	
f) Identify the potential impacts of projected climate change on the projects operations, closure and post-closure phases.	☐	☐	☒	Attachment G of Appendix B and 3.2.2	
2.2 Geology					
2.2.1 Regional Geology					
a) Provide an overview of the geology of the area, with emphasis on the regional framework. This will include a description of the tectonic belt(s), terrain(s), physiography, and regional metamorphism and structure.	☒	☐	☐	Section 3.1	Also see RFOA
b) Describe geologic units or lithology in key areas of the project property such as tailings dam(s) and mill site: distance to bedrock, overburden type.	☐	☒	☐	Section 3.1	Also see RFOA
2.2.2 Deposit (Ore) Geology					
a) Summarize the mine site geology, including descriptions of major rock units, stratigraphy, structure, metamorphism, geochemistry, paleontology and details about the ore deposit.	☒	☐	☐	Section 3.1	Also see RFOA
b) Provide a detailed stratigraphic description.	☐	☒	☐	Section 3.1	Also see RFOA
c) Describe ore deposit information, including: Ore mineralogy, alteration type, deposit character, deposit classification, age of mineralization, general ore controls and average assay values and reserve information (proven probable and possible	☐	☒	☐	Section 3.1	Also see RFOA
2.2.3 Metal Leaching/Acid Rock Drainage Geochemistry					
a) Provide and describe ML/ARD characterization results for all mine components and materials exposed and produced, ensuring that geochemical and spatial variability is captured and that test work informs and is relevant to the proposed storage environment.	☒	☐	☐	Section 3.1, Appendix C	
b) Assess the lag times to ARD onset for all potentially acid-generating materials, and assess metal leaching potential/behaviour for all materials to be generated.	☒	☐	☐	Section 3.1, Appendix C	
c) Develop geochemical source terms for water quality modelling purposes (water quality modelling is listed in section 4.3.2).	☒	☐	☐	Appendix C	

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
d) Describe and justify source term modelling methods and provide calculation examples.	X			Appendix C	
e) Provide site-specific geochemical criteria defining potentially ML/ARD materials, as required to support waste management/handling.		X		Appendix C	
f) Include all ML/ARD characterization data, analyses and interpretations.		X		Appendix C	Sufficient information to support analysis provided
2.3 Topography, Surface Drainage Features and Natural Hazards					
a) Describe pre-mine topography and surface drainage features.		X		Section 3.2 of Appendix B and 3.2	
b) Provide detailed maps showing all drainage basins (local and regional) that will be affected by the proposed mine, areas of groundwater discharge, wetlands and notable topographic features (e.g., glaciers).	X			Section 3.2 of Appendix B and 3.2	
c) Provide information on natural hazards relevant to the site, such as snow avalanches, landslides and earthquakes.			X		Not relevant to the four-year mine plan
2.4 Water Quantity					
2.4.1 Surface Water - Hydrology					
a) Provide a detailed hydrologic analysis of key surface drainages within the project area, to define seasonal flow regimes of local drainages. Provide monthly and annual stream flow/runoff summaries and critical low flow metrics.	X			Section 3.2 of Appendix B and 3.2	
b) Describe and justify baseline study design, methods of hydrometric station installation, sampling methods and QA/QC procedures.	X			Attachment A of Appendix A	
c) Include all hydrological data in an appendix (electronic preferred), including rating curves, manual measurements, plots of site-specific discharge, site photos, etc.	X			Attachment A of Appendix A	
d) Provide a conceptual hydrologic or water balance model for the site illustrating worst case scenarios for low and high flows.	X			Appendix B	Sufficient information to support analysis provided
e) Provide recurrence interval analyses of peak and low flow events (instantaneous, annual, etc. as appropriate).	X			Section 3.2 of Appendix B and 3.2	
f) Provide calibration/validation statistics and plots for hydrological model.	X			Section 5.0 of Appendix B and 3.2	
g) Identify spatial or temporal gaps in the database, and provide record periods for all gauging stations (regional and project specific).	X			Section 3.2 of Appendix B and 3.2	
h) For projects with life span greater than 20 years, include an assessment of the potential impacts of climate change on the project water balance.	X			Attachment G of Appendix B and 3.2.2	

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
2.4.2 Groundwater – Hydrogeology					
a) Describe existing and potential uses of groundwater down-gradient of the property boundary.	X			3.3	
b) Describe aquifers and aquitards within and downstream of the mine property, including the geological units in which groundwater occurs and the units' characteristics.	X			Attachments C, D, E and F of Appendix B and 3.3	
c) Describe and justify baseline study design, methods and QA/QC procedures, following guidance in the Water and Air Baseline Guidance document.		X		3.3	Sufficient information to support analysis provided
d) Provide a minimum of 1 year of water level data from observation wells and assess all relevant units for aquifer characteristics (e.g. storativity, hydraulic conductivity, etc.		X		Attachments C, D, E and F of Appendix B and 3.3	Additional information available upon request
e) Provide piezometric contour maps depicting groundwater flow direction and hydro-stratigraphic cross-sections.	X			Attachments C and F of Appendix B and 3.3	
f) Develop and provide methods and outcomes of a conceptual hydrogeological model (considering seasonal variation) of the project area.	X			Attachments C, D, E and F of Appendix B and 3.3	
g) Identify and justify the assumptions in the conceptual hydrogeological model.	X			Attachments C, D, E and F of Appendix B and 3.3	
h) Provide calibration/validation statistics and plots for the groundwater model.	X			Attachments C, D, E and F of Appendix B and 3.3	
j) Conduct a sensitivity analysis for any groundwater flow and level modeling, considering variation in hydraulic conductivity, wet and dry conditions, etc.	X			Attachments C, D, E and F of Appendix B and 3.3	
k) Provide all well logs, pump/slug test results, core pictures etc. in an appendix.		X		Attachments C, D, E and F of Appendix B and 3.3	Sufficient information to support analysis provided
l) Identify spatial or temporal gaps in the database.	X			Attachments C, D, E and F of Appendix B and 3.3	
2.5 Water Quality					
2.5.1 Groundwater Quality					
a) Describe and justify baseline study design, methods, analysed parameters and QA/QC procedures. Provide rationale, if design and methods differs from those described in the *Water and Air Baseline Guidance Document.*			X	Rationale provided in 6.1	Available upon request.
b) Provide data summaries (using appropriate statistics) that characterize spatial and temporal variations and identify location, frequency, duration and magnitude of applicable standards or environmental quality guideline exceedances.			X	Rationale provided in 6.1	Available upon request.
c) Identify certified laboratories that conducted sample analysis.			X	Rationale provided in 6.1	Available upon request
d) Provide a detailed map with groundwater sampling locations, potential seepage areas, proposed or existing discharge points and potential areas of disturbance.			X	Rationale provided in 6.1	Available upon request

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		Post-Event Environmental Impact Assessment Report (PEEIAR)
e) Identify and discuss QA/QC concerns related to the data, following the procedures in the BC Field Sampling Manual.	☐	☐	☒	Rationale provided in 6.1	Available upon request
f) Identify spatial or temporal data gaps.	☐	☐	☒	Rationale provided in 6.1	Available upon request
2.5.2 Surface Water Quality					
a) Describe and justify baseline study design, methods, analysed parameters and QA/QC procedures. Provide rationale, if design and methods differs from, following guidance in those described in the Water and Air Baseline Guidance Document.	☒	☐	☐	3.4	
b) Identify downstream surface water users.	☒	☐	☐	3.4	
c) Provide data summaries (using appropriate statistics) that characterize spatial and temporal variations and identify location, frequency, duration and magnitude of applicable standards or environmental quality guideline exceedances.	☒	☐	☐	3.4	
d) For lakes provide limnological characterizations, at a representative deep station for each basin. Sampling design should be adequate to support determination of trophic status.	☒	☐	☐	3.4	
e) Provide raw data in tables, including applicable method detection limits (in appendices – electronic preferred).	☒	☐	☐	3.4	
f) Identify certified laboratories that conducted sample analysis.	☒	☐	☐	3.4	
g) Provide a detailed map with surface water sampling locations in relation to proposed or existing discharge locations and areas of disturbance.	☒	☐	☐	3.4	
h) Identify safe site specific thresholds (e.g. background water quality, SSWQOs, or SBEBs) and a sound weight of evidence to support these for sites where parameter concentrations exceed WQGs naturally (ensure this refers to un-impacted baseline)	☐	☒	☐	6.3.2	Sufficient information for the use of the background calculation approach provided within the context of deriving permit limits.
i) Identify and discuss QA/QC concerns related to the data, following the procedures in the BC Field Sampling Manual.	☒	☐	☐	3.4	
j) Identify spatial or temporal data gaps.	☒	☐	☐	3.4	
2.6 Sediment Quality					
a) Describe and justify baseline study design, methods, parameters analysed and QA/QC procedures, following guidance in the Water and Air Baseline guidance document.	☒	☐	☐	3.5	

X

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
b) Provide data summaries (using appropriate statistics) that characterize spatial and temporal variations and identify location, frequency, duration and magnitude of applicable standards or environmental quality guideline exceedances.	☒	☐	☐	3.5	
c) Provide raw data in tables, including applicable method detection limits (in appendices – electronic preferred).	☒	☐	☐	3.5	
d) Identify certified laboratories that conducted sample analysis.	☒	☐	☐	3.5	
e) Provide a detailed map with sediment sampling locations, and proposed or existing discharge locations and areas of disturbance.	☒	☐	☐	3.5	
f) Identify and discuss QA/QC concerns related to the data, following the procedures in the BC Field Sampling Manual.	☒	☐	☐	3.5	
g) Identify spatial or temporal data gaps.	☒	☐	☐	3.5	
2.7 Aquatic Life					
a) Describe and justify baseline study design, methods, measuring endpoints, parameters analysed and QA/QC procedures, following guidance in the Water and Air Baseline guidance document. Multiple years of data are recommended.	☒	☐	☐	3.6	
b) Identify certified laboratories that conducted sample analysis.	☒	☐	☐	3.6	
c) Provide a detailed map with sampling locations, and proposed or existing discharge locations and areas of disturbance and other water and sediment quality sample locations.	☒	☐	☐	3.6	
d) Provide data summaries (using appropriate statistics to determine biological significance) that characterize spatial and temporal variations and identify location, frequency, duration and magnitude of effects on aquatic resources.	☒	☐	☐	3.6	
e) Provide raw data in tables, including applicable method detection limits (in appendices – electronic preferred).	☒	☐	☐	3.6	
f) Demonstrate that the baseline aquatic life monitoring program is sufficiently robust to assist future monitoring in detecting a biologically significant predetermined change.	☒	☐	☐	3.6	
g) Identify spatial or temporal data gaps.	☒	☐	☐	8.0	

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
3.0 Discharges and Treatment - *Information in this section establishes the location and quality and quantity of each of the proposed effluent discharges, including process water, storm water and seepages. Design and use of proposed pollution control works and management practices are described.*					
3.1 Summary					
a) Provide an overview of contaminant sources in process, storm and/or seepage water.	X			Appendix D	
b) Describe the proposed water management plan.	X			Appendix B and 2.3	
c) Describe the proposed source control and/or best management practices.	X			Appendices E and G	
3.2 Specific Information Requirements for Effluent Storage and Discharge					
a) Characterize and/or predict raw water quality for all site-waters, including source, quantity, chemistry and toxicity; describe methodology. This should include water from pits and/or underground facilities, tailings impoundments, waste rock storage, seepage collection, ore and soil stockpiles, etc. Water quality and quantity from ancillary facilities must also be characterized.	X			Appendix D	
b) Describe how best achievable technology and best management practices will be applied to limit contaminant loading.	X			Appendices E, F and L and 5.5	
c) Describe all proposed effluent discharge locations and sources, as well as proposed timing and frequency of discharge.	X			5.0	
d) Indicate the expected daily maximum and mean discharge flow rates (m^3/d); maximum annual flow rates (m^3/a) should also be provided for runoff-driven discharges (i.e. the total annual discharge that will not be exceeded in any given year).	X			Section 6 of Appendix B and 5	
e) Indicate the maximum concentrations of contaminants of concern that are proposed for the discharges.	X			Section 5 of Appendix D and 5	
f) Provide explanation and detailed design for effluent discharge works.	X			Appendix E	
g) Describe the proposed sampling and flow measuring facilities at discharge points.	X			Section 8.0	
h) Explain the storm water management system and provide detailed design for proposed storm water works.			X		Not applicable
i) For settling ponds, specify and justify the design flood events for structural integrity and for removal of suspended solids.			X		Not applicable
j) Describe any proposed use of settling aids, including a toxicity evaluation.	X			Appendices E and F	
k) Explain how fast settled solids are expected to fill any proposed settling ponds and provide a plan for sediment removal.			X		Not applicable

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
l) Provide a site-specific erosion and sedimentation control plan.	☐	☐	☒		Provided to MEM under the *Mine's Act; no change*
m) Estimate monthly effluent discharge dilution ratios for all discharges.	☒	☐	☐	Section 6 of Appendix B and 5.0	
3.3 Information Requirements for Wastewater Treatment Plants					
a) Describe and provide a schematic of the treatment method including processes, inputs and outputs.	☒	☐	☐	Appendices E, F and K	
b) Explain how the proposed treatment system compares to best achievable technology.	☒	☐	☐	Appendices E, F and K	
c) Specify the treatment design criteria including treatment capacity, retention times, and input and output water quality.	☒	☐	☐	Appendices E, F and K	
d) Provide treatment system detailed design, power requirements, construction and commissioning schedule and projected capital and operating costs.	☒	☐	☐	Appendices E and F	
e) Provide rationale for expected treatment effectiveness, including an evaluation of potential variable operating conditions.	☒	☐	☐	Appendices E, F and K	
f) Describe all treatment process by-products (liquid, solid and gaseous), including quantity and quality, and provide a management plan for each, including sludge management plan if applicable.	☒	☐	☐	Appendix E	
g) Describe the treatment plant's preventative maintenance plan.	☒	☐	☐	Appendices E, F and K	
3.4 Site Contamination					
a) Describe current and potential future soil and/or groundwater contamination in the project area.	☐	☐	☒		Not applicable
b) Provide water use determination as per *Technical Guidance 6* of the Contaminated Sites Regulation.	☐	☐	☒		Not applicable
c) Identify remedial strategies to be used to mitigate and/or remediate contamination.	☐	☐	☒		Not applicable
d) Identify monitoring proposal to aid in characterizing potential groundwater contamination.	☐	☐	☒		Not applicable
e) Describe and justify measures proposed to manage site contamination during construction, operation and closure.	☐	☐	☒		Not applicable

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
3.5 Sewage Disposal (not required if an MWR registration is to be made out)					
a) Describe the disposal plan for sewage generated on-site.	☐	☐	☒		Not applicable
b) If sewage is proposed to be included in the effluent permit, provide justification and technical information supporting this discharge. Specify why sewage disposal is not proposed as a registration under the Municipal Wastewater Regulation.	☐	☐	☒		Not applicable
4.0 Environmental Effects Prediction for EMA - *This section assesses potential residual environmental effects and evaluates the risks of the mine project on human health and water users including aquatic and terrestrial resources.*					
a) Identify the environmental values that may be at risk due to mine related activities.	☒	☐	☐	6	
b) Identify and justify spatial and temporal boundaries for effects predictions.	☒	☐	☐	6	
c) Identify critical contaminant sources.	☒	☐	☐	6	
4.1 Summary					
a) Summarize potential impacts by media and location, using tables.	☒	☐	☐	6	
b) Illustrate graphically the pathways from contaminant sources to receptors.	☐	☒	☐		Not applicable; BC Water Quality Guidelines (WQGs) are
c) Summarize risk to surface, groundwater and aquatic resources.	☒	☐	☐	6	
4.2 Groundwater Quantity and Quality					
a) Describe and justify impact prediction approach (incl. study boundaries, assessment and measurement endpoints, models and methods).	☒	☐	☐	6.1	
b) Provide predicted effects on groundwater, surface water, interaction between ground and surface water, water uses and receptors.				Appendices B and D and 6.1.and 6.2	
c) Provide a conceptual model to describe the contaminant transport through groundwater from source to receptors and establish a risk assessment process.	☒	☐	☐	Attachments C, D, E, F of Appendix B	
d) Estimate probabilities of occurrence of each pathway/exposure combination, estimate risk and develop a matrix to manage risk.	☐	☐	☒		Not applicable – no groundwater uses
e) Identify data gaps, and uncertainty in models, and how they will be addressed.	☒	☐	☐	6.5	
f) Discuss risk reduction options and adaptive management strategies.	☒	☐	☐	5.2.2	
4.3 Surface Water Quantity and Quality					
a) Describe and justify study boundaries, assessment (e.g., drinking water quality; aquatic life) and measurement endpoints (chemical, toxicological or biological).	☒	☐	☐	6	
b) Describe and justify modelling methods to predict how surface water quantity and quality may be affected within, and downstream of, the property.	☒	☐	☐	Section 2 Appendix D	

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
4.3.1 Water Quantity					
a) Describe predicted effects of mine related activities on water balance, flows and water levels.	☒	☐	☐	Section 6 of Appendix B and 5.0	
b) Identify whether current regional trends or projected changes in stream flow or climate could potentially affect dilution, water management infrastructure, ability to provide sufficient water covers where required, etc. during and after the life of the project.	☐	☐	☒		Not applicable for four-year mine plan
4.3.2 Water and Sediment Quality					
a) Describe and justify impact prediction approach (incl. study boundaries, assessment and measurement endpoints, models and methods).	☒	☐	☐	6	
b) Identify key discharges, seepages, or disturbance regimes and associated contaminants.	☒	☐	☐	5	
c) Determine the extent of the IDZ for all proposed discharges, including methodology and rationale.	☒	☐	☐	Appendices I and J	
d) Provide predicted incremental changes over existing receiving environment water and sediment quality at critical points downstream (within IDZ, edge of IDZ, near field and far field) and during critical time periods (e.g. low dilution $7Q_{10}$, high flows, spawning, hatching, etc.) This should be included for all mine phases.	☒	☐	☐	Section 5 of Appendix D and 6	
e) Conduct a sensitivity analysis for the water quality model that considers a range of hydro-climatic conditions (wet and dry events) that are representative of the streamflow variability in the project area.	☒	☐	☐	Section 5 of Appendix D	
f) Describe and justify modelling approach and make calculations and tabulated data available for government review.	☒	☐	☐	Appendices B and D	
g) Identify sites, parameters and time periods, when water or sediment quality is expected to exceed WQG or SQG.	☒	☐	☐	6	
a) Demonstrate through a weight of evidence approach that effluents or seepages will not cause acute and/or chronic toxicity.	☒	☐	☐	6	
b) Develop a conceptual model or framework to describe the transport of key contaminants from source to receptors.	☐	☐	☒		Not applicable; BC WQGs are met in receptors
c) Estimate probabilities of occurrence of each pathway/exposure combination and develop a risk assessment matrix or other process to prioritize and manage risk.	☐	☐	☒		Effluent quality treated so that exceedances of BC WQGs at the edge of the IDZ are not anticipated
d) Identify data gaps and uncertainties and describe how they would be addressed in adaptive management and environmental monitoring programs.	☒	☐	☐	6	

Information Requested	Information			Location	Comments Comprehensive Environmental Monitoring Program (CEMP)
	Provided	Partially Provided	Not Provided		
4.4 Aquatic Resources and other Receptors					
a) Describe and justify study boundaries and assessment endpoints and discuss relevance of measurement endpoints.	☐	☒	☐	6	
b) Develop conceptual models or frameworks to describe the contaminant transport linking sources to receptors and establish a risk assessment process.	☐	☐	☒	6	Not applicable for a TAR where BC WQGs are met in the receiving environment
c) Describe and discuss the potential for bioaccumulation or bioconcentration of contaminants, and the associated risk to assessment endpoints (i.e., fish health, fish reproduction, consumers of fish, etc.).	☐	☒	☐	6	The BC WQGs used in the assessment are protective of assessment endpoints such as fish health and where appropriate also consider the contaminant bioaccumulation. The TAR focused on an assessment of the potential for impairment of water uses
d) Predict changes in aquatic resources at species, community and/or ecosystem levels as appropriate due to water quality and water quantity changes.	☒	☐	☐	6	
e) Identify risks to other receptors, including wildlife, livestock, human health.	☐	☒	☐	6	The TAR focused on an assessment of the potential for impairment of water uses.
f) Identify data gaps and uncertainties and describe how they would be addressed in adaptive management and environmental monitoring plans.	☒	☐	☐	6	
4.5 Safe Discharge Plans					
a) Propose safe discharge plans for all discharges to surface or groundwater, that ensure protection of all down-gradient or downstream users.	☒	☐	☐	Section 4 of Appendix B	
b) Provide an emergency preparedness plan including identification of, and contingency and mitigation procedures for, any event capable of affecting discharge quality and/or human health	☒	☐	☐	Appendices B and D and 5	A no discharge scenario was included in the TAR
c) Assess potential for residual environmental risk following contingency plan implementation	☐	☐	☒		Base case indicates additional contingency not required
5.0 Discharge and Environmental Monitoring Requirements for EMA Permits - *This section provides a proposal for a monitoring program to evaluate waste management performance, receiving environment conditions, mine activity effects on the receiving water, and to verify and adapt predictions. This information will be used to develop monitoring requirements under the EMA effluent permit.*					
a) Describe proposed data assessment techniques and reporting, including reporting frequency and content.	☐	☒	☐	8	Details provided in the CEMP
5.1 Discharge Monitoring					
a) Describe and justify the proposed monitoring study design.	☐	☒	☐	8	Details provided in the CEMP
5.2 Receiving Environment Monitoring					
a) Describe and justify the proposed monitoring program and biological measurement endpoints. Include cumulative effects monitoring.	☐	☒	☐	8	Details provided in the CEMP

Information Requested	Information			Location	Comments
	Provided	Partially Provided	Not Provided		
5.3 Aquatic Effects Monitoring					
a) Describe and justify the proposed weight of evidence assessment monitoring program.	☐	☒	☐	8	Details provided in the CEMP
5.4 Quality Assurance Requirements					
a) Describe and justify proposed quality assurance/quality control procedures.	☐	☒	☐	8	Details provided in the CEMP

Table A-2 Ministry of Energy and Mines Information Requirements - Table of Concordance

Table A-2:
Ministry of Energy and Mines Information Requirements - Table of Concordance

IR #	Information Requirement	Provided/Partially	Location	Comments
IR-1	Provide report that clearly outlines the rationale and derivation of geochemical source terms and solubility limits for each of the major mine facilities including ore stockpiles, waste rock dumps, tailings impoundment embankment, and tailings. Source terms should be developed for a full suite of parameters including but not necessarily limited to pH, Alk., SO4, Al, As, Ca, Cd, Co, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, U, V, Zn, NO3, NO2 and NH3. Operational source terms should be validated with site monitoring data.	Provided	Appendix C	
IR-2	Compile a ML/ARD Management Procedure Manual. The manual should include direction on how to design, plan and implement in-pit monitoring, tailings monitoring, in-pit segregation, waste rock placement, and confirmatory waste dump monitoring. With the exception of procedures for the segregation and placement of PAG and NPAG waste rock, many of these procedures have been provided to MEM during the review period in the form of SOPs and the 2015 Annual Environmental and Reclamation Report for the Mount Polley Mine. However, the requested information should be amassed into a single document written with the intent and sufficient detail to provide MPMC equipment operators and staff with the necessary information to carry out	Not provided		ML/ARD Management Plan already developed as per *Mine's Act* requirements. Information will be provided separately.
IR-3	The water quality model should be calibrated with on-site water quality monitoring results. Predicted concentrations for the water treatment plant discharges and water quality prediction model nodes should be compared with operating monitoring data for the full suite of parameters listed above for IR#1.	Provided	Section 4 of Appendix D	pH and alkalinity are not modelled as per the rationale provided to MEM on teleconference call on May 20, 2016.
IR-4	The rationale and implementation of proposed closure / remediation strategies should be clearly stated for key facilities including open pits, ore stockpiles, PAG waste rock, NPAG waste rock, pit backfill and tailings. These conditions should be accounted for and accurately represented in the post-closure water quality model.	Provided	Section 4	
IR-5	Provide a conservative evaluation in the site-wide water balance and water quality model of seepage losses from all mine components that could interact with the groundwater system. This includes, but is not limited to the following components: TSF, Boundary, Cariboo, Wight and Springer pits, NEZ, SERDS, Temporary NW PAG Stockpile. In addition, potential for seepage from the ore stockpiles, magnetite and sulphur stockpiles should be assessed. If seepage from a component has not been included, rationale for the exclusion must be provided.	Provided	Attachments C, D, E and F of Appendix B Attachment A of Appendix D	
IR-6	Clearly present sensitivity analyses on key parameters that control TSF seepage (and other groundwater flows across the site).	Provided	Attachment F of Appendix B	
IR-7	Provide a proposed investigation plan and associated timeline to ultimately provide a clear and defensible explanation of the rapid tracer breakthrough at GW12-2b beginning in mid-2015. The investigation must assess all potential sources (including, but not limited to PAG waste stockpile, haul road, seepage losses from unlined sumps/ditches) as well as their magnitudes and behaviours. The investigation must also defensibly address the apparent discrepancies between the significant groundwater inflows reported in the well logs (e.g., increasing from 60 to 100 gpm across the screened interval in GW12-2a) and single-well response test results that suggest low permeability in the vicinity of the wells (which should not have allowed for such rates of groundwater inflow during drilling). This may have an impact on long-term water quality in the vicinity of Springer Pit and Bootjack Lake, and also suggests that actual conditions are substantially different from those previously assumed by groundwater modeling efforts.	Not provided		Information provided as a separate memo
IR-8	In the absence of the results of the investigation plan required in IR-7, the site-wide water balance model and water quality model must conservatively account for all reasonably foreseeable sources of loadings to groundwater and ultimately Bootjack Lake. This shall include a clear explanation and rationale for how mass loadings from other site facilities (including, but not limited to PAG waste stockpile, haul road, seepage losses from unlined sumps/ditches) are accounted for in the modeling.	Provided	Appendix I Section 3.1 of Appendix D Attachment C of Appendix B Attachment A of Appendix B Section 6.1.2	

IR #	Information Requirement	Provided/Partially	Location	Comments
IR-9	Provide all available hydrology information for the Hazeltine, Edney and Bootjack Creek monitoring stations, with a focus on the recent installations (post-breach). Information should include: • Rating curves (equations, error metrics, data grades) • Table of manual measurements • Benchmark surveys, and notes on required adjustments to the staff gauge/transducers as a result • Photos (upstream and downstream) If a discharge to Hazeltine Creek is selected as the preferred (or one of several) long-term water management options, the rate that contact water is moved offsite is related in part to the dilution capacity in Hazeltine Creek. This has direct implications for the maintenance of a neutral site water balance, including the TSF operating pond volumes. Flows in Hazeltine Creek also impact the dilutive capacity, and thus the WTP discharge targets (rate and quality). • Include all available data for Bootjack Creek, to be used for dilution calculations in Bootjack Lake (Springer Pit water –via surface spillway at closure, and groundwater seepage from the Springer Pit lake).	Provided	Section 3 of Appendix B of the TAR Attachment A of this Appendix	
IR-10	Present a discussion, along with supporting plots and metrics, of the WBM/WQM calibration. This should be done for both flows (volumes, annual distribution, etc.) and all relevant water quality parameters that are listed in IR-1, particularly all parameters of concern (POCs; including selenium). The report should present the rationale for those parameters that are not carried through to the environmental effects assessment.	Provided	Section 5.9 of Appendix B and Section 4 of Appendix D	
IR-11	Provide summaries of the data supporting all model inputs (e.g., mine plan, reclamation and closure plan, climate, measured surface and ground water quality, geochemical source terms, surface water flows, groundwater levels, hydrogeological hydraulic testing, groundwater well drilling logs) and detail the assumptions made in parameterizing the model (e.g., statistical distribution of water quality parameters, runoff coefficients, wet- and dry-years, groundwater flow paths and rates). Present the modeling exercise in a clear and transparent manner, and describe all assumptions made in the model and sensitivity analyses conducted with supporting information provided.	Provided	Appendix D	
IR-12	Present water balance and water quality predictions for the proposed full operations period (4 years) and for the reclamation and closure phase. This includes, but is not limited to the following mine site components and downstream receivers: Receiving Environment • Hazeltine Creek, below the Polley Lake weir • The Quesnel River, if this is selected as one of the effluent discharge points • Quesnel Lake, Bootjack Lake and Polley Lake Mine Site • CCS • Springer Pit • Cariboo Pit • 9k Sump • NW Sump • Mine Drainage Creek Sump • Bootjack Creek Sump • South Seepage Pond • Main Embankment Seepage Pond • PETBP • TSF supernatant pond • All ore stockpiles (Cariboo, No. 1, No. 3 and Oxide)	Provided	Section 5 of Appendix D and Attachment B of Appendix D	Predictions for Quesnel River and Hazeltine Creek not provided since Hazeltine Creek is not fish habitat within the context of the TAR and the Quesnel River was not selected as the discharge location
IR-13 (formerly mislabeled IR-14)	Present an analysis of discharge rates (and duration) required to maintain a neutral site water balance, and maintain the TSF pond within design and permitted levels. • Present estimates for a range of climatic conditions	Provided	Appendix B	

IR #	Information Requirement	Provided/Partially	Location	Comments
IR-14 (formerly mislabeled IR-15)	Present a detailed effluent discharge management plan that includes the following information: • Monitoring stations and thresholds used to set discharge rates, including a specific management plan for selenium • Allocation of site staff responsibility • Operation plan for Polley Lake weir • Response times for altering discharge rates based on streamflows in Hazeltine Creek, sediment pond levels, WTP influent chemistry, etc. • Other operational considerations, and potential mitigation strategies to handle larger than expected volumes of water on-site.	Partially Provided	Appendix B Appendix M	Other site management plans will be provided separately
IR-15 (formerly mislabeled IR-16)	Present the potential upset conditions and/or discharge restrictions that would impact the ability to maintain a neutral site water balance and the contingency measures that would be implemented to address these. Specifically, present this information for: • A high-magnitude freshet, followed by a wetter than average spring season (2014 would be an appropriate surrogate); • Periods where WTP discharge rate to Hazeltine Creek is limited or precluded due to natural flows consuming Quesnel Lake diffuser capacity; • Prolonged shutdowns of the water discharge plant for servicing, maintenance, or repairs; • A situation in which effluent chemistry does not meet discharge criteria; • Any other issue that requires the movement of water out of Springer Pit earlier than predicted, or an large TSF drain down in the event that further dam construction activities are required, and; • Other foreseeable circumstances that would reduce overall capacity to discharge water off-site.	Provided	Section 6.5 of Appendix B and Section 5.2 of Appendix D and Section 5.0	A no Discharge scenario is also included in the TAR
IR-16 (formerly mislabeled IR-17)	Provide an updated standalone mine water quality and quantity monitoring program specific to the *Mines Act* permit that includes water quality (surface and groundwater), water quantity (flow and groundwater levels), seepage monitoring points, locations, frequency, parameters, rationale, reporting structure and frequency. This will cover all current and proposed stations/sites within and immediately adjacent to the mine site boundaries for the operational, closure, and post-closure periods. Reference to the current CEMP can be made for details on the SOPs, QA/QC practices, monitoring methodology. It is understood that changes may be made to the monitoring plans in the future, however, the Chief Inspector requires a monitoring plan that is reflective of the current mine plan and Reclamation and Closure Plan.	Not provided		Will be provided as a separate document
IR-17 (formerly mislabeled IR-18)	Provide the locations, rationale, and estimated depths for additional monitoring wells to be installed in 2016 within and immediately adjacent to the mine boundaries where there is potential for migration of seepage from mine-related features.	Not provided		Will be provided as a separate document
IR-18 (formerly mislabeled IR-19)	Provide the hydrology monitoring protocols, including division of responsibility between site staff and contractors). List activities/schedule/station changes that site staff are required to confirm with the responsible Qualified Professional prior to implementing.	Not provided		Will be provided as a separate document

ATTACHMENT A
WaterSmith

WATERSMITH

450 Cadder Avenue, Kelowna, BC, V1Y 5N3
Tel: (250) 826-1079 Fax: (888) 370-3102
info@watersmith.ca www.watersmith.ca

June 29, 2016

Colleen Hughes
Mount Polley Mining Corporation
200 – 580 Hornby Street
Vancouver, BC, V6C 3B6

Re: Hydrometric monitoring update for Hazeltine, Edney, and Bootjack Creeks

Dear Ms. Hughes,

Mount Polley Mining Corporation (MPMC) contracted WaterSmith Research Inc. (WaterSmith) to continue implementation of its hydrometric monitoring program for streams influenced by or in close proximity to the Mount Polley Mine. This report provides an update on program activities for Hazeltine, Edney, and Bootjack Creeks, as requested by MPMC. The most recent update was the release of year-end reports on March 28, 2016, for the 2015 monitoring season (Smith and Little, 2016a, 2016b).

1 Status of the monitoring infrastructure

Monitoring stations at Upper Hazeltine Creek (H1), Lower Hazeltine Creek (H2), and Edney Creek (H3) were established by WaterSmith following the foundation failure of the Tailings Storage Facility in 2014. Details of the setup and operation of these stations were reported in Smith and Little (2015, 2016a). The monitoring station at Bootjack Creek (W5) was established in 1995 and operated by the MPMC Environmental Department (continuous measurements during the ice free period have been recorded since 2003). Details of the monitoring program at Bootjack Creek were reported each year in MPMC's Annual Environmental and Reclamation Report.

On April 13, 2016, WaterSmith moved the Bootjack Creek station to a new location ~10 m downstream to improve the long-term stability of the control cross-section and to ensure the pressure transducer remains submerged during low flows. The original site was at risk of being influenced by vegetation and movement of debris. A site schematic for the new station is provided in Appendix 1. No changes were made to stations H1, H2, or H3; however, backup water level loggers were installed at H1 and H2 to confirm data reliability and to ensure that any potential logger malfunctions do not result in data gaps at these important stations. A summary of the monitoring stations is provided in Table 1.

Table 1. Location and infrastructure details for the hydrometric stations.

Station name	Period of operation	Location Easting / Northing	Measurement variables	Channel characteristics	Hardware anchoring system
Upper Hazeltine (H1)	Apr 15/15 – present	597030 / 5818978	Stream discharge, barometric pressure, water temperature, turbidity	Monitoring hardware installed in pool upstream of constructed rock weir	Bolted to boulder
Lower Hazeltine (H2)	Jul 20/15 – present	601024 / 5817253	Stream discharge, barometric pressure, water temperature, turbidity	Monitoring hardware installed in pool upstream of constructed rock weir	Bolted to boulder
Edney (H3)	Aug 10/15 – present	604538 / 5817123	Stream discharge, water temperature	Monitoring hardware installed in pool upstream of constructed rock weir	Bolted to boulder
Bootjack (W5)	Apr 13/16 - present	594467 / 5820783	Stream discharge, water temperature	Monitoring hardware installed in pool at upstream end of road culvert.	Stilling well driven into stream bed. Staff gauge bolted to culvert.

2 Station benchmarking

Benchmark elevations were established during installation of the stations, as recommended by the Resources Information Standards Committee (RISC) for hydrometric monitoring (BC Ministry of Environment, 2009). A site schematic for the relocated W5 station on Bootjack Creek is included in Appendix 1, including benchmark details. Benchmarks 1 and 3 from the original station were used to benchmark the new station. The Hazeltine Creek and Edney Creek stations are scheduled for annual benchmarking during the summer of 2016.

3 Station calibration

Discharge measurements conducted by WaterSmith (using salt dilution methods) and MPMC (using a Sontek FlowTracker) were used to develop stage-discharge rating curves for the stations on Hazeltine Creek and Edney Creek. A rating curve for the relocated station on Bootjack Creek was not developed due to insufficient calibration data since relocating the station in April 2016.

Rating curve details are provided in Table 2. The calibration data and plots of the stage-discharge rating curves and auto-manual water level relations are provided in Appendix 2. For discussion of error metrics (Section 4), which were not reported in past reports (e.g., Smith and Little, 2016b), Appendix 2 includes calibration data from 2011-2015 for the previous Bootjack Creek station.

Table 2. Stage-discharge rating curve details.

Rating curve	Release date	Calibration period	Applicable period for rating curve
H1-A	Apr 28/16	Apr 17/15 – Jun 29/15	Apr 15/15 – Jun 30/15
H1-B	Jun 15/16	Jul 9/15 – May 4/16	Jul 1/15 – Present
H2	Apr 28/16	Jul 21/15 – Apr 14/16	Jul 20/15 – Present
H3-Preliminary	Jun 1/16	Sep 9/15 – May 16/16	Aug 24/15 – Present

3.1 Upper Hazeltine Creek (H1)

Separate rating curves were developed for two different periods since station establishment. Rating curve H1-A was developed for a period immediately after the station was established (April 15 to June 30, 2015). Near the end of this period, it is suspected that fine sediment filled pores in the newly constructed

rock weir that forms the control cross-section for the station, which caused a rating curve shift. A second rating curve (H1-B) was developed for the period after the control cross-section stabilized (July 1, 2015, to present).

3.2 Lower Hazeltine Creek (H2)

A single rating curve was developed for lower Hazeltine Creek that applies to the entire period of record since the station was established.

3.3 Edney Creek (H3)

A single preliminary rating curve was developed for Edney Creek that applies to the entire period of record since the station was established. As the rating curve is preliminary, discharge data derived from the rating curve are also preliminary and likely to change. An ongoing discharge monitoring program is being implemented to further refine the rating curve.

3.4 Bootjack Creek (W5)

A new rating curve will be developed for the relocated station on Bootjack Creek once sufficient calibration data are available. Until a new rating curve is developed, continuous discharge data from April 13, 2016, onward will be unavailable.

4 Data quality

Discharge data for H1, H2, H3, and the historical dataset (2011-2015) from the previous W5 station were graded according to the Provincial RISC standards (BC Ministry of Environment, 2009). The RISC standards use criteria to assign grades to hydrometric data. The criteria address four main categories:

1. Instrumentation
    - Meter calibration
    - Meter field verification
    - Water level gauge type
    - Water level gauge accuracy
2. Stream channel condition
3. Field Procedure
    - Minimum number of bench marks
    - Number of verticals in manual flow measurements (current meter)

- Number of manual flow measurements per year
- Number of level checks per year

4. Data calculation and assessment
   - Discharge rating accuracy
   - Data reviewed for anomalies
   - Results compared with other stations/years

The resulting grades range from the highest grade of A/RS (rated structure) to lower grades of A, B, and C. Data grade U (unknown) is applied to data of unknown quality or data collected and managed using procedures that are inconsistent with the grade A, B, or C standards.

Grade E (estimated) is a special indication applied to data from stations operated according to the RISC standards (grades A, B, or C), but for periods when data were estimated due to instrument anomalies, shift corrections, missing data, or rating curve extrapolations.

Data collected at stations H1, H2, and H3 meet grade A standards for all criteria except *discharge rating accuracy* (H1 and H3) and *water level gauge accuracy* (H1, H2, and H3). A gauge accuracy within 2 mm is required to meet the RISC grade A data standards, and within 5 mm to meet the grade B standards. Stations H1, H2, and H3 use Solinst water level loggers, which are accurate to ±2.5 mm according to the manufacturer (i.e., grade B accuracy). Discharge rating accuracy is discussed in Section 4.1.

Data from the previous W5 station meet the grade C standards or higher for all criteria except *discharge rating accuracy* and *number of manual flow measurements per year*. Logger accuracy within 10 mm is required to meet RISC grade C standards. The PT2X logger used at W5 is accurate to ±5 mm according to the manufacturer. Due to the freshet timing, the relatively early onset of low flow conditions, and difficulties with conducting velocity-based flow measurements under low water levels at this site, no manual flow measurements were collected at W5 during 2015, which is inconsistent with the RISC standards for that year. However, the grade C or higher standards were met during prior years for the criterion *number of manual flow measurements per year*.

4.1 Discharge rating accuracy

A *discharge rating accuracy* less than (i.e., within) 7% is required to meet the RISC grade A data standards, less than 15% to meet the grade B standards, and less than 25% to meet the grade C standards.

4.1.1 Upper Hazeltine Creek (H1)

Station H1 meets the grade A or B standards for *discharge rating accuracy*, depending on the time period. The standard error of the calibration measurements is less than 7% (grade A accuracy) for rating curve H1-A and less than 15% for H1-B (grade B accuracy) (Table 3). All discharge measurements for these rating curves were within 15% of the calculated discharge, with the exception of two measurements (see Table 3 and the calibration data in Appendix 2). These two measurements were made at extremely low flows, and agreement between measured and calculated discharge was within 0.004 m^3/s.

4.1.2 Lower Hazeltine Creek (H2)

Station H2 meets the grade A standards for *discharge rating accuracy*. The standard error of the rating curve calibration measurements was less than 7% (grade A accuracy). All discharge measurements were within 15% of the discharge calculated using the stage-discharge rating curve, with the exception of one measurement, which occurred during a period when a shift correction was applied to the continuous water level data (see Table 3 and the calibration data in Appendix 2). The data during this period were assigned a grade E rating.

4.1.3 Edney Creek (H3)

Station H3 meets the grade C standards for *discharge rating accuracy*. The preliminary nature of the rating curve resulted in greater disagreement between the calculated and measured discharges. Overall, the standard error of the measurements was less than 25% (grade C accuracy) at H3. Three out of eight measurements had a deviation greater than 15% (see Table 3 and the calibration data in Appendix 2). It is possible that a rating curve shift occurred shortly after establishing the station while the control cross-section was stabilizing. As the rating curve is further refined, the overall accuracy of the measurements relative to the calculated discharge should improve, and a shift can be accounted for if it occurred.

4.1.4 Bootjack Creek (W5)

The measurements for the previous W5 station showed large variability. The standard error of the measurements was greater than 25%, with half of the measurements showing a deviation greater than 25% (see Table 3 and the calibration data in Appendix 2). This deviation was likely due to instability in the channel at the control cross-section, as well as the difficulty with measuring low flows at the site. As discussed in Section 1, this station was moved to a new location in April 2016, which should result in a more stable control cross-section and a more accurate discharge record for 2016 and beyond.

Table 3. Rating curve error metrics. For each rating curve, the residuals were calculated as the difference between measured discharge and calculated discharge, and were expressed as a percentage of the calculated discharge (Appendix 2). The standard error was calculated for each rating curve from these results. The rating curve from the previous W5 station is not reported in Table 2, as it is not applicable to the 2016 water level data; however, it is included in this table because error metrics were not reported in the past reports (e.g., Smith and Little, 2016b).

Rating curve	Standard error (% of calculated Q)	Quantity of calibration measurements				
		Total	Deviation <7%	Deviation >7 & <15%	Deviation >15% & <25%	Deviation >25%
H1-A	6.0	13	10	3	0	0
H1-B	11.5	14	8	4	2	0
H2	6.6	28	21	6	1	0
H3-Preliminary	23.6	8	5	0	1	2
W5	45.1	24	5	2	5	12

4.2 Grade summary

Based on the criteria outlined in the RISC standards, the discharge data for H1 and H2 meet the grade B standards. The discharge data for H3 currently meet the grade C standards; however, once the H3 rating curve is refined, data for this station are expected to meet the grade B standards. Notwithstanding these ratings for the three stations, periods with estimated discharge were assigned a grade E rating. The 2011-2015 data for the previous W5 station did not meet the standards for grade A, B, or C in several criteria and were, therefore, assigned a grade U rating. The W5 data from 2016 onward are expected to meet the grade C standards.

5 Missing data

The discharge datasets are continuous since the date of establishment (Table 1), with the exception of the missing data outlined in Table 4. Short data gaps (less than or equal to three hours; not reported in Table 4) were filled by linear interpolation of the water level data prior to calculating discharge. Longer data gaps (e.g., several days; not reported in Table 4) in the H3 dataset during periods of stable winter low flow conditions were also filled using linear interpolation. Discharge hydrographs are provided in Appendix 3.

Table 4. Timing and cause of gaps in the continuous water level / stream discharge data.

Site	Timing of gap	Cause of data gap
H1	Nov 2/15 – Feb 26/16	Suspected ice build-up at control cross-section resulted in artificially elevated water levels.
H1	Mar 17/16 – Mar 20/16	Suspected ice build-up at control cross-section resulted in artificially elevated water levels.
H1	Apr 13/16 – Apr 14/16	Unexplained water level deviation.
H2	Nov 2/15 – Feb 26/16	Suspected ice build-up at the control cross-section resulted in artificially elevated water levels.
H3	Aug 10/15 – Aug 24/15	Extremely low water levels during this period resulted in negligible flow. Data were discarded due to unreliability at low water levels.

6 Recommendations for future monitoring

1. The range and quantity of flow measurements used for developing the preliminary stage-discharge rating curve at Edney Creek (H3) do not represent the full range of flows at the hydrometric station, and do not sufficiently replicate measurements within the calibration range. As a result, additional manual discharge calibration measurements should be completed for supplementing and/or revising the rating curve. A complete set of discharge measurements is required for developing a new rating curve at Bootjack Creek (W5). Calibration measurements at H3 and W5 should span the full range of annual flows, including spring freshet and summer low flows. Manual calibration measurements should be completed semi-monthly at these stations for the remainder of the season, and weekly during the 2017 spring freshet.
2. Stage-discharge rating curves are well defined for Upper Hazeltine (H1) and Lower Hazeltine (H2) Creek; however, recent data from late April and early May of 2016 indicate that a rating curve shift might have occurred at one or both stations. Given the importance of the hydrometric monitoring program for Hazeltine Creek, manual calibration measurements should be completed semi-monthly at these stations for the remainder of the season, and weekly during the 2017 spring freshet. Moreover, the backup set of water level loggers installed at H1 and H2 should be retained for the foreseeable future.
3. Stations H1, H2, and H3 should be benchmarked during the 2016 field season to ensure the staff gauges and stilling wells have remained stationary.

4. The MPMC *Standard Operating Procedure* and *Work Method* documentation for hydrometric monitoring should be revised to incorporate the recommendations that have been provided in recent program reports (Smith and Little, 2015, 2016a, 2016b), and to ensure that operation of the hydrometric stations is consistent with the Provincial RISC standards.

Please do not hesitate to contact the undersigned if you have questions or require additional information.

Sincerely,

BRITISH COLUMBIA INSTITUTE OF AGROLOGISTS 2861 Patrick Little P.Ag.

June 30, 2016

Patrick Little, MSc, PAg
Project Hydrologist

REGISTERED PROFESSIONAL FORESTER PROVINCE OF RUSSELL S. SMITH BRITISH COLUMBIA NO. 4019

June 30/16

Russell Smith, PhD, RPF
Senior Hydrologist

Encl. Hydrometric data files (provided electronically):

H1 Daily Flow Upper Hazeltine--160623.csv
H1 Flow Upper Hazeltine--160623.csv
H2 Daily Flow Lower Hazeltine--160623.csv
H2 Flow Lower Hazeltine--160623.csv
H3 PRELIMINARY Daily Flow Edney--160623.csv
H3 PRELIMINARY Flow Edney--160623.csv
W5 Daily Flow Bootjack--160623.csv
W5 Flow Upper Bootjack--160623.csv

References

BC Ministry of Environment (2009), Manual of British Columbia hydrometric standards, edited by S. a. I. Branch, p. 204, Resources Information Standards Committee, Victoria, BC.

Smith, R., and P. Little (2015), Mount Polley Mine water monitoring program – implementation and data processing, prepared for Mount Polley Mining Corporation on behalf of SNC-Lavalin Inc., dated May 26, 2015.

Smith, R., and P. Little (2016a), Hazeltine & Edney Creek hydrometric monitoring – 2015 year-end report, prepared for Mount Polley Mining Corporation, dated March 28, 2016.

Smith, R., and P. Little (2016b), Summary of 2015 MPMC hydrometric monitoring program, prepared for Mount Polley Mining Corporation, dated March 28, 2016.

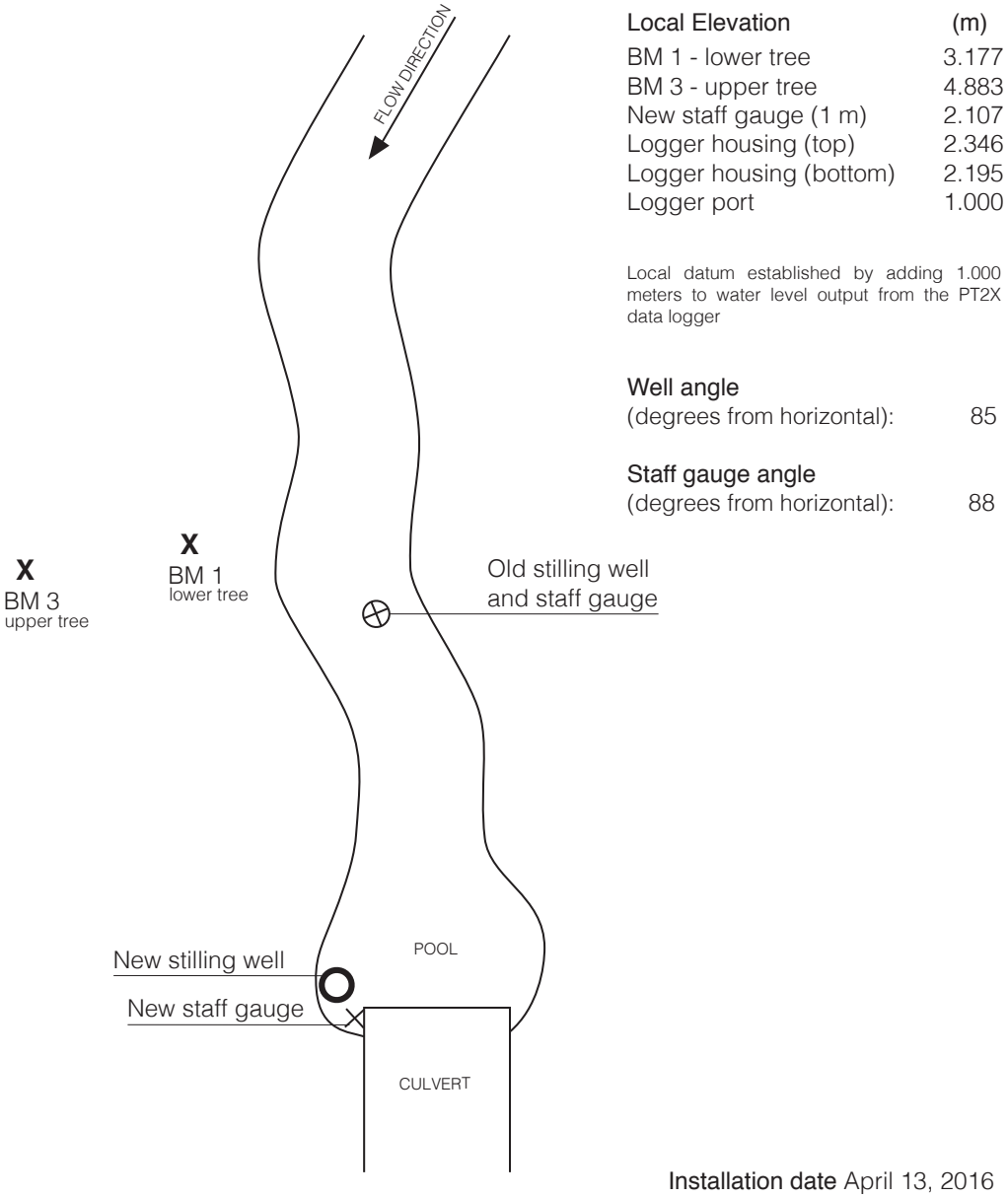
Appendix 1

Site schematic and benchmark data

for the Bootjack Creek hydrometric station (W5)

BOOTJACK CREEK (W5)

Well location (UTM NAD 83 easting/northing): 594467/5820783



Local Elevation	(m)
BM 1 - lower tree	3.177
BM 3 - upper tree	4.883
New staff gauge (1 m)	2.107
Logger housing (top)	2.346
Logger housing (bottom)	2.195
Logger port	1.000

Local datum established by adding 1.000 meters to water level output from the PT2X data logger

Well angle
(degrees from horizontal): 85

Staff gauge angle
(degrees from horizontal): 88

Installation date April 13, 2016

Figure 1-1. Schematic diagram and benchmark data for the Bootjack Creek hydrometric station (W5).

Appendix 2

Calibration data, stage-discharge

rating curves, and auto-manual water level relations

Table A2-1. Calibration data from upper Hazeltine Creek for the H1-A rating curve. The manual water levels are raw observations from the staff gauge (i.e., they are not adjusted for any staff gauge slope). Q is discharge.

Date	Time (PDT)	Automated water level (m)	Manual water level (m)	Measured Q (m^3/s)	Calculated Q (m^3/s)	Difference [meas. Q - calc. Q] (m^3/s)	Difference (% of calc. Q)	Method
2015-04-17	8:10	1.388	0.495	0.401	0.413	-0.012	-2.8%	Salt Dilution
2015-04-17	10:10	1.355	0.467	0.348	0.335	0.013	3.9%	Salt Dilution
2015-04-17	10:20	1.354	0.464	0.339	0.331	0.008	2.4%	Salt Dilution
2015-04-17	11:50	1.316	0.435	0.278	0.252	0.026	10.5%	Salt Dilution
2015-04-17	13:00	1.233	0.350	0.111	0.110	0.001	1.0%	Salt Dilution
2015-04-17	17:10	1.184	0.305	0.050	0.051	-0.001	-1.5%	Salt Dilution
2015-04-23	10:20	1.413	0.525	0.455	0.475	-0.020	-4.2%	FlowTracker
2015-05-07	14:50	1.316	0.439	0.249	0.250	-0.001	-0.5%	FlowTracker
2015-05-26	9:00	1.346	0.472	0.327	0.313	0.013	4.3%	FlowTracker
2015-06-04	14:00	1.309	0.422	0.210	0.237	-0.027	-11.6%	FlowTracker
2015-06-15	10:10	1.161	0.274	0.030	0.029	0.001	2.5%	FlowTracker
2015-06-23	11:00	1.198	0.329	0.069	0.065	0.004	6.4%	FlowTracker
2015-06-29	15:20	1.188	0.300	0.050	0.055	-0.004	-8.1%	FlowTracker

Table A2-2. Calibration data from upper Hazeltine Creek for the H1-B rating curve. The manual water levels are raw observations from the staff gauge (i.e., they are not adjusted for any staff gauge slope). Q is discharge. Measurements from 2015-11-17 to 2016-02-23 were not included in this rating curve, as the water level was artificially elevated due to ice effects at the control cross-section.

Date	Time (PDT)	Automated water level (m)	Manual water level (m)	Measured Q (m^3/s)	Calculated Q (m^3/s)	Difference [meas. Q - calc. Q] (m^3/s)	Difference (% of calc. Q)	Method
2015-07-09	11:50	1.339	0.461	0.310	0.277	0.033	12.0%	FlowTracker
2015-07-15	13:50	1.315	0.446	0.250	0.220	0.029	13.3%	FlowTracker
2015-07-21	8:00	1.313	0.438	0.229	0.216	0.013	6.2%	Salt Dilution
2015-07-21	8:20	1.311	0.435	0.221	0.211	0.010	4.9%	Salt Dilution
2015-07-21	18:10	1.163	0.280	0.017	0.021	-0.004	-20.7%	Salt Dilution
2015-08-30	10:40	1.155		0.022	0.018	0.004	24.8%	FlowTracker
2015-09-06	11:20	1.165	0.280	0.022	0.023	-0.001	-2.4%	FlowTracker
2015-09-08	10:30	1.174	0.288		0.028			
2015-09-08	15:40	1.181	0.296		0.033			
2015-11-17	13:10		0.364	0.110				FlowTracker
2016-01-14	15:50		0.461	0.309				FlowTracker
2016-01-21	12:20		0.446	0.228				FlowTracker
2016-01-26	12:30		0.474					
2016-01-26	15:20		0.478	0.319				FlowTracker
2016-01-27	16:50		0.469	0.300				FlowTracker
2016-02-01	17:00		0.471	0.274				FlowTracker
2016-02-03	14:40		0.467	0.269				FlowTracker
2016-02-09	13:30		0.458	0.254				FlowTracker
2016-02-22	14:40		0.476					
2016-02-23	15:40		0.476	0.306				FlowTracker
2016-03-07	15:10	1.321	0.431	0.224	0.233	-0.009	-3.9%	FlowTracker
2016-03-09	16:50	1.375	0.489	0.323	0.374	-0.051	-13.6%	FlowTracker
2016-03-29	11:30	1.318	0.440		0.226			
2016-03-31	12:40	1.250	0.359		0.104			
2016-04-04	11:20	1.343	0.468		0.286			
2016-04-07	15:00	1.401	0.527	0.463	0.455	0.007	1.6%	FlowTracker
2016-04-13	13:00	1.404	0.530	0.440	0.466	-0.026	-5.5%	Salt Dilution
2016-04-13	14:10	1.406	0.532		0.471			
2016-04-14	16:50	1.374	0.499	0.367	0.370	-0.003	-0.8%	Salt Dilution
2016-04-19	12:00	1.443	0.558		0.610			
2016-04-20	14:20	1.382	0.491		0.395			
2016-04-20	14:30	1.406		0.471	0.472	-0.001	-0.2%	FlowTracker
2016-04-20	14:40	1.416	0.535		0.508			
2016-05-04	10:10	1.315	0.443		0.221			
2016-05-04	11:00	1.249		0.096	0.103	-0.008	-7.3%	FlowTracker
2016-05-04	11:10	1.244	0.360		0.097			
2016-05-05	11:20	1.307	0.435		0.203			

Table A2-3. Calibration data from lower Hazeltine Creek for the H2 rating curve. The manual water levels are raw observations from the staff gauge (i.e., they are not adjusted for any staff gauge slope). Q is discharge. Measurements from 2015-11-05 to 2016-02-22 were not included in this rating curve, as the water level was artificially elevated due to ice effects at the control cross-section.

Date	Time (PDT)	Automated water level (m)	Manual water level (m)	Measured Q (m^3/s)	Calculated Q (m^3/s)	Difference [meas. Q - calc. Q] (m^3/s)	Difference (% of calc. Q)	Method
2015-07-21	9:00	1.286	0.423	0.241	0.245	-0.004	-1.4%	Salt Dilution
2015-07-21	10:30	1.282	0.418	0.221	0.233	-0.012	-5.0%	Salt Dilution
2015-07-21	11:30	1.271	0.407	0.196	0.201	-0.005	-2.3%	Salt Dilution
2015-07-21	13:20	1.232	0.354	0.114	0.113	0.000	0.4%	Salt Dilution
2015-07-21	13:30	1.228	0.348	0.121	0.106	0.014	13.4%	FlowTracker
2015-07-21	13:40	1.223	0.342	0.100	0.098	0.002	2.4%	Salt Dilution
2015-07-21	14:20	1.215	0.326	0.085	0.084	0.001	1.1%	Salt Dilution
2015-07-21	14:30	1.211	0.323	0.080	0.079	0.001	1.2%	FlowTracker
2015-07-21	14:40	1.209	0.319	0.080	0.076	0.004	5.1%	Salt Dilution
2015-07-21	17:10	1.187	0.295	0.050	0.049	0.001	1.8%	Salt Dilution
2015-07-30	12:00	1.270	0.414	0.178	0.196	-0.018	-9.3%	FlowTracker
2015-08-09	13:50	1.229		0.100	0.107	-0.006	-6.0%	FlowTracker
2015-08-10	15:00	1.226	0.350	0.104	0.102	0.002	2.1%	Salt Dilution
2015-08-10	15:40	1.232	0.347	0.111	0.112	-0.001	-0.7%	Salt Dilution
2015-08-30	11:50	1.168		0.031	0.031	0.000	-0.8%	FlowTracker
2015-09-06	13:10	1.167	0.272	0.029	0.030	-0.001	-4.6%	FlowTracker
2015-11-05	16:40		0.379					
2015-11-10	10:40			0.123				FlowTracker
2015-11-17	12:20		0.371	0.114				FlowTracker
2015-12-07	13:50		0.419					
2015-12-08	14:30		0.440					
2015-12-15	12:00		0.432	0.243				FlowTracker
2015-12-22	11:00		0.402	0.153				FlowTracker
2016-01-06	14:20		0.472	0.268				FlowTracker
2016-01-12	13:00		0.454					
2016-01-13	16:10		0.470	0.299				FlowTracker
2016-01-21	15:10		0.448	0.267				FlowTracker
2016-01-26	13:50		0.475					
2016-01-27	14:30		0.478	0.318				FlowTracker
2016-02-01	15:00		0.470	0.246				FlowTracker
2016-02-03	12:50		0.491	0.322				FlowTracker
2016-02-09	12:30		0.452	0.283				FlowTracker
2016-02-11	15:50		0.456	0.254				FlowTracker
2016-02-17	15:40		0.468	0.330				FlowTracker
2016-02-22	13:50		0.484	0.359				FlowTracker
2016-03-01	14:20	1.332	0.494	0.341	0.414	-0.073	-17.6%	FlowTracker
2016-03-07	12:30	1.338	0.496	0.394	0.442	-0.048	-11.0%	FlowTracker
2016-03-09	14:30	1.349	0.512	0.443	0.491	-0.048	-9.8%	FlowTracker
2016-03-10	14:40	1.352	0.514		0.506			

Table A2-3 continued. Calibration data from lower Hazeltine Creek for the H2 rating curve. The manual water levels are raw observations from the staff gauge (i.e., they are not adjusted for any staff gauge slope). Q is discharge.

Date	Time (PDT)	Automated water level (m)	Manual water level (m)	Measured Q (m^3/s)	Calculated Q (m^3/s)	Difference [meas. Q - calc. Q] (m^3/s)	Difference (% of calc. Q)	Method
2016-03-21	11:50	1.285	0.430	0.238	0.242	-0.004	-1.5%	FlowTracker
2016-03-22	8:30	1.294	0.460		0.268			
2016-03-29	11:00	1.327	0.492		0.394			
2016-03-31	13:30	1.295	0.452		0.272			
2016-04-04	12:30	1.359	0.534		0.542			
2016-04-06	9:20	1.360	0.540		0.550			
2016-04-06	16:00	1.423	0.632	0.983	0.957	0.025	2.6%	FlowTracker
2016-04-11	14:30	1.346	0.514		0.477			
2016-04-12	16:10	1.352	0.510	0.531	0.506	0.025	5.0%	Salt Dilution
2016-04-12	16:20	1.352	0.510	0.563	0.506	0.057	11.4%	Salt Dilution
2016-04-14	15:50	1.331	0.492	0.427	0.409	0.018	4.4%	Salt Dilution
2016-04-14	16:10	1.333	0.492	0.422	0.419	0.003	0.8%	FlowTracker
2016-04-14	16:20	1.333	0.492	0.439	0.419	0.020	4.7%	Salt Dilution
2016-04-20	13:20	1.347	0.513	0.522	0.486	0.036	7.4%	FlowTracker
2016-05-04	12:00	1.273	0.403	0.201	0.206	-0.005	-2.5%	FlowTracker
2016-05-05	12:00	1.293	0.442		0.266			

Table A2-4. Calibration data from Edney Creek for the H3 rating curve. The manual water levels are raw observations from the staff gauge (i.e., they are not adjusted for any staff gauge slope). Q is discharge.

Date	Time (PDT)	Automated water level (m)	Manual water level (m)	Measured Q (m^3/s)	Calculated Q (m^3/s)	Difference [meas. Q - calc. Q] (m^3/s)	Difference (% of calc. Q)	Method
2015-09-06	12:50	1.171		0.009	0.008	0.000	3.3%	FlowTracker
2015-11-05	14:30	1.280	0.418		0.095			
2015-11-17	10:50	1.280	0.414	0.058	0.095	-0.037	-39.2%	FlowTracker
2016-01-27	13:10	1.294	0.438	0.118	0.115	0.003	2.9%	FlowTracker
2016-03-07	13:40	1.569	0.712	0.903	0.947	-0.044	-4.6%	FlowTracker
2016-04-12	15:40	1.881	1.080	3.140	3.109	0.031	1.0%	Salt Dilution
2016-04-14	14:40	1.819	0.980	2.437	2.566	-0.129	-5.0%	Salt Dilution
2016-05-04	12:50	1.358	0.529	0.268	0.230	0.038	16.4%	FlowTracker
2016-05-05	12:50	1.341	0.511		0.194			
2016-05-16	12:50	1.320	0.500	0.227	0.156	0.071	45.4%	FlowTracker

Table A2-5. Calibration data from Bootjack Creek for the W5 rating curve. The manual water levels are raw observations from the staff gauge (i.e., they are not adjusted for any staff gauge slope). Q is discharge.

Date	Time	Manual water level (m)	Measured Q (m^3/s)	Calculated Q (m^3/s)	Difference [meas. Q - calc. Q] (m^3/s)	Difference (% of calc. Q)
2011-05-19	14:32	0.36	0.1279	0.104	0.024	22.9%
2011-06-03	13:58	0.235	0.0204	0.020	0.001	3.4%
2011-06-13	11:02	0.218	0.0115	0.014	-0.002	-17.2%
2011-06-29	10:00	0.212	0.0157	0.012	0.004	29.7%
2011-07-05	11:47	0.212	0.0175	0.012	0.005	44.5%
2011-07-12	10:16	0.185	0.0068	0.006	0.001	17.5%
2011-07-20	9:28	0.217	0.0166	0.014	0.003	22.2%
2011-07-28	10:10	0.209	0.0167	0.011	0.005	48.2%
2011-08-02	11:15	0.211	0.0132	0.012	0.001	11.6%
2011-08-11	10:33	0.162	0.0024	0.002	0.000	-0.1%
2012-06-15	0:00	0.204	0.015	0.010	0.005	50.7%
2012-06-20	15:45	0.265	0.0481	0.033	0.015	45.5%
2012-07-09	15:30	0.17	0.0053	0.003	0.002	56.4%
2013-03-10	8:19	0.158		0.002		
2013-04-18	11:35	0.304		0.057		
2013-04-20	9:37	0.428	0.181	0.185	-0.004	-2.4%
2013-04-25	11:40	0.35		0.094		
2013-04-26	13:19	0.378	0.131	0.123	0.008	6.5%
2013-05-01	13:11	0.295		0.051		
2013-05-03	11:28	0.325	0.056	0.072	-0.016	-22.7%
2013-05-09	9:57	0.312		0.062		
2013-05-15	14:21	0.247	0.031	0.025	0.006	26.1%
2013-05-16	9:50	0.249		0.025		
2013-05-27	13:34	0.235	0.0201	0.020	0.000	1.9%
2013-06-06	5:45	0.221		0.015		
2013-06-10	11:05	0.196	0.0049	0.008	-0.003	-39.0%
2013-06-25	12:11	0.243	0.0197	0.023	-0.003	-13.9%
2013-07-10	9:44	0.152		0.001		
2013-07-25	11:32	0.132		0.000		
2013-08-01	11:17	0.142		0.001		
2013-08-08	12:00	0.148		0.001		
2013-09-05	7:49	0.15		0.001		
2013-09-18	10:45	0.163		0.003		
2013-10-03	8:19	0.158		0.002		
2013-10-17	9:38	0.176		0.004		
2013-10-24	12:15	0.165		0.003		
2013-10-29	10:58	0.172		0.004		
2014-02-09		0.185		0.006		

Table A2-5 continued. Calibration data from Bootjack Creek for the W5 rating curve. The manual water levels are raw observations from the staff gauge (i.e., they are not adjusted for any staff gauge slope). Q is discharge.

Date	Time	Manual water level (m)	Measured Q (m^3/s)	Calculated Q (m^3/s)	Difference [meas. Q - calc. Q] (m^3/s)	Difference (% of calc. Q)
2014-04-16	12:20	0.334	0.0437	0.080	-0.036	-45.4%
2014-04-24	14:45	0.36		0.104		
2014-05-08	10:01	0.327		0.074		
2014-05-20	13:52	0.283		0.043		
2014-05-26	11:55	0.292	0.0929	0.049	0.044	91.2%
2014-06-17	10:55		0.0127			
2014-06-24	12:10	0.203		0.010		
2014-07-01	10:50		0.0014			
2014-07-08	12:40	0.187		0.006		
2014-07-14		0.181		0.005		
2014-07-15		0.187		0.006		
2014-07-22		0.187		0.006		
2014-07-29		0.203		0.010		
2014-08-05	11:20	0.183		0.005		
2014-08-12	13:40	0.187		0.006		
2014-08-19	13:50	0.175	0.00008	0.004	-0.004	-98.0%
2014-08-26	11:45	0.171	0.00002	0.004	-0.004	-99.5%
2014-10-01	15:22	0.179		0.005		
2014-10-20	10:38	0.187		0.006		
2014-10-30	16:18	0.212		0.012		
2014-11-11	10:55	0.199		0.009		
2015-05-05		0.216		0.013		
2015-06-04		0.178		0.005		
2015-06-15		0.168		0.003		
2015-07-01		0.178		0.005		
2015-07-09		0.165		0.003		
2015-07-23		0.173		0.004		
2015-08-06		0.168		0.003		
2015-08-08		0.166		0.003		
2015-09-02		0.172		0.004		
2015-10-01		0.176		0.004		
2015-10-08		0.181		0.005		
2015-10-15		0.186		0.006		
2015-10-22		0.193		0.007		
2015-10-29		0.188		0.006		
2015-11-02		0.216		0.013		

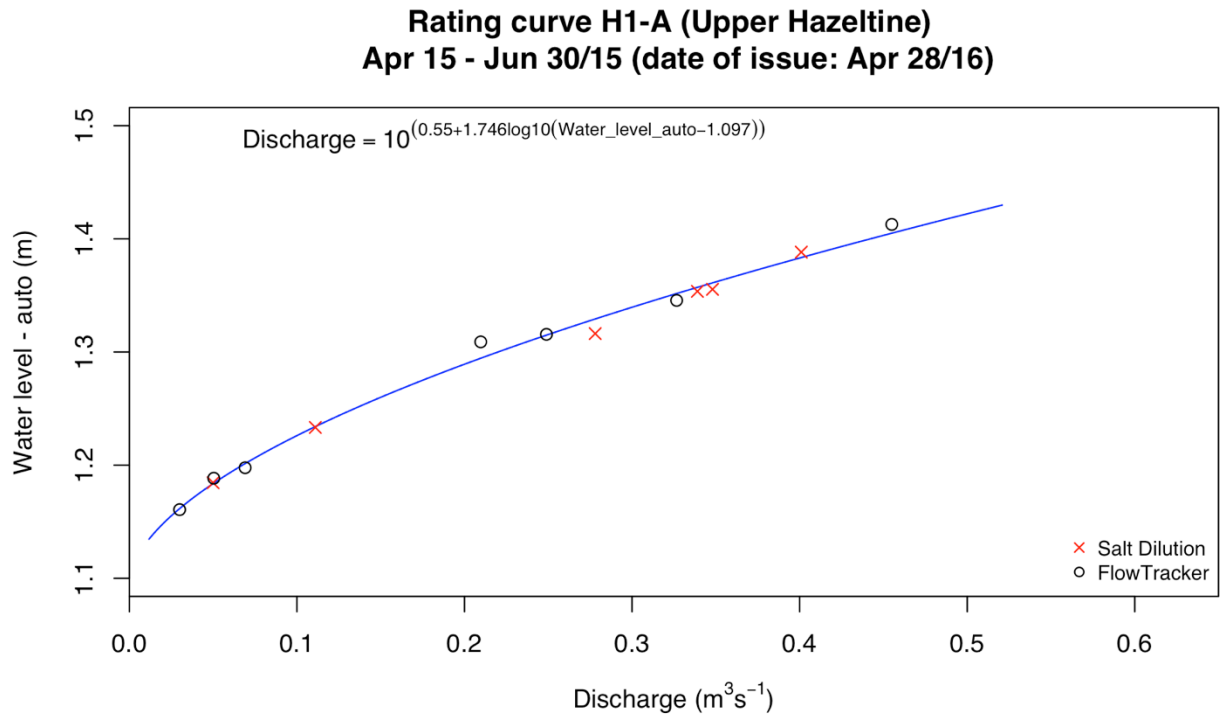


Figure A2-1. Rating curve H1-A (Upper Hazeltine). This rating curve applies to data from April 15 – June 30, 2015.

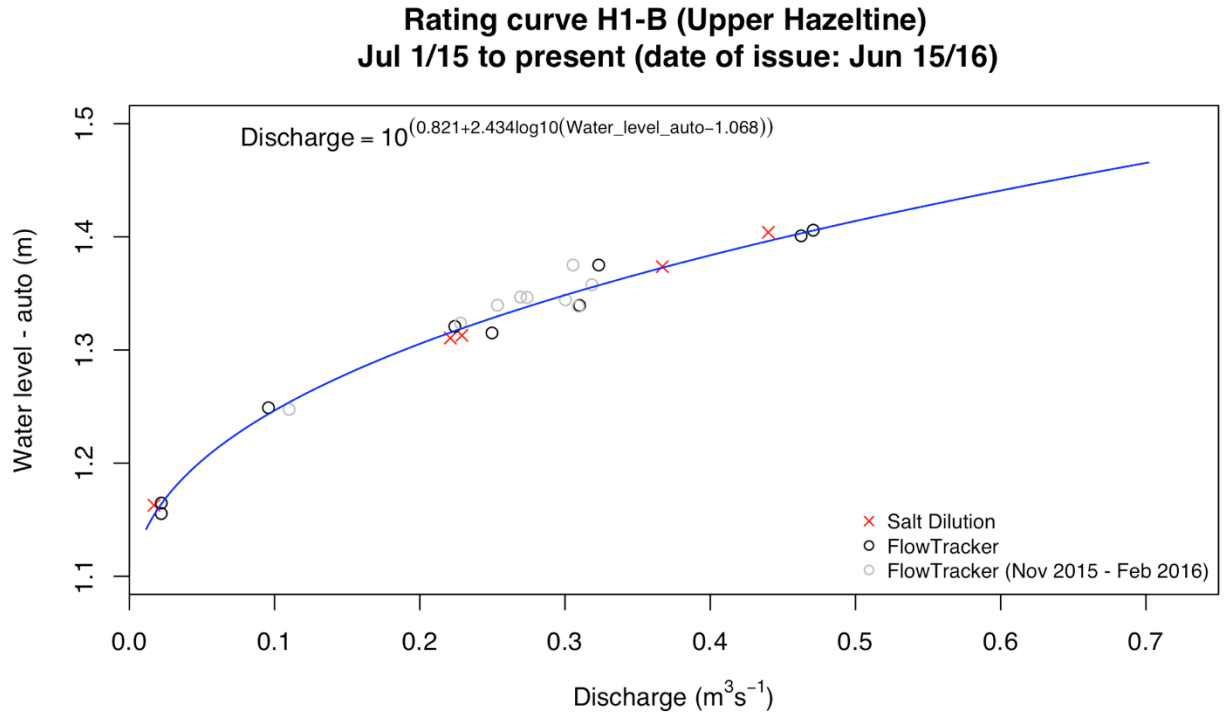


Figure A2-2. Rating curve H1-B (Upper Hazeltine). This rating curve applies to data from July 1, 2015 to present. Measurements from 2015-11-17 to 2016-02-23 were not included in this rating curve, as the water level was artificially elevated due to ice effects at the control cross-section.

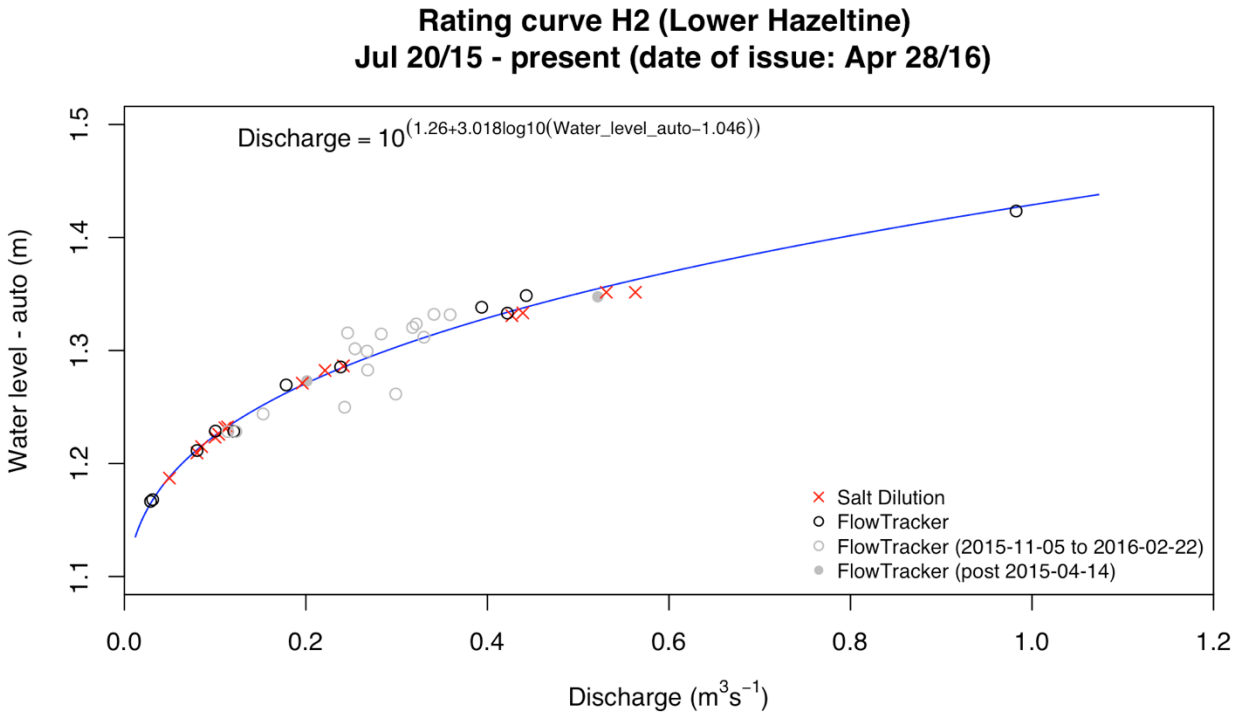


Figure A2-3. Rating curve H2 (Lower Hazeltine). This rating curve applies to data from July 20, 2015, to present. Measurements from 2015-11-05 to 2016-02-22 were not included in this rating curve, as the water level was artificially elevated due to ice effects at the control cross-section. The stage discharge relationship was calculated based on measurements up to April 14, 2016.

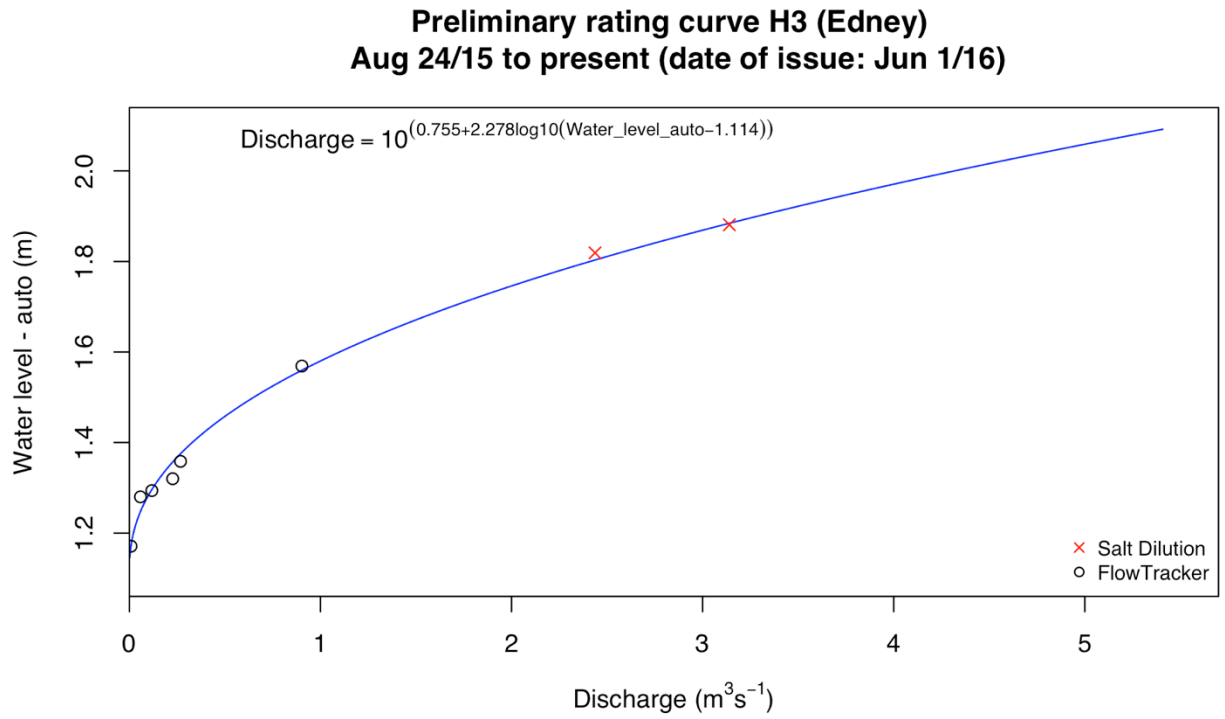


Figure A2-4. Preliminary rating curve H3 (Edney). This preliminary rating curve applies to data from August 24, 2015, to present. All continuous discharge data derived from this rating curve are considered preliminary.

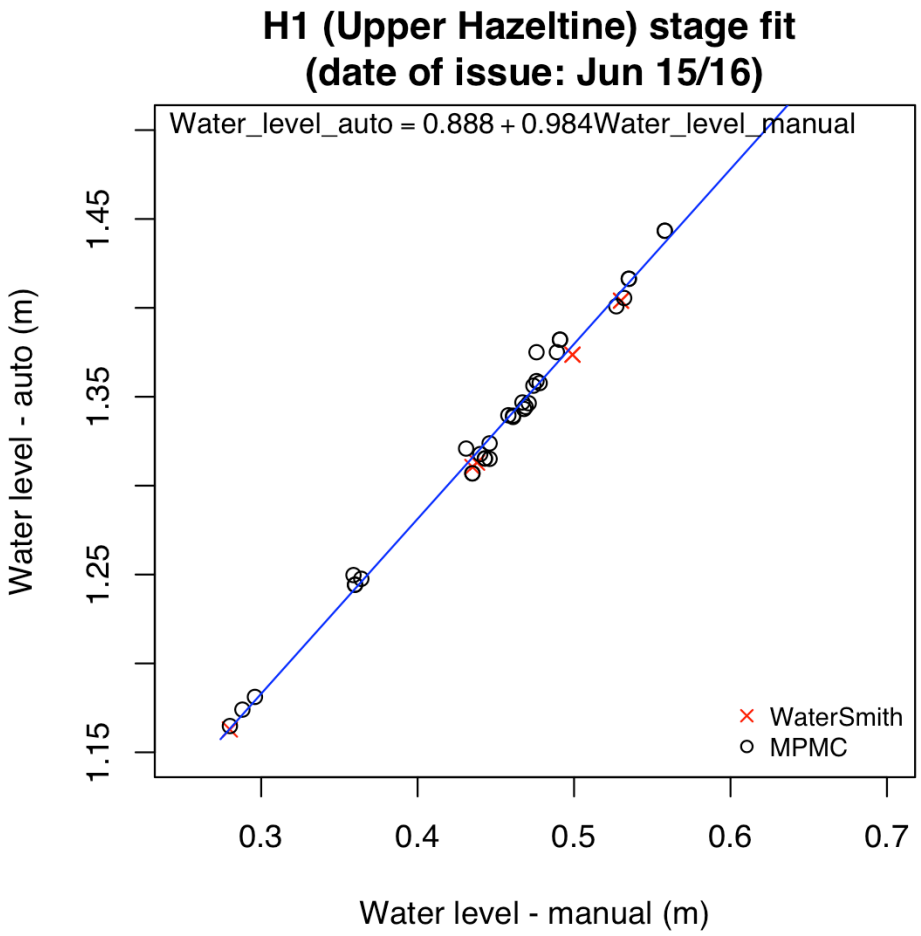


Figure A2-5. Relation between the automated water level data and the manual staff gauge measurements for H1 (Upper Hazeltine).

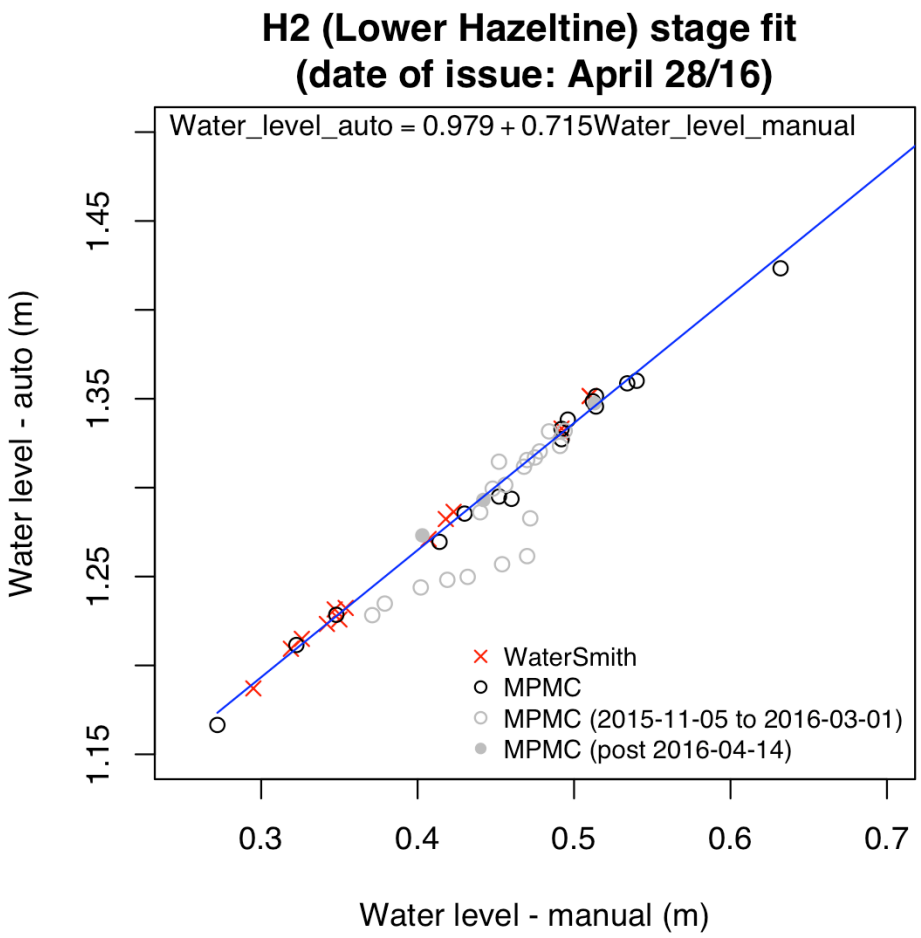


Figure A2-6. Relation between the automated water level data and the manual staff gauge measurements for H2 (Lower Hazeltine). Measurements from 2015-11-05 to 2016-03-01 were not included in this rating curve, as the automated water level was reporting lower than expected relative to the staff gauge, potentially due to being elevated by sediment and/or ice build-up. The stage fit relationship was calculated based on measurements up to April 14, 2016.

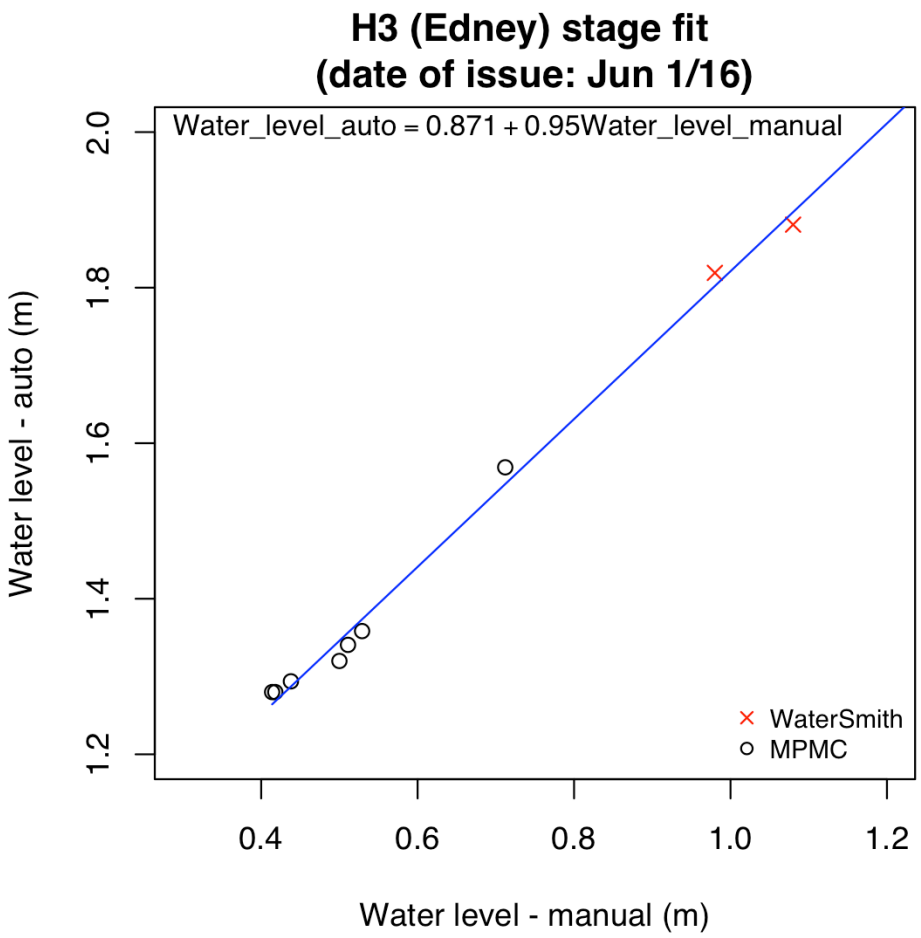


Figure A2-7. Relation between the automated water level data and the manual staff gauge measurements for H3 (Edney).

Appendix 3

Continuous and manual stream discharge data

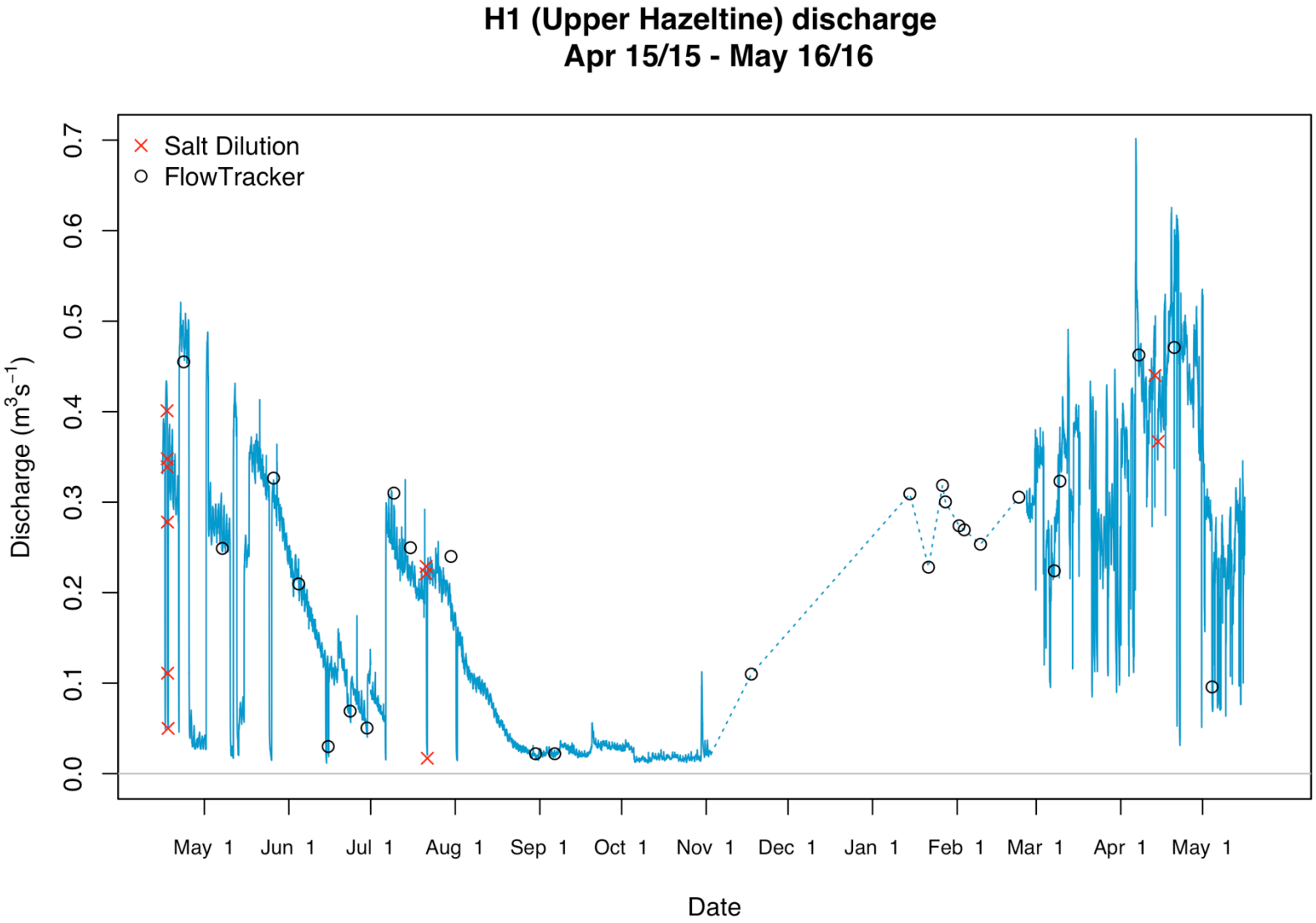


Figure A3-1. Stream discharge at H1 (Upper Hazeltine Creek). The dashed line indicates the period when the station was experiencing ice effects and approximates the hydrograph by interpolating between the manual measurements.

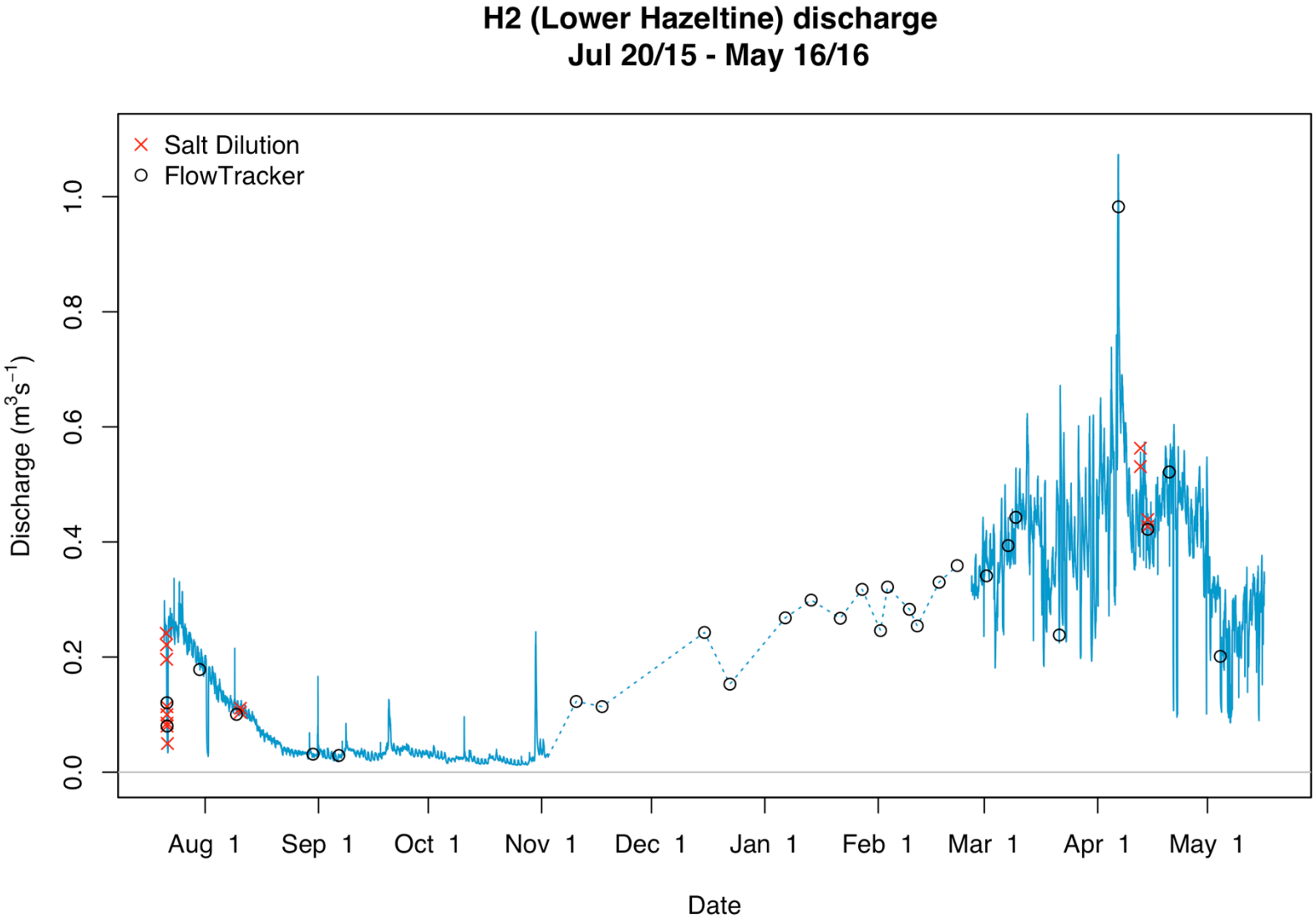


Figure A3-2. Stream discharge at H2 (Lower Hazeltine). The dashed line indicates the period when the station was experiencing ice effects and approximates the hydrograph by interpolating between the manual measurements.

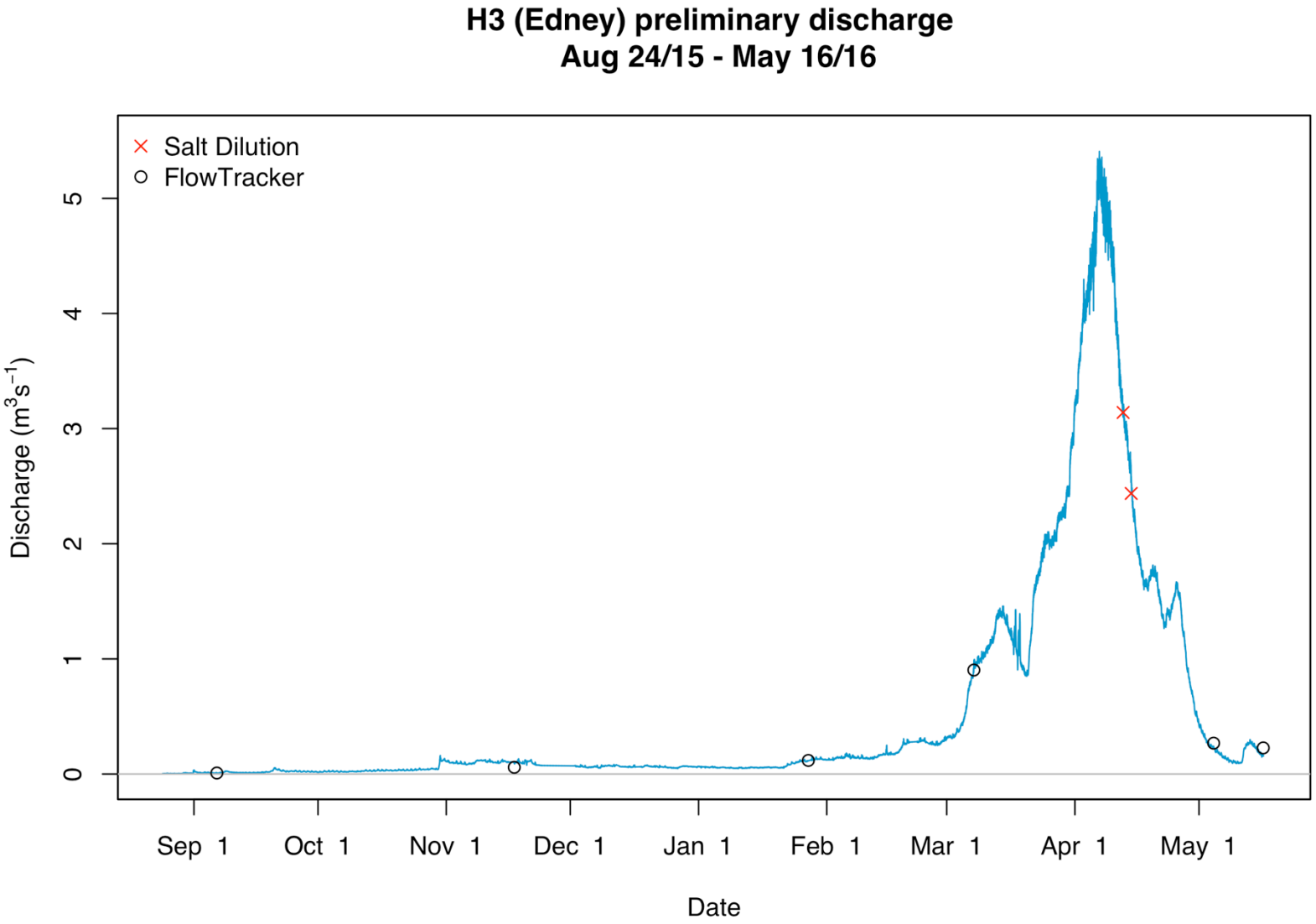


Figure A3-3. Preliminary stream discharge at H3 (Edney).

Appendix 4

Site photos

Photo 1. Looking downstream at the staff gauge, stilling well, and culvert that functions as a control cross-section at the relocated Bootjack Creek (W5) hydrometric station (April 13, 2016).

Photo 2. Looking upstream from the relocated W5 station towards the staff gauge at the previous W5 station (April 13, 2016).

APPENDIX B

Operations and Closure – Mount Polley Mine Water Balance

17 October 2016

OPERATIONS AND CLOSURE

Mount Polley Mine Water Balance Model

Submitted to:
Mount Polley Mining Corporation
Box 12
Likely, BC
V0L 1N0

Attention: Dale Reimer, General Manager

REPORT

Reference Number: 1411734-167-R-Rev0-16000

Distribution:

1 Electronic Copy - Mount Polley Mining Corporation
1 Hard Copy - Golder Associates Ltd.

Golder Associates

Executive Summary

Mount Polley Mining Corporation (MPMC) retained Golder Associates Ltd. (Golder) to prepare a Technical Assessment Report (TAR) in support of the Long-term Water Management Plan (LTWMP) that will include operations through closure and post-closure mining phases.

Mining operations at the Mount Polley Mine (the Mine) were suspended following a foundation failure of the Tailings Storage Facility (TSF) Perimeter Embankment on 4 August 2014. MPMC resumed restricted operations in August 2015, with the tailings being deposited within Springer Pit. Authorization to use the TSF for resumed tailings deposition was received by MPMC on 23 June 2016; however, due to the timelines required in developing this report, for the purpose of this document, use of the TSF is assumed from July 2016.

This site-wide water balance model (SWWBM) was developed for the Mine using GoldSim™ (Version 11.1) software. The SWWB is being used to support short- and long-term water management planning, and will form the basis of effluent treatment and discharge options.

Two operational Mine management scenarios were evaluated with this water balance:

- restricted operations - until 30 June 2016
- full operations – 1 July 2016 to 30 June 2020

Additional scenarios were evaluated for closure and post-closure. Closure is defined as the first two years (1 July 2020 to 30 June 2022) following the end of operations, followed by post-closure from 1 July 2022 to 31 December 2050.

The SWWBM was calibrated and validated based on past and current Mine conditions, and used to generate a range of stochastic climate scenarios (0.5 percentile to 99.5 percentile) to probabilistically assess Mine water management alternatives. The Mine has a positive water balance; consequently, water will need to be discharged under mean climate conditions. A summary of key findings is provided below:

- During dewatering of the Springer Pit (2016 and 2017), the mean annual discharge is approximately 7.5 Mm^3.
- During future operations (2018 to 2020), the mean annual discharge is approximately 5.9 Mm^3.
- During closure (2021 and 2022), the mean annual discharge is approximately 3.8 Mm^3.
- The maximum annual discharge for 99.5 percentile extreme wet conditions is 9.9 Mm^3 in 2017.
- The Springer Pit is projected to be dewatered to the elevation of the deposited tailings by the second quarter 2018, or as late as the fourth quarter 2018, under extreme wet (99.5 percentile) conditions.
- The mean pond volume in the TSF during full operations is expected to reach approximately 1.5 Mm^3 on 1 July each year.
- The maximum TSF pond elevation during full operations (99.5 percentile) is approximately 3.7 Mm^3.

- Because discharge from the Mine is constrained in 2017 by natural flows in Hazeltine Creek, there is some potential for carry-over volume in the TSF to 2018 under extreme wet conditions. In all other years there is no carry over.
- During full operations, the mean annual volume of makeup water drawn from Polley Lake is approximately 2.0 Mm^3. Under extreme dry conditions (99.5 percentile), the estimated annual makeup water volume is 2.8 Mm^3.
- Permanent pit lakes are projected to develop in the combined Phase 4 Cariboo-Springer Pit and the Wight Pit.
- Post-closure, the combined Cariboo-Springer Pit Lake is projected to reach the overflow elevation of 1,050 masl between 2042 and 2044. The effect of climate change was assessed using the conservative Representative Concentration Pathways (RPC) 8.5 scenario, and this affected Springer pit lake filling to 1,050 masl by only a few months.
- Post-closure, the Wight Pit Lake will reach the overflow elevation of 926 masl by 2026.
- A seasonal pond will develop in the Boundary Pit, which will not reach the overflow elevation of 1,073 masl.
- PAG material placed in the combined Cariboo-Springer Pit will have a final elevation of 1,004 masl. Post-closure, this will be inundated and covered by the pit lake before 2025.

In addition to the Base Case, four additional contingencies were evaluated:

1) Base Case with rewetting of the tailings in the TSF.
2) Base Case with Mine Care and Maintenance starting 1 July 2017.
3) Base Case with no discharge from the Mine during April and May 2017.
4) Base Case with no controlled discharge from the Mine after 30 March 2017.

Study Limitations

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation (MPMC). It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by MPMC, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. MPMC may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

Table of Contents

EXECUTIVE SUMMARY ..... **i**

STUDY LIMITATIONS ..... **iii**

1.0 INTRODUCTION **1**

2.0 BACKGROUND **2**

3.0 CLIMATE AND HYDROLOGY **7**

3.1 Climate 7

3.1.1 Temperature 9

3.1.2 Precipitation 10

3.1.3 Evaporation 10

3.1.4 Future Climate Change Projections 11

3.2 Site Drainage and Surface Hydrology 13

3.3 Pit Groundwater Hydrology 16

3.3.1 Springer and Cariboo Pits 16

3.3.2 Wight Pit 17

3.3.3 Boundary Pit 18

3.4 Seepage from the Tailings Storage Facility 18

4.0 OVERVIEW OF MINE WATER MANAGEMENT AT MOUNT POLLEY **20**

4.1 Objectives 20

4.2 Surface Water Management 20

4.3 Groundwater Management 21

4.4 Mine Long-term Water Management Plan 21

4.4.1 Restricted Operations Phase 22

4.4.2 Full Operations Phase 22

4.4.3 Closure and Post-closure Phases 24

4.4.3.1 Tailings Storage Facility 24

4.4.3.2 Pit Lakes 25

5.0 SITE WIDE WATER BALANCE MODEL **26**

5.1 Model Software 26

5.2 Model Objectives 26

5.3 General Assumptions 27

5.3.1 Water Treatment Plant Operation 27
5.4 Model Scope and Flow Diagram 27
5.5 Climate Inputs 34
5.5.1 Deterministic Climate Inputs 34
5.5.2 Stochastic Climate Inputs 34
5.6 Hydrology Inputs 35
5.6.1 Runoff Parameters 35
5.6.2 Hazeltine Creek Flows 37
5.6.3 Catchment Areas 38
5.7 Storage Capacities 39
5.8 Flow Derivation and Logic 41
5.8.1 Pumped Flows 41
5.8.1.1 Operational Pumping Rules – Restricted Operations and Full Operations 41
5.8.1.2 Operational Pumping Rules – Closure/Post-closure 41
5.8.1.3 Mill Process Flows – Restricted and Full Operations 42
5.8.2 Tailings Storage Facility Seepage Flows 42
5.8.3 Consumption Flows 42
5.9 Model Calibration/Validation – Existing Conditions 42
5.9.1 Northwest Ditch 42
5.9.2 Long Ditch 43
5.9.3 Springer Pit 44
5.10 Model Simulation 47
5.10.1 Assumptions 47
6.0 RESULTS 48
6.1 Discharge Quantity of Treated Mine Effluent 48
6.1.1 Full Operations 48
6.1.2 Closure/Post-closure 49
6.2 Springer Pit Dewatering 50
6.3 Tailings Storage Facility 51
6.4 Perimeter Embankment Till Borrow Pond 53
6.4.1 Polley Lake Makeup Water 54
6.5 Contingency Scenarios 55

6.5.1 Contingency 1: Base Case with Tailings Rewetting 56
6.5.2 Contingency 2: Base Case with Care and Maintenance Starting July 1, 2017....58
6.5.3 Contingency 3: Base Case with No Discharge during April and May 2017 61
6.5.4 Contingency 4: Base Case with No Controlled Discharge after March 30, 2017 63
6.6 Pit Lakes during Closure....65
6.6.1 Combined Cariboo-Springer Pit 65
6.6.2 Boundary Pit 66
6.6.3 Wight Pit....67
7.0 SUMMARY....68
8.0 CLOSURE....70
REFERENCES....71

TABLES

Table 1: Local and Regional Climate Stations for the Mount Polley Mine 7
Table 2: Local Snow Course Sites at the Mount Polley Mine 9
Table 3: Likely Climate Station Monthly Temperatures (1974 to 1993) 9
Table 4: Long-Term Precipitation at the Mount Polley Mine Site (1974 to 2015) 10
Table 5: Estimated Monthly and Annual Lake Evaporation (1997 to 2012)....11
Table 6: Projected Annual Mount Polley Climate from CanESM2 model. 13
Table 7: Adopted Design Flows 14
Table 8: Predicted Groundwater Flows for the Springer and Cariboo Pit 17
Table 9: Predicted Groundwater Flows for the Wight Pit....17
Table 10: Estimated Seepage Outflows from Boundary Pit 18
Table 11: Tailings Deposition in Springer Pit....22
Table 12: TSF Tailings Deposition Schedule (Future Operations) 23
Table 13: Primary Mine Water Flows 33
Table 14: Stochastic Climate Generator Statistics 35
Table 15: Seasonal Runoff Coefficients 36
Table 16: Annual Runoff (m^3/s) based on Derived Hazeltine Flows 37
Table 17: Generated Stochastic Monthly and Annual Flows 38
Table 18: Catchment Areas for Storage/Conveyance Elements 38
Table 19: Maximum Capacities for Major Storage Facilities....39
Table 20: Monthly Changes in Springer Pit Lake Total Volume (Mm^3)....45
Table 21: Annual Discharge of Mine Water during Future Operations 49

Table 22: Annual Discharge of Mine Water during Closure and Post-closure 50
Table 23: Annual Volume of Makeup Water Drawn from Polley Lake 55
Table 24: Annual Discharge of Mine Water for Contingency 1 57
Table 25: Annual Discharge of Mine Water for Contingency 2 59
Table 26: Annual Discharge of Mine Water for Contingency 3 61
Table 27: Annual Discharge of Mine Water for Contingency 4 63

FIGURES

Figure 1: Location of Mount Polley Mine 4
Figure 2: Mine Site Layout 5
Figure 3: Polley Lake Weir with Sluice Gate for Controlled Release of Flow 6
Figure 4: Mount Polley Climate and Snowcourse Stations 8
Figure 5: C02 Equivalent Climate Forcing's for Representative Pathway Concentrations (RCP) Scenarios. 12
Figure 6: Mount Polley Mine – Major Drainages and Flow Monitoring Stations 15
Figure 7: Seepage Flows from the Tailings Storage Facility during Closure 19
Figure 8: Conceptual Flow Diagram – Restricted Operations 29
Figure 9: Conceptual Flow Diagram – Future Operations 30
Figure 10: Conceptual Flow Diagram – Closure 31
Figure 11: Conceptual Flow Diagram – Post-closure 32
Figure 12: Mount Polley Site Wide Water Balance – Catchment Areas 40
Figure 13: Northwest Ditch Measured Spot Flows and Calculated Flows between September 2014 and April 2015 43
Figure 14: Long Ditch Measured Spot Flows and Calculated Flows between September 2014 and April 2015 43
Figure 15: Comparison of Measured and Calculated Water Elevations for Springer Pit 44
Figure 16: Springer Pit Accumulated Water Volume (Mm^3) since September 2014 45
Figure 17: Monthly Change (Mm^3) in Springer Pit Lake Volume (water plus solids) 46
Figure 18: Discharge of Mine Water during Full Operations 48
Figure 19: Discharge of Mine Water during Closure and Post-Closure 49
Figure 20: Springer Pit Water Elevations Simulated from 1 April 2016 50
Figure 21: Springer Pit Sump Water Volume (Mm^3) 51
Figure 22: Tailings Storage Facility Water Volumes during Full Operations and into Closure 52
Figure 23: Tailings Storage Facility Water Elevations during Full Operations and into Closure 53
Figure 24: Perimeter Embankment Till Borrow Pond Water Volumes 54
Figure 25: Polley Lake Makeup Water (m^3/s) 55
Figure 26: Discharge of Mine Water for Contingency 1 56

Figure 27: Springer Pit Water Elevations for Contingency 1 57
Figure 28: Tailings Storage Facility Water Volumes during Full Operations and into Closure for Contingency 1.....58
Figure 29: Discharge of Mine Water for Contingency 2.....59
Figure 30: Springer Pit Water Elevations for Contingency 2 60
Figure 31: Tailings Storage Facility Water Volumes during Full Operations and into Closure for Contingency 2.....60
Figure 32: Discharge of Mine Water during Operations for Contingency 3 61
Figure 33: Springer Pit Water Elevations for Contingency 3 62
Figure 34: Tailings Storage Facility Water Volumes during Full Operations and into Closure for Contingency 3.....62
Figure 35: Discharge of Mine Water for Contingency 4.....63
Figure 36: Springer Pit Water Elevations for Contingency 4 64
Figure 37: Tailings Storage Facility Water Volumes for Contingency 4.....64
Figure 38: Springer Pit Lake Elevation (masl). 65
Figure 39: Filling of Springer Pit under the RCP 8.5 Climate Change Scenario.....66
Figure 40: Seasonal Boundary Pit Lake Elevation (masl) 67
Figure 41: Wight Pit Lake Elevation (masl) 68

ATTACHMENTS

ATTACHMENT A
Model Inputs

ATTACHMENT B
Climate Data

ATTACHMENT C
Predictions of Hydrogeological Conditions near the Springer and Cariboo Pits - Long-Term Technical Assessment Report - Mount Polley Mine

ATTACHMENT D
Preliminary Predictions of Groundwater Seepage for the Boundary Pit - Mount Polley Mine

ATTACHMENT E
Preliminary Predictions of Groundwater Seepage for the Wight Open Pit at Closure - Mount Polley Mine

ATTACHMENT F
Predictions of Hydrogeological Conditions near the Tailings Storage Facility during Closure - Long-Term Technical Assessment Report – Mount Polley Mine

ATTACHMENT G
Mount Polley Mine Technical Assessment Report: Climate Change Projections.

1.0 INTRODUCTION

Mount Polley Mining Corporation (MPMC) retained Golder Associates Ltd. (Golder) to prepare a Technical Assessment Report (TAR) in support of the Long-term Water Management Plan (LTWMP) that covers the operations through closure and post-closure mining phases, as defined in the TAR (Section 2.3.3).

Mining operations at the Mount Polley Mine (the Mine) were suspended following a foundation failure of the Tailings Storage Facility (TSF) Perimeter Embankment at Corner 1 on 4 August 2014. MPMC resumed restricted operations in August 2015, with the tailings being deposited within Springer Pit. Authorization to resume using the TSF for tailings deposition was received by MPMC on 23 June 2016; however, due to the timelines required in developing this report, for the purpose of this document, use of the TSF is assumed from July 2016.

This report presents the site-wide water balance model (SWWBM), based on the Cariboo-Springer Pit Phase 4 Mine plan, which includes the 970 metre (m) raise on the TSF to facilitate deposition associated with the return to full operations (Golder, 2015a). The work presented in this report is as follows:

- a brief summary of the background physical setting at the project site (Section 2.0)
- an overview of the climate and hydrology at the site (Section 3.0)
- an overview of surface and groundwater considerations (Section 4.0)
- a presentation of the SWWBM (Section 5.0)
- results of the SWWBM (Section 6.0)

2.0 BACKGROUND

The Mine is a copper and gold mine operated by MPMC. The Mine is 56 kilometers (km) northeast of Williams Lake, British Columbia. The Mine began production in 1997 and operated until October 2001, when operations were suspended for economic reasons. In March 2005, the Mine restarted production and it had been in continuous operation up to the time of the TSF foundation failure. Ore is crushed and processed by selective flotation to produce a copper-gold concentrate. The maximum mill throughput rate was approximately 6 to 8 million tonnes per year (22,000 tonnes per day).

The project location is shown in Figure 1, while the Mine site layout is shown in Figure 2. The Mine is located between Polley Lake and Bootjack Lake. The Mine operates with an annual water surplus. During its first stage of development (1997 to 2001), the Mine recycled water from the TSF for reuse in the milling process. It was not necessary for the Mine to discharge water during the initial period of operation. When the Mine re-opened in 2005, a surplus of water was present and a permit amendment was sought to allow discharge of treated surplus water into Hazeltine Creek (MPMC 2009). This amendment, issued in 2013 for Permit 11678 under the BC *Environmental Management Act* (EMA), imposed certain limits for effluent quality, non-toxicity requirements, and target levels for specific analytes in Hazeltine Creek, as well as the following volume limits:

- A maximum annual discharge of 1.4 million cubic metres (Mm^3) could be discharged.
- The permitted discharge amount was not to exceed 35% of the daily flow of Hazeltine Creek.

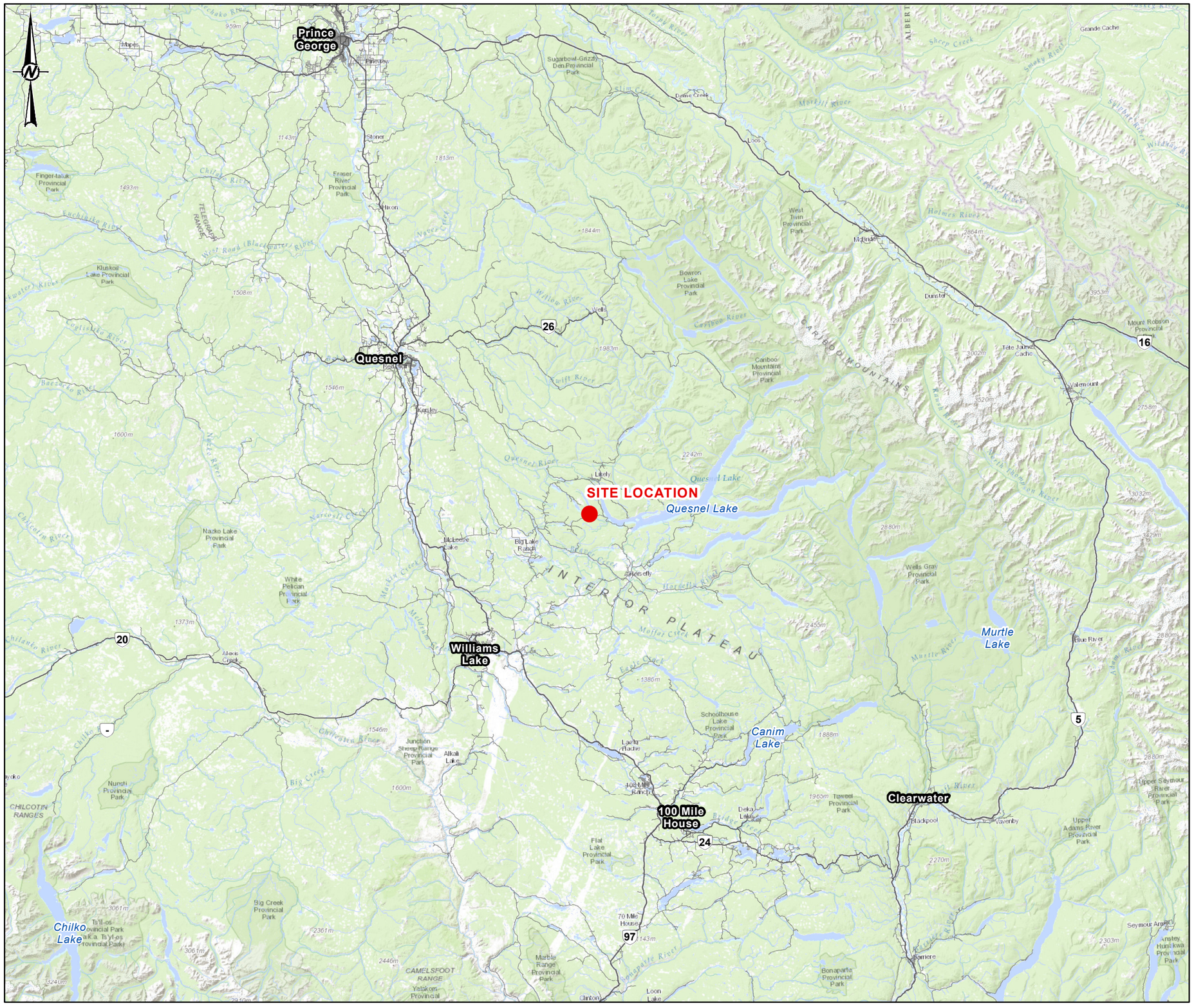
The Mine has continued to expand its operation, resulting in an increased Mine footprint as well as an increase in the contact water to be managed. To address the increased contact water volumes, prior to the TSF foundation failure, MPMC was actively pursuing an interim water management measures using a reverse osmosis treatment plant with discharge of treated water to Polley Lake. The reject water from the reverse osmosis plant was to be directed to the TSF. The proposed application of reverse osmosis was intended for a short period (approximately four years) and not as a suitable technology post-closure.

Prior to the TSF foundation failure on 4 August 2014, contact water flowed or was pumped to the TSF and was recycled to the mill as process water. Operations were suspended until August 2015, when restricted operations commenced with mining and milling of 4 million tonnes (Mt) of ore. Under restricted operations, tailings, process water, and Mine contact water have been pumped and stored in Springer Pit. In April 2016, authorization was received to allow 5 Mt of ore to be processed, which would allow mining to continue under restricted operations until late June 2016.

A Veolia Actiflo® water treatment plant (WTP) was commissioned in December 2015, and discharge of treated Mine water from the Perimeter Embankment Till Borrow Pond (PETBP) commenced. The design capacity of the WTP is 0.23 cubic metres per second (m^3/s), but actual performance achieved closer to 0.18 m^3/s in the current configuration. In May 2016, a direct pipeline from Springer Pit to the WTP was installed to maximize the effective discharge rate. On 11 March 2016, MPMC obtained a temporary authorization to bypass the WTP, provided water quality and total flow limits in the EMA Permit 11678 are met. To date, this bypass has not been used and all discharge is through the WTP. In recent weeks, flows near the Permit limit of 0.3 m^3/s have been achieved by passing the water conveyed directly from Springer Pit through the WTP in "passive mode". The allowable maximum annual discharge is currently 9.47 Mm^3 (0.3 m^3/s). The water balance model assumes that the maximum annual discharge will be increased to 10.4 Mm^3 (0.33 m^3/s) after 1 July 2016.

Mine effluent is discharged into the upper Hazeltine Creek channel, which flows to a diffuser at Quesnel Lake. The design capacity of the diffuser is 0.6 m^3/s, and during high flows in Hazeltine Creek, the discharge of Mine water is curtailed or halted to avoid overflow of Mine effluent to the surface of Quesnel Lake.

In 2015, a weir with a sluice gate was installed at the outlet channel of Polley Lake (Figure 3) to regulate flows to Hazeltine Creek. The sluice gate is currently operated to detain freshet runoff in Polley Lake to reduce peak flows and to release the flow over later summer, fall, and winter months. This allows increased discharge of Mine effluent during the freshet period (April to June). The weir also allows detainment of flows to accommodate ongoing construction associated with creek rehabilitation following the TSF foundation failure. Discharge to Quesnel Lake via the Hazeltine Creek channel is scheduled to continue until November 2017, then a pipeline is proposed to convey Mine effluent directly to the diffuser in Quesnel Lake, which would allow Hazeltine Creek to be rehabilitated for fish access.



LEGEND

- SITE LOCATION
- ROAD
- WATERCOURSE
- WATERBODY

0 25 50

1:1,250,000 KILOMETRES

REFERENCES

1. INSET MAP DATA OBTAINED FROM GEOBASE®.
2. BASEMAP OBTAINED FROM ESRI. USED UNDER LICENCE, ALL RIGHTS RESERVED.
3. ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM IHS INC.
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT

MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT

WATER MANAGEMENT PLAN - SITE WATER BALANCE MODEL

TITLE

LOCATION OF MOUNT POLLEY MINE

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-05-29
DESIGNED	JR
PREPARED	CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	CONTROL	REV.	FIGURE
14-11734	12000	0	01

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\Imperial_Metals_Corp\Mount_Polley_Mine\99_PROJECTS\14-11734\02_PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\14117342_12000_FIG_1_PROJECT_LOCATION.mxd

LEGEND

WATER COLLECTION SYSTEMS

- CLEAN WATER DITCH
- CONTACT WATER DITCH
- PIPELINE
- CONTOUR (10m)

0 750 1,500

1:30,000 METRES

REFERENCES

1. CONTOURS AND PROJECT IMAGERY OBTAINED FROM SNC LAVALIN (2014)
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT
WATER MANAGMENT PLAN - SITE WATER BALANCE MODEL

TITLE
MINE SITE LAYOUT

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-06-09
DESIGNED	APB
PREPARED	RH / CD
REVIEWED	RM
APPROVED	RM

PROJECT NO.	CONTROL	REV.	FIGURE
14-11734	12000	0	02

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Figure 3: Polley Lake Weir with Sluice Gate for Controlled Release of Flow

3.0 CLIMATE AND HYDROLOGY

3.1 Climate

The Mine is in the Cariboo region of British Columbia, approximately 56 km northeast of Williams Lake. This region experiences high spatial climate variation due to its topographical complexity. MPMC has operated climate stations on site since 1995, although records are not continuous. From 1995 through 2012, MPMC maintained one climate station at the mill site that measured and recorded rainfall and temperature. In 2012, this was replaced with two stations: one near the mill site and one adjacent to the TSF. These new stations measure and record wind speed and direction, relative humidity, solar radiation, temperature, and rainfall. The details of these stations are shown in Table 1. The locations of the Mine weather stations are shown in Figure 4, and climate data are provided in Attachment B.

The climate of the Mine site was characterized using the Environment Canada (EC) station in the nearby community of Likely, as well as the three on-site climate stations.

Table 1: Local and Regional Climate Stations for the Mount Polley Mine

Station Name	ID	Northing (m N)[a]	Easting (m E)	Elevation (masl)[b]	Data Type	Period of Record
Likely	1094616	5828785	599332	724	Temperature, rainfall, snowfall, total precipitation	1974–1993
Mill Site Weather Station	N/A	5822420	592495	1,181	Rainfall, temperature	1995–2012
Weather Station #1 (near mill)	N/A	5822420	592792	1,171	Rainfall, temperature, relative humidity, solar radiation, wind speed, wind direction	2012–present
Weather Station #2 (TSF)	N/A	5819955	594059	964	Rainfall, temperature, relative humidity, solar radiation, wind speed, wind direction	2012–present

a) UTM Coordinate system - Zone 10U.

b) Elevation for on-site climate stations measured with handheld GPS device.

masl = metres above sea level; N/A = not applicable; TSF = Tailings Storage Facility.

During the winter, snowpack is measured at four snowcourse sites at least once per month, with more frequent measurements typically being recorded during the snowmelt phase. The details of these stations are provided in Table 2, and their locations are shown on Figure 4.

LEGEND

- CLIMATE STATION
- CONTOUR (10m)

0 750 1,500

1:30,000 METRES

REFERENCES

1. CONTOURS AND PROJECT IMAGERY OBTAINED FROM SNC LAVALIN (2014)
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT
WATER MANAGMENT PLAN - SITE WATER BALANCE MODEL

TITLE
MOUNT POLLEY CLIMATE AND SNOWCOURSE STATIONS

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-06-02
DESIGNED	APB
PREPARED	CD
REVIEWED	RM
APPROVED	RM

PROJECT NO.	CONTROL	REV.	FIGURE
14-11734	12000	0	04

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\14111734\PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\1411734_12000_FIG_4_CLIMATE_STATIONS.mxd

Table 2: Local Snowcourse Stations at the Mount Polley Mine

Station Name	ID	Northing (m N)[(a)]	Easting (m E)	Approximate Elevation (masl)[(b)]	Period of Record
Snowcourse # 1 (near Mill)	N/A	5823182	592792	1,171	1997–2010, 2015–current
Snowcourse # 2 (near TSF)	N/A	5819976	594092	964	1997–current
Snowcourse # 3	N/A	5823895	593632	976	2012–current
Snowcourse # 4	N/A	5823537	590835	1,112	2015–current

a) UTM Coordinate system - Zone 10U.

b) Elevation for on-site climate stations measured with handheld GPS device.

masl = metres above sea level; N/A = not applicable; TSF = Tailings Storage Facility.

3.1.1 Temperature

The community of Likely is approximately 9 km northeast of the Mine at 724 metres above sea level (masl). The elevation of the Mine ranges from about 920 masl to 1,200 masl, and therefore the average temperatures are generally 0.3 to 1.0°C cooler than recorded at Likely.

Monthly values for the Likely climate station are shown in Table 3. Temperatures at Likely are generally mild to cold, with average monthly temperatures ranging from 15.1°C in July to -6.6°C in January.

Table 3: Likely Climate Station Monthly Temperatures (1974 to 1993)

Month	Temperature (°C)		
	Average	Maximum	Minimum
January	-6.6	-2.9	-11.1
February	-4.5	0.6	-9.4
March	-0.8	5.8	-6.0
April	4.0	11.3	-2.1
May	9.1	16.3	2.3
June	12.8	19.8	6.0
July	15.1	22.7	8.1
August	15.1	22.3	7.8
September	10.7	17.3	4.0
October	4.7	10.6	0.1
November	-1.3	2.4	-4.8
December	-5.6	-2.1	-9.2
Annual	**4.4**	**10.3**	**-1.2**

3.1.2 Precipitation

Long-term precipitation time series representative of the climate conditions at the Mine were derived using the long-term regional data from the Likely station (1974 to 1993) and available local data from the three Mine climate stations (1995 to 2015).

The Mine experiences high summer precipitation due to summer storms, with the lowest precipitation occurring in February. Precipitation typically occurs as snowfall starting in November and accumulates until March. Average annual precipitation at the Mine is estimated to be 670 mm. Estimated 1:200-year dry, average, and 1:200-year wet precipitation depths are shown in Table 4.

Table 4: Long-Term Precipitation at the Mount Polley Mine (1974 to 2015)

Month	Precipitation (mm)				
	Average	1:200-Year Dry	1:25-Year Dry	1:25-Year Wet	1:200-Year Wet
January	50.8	26.9	33.3	72.0	82.9
February	37.5	19.8	24.5	53.1	61.1
March	42.8	22.7	28.0	60.7	69.8
April	49.5	26.2	32.4	70.2	80.7
May	53.5	28.3	35.1	75.8	87.3
June	78.2	41.4	51.3	111	128
July	58.9	31.2	38.6	83.4	96.0
August	52.2	27.6	34.2	73.9	85.1
September	48.2	25.5	31.5	68.3	78.6
October	58.2	30.8	38.1	82.5	94.9
November	53.5	28.3	35.1	75.8	87.3
December	85.6	45.3	56.1	121.3	140
Annual	**670**	**354**	**438**	**948**	**1091**

Note: No precipitation data were available for 1994. Includes Likely climate station data (1974 to 1993).

The 1:25-year dry and wet, as well as the 1:200-year dry and wet precipitation values were determined by distributing the average annual precipitation (derived based on Likely and Mine stations) among the months based on average percentage of precipitation for each month.

3.1.3 Evaporation

Currently at the Mine, there are two climate stations that measure and record precipitation (rain), temperature, wind speed and direction, solar radiation, and relative humidity every 5 to 30 minutes. Lake (open water) evaporation is calculated based on measured climate parameters such solar radiation, wind speed, and temperature, using the Penman equation (Penman 1948). Lake evaporation estimates have been derived for 2005 through 2012. Lake evaporation shows a typical seasonal profile, with no evaporation in the winter months and maximum evaporation in the summer months. Average annual lake evaporation at the Mine is estimated to be 404 mm. Estimated average monthly and annual lake evaporation values are provided in Table 5.

Table 5: Estimated Monthly and Annual Lake Evaporation (1997 to 2012)

Month	Lake Evaporation (mm)
January	0
February	0
March	0
April	0
May	52.0
June	94.3
July	102
August	88.8
September	48.1
October	18.2
November	0.3
December	0
Annual	**404**

Note: Derived from data measured at on-site climate stations, pro-rated with long-term data from Likely Climate Station (19 years).

3.1.4 Future Climate Change Projections

Current operations are scheduled until 2020, and therefore adjustments for future climate change are not required. However, over the longer term into post-closure, climate change may become significant. Although the current water balance focuses on the current operations, pit lake filling (Section 6.6) extends several decades into post-closure; therefore, the potential effects of climate change should be considered.

The effect of climate change on precipitation and temperature can be assessed using results from global circulation models (GCMs) that have been run to forecast changes under different climate scenarios. The resolution of these models is typically spatially coarse. For example, the Canadian Earth System Model CanESM2 (Chylek et al. 2011) has a horizontal resolution of 310 km (2.81 degrees), which limits the application to local changes, particularly in mountainous environments. Statistical downscaling and interpolation techniques are available to provide greater resolution. An approach that is used in British Columbia is PRISM (Parameter-elevation Regressions on Independent Slopes Model), which is an expert system that uses point data and a digital elevation model to generate gridded estimates of climate parameters (Daley et al. 2002). In British Columbia and North America, PRISM-generated data for historical conditions and for future climate scenarios are available from the ClimateBC online resource (Wang et al. 2012).

PRISM-generated values from ClimateBC have been used to assess future changes to temperature and precipitation (Attachment G). Results from the CanESM2 are available for two scenarios: RCP 4.5 and RCP 8.5. RCPs (Representative Concentration Pathways) refer to climate scenarios and indicate the additional climate forcing (W/m^2) in the year 2100 (e.g., 4.5 W/m^2). RCP 8.5 is the more conservative (warmer) scenario (Figure 5), although there are indications that the projected CO_2 forcings for RCP 8.5 are too extreme to be realized (Inman 2011).

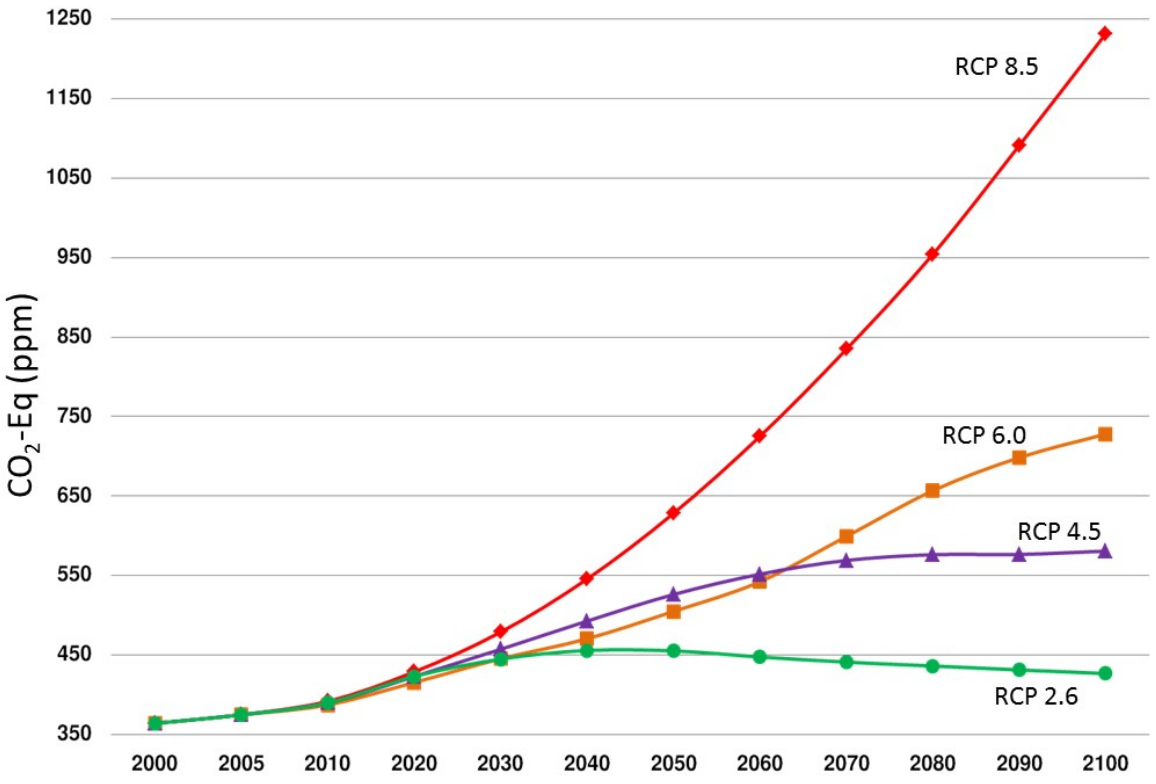


Figure 5: C02 Equivalent Climate Forcing's for Representative Pathway Concentrations (RCP) Scenarios.

Source: Moss et al. (2008).

Changes relative to current conditions were determined for the RCP 4.5 and RCP 8.5 scenarios for years 2025, 2055, and 2085. The relative changes determined from the ClimateBC data were added to the Current (2016) Mount Polley Mine monthly values to derive future average monthly and annual values for 2025, 2055, and 2085. The projected annual climate parameters for Current (2016) conditions and for RCP 4.5 and RCP 8.5 scenarios for 2025, 2055, and 2085 are summarized in Table 6. The climate change scenarios are based on the CanESM2 model values provided from the ClimateBC online resource. In general, the future climate change scenarios indicate warmer, wetter conditions, with increased evaporation and reduced snowfall.

Table 6: Projected Annual Mount Polley Climate from CanESM2 Model

Scenario	Year	Mean Annual Temp (°C)	Change in Mean Annual Temp (°C)	Precipitation (mm)	Rainfall (%)	Snowfall (%)[a]	Evaporation (mm)
Current	2016	4.4	0	670	67	33	404
RCP 4.5	2025	5.9	1.5	692	67	33	457
	2055	7.3	2.9	694	73	27	524
	2085	8.1	3.7	721	74	26	547
RCP 8.5	2025	6.0	1.6	689	67	33	458
	2055	8.4	4	718	74	26	557
	2085	11.1	6.7	742	84	16	644

a) After sublimation loss.

RCP = representative concentration pathway.

3.2 Site Drainage and Surface Hydrology

The Mine is drained by three main watersheds: the Hazeltine Creek (30.2 km^2) at Quesnel Lake, the Edney Creek (87.4 km^2) at Quesnel Lake, and the Morehead Creek (11.2 km^2) watersheds (Figure 6). The Hazeltine Creek watershed includes Polley Lake and conveys all water from Polley Lake, the east side of the Mine, and the area surrounding the TSF. The Morehead Creek watershed includes the Bootjack Lake catchment area (11.2 km^2). The watershed areas listed here exclude the Mine, which covers part of the original watersheds.

Both the Hazeltine Creek and the Morehead Creek watersheds were significantly altered by historical water diversions. Bootjack Creek, a small remnant of which now flows into Polley Lake via Bootjack Creek, historically conveyed water from Bootjack Lake to Hazeltine Creek. In 1913, flow from Bootjack Lake was reversed by miners (not associated with MPMC) damming the east end of Bootjack Lake and digging a new outlet westward to Morehead Creek. Around the same time, a water control structure was built at the outlet of Polley Lake (Hazeltine Creek), and Hazeltine Creek water was diverted to the Bullion Pit to support hydraulic mining. Flow from Polley Lake to Hazeltine Creek was restored with the abandonment of mining at the Bullion Pit during World War II. However, the flow from Bootjack Lake to Hazeltine Creek was never restored.

Prior to the TSF foundation failure, Edney Creek flowed into and Hazeltine Creek near Quesnel Lake. The mouths of the two creeks have now been separated, and Edney Creek and Hazeltine Creek now both discharge directly into Quesnel Lake.

Adopted design flows for Hazeltine Creek and other Mine drainages are provided in Table 7.

Table 7: Adopted Design Flows

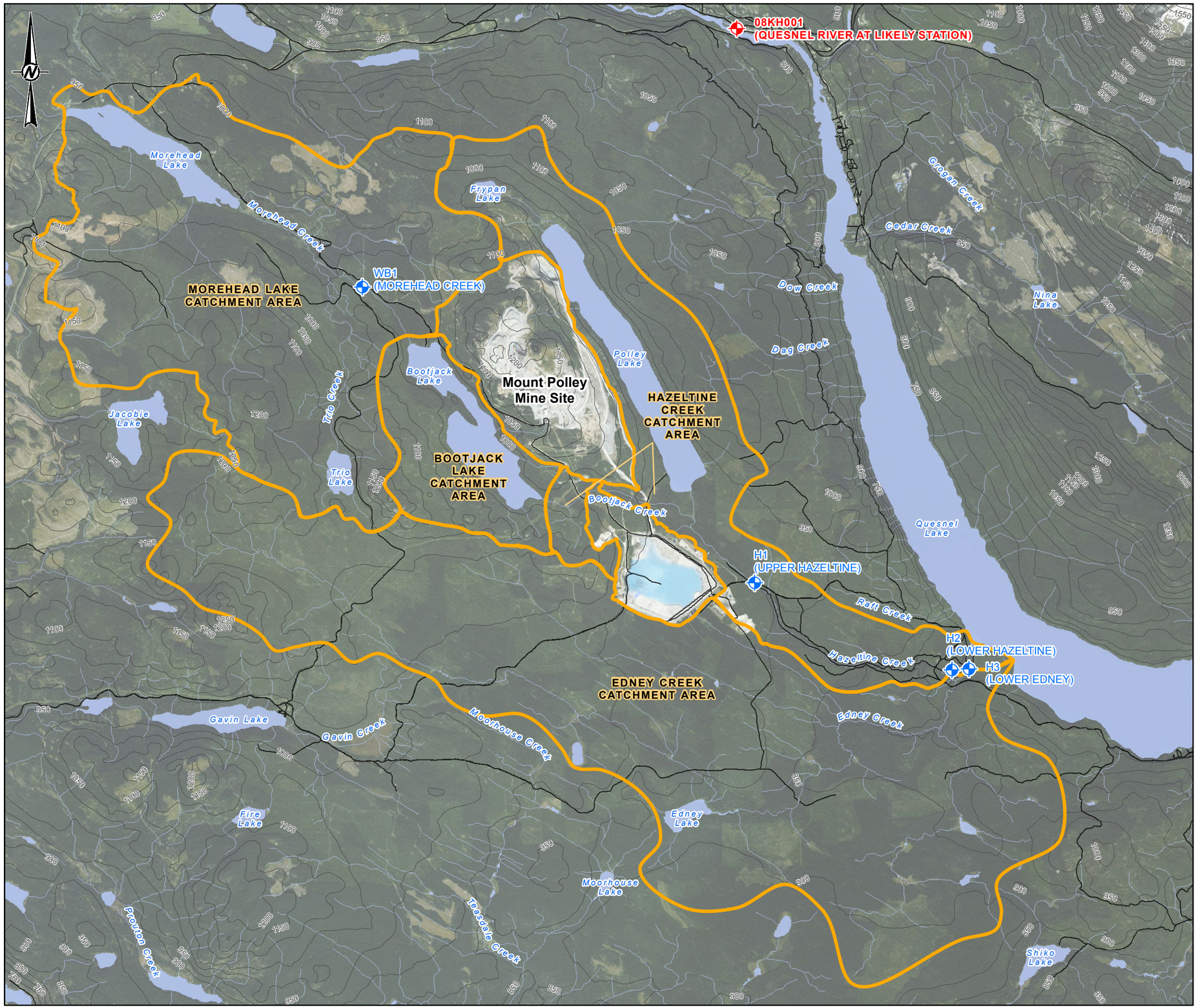
Location	Area[(a)] (km^2)	Discharge (m^3/s)						
		MAD	Mean 7-Day Low Flow	7Q10 Low Flow	MAF	Q10	Q100	Q200
Polley Lake Outlet (including Lake Area)	21.4	0.17	0.014	0.0015	1.5	2.3	3.4	3.6
Upper Hazeltine Creek Gauge (H1)	24.3	0.19	0.016	0.0017	1.6	2.5	3.7	4.0
Lower Hazeltine Creek (H2)	28.6	0.21[(b)]	0.018[(2)]	0.0019	1.8	2.8	4.2	4.5
Morehead Creek (outlet of Bootjack Lake)	11.2	0.09	0.007	0.0008	0.9	1.4	2.1	2.2
Edney Creek (above Hazeltine confluence)	87.4	0.68	0.058	0.0061	4.2	6.5	9.7	10.4

a) Catchment areas provided by MPMC.

b) Adjusted by a factor of 1.12 from H1 based on measured flows at H2.

Source: Golder 2015b.

MAD = mean annual discharge; MAF = mean annual flood; Q10 = 1:10-year flow; Q100 = 1:100-year flow; Q200 = 1:200-year flow; MPMC = Mount Polley Mining Corporation.



LEGEND

- MPMC HYDROMETRIC STATION
- ENVIRONMENT CANADA HYDROMETRIC STATIONS
- WATER CATCHMENT AREA
- CONTOUR (50m)
- ROAD
- WATERCOURSE
- WATERBODY

0 2 4

1:80,000 KILOMETRES

REFERENCES

1. CONTOURS, ROAD, WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT
WATER MANAGEMENT PLAN - SITE WATER BALANCE MODEL

TITLE
MAJOR DRAINAGES AND FLOW MONITORING STATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-06-02
DESIGNED	RM
PREPARED	RH / CD
REVIEWED	RM
APPROVED	RM

PROJECT NO.	CONTROL	REV.	FIGURE
1411734	12000	0	**06**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1in

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\1141380\1141734\PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\1411734_12000_FIG_5_MAJOR_DRAINAGE_FLOW_MONITORING.mxd

3.3 Pit Groundwater Hydrology

Groundwater flow has been assessed for these open pits at the Mine:

- Springer and Cariboo pits
- Wight Pit
- Boundary Pit

The analysis is described in a series of technical memoranda (Attachments C, D, and E) and summarized below.

3.3.1 Springer and Cariboo Pits

As of May 2016, all tailings and Mine water are being pumped to and stored in the Springer Pit. Dewatering of the Springer Pit commenced in December 2015 after a short-term approval to discharge treated Mine water was received by MPMC. For the modelling described in this document, tailings deposition in the Springer Pit will continue until late June 2016, when the TSF becomes operational. The water stored in the Springer Pit will be drawn down and discharged, and deposited tailings will be removed from the pit and transferred to the TSF. The Springer Pit and the Cariboo Pit will be mined to the ultimate depths of approximately 878 and 938 masl elevation, respectively.

During closure, the Springer Pit and the Cariboo Pit will be allowed to flood. Once the pit lake level is above approximately 1,028 masl, these two pit lakes will merge and form a single pit lake. The spillway for this pit lake will be approximately 1,050 masl. Potentially acid generating (PAG) materials will be placed in the combined Cariboo-Springer Pit at closure and stored underwater (Section 6.6) to mitigate acid generation and metal leaching, in accordance with standard Mine waste handling practices (MEND 2015).

A hydrogeological assessment was conducted to predict the quantity of long-term groundwater seepage from both the Springer and the Cariboo pits towards Bootjack Lake for the Phase 4 Cariboo-Springer Pit Mine plan (Golder 2016). The analysis considered placing waste rock in the ultimate pit prior to the pit lake formation. As the pit lake level increases between 1,020 masl and 1,030 masl, seepage in the range of 10 to 100 m^3/d from the Springer Pit Lake into the subsurface was predicted to occur (Table 8). Seepage was found to gradually increase to approximately 400 m^3/d when the pit lake reaches the spillway at 1,050 masl. In the Cariboo Pit, seepage towards the Bootjack Lake of approximately 20 m^3/d was predicted to occur only when the pit lake level approaches 1,050 masl. At this elevation, Phase 4 Cariboo-Springer Pit Lake was predicted to act as a “flow-through” lake with groundwater recharge occurring from the uplands, northeast from both pits, and recharge to groundwater occurring towards southwest.

Table 8: Predicted Groundwater Flows for the Springer and Cariboo Pit

Pit Lake Elevation (masl)	Springer Pit		Cariboo Pit	
	Groundwater Flow (m^3/d)		Groundwater Flow (m^3/d)	
Base Case	**Into the Lake**	**Out of the Lake**	**Into the Lake**	**Out of the Lake**
880 (dewatered pit)	520	0	600[(a)]	0[(a)]
940	510	0	610	0
960	490	0	610	0
980	460	0	590	0
1,000	420	0	540	0
1,020	320	10	460	0
1,030	300	100	420	0
1,040	280	250	380	0
1,050	270	400	320	20
Upper Bound				
1,050	440	880	500	90
Lower Bound				
1,050	190	220	250	0

a) These values represent conditions when the Cariboo Pit is fully dewatered (i.e., the base of the Cariboo Pit is at ~938 masl).

Source: Attachment C.

3.3.2 Wight Pit

Hydrogeological modelling was carried out for the Wight Pit (Attachment E). The results from the hydrogeological model indicate that under steady-state conditions, groundwater inflow to the Wight Pit is projected to gradually decrease from 2,600 m^3/d at of 880 masl, to 600 m^3/d at 926 masl (Table 9; Attachment E).

Table 9: Predicted Groundwater Flows for the Wight Pit

Pit Lake Elevation (masl)	Groundwater Flow (m^3/d)	
	Into the Lake	**Out of the Lake**
Base Case		
880	2,600	0
900	2,500	0
910	2,100	0
920	800	0
926	600	500
Lower Reasonable Bound		
926	400	300
Upper Reasonable Bound		
926	700	800

Source: Attachment E.

3.3.3 Boundary Pit

At present, hydrogeological data specific to the Boundary Pit are not available. However, MPMC indicated that seepage was not observed along the pit walls while mining. This is considered reasonable due to the relatively shallow depth of the Boundary Pit and depth to water table measured at monitoring wells that were installed near other Mine facilities. It is thus considered likely that the water table was located near or below the floor of the Boundary Pit before mining at this location commenced.

Although seepage to the Boundary Pit from the surrounding rock mass is not expected, seepage out of this pit could occur due to water entering this pit via surface water runoff and direct precipitation. The potential seepage rates out of the pit were estimated for input to the pit water balance and to characterize a potential seepage pathway originating from this pit (Attachment D).

Seepage rates out of the Boundary Pit were estimated from a Darcy's Law calculation that considers changes in the dimensions of the seepage area as the pit is being flooded. The estimated seepage rate from the Boundary Pit when the pit lake surface level is 5 m above its base (1,073 masl) is approximately 59 m^3/d, with a potential range between 35 m^3/d and 177 m^3/d due to uncertainty in bedrock permeability (Table 10). Seepage outflow is estimated to decrease as the height of water column above the pit bottom decreases as shown Table 10.

Table 10: Estimated Seepage Outflows from Boundary Pit

Surface Water Level (masl)	Estimated Groundwater Outflow (m^3/d)		
	Lower Bound	Base Case	Upper Bound
1,068	2	3	10
1,069	6	10	29
1,070	12	20	61
1,071	16	26	79
1,072	32	53	159
1,073	35	59	177

Source: Attachment D.

3.4 Seepage from the Tailings Storage Facility

Seepage from the TSF is collected in the seepage collection systems installed upstream and downstream of the till core. These systems drain to three seepage collection ponds (located downgradient of each of the South, Main, and Perimeter Embankments):

- Main Embankment Seepage Pond
- Perimeter Embankment Till Borrow Pond (PETBP)
- South Embankment Seepage Collection Pond

Data from the seepage collection systems before the TSF foundation failure were provided by MPMC staff. Approximately 87.2 liters per second (L/s) was measured to be draining to the three collection ponds before the TSF foundation failure.

A hydrogeological assessment was carried out to estimate the seepage rates and the potential seepage pathways from the TSF to the downgradient discharge areas during the closure phase (Attachment F). The assessment utilized a three-dimensional numerical model to represent the TSF and the surrounding areas based on the conceptual understanding of hydrogeological conditions that was derived using the available Mine data.

Figure 7 shows a time history of the Base Case predictions of seepage rates from the TSF. Similar to pre-TSF foundation failure operational conditions, groundwater flow towards the TSF was predicted to be generally from the northwest, originating from the area of Bootjack Lake and Mount Polley. Predicted groundwater flow within the TSF footprint was directed radially from the TSF towards Hazeltine Creek to the east, Edney Creek to the southeast, and Edney Creek tributaries to the southwest. The predicted average total seepage from the TSF in the first year of closure was approximately 47.2 L/s (Attachment F). The estimated seepage for each year of closure are provided in Attachment A.

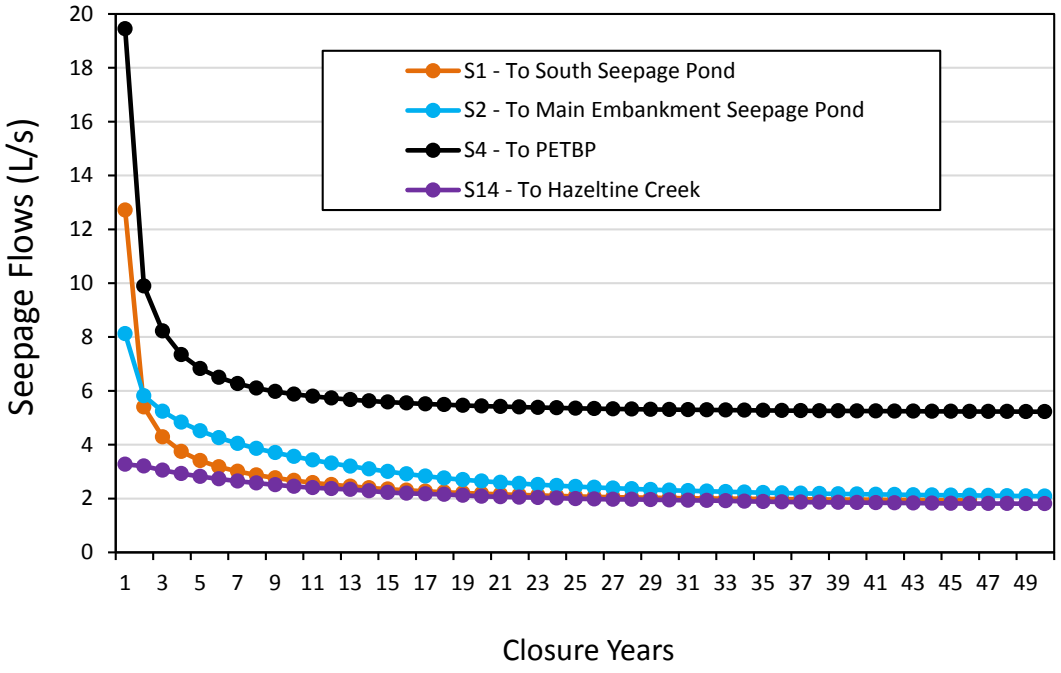


Figure 7: Seepage Flows from the Tailings Storage Facility during Closure

Source: Attachment F.

4.0 OVERVIEW OF MINE WATER MANAGEMENT AT MOUNT POLLEY

4.1 Objectives

The main objective of this LTWMP at the Mine is to define the practices that will help prevent the accumulation of contact water at the Mine, and to prevent unplanned and/or non-compliant releases of untreated contact water to the environment. The following strategies are proposed to meet this objective:

- to the extent practical, reduce the volume of non-contact water by diverting non-contact water away from disturbed areas
- treat and discharge excess Mine water so that minimal water accumulates with minimal carry-over from year to year, for conditions up to the 1-in-200-year wet conditions
- maintain a minimum pond volume of 1 Mm^3 in the TSF for the operation of reclaim pumps
- maintain adequate tailings beaches, with the goal of a minimum of 100-m-long beaches

There will be minimal storage of Mine water on site; however, during freshet (April through June) and extreme storm events, the volume of Mine water runoff will exceed the discharge and treatment capacity. Therefore, temporary detention of the freshet and extreme storm runoff volume will be necessary to equalize effluent discharge flows.

4.2 Surface Water Management

A network of channels, ponds, and pumping systems is operated by MPMC for managing surface water at the Mine. Surface water is segregated by contact and non-contact water:

- **Non-contact water**—water that has not been physically or chemically altered by mining or milling activities. Non-contact water is understood as runoff originating from upgradient areas unaltered by mining activity that does not come into contact with mining areas. It is typically diverted to the maximum extent practicable and allowed to discharge directly to the receiving environment (Figure 2).
- **Contact water**—water that may have been physically or chemically altered by mining or milling activities. This water generally requires treatment before releasing to the environment. To the extent practicable, contact water is recirculated for internal use to reduce the amount of fresh water supply from natural sources.

The contact/non-contact water systems are currently managed to minimize mixing of these waters. Examples include the following:

- keeping runoff originating from areas unaltered by mining activities (non-contact water) separate from areas altered by mining activities (contact water), and diverting it to the natural conveyance channels
- diverting runoff from waste rock dumps and other disturbed areas that could contain sediment
- detaining contact stormwater in the active pits, waste rock stockpiles, and other areas that could contribute contaminants to site water

On November 2015, MPMC received approval to discharge treated water to Quesnel Lake via the Hazeltine Channel up to a maximum rate of 0.3 m^3/s or 9.47 Mm^3/yr. The Mine began to discharge 1 December 2015. The installed WTP has been achieving an output of approximately 0.18 m^3/s. In March, MPMC received approval to bypass the WTP and discharge water directly from Springer Pit to the Hazeltine Channel as long as the effluent meets the bypass authorization and EMA Permit 11678 water quality limits; as of June 2016, this bypass has not been used. The Mine will be currently seeking an amendment to increase the maximum annual discharge by 10% to 10.4 Mm^3, which is equivalent to a sustained discharge of 0.33 m^3/s.

4.3 Groundwater Management

Groundwater that flows into the Springer Pit, the Cariboo Pit, and the underground workings are currently collected and mixed with Mine surface water for use as process water, or to be treated and discharged.

4.4 Mine Long-term Water Management Plan

This section provides a description of the proposed Mine LTWMP for the three mining phases:

- **Restricted Operations** will extend from present until early July 2016. Use of the TSF has not been authorized, and tailings and Mine water will continue to be deposited in the Springer Pit. A condition of the permit is that mining and milling shall cease if the Springer Pit Lake reaches an elevation of 1,030 masl (*Mines Act* Permit M-200). In March 2016, this was amended to allow the water level in the Springer Pit to increase to a maximum level of 1,042 masl until 31 August 2016. On 5 June 2016, the Springer Pit Lake elevation was 1,038.2 masl.
- **Full Operations** will extend from July 2016 until the second quarter of 2020. Full Operations will include:
  - Full mining and milling operations will resume, including deepening of the Cariboo and Springer Pits.
  - Tailings will be deposited in the TSF.
  - The Springer Pit will be dewatered.
  - Tailings previously deposited in the Springer Pit will be removed and transferred to the TSF.
- **Closure/post-closure phase**—the closure phase will extend from July 2020 to July 2030, and will include closure and reclamation activities as identified in the Mine Reclamation and Closure Plan (MPMC 2015). The post-closure period will continue indefinitely after the closure phase. Pit lakes will develop in the combined Cariboo-Springer Pit, the Wight Pit, and the Boundary Pit.

Summaries of tailings deposition during the restricted operations and full operations phases are in Table 11 and Table 12. A total of 33.9 Mt of tailings solids are to be deposited in the TSF under the current elevation 970 m design (Golder 2015a), which includes the tailings to be transferred from the Springer Pit.

4.4.1 Restricted Operations Phase

Prior to resumption of full mining, all mine contact water and tailings were deposited in Springer Pit for temporary storage. The tailings deposition schedule in the Springer Pit is shown in Table 11. The schedule is based on actual tailings deposition to 31 March 2016, and the MPMC Mine plan received 13 October 2015, and revised to 5 Mt.

Contact water from roads, haul roads, waste rock dumps, and other Mine areas north of Bootjack Creek either collects in sumps (Northwest [NW], 9K, Mine Drainage Creek, Mill Site, Wight Pit, Cariboo Pit) or flows directly to the Southeast Rock Disposal Site (SERDS), West, and Long ditches (Figure 2). The water that collects in the sumps is either pumped directly to the Springer Pit or to the SERDS, West, or Long ditches, which flow to the Central Collection Sump (CCS). Water in the TSF is currently pumped to the CCS. All water in the CCS is used for mill processing requirements, or reports to the PETBP for treatment prior to discharge to Hazeltine Channel. A direct pipeline from the Springer Pit to the WTP was commissioned in May 2016 to take advantage of passive settling of particulate matter in the pit, leading to better quality feed water to the WTP and increased flow rate through the WTP in “passive mode”.

The current *Mines Act* Permit M-200 authorizes mining and processing of up to 5 Mt for up to one year from the date of permit amendment (restricted operations) (July 9, 2015). The tailings deposition schedule for assumed restricted operations is shown in Table 11.

Table 11: Tailings Deposition in Springer Pit

Phase	Period	Tailings Solids (tonnes)
Restricted Operations	Total to Mar 2016	3,462,000
	April 2016	540,000
	May 2016	540,000
	June 2016	458,000
	Total	**5,000,000**

4.4.2 Full Operations Phase

Under full operations, the TSF will begin receiving tailings from July 2016, and tailings deposition in the Springer Pit will cease. The direct pipeline from Springer Pit to the WTP will remain operational until Springer Pit water is drawn down. Outside of the TSF, Mine contact water will either flow or be pumped to the SERDS and Long ditches, which flow to the CCS. Water from the CCS reports by gravity to the PETBP, where it will be treated and discharged though the pipeline from the Springer Pit to the WTP (Figure 2). When the inflows to the CCS exceed the discharge rate (typically during the freshet), excess contact water will be pumped to the TSF for temporary detention. At other times, water from the TSF will be pumped to the CCS for use in processing or treatment prior to discharge.

Mine water inflows into the TSF consist of:

- Water pumped with the tailings slurry.
- Precipitation and runoff into the TSF.
- Excess water pumped from the water management structures for temporary storage in the TSF, during the freshet and high precipitation events.
- Water pumped to the TSF to provide makeup water to meet process requirements and to maintain the minimum pond volume in the TSF necessary for operation of the reclaim pumps. This makeup water would typically be required during the winter and extreme dry years. Initially, makeup water will be drawn from the Springer Pit as it is dewatered. Predictions for Springer Pit dewatering are in Section 5.10. Later, makeup water will be drawn from Polley Lake (Section 6.4.1), if necessary.

The assumed tailings deposition schedule for the TSF during the full operation phase is shown in Table 12, which was based on the MPMC Mine plan received 13 October 2015. Total tonnage of tailings under the 970- masl embankment is 33.9 Mt, which includes 5 Mt of tailings that have been previously deposited in the Springer Pit. Currently, it is assumed that tailings in the Springer Pit will be pumped as a slurry to the TSF. Options for tailings removal are being assessed.

Table 12: TSF Tailings Deposition Schedule (Full Operations)

Phase	Period	Direct to TSF (tonnes)	Transferred from Springer Pit (tonnes)
Full Operations	2016 Q3	2,024,000	N/A
	2016 Q4	1,906,000	N/A
	2017 Q1	1,862,000	N/A
	2017 Q2	2,002,000	N/A
	2017 Q3	2,024,000	N/A
	2017 Q4	1,902,000	138,000
	2018 Q1	1,862,000	900,000
	2018 Q2	2,002,000	1,900,000
	2018 Q3	2,024,000	1,100,000
	2018 Q4	1,902,000	962,000
	2019 Q1	1,862,000	N/A
	2019 Q2	2,002,000	N/A
	2019 Q3	2,024,000	N/A
	2019 Q4	1,902,000	N/A
	2020 Q1	1,600,000	N/A
	2020 Q2	N/A	N/A
Total		**28,900,000**	**5,000,000**

4.4.3 Closure and Post-closure Phase

An updated Mine Reclamation and Closure Plan was prepared by MPMC (2015). The following objectives to the closure and reclamation have been identified:

- long-term preservation of water quality within and downstream of decommissioned operations
- long-term stability of the TSF
- removal of all access roads, ponds, ditches, pipelines, structures, and equipment not required during Mine closure
- long-term stabilization of all exposed materials that are susceptible to erosion
- establishment of a self-sustaining vegetative cover consistent with existing forestry, grazing, and wildlife needs
- natural integration of disturbed lands into the surrounding landscape and restoration of the natural appearance of the area

The following sections provide an overview of the closure and post-closure management strategies for the TSF and the pits. More detail regarding the closure and post-closure management of the Mine facilities is in the Mine Reclamation and Closure Plan (MPMC 2015).

4.4.3.1 Tailings Storage Facility

The surface of the TSF will be converted into a forested and wetlands site. Approximately 15% of the surface area of the TSF basin will be covered with water, with the remainder of the area being vegetated with indigenous species of trees, shrubs, and grasses. The pond level within the TSF will be controlled by an overflow spillway constructed at an abutment. The spillway will be sized to manage the probable maximum flood. The downstream embankment slopes will be pushed down to a slope of 2H:1V, and these slopes and the 3H:1V buttress slopes will be covered with selected overburden materials and seeded with grasses and legumes to provide a stable vegetation mat that resists erosion. The seepage collection ponds and recycle pumps will be retained after closure until monitoring results indicate that the water quality from the TSF is suitable for direct release to the environment.

The tailings deposition plan will maintain the supernatant pond at the centre of the facility, against the natural topography. Within the last year of deposition, prior to closure, the deposition plan will change to push the pond closer to Corner 5, where the spillway is located, and at the same time reduce the pond volume. The operational spillway will limit the size of the pond and maintain the majority of the tailings in an unsaturated state.

The tailings conveyance system will be removed immediately following cessation of operations. The reclaim barge, pumps, and pipeline will be utilized for supplementary flooding of the open pits, as required, and will then be removed. Once open pit flooding is complete, the surface water diversion channel will be regraded to allow natural runoff through the tailings area.

4.4.3.2 Pit Lakes

Approximately 191 ha of the Mine property are projected to be open pits at closure, which includes Cariboo-Springer Pit, Wight Pit, and Boundary Pit. All of the pits will be allowed to flood during closure, creating pit lakes.

Little or none of the upper pit walls can be reclaimed due to the steep terrain and poor access, and as permitted under Section 10.7.14 of the Health, Safety and Reclamation Code for Mines in British Columbia, they will not be re-vegetated. If any benches are safely accessible by foot at closure, they will be broadcast-seeded with a native grasses and forbs seed mixture, and potentially fertilized. If access allows, these areas will then be hand-planted with seedlings, which grow naturally on colluvial veneers and steep droughty sites in the region, such as of lodgepole pine, black cottonwood, sitka alder, and common juniper.

As described in Section 3.3, upon completion of operations, the Springer Pit will be allowed to flood and will spill over to the Cariboo Pit, and the two pits will form a single pit lake. Upon completion of underground operations (portal located in the bottom of the Wight Pit), the Wight Pit will be allowed to fill to the spillover into Polley Lake of 926 masl.

The Boundary Pit is a small pit (0.4 ha that will not be reclaimed), and observations throughout operations indicate that the water exists in a roughly steady state (does not overflow).

5.0 SITE WIDE WATER BALANCE MODEL

5.1 Model Software

An Excel-based deterministic SWWBM was originally developed by Knight Piésold Ltd. (KP 2004) for water management at the Mine. Over time, the model has been adapted by MPMC as the Mine has developed. The Excel-based water balance was designed to track and predict overall Mine water accumulation, and MPMC has previously used the Excel-based site water balance for operational and planning purposes.

A new site-wide operational and predictive water balance model has been developed by Golder using GoldSim™ (Version 11.1). GoldSim allows dynamic, complex interactions within the water system to be represented through a visual, modular framework. All input parameters and functions are defined by the user and are built as individual objects or elements linked together by mathematical expressions. GoldSim is widely used for mine water quantity studies. The GoldSim model now supersedes the Excel-based model. Benefits of converting the Excel-based water balance to GoldSim include the following GoldSim capabilities:

- Deterministic and probabilistic simulations can be run within the model, allowing statistics and probabilities to be assigned to the model outputs.
- Simulation periods can be varied within the same model.
- The model framework can be easily adjusted to account for changing/future conditions at the Mine, allowing the model to be used as an operational and planning tool.
- Water quantity and water quality modules can be directly linked, allowing both models to be updated simultaneously when evaluating various sensitivity scenarios of alternative water management strategies.

Hydrological parameters such as runoff coefficients, seepage flows, snow pack accumulation, and snowmelt have been largely retained from the Excel-based model.

5.2 Model Objectives

The SWWBM has been developed for the Mine with the following objectives:

- simulate current and future site water management, including a transition from restricted operations to full operations, and into closure and post-closure
- determine water detention requirements in the TSF
- develop strategies and assess timelines for Springer Pit dewatering
- determine pumping capacities between the TSF, Springer Pit, the CCS, the PETBP, and other major facilities at the Mine
- provide support for assessment of water treatment and discharge options
- couple with a water quality module to assess site and discharge water quality during operations and into closure and post-closure

The following sections are an overview of the SWWBM inputs and assumptions.

5.3 General Assumptions

General assumptions applied to model development were as follows:

- No seepage is lost from the ponds or sumps (i.e., all ponds and sumps are assumed to be lined).
- Direct precipitation, evaporation, and seepage loss from ditches are assumed to be negligible.
- Precipitation occurs as snow from December to February, and as rain or a mixture of rain and snow in all other months.
- Snowmelt occurs in the months of March, April, and May as a percentage of the maximum snowpack at the end of February (5% in March, 90% in April, and 5% in May).

5.3.1 Water Treatment Plant Operation

An amendment in November 2015 to Permit 11678 under the BC *Environmental Management Act* allows the Mine to discharge 9.47 Mm^3 of treated water per year (0.3 m^3/s) in the short term. Currently, feed water to the WTP is being sourced from Springer Pit.

Prior to 4 May 2016, Mine contact water from the PETBP was pumped to the WTP at a controlled rate. A direct pipeline from the Springer Pit to the WTP was completed 4 May 2016. The Actiflo system has a design flow rate of 0.23 m^3/s (20,000 m^3/d). The existing maximum authorized total discharge rate is 0.3 m^3/s. When feed water already meets Permit 11678 water quality limits, feed water flows exceeding the design flow may be passed through the WTP in a passive treatment mode as determined by online instrumentation, whereby reagents are not added and mechanical mixing is not active. Details are provided in Appendix E of the TAR (Operations Treatment). In recent weeks, discharge has averaged 0.29 m^3/s with the WTP operating in passive mode.

5.4 Model Scope and Flow Diagram

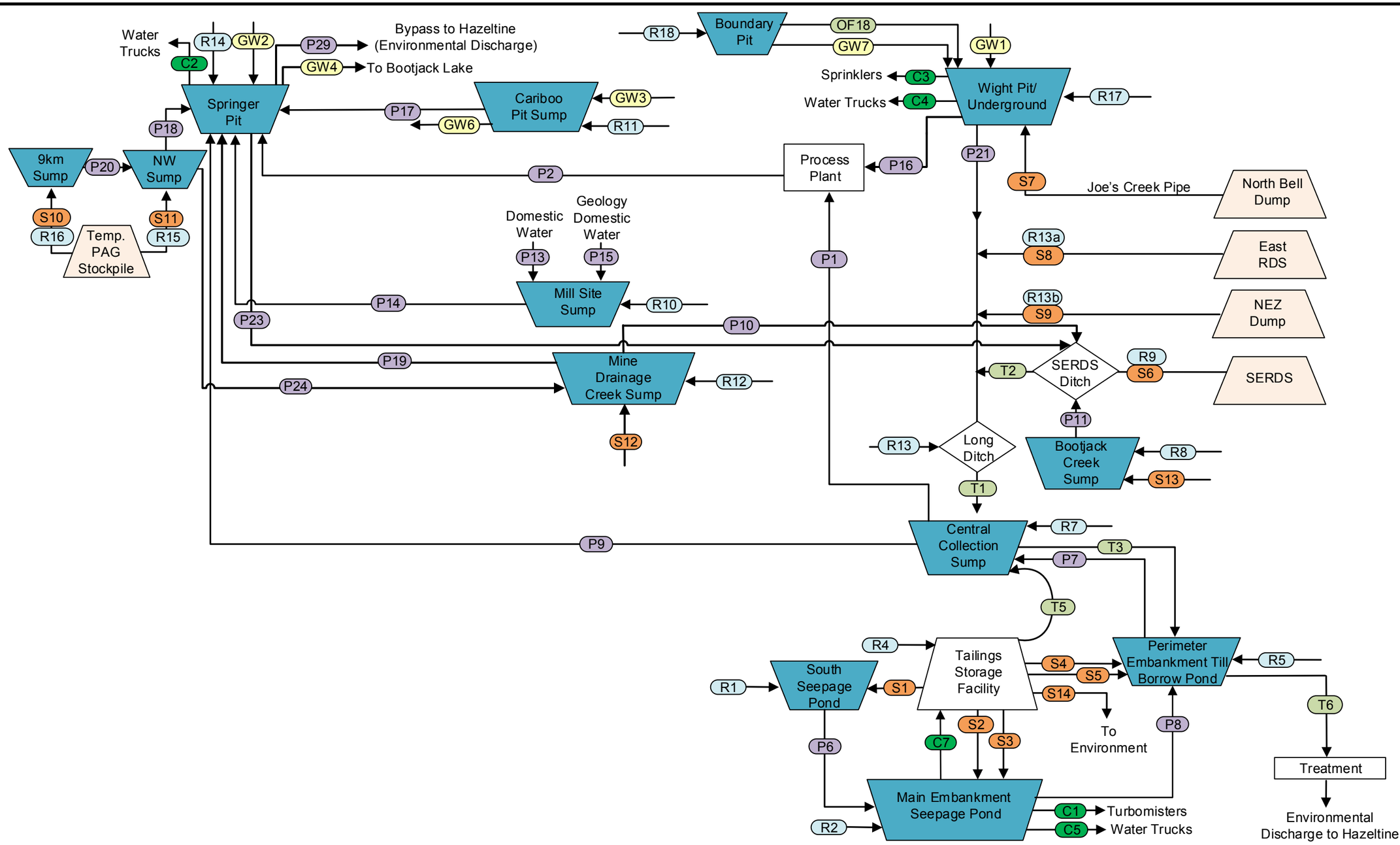
The scope and structure of the SWWBM is outlined in conceptual process flow diagrams for each phase of Mine life: restricted operations (Figure 8), full operations (Figure 9), closure (Figure 10), and post-closure (Figure 11). The flow diagrams illustrate the water circuit system at the Mine, including the operational storage and conveyance of water. The water management facilities within the SWWBM are:

- South Embankment Seepage Collection Pond (SESCP)
- Main Embankment Seepage Collection Pond (MESCP
- TSF
- PETBP
- CCS

- Bootjack Creek Sump
- SERDS Ditch
- Mill Site Sump
- Cariboo Pit Sump
- Mine Drainage Creek Sump
- Long Ditch
- Springer Pit
- NW Sump
- 9K Sump
- Wight Pit
- the Mill

The following flow types are represented in the model:

- direct precipitation and evaporation
- runoff
- seepage (includes baseflows)
- water consumption flows (turbomisters, sprinklers, and water trucks)
- pumped flows between facilities
- transfer flows (gravity flows between facilities)



Runoff (R)
Seepage Flow (S)
Water consumption (C)
Pumped Flows (P)
Groundwater Flows (GW)
Transfer Flows (T)
Flow Path

Note: Evaporation and Direct Precipitation are modelled for all ponds, but are not shown on this diagram

Golder Associates

CLIENT: Imperial Metals Ltd.
Mount Polley Mining Corporation

DRAWN: APB DATE: May, 19, 2016

CHECKED: RGM DATE: May, 19, 2016

SCALE: Not to Scale

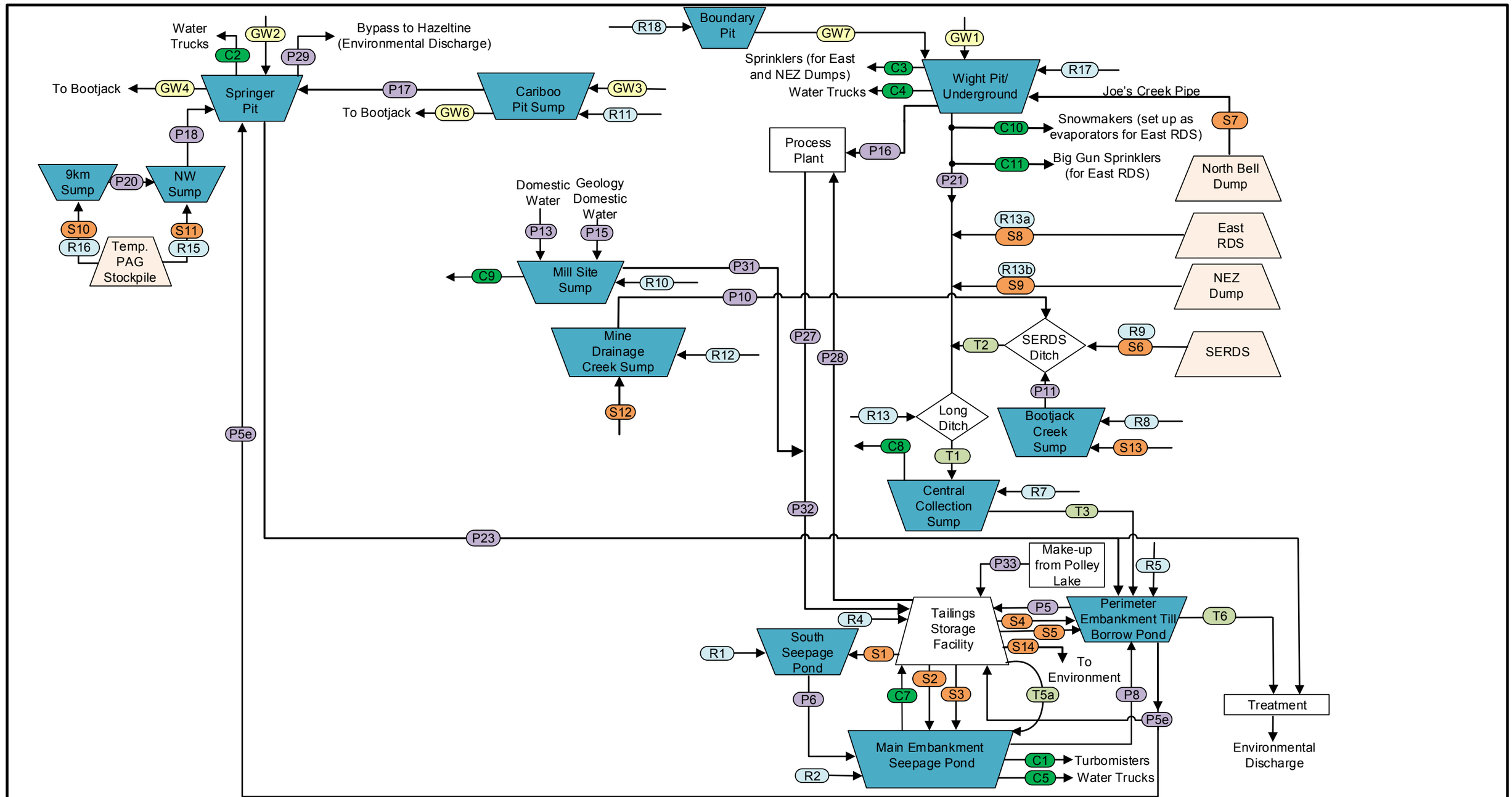
PROJECT No: 1411734/12000

FIGURE No: 8

REV No: 0

TITLE

Site Wide Water Balance
Restricted Operations
April 2016 – July 2016



Runoff (R)
Seepage Flow (S)
Water consumption (C)
Pumped Flows (P)
Groundwater Flows (GW)
Transfer Flows (T)
Flow Path

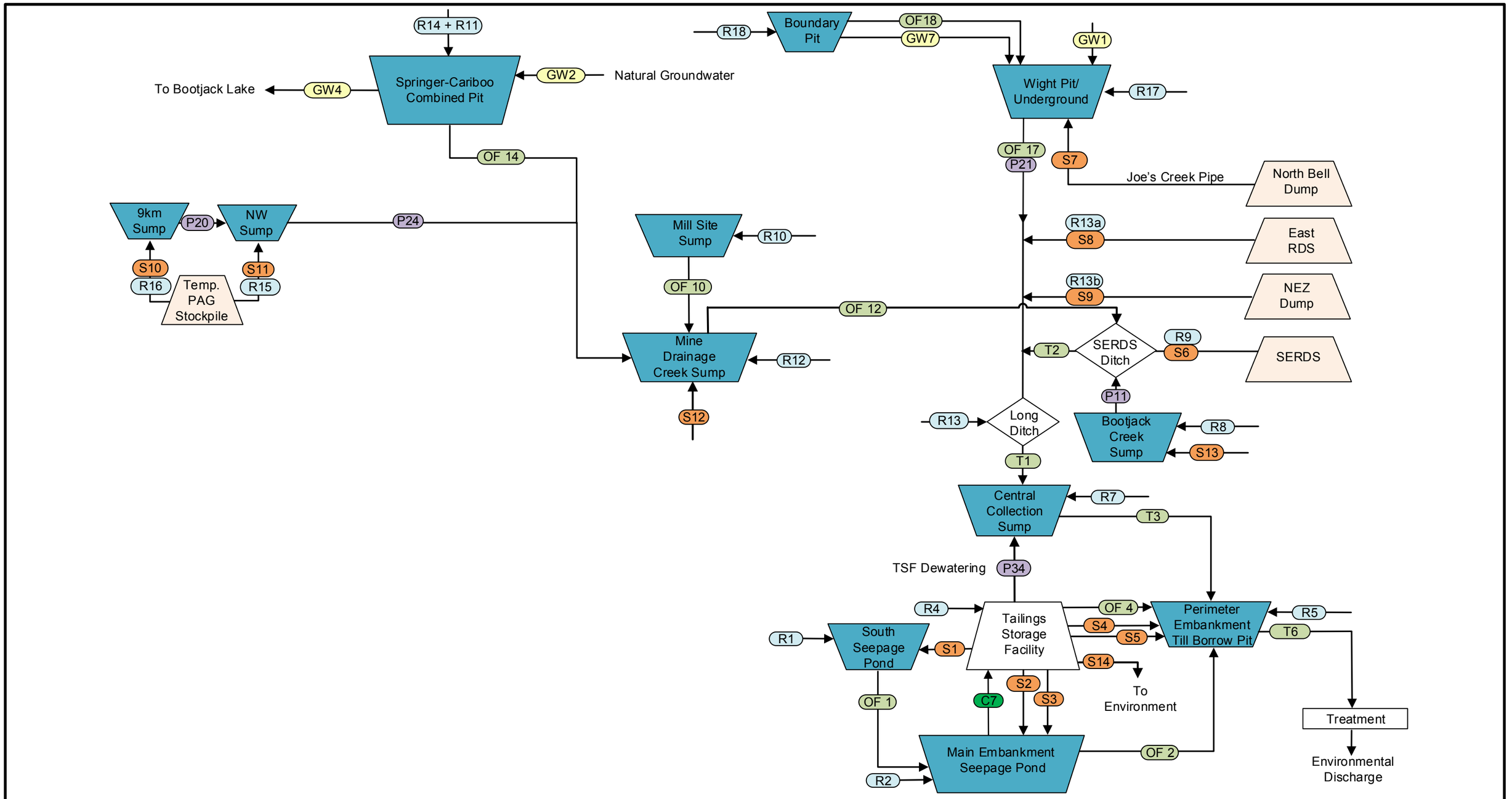
Note: Evaporation and Direct Precipitation are modelled for all ponds, but are not shown on this diagram

Golder Associates

CLIENT	Imperial Metals Ltd. Mount Polley Mining Corporation		
DRAWN	APB	DATE	Jun 08, 2016
CHECKED	RGM	DATE	Jun 08, 2016
SCALE	Not to Scale	PROJECT No	1411734/12000
FIGURE No	9	REV No	0

TITLE

Site Wide Water Balance
Future Operations
July 2016 – July 2020



Runoff (R)
Seepage Flow (S)
Pumped Flows (P)
Groundwater Flows (GW)
Transfer Flows (T) / Overflow (OF)
Flow Path

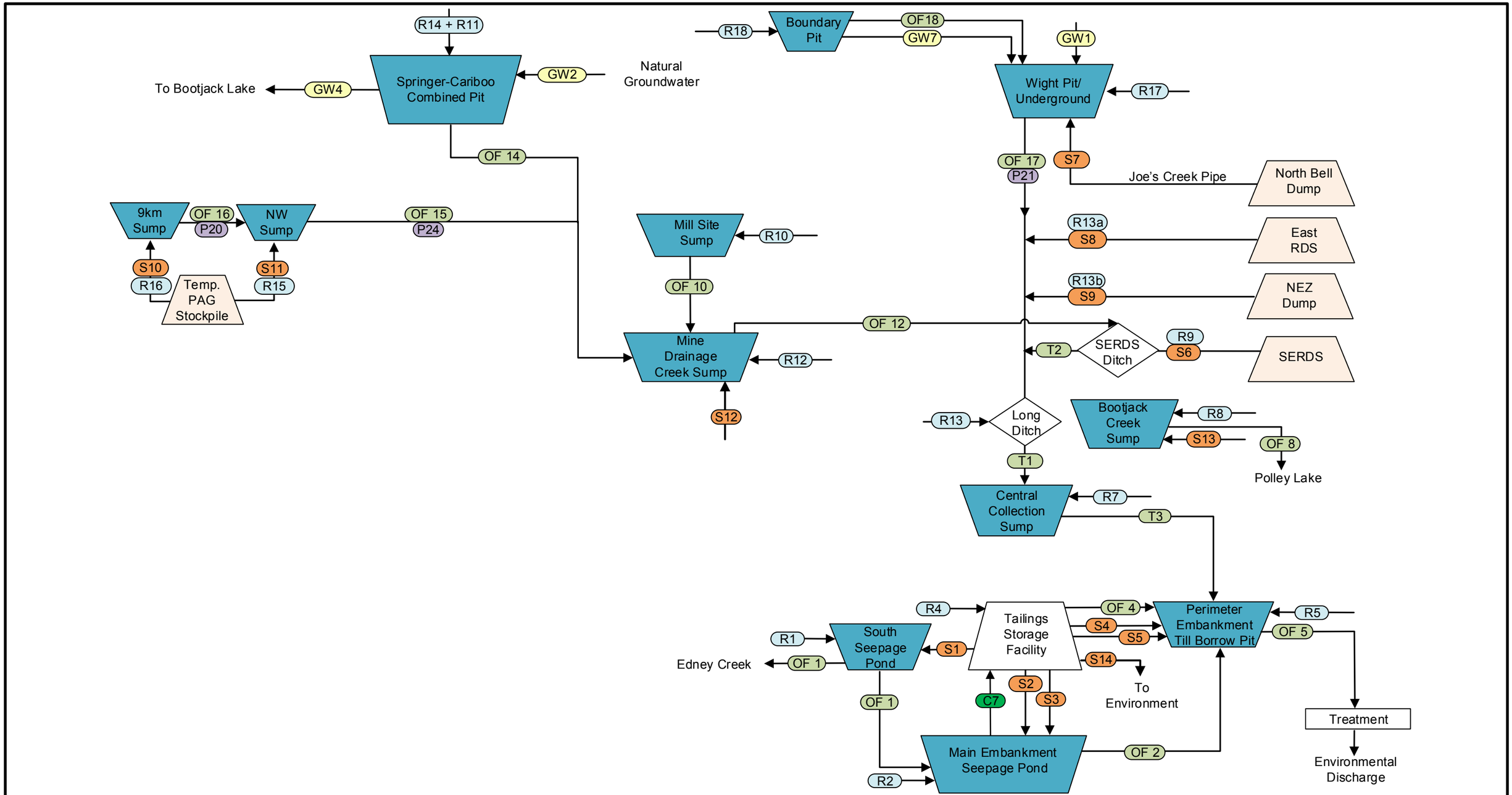
Note:
- Evaporation and Direct Precipitation are modeled for all ponds, but are not shown on this diagram.
- Temporary PAG Stockpile will be rehandled to Springer Pit starting Q4 2018

Golder Associates

CLIENT	Imperial Metals Ltd. Mount Polley Mining Corporation		
DRAWN	APB	DATE	May 19, 2016
CHECKED	RGM	DATE	May 19, 2016
SCALE	Not to Scale	PROJECT No	1411734/12000
FIGURE No	10	REV No	0

TITLE

Site Wide Water Balance
Closure
July 2020-July 2022



Runoff (R)
Seepage Flow (S)
Pumped Flows (P)
Groundwater Flows (GW)
Transfer Flows (T) / Overflow (OF)
Flow Path

Note:

- Evaporation and Direct Precipitation are modeled for all ponds, but are not shown on this diagram.
- Temporary PAG Stockpile will be rehandled to Springer Pit starting Q4 2018

Golder Associates

CLIENT	Imperial Metals Ltd. Mount Polley Mining Corporation		
DRAWN	APB	DATE	May 19, 2016
CHECKED	RGM	DATE	May 19, 2016
SCALE	Not to Scale	PROJECT No	1411734/12000
FIGURE No	11	REV No	0

TITLE

Site Wide Water Balance
Post-Closure
July 2022 Onwards

The SERDS Ditch and the Long Ditch have been included in the model as conveyance elements. They do not store water, but the model tracks the various inflows to these elements and transfers the cumulative flows to the CCS.

The primary flows in the model are summarized in Table 13. A complete list of flows for different Mine phases is provided in Attachment A.

Table 13: Primary Mine Water Flows

Flow Group	Component	Flow Label
Hydrology	Precipitation	N/A[a]
	Evaporation	N/A[a]
	Runoff	All flows labelled R[b]
Consumption	Sprinklers	C3,C7
	Turbomisters	C1
	Water truck usage	C2, C4, C5
Seepage (from TSF)	South Seepage Pond inflow	S1
	PETBP	S4, S5
	Main Embankment Seepage Pond	S2, S3
	Seepage to environment	S14
	Tailings drainage to CCS	T5
Groundwater flows	Wight Pit groundwater inflow	GW1
	Springer Pit groundwater inflow	GW2
	Cariboo Pit groundwater inflow	GW3
	Springer Pit groundwater outflow	GW4
	Cariboo Pit groundwater outflow	GW6
Pumped flows – outflows from Wight Pit	Process water	P16
	Dewatering to Long Ditch	P21
Pumped flows – inflows to Springer Pit	Tailings slurry from the mill	P2
	Pumped flow from CCS	P9
	Pumped flow from Mill Site Sump	P14
	Pumped flow from Cariboo Pit Sump	P17
	Pumped flow from NW Sump	P18
	Pumped flow from Mine Drainage Creek Sump	P19
Pumped flows – pit dewatering	Springer Pit lake dewatering to SERDS	P23
	Springer Pit lake dewatering to WTP	P29
Pumped flows – mill site and process flows	Process water from CCS	P1
	Geology domestic water effluent to Mill Site Sump	P15
	Mill domestic water into Mill Site Sump	P13
Pumped flows – outflows from TSF	Process water demand	P28
Discharge from PETBP	Treated discharge to environment	T6
Overflows	Wight Pit to Long Ditch	OF17
	Cariboo-Springer Pit to Mine Drainage Creek Sump	OF14
	TSF to PETBP	OF4
	PETBP to Environment	OF5

a) Evaporation and direct precipitation flows not shown on process flow diagram.

b) No flows were assigned specifically for snowpack. Instead, snowpack was accumulated in the model and applied to the runoff flows as snowmelt.

N/A = not applicable; TSF = Tailings Storage Facility; PETBP = Perimeter Embankment Till Borrow Pond; CCS = Central Collection Sump; SERDS = Southeast Rock Dump.

5.5 Climate Inputs

5.5.1 Deterministic Climate Inputs

The model features a deterministic mode, which allows the user to select from six predefined climate scenarios, as well as one custom (manual) input. The predefined climate scenarios are as follows:

- average annual precipitation data, derived based on long-term EC[1] and local data (as described in Section 3.1)
- current climate conditions—measured precipitation and evaporation data up to the end of September 2015, with average precipitation and evaporation used for subsequent months
- 1:25-year wet and dry annual precipitation (Table 4)
- 1:200-year wet and dry annual precipitation (Table 4)

A manual climate condition can be defined by the user to simulate actual weather forecasts or extreme events. Annual average lake evaporation is used for the deterministic mode, and snowpack is accumulated within the model based on the assumption that snow accumulates from December to February, with a 5%, 90%, and 5% melting in March, April, and May, respectively.

5.5.2 Stochastic Climate Inputs

GoldSim has stochastic elements, allowing uncertainty to be represented in model input data. GoldSim uses the Monte Carlo method to sample stochastic elements for probabilistic simulations. A stochastic generator was developed within the GoldSim SWWBM to probabilistically simulate natural climatic variation at the Mine. The stochastic generator operates on a monthly basis, and generates random sequences of monthly precipitation over the simulation period (one such random sequence is called a “realization”).

The benefits of the stochastic generator are as follows:

- The model generates precipitation inputs for each realization that are randomly drawn from a seasonally representative distribution.
- The statistics (i.e., mean and standard deviation) of stochastically generated values are representative of those of observed data.
- The approach can be used to generate multiple sequences of precipitation, each being equally likely as those that have occurred historically. GoldSim can then collate results for each rainfall sequence scenario to produce probabilistic results. As many time series can be generated, more extreme weather conditions (both wet and dry) can be simulated and tested in the SWWBM than are available in the measured historical precipitation data.

[1] https://wateroffice.ec.gc.ca/

An analysis of variance was performed on historical monthly precipitation data to test whether consecutive monthly precipitation totals were auto-correlated (i.e., whether one month was influenced by a previous month). It was important to determine whether there was auto-correlation to properly understand the underlying trends of the monthly precipitation time series. The analysis of variance confirmed that months were not auto-correlated.

The monthly values were then log-transformed, and the distribution of the values fit to a normal distribution. A normal distribution is a type of probability distribution (mathematical representation of the relative likelihood of an uncertain variable having specific values). All distribution types use a set of arguments to specify the relative likelihood for each possible value. The arguments for the normal distribution are the mean and standard deviation. The monthly means and standard deviations of the log-transformed monthly precipitation values were therefore determined. The standard deviations were adjusted based on trial and error so that the annual mean of the stochastically generated results agreed with the mean of the historical data. The monthly input arguments (mean and standard deviation) are shown in Attachment A.

The derived monthly means and standard deviations of the log-transformed precipitation values were defined in GoldSim's stochastic element to generate random values based on a normal distribution. The inverse logarithms were then determined for each generated value to calculate the monthly precipitation value (in mm). The stochastic generator was set to perform 1,000 realizations to create a sample size that was sufficiently large and accounted for a range of conceivable climatic scenarios for the study period.

Table 14 shows a summary of the precipitation depths generated by the stochastic generator and compared with the values obtained from frequency analysis of the historical annual data.

Table 14: Stochastic Climate Generator Statistics

Climate Scenario	Stochastically Generated Annual Precipitation (mm)	Historical Annual Precipitation (mm)
Average	668	670
1:200-year dry	419	354
1:25-year dry	482	438
1:25-year wet	918	948
1:200-year wet	1,086	1,091

5.6 Hydrology Inputs

The following sections describe the processes and inputs that define the hydrology in the model.

5.6.1 Runoff Parameters

Runoff in the SWWBM is estimated using seasonal runoff coefficients. Runoff coefficients represent the proportion of rainfall for runoff or seepage, and account for losses due to evaporation, storage, and infiltration. The runoff coefficients account for the following seasons:

- dry—July to October
- winter—November to February
- freshet—March to June

The runoff coefficients are defined for six catchment types:

- exposed tailings
- disturbed areas (cleared areas – not including pit surfaces, roads, or rock dump storage)
- rock disposal sites
- open pits
- undisturbed catchments
- haul and access roads

The seasonal runoff coefficients for each catchment type are presented in Table 15. The runoff coefficients were determined from the MPMC water balance model (largely based on a water balance prepared by KP [2004]) and revised based on runoff measurements and model calibration (Section 5.9).

Table 15: Seasonal Runoff Coefficients

Catchment Type	Dry	Winter	Freshet
Exposed tailings	0.3	0.6	0.9
Disturbed areas	0.0	0.3	0.9
Rock disposal sites	0.0	0.1	0.6
Open pits	0.5	0.75	0.9
Undisturbed catchments	0.35	0.4	0.42
Haul roads and access roads [(a)]	0.0	0.15	0.9
Mill site area [(a,b)]	0.0	0.1	0.1

a) Defined subsequent to the Knight Piésold water balance report (KP 2004).

b) Calibrated parameter.

A constant baseflow seepage depth of 25 mm/month (300 mm/yr) for rock disposal sites is included in the SWWBM to provide flows during the dry and winter months. The seepage value is based on measured flows in the NW Ditch and Long Ditch during the calibration period (Section 5.9). Seepage from the waste rock dumps to groundwater is assumed to be equal to the recharge value of 30% of the mean annual precipitation (Golder 2016).

5.6.2 Hazeltine Creek Flows

Until November 2017, effluent will be discharged to Quesnel Lake via the Hazeltine Creek channel. Mine effluent plus natural runoff is discharged to Quesnel Lake via a pipeline and diffuser, the intake of which is located at the upper sediment pond near the mouth of Hazeltine Creek. The design capacity of the diffuser is 0.6 m^3/s. As natural flows in Hazeltine Creek increase above 0.25 m^3/s, discharge from the Mine is curtailed to avoid Mine effluent reporting to the surface of Quesnel Lake. In addition, outflow from Polley Lake is regulated by a sluice gate and weir. Total live storage in Polley Lake is approximately 4 Mm^3; while effluent is being discharged to Hazeltine Creek, the sluice gate is assumed to temporarily store the freshet runoff into Polley Lake during April through June, and release this water over the remainder of the year. This allows increased discharge of Mine effluent through the diffuser during freshet. It will also allow flows to be regulated during instream construction, such as rehabilitation of fish habitat in Hazeltine Creek.

Until November 2017 (with the commissioning of direct conveyance between the Mine and the Quesnel Lake diffuser), discharge of Mine water will be affected by the flow in Hazeltine Creek. Stochastic flows are generated in the water balance to support a probabilistic assessment of Mine discharges and water quality for 2016 and 2017.

Runoff into Polley Lake is estimated using natural area runoff coefficients with a baseflow component. Direct precipitation and evaporation for Polley Lake are accounted for. The constant baseflow component was adjusted to give an average annual outflow of 0.17 m^3/s (Table 16).

Table 16: Annual Runoff (m^3/s) based on Derived Hazeltine Flows

Location	Area	Average	0.5 Percentile	99.5 Percentile
Outlet of Polley Lake	21.4[(a)]	0.17	0.06[(b)]	0.32[(c)]
Upper Hazeltine (H1)	24.3	0.19	0.07	0.36
Lower Hazeltine (H2)	28.6	0.21	0.09[(b)]	0.40[(c)]

a) Includes Polley Lake Area of approximately 4 km^2.

b) Scaled linearly by catchment area relative upper Hazeltine (H1) value.

c) Scaled proportional to the catchment area ratio to the power 0.75 relative upper Hazeltine (H1) value.

Source: KP 2014.

Downstream of Polley Lake, stochastic flows from the natural catchment areas were provided by scaling the average monthly flow by a scaling factor that is given by the ratio of the current monthly stochastic rainfall plus snowmelt, divided by the average rainfall plus snowmelt for that month. The objective of the stochastic analysis is not to forecast future rainfall and Hazeltine Creek flows, but rather to generate a series of realizations that capture the natural variability in Hazeltine Creek, and to link the stochastic Hazeltine Creek flow to the stochastic precipitation.

Summary of the generated monthly and annual stochastic flows in Hazeltine Creek are summarized in Table 17. Direct comparison with measured historical flows in upper Hazeltine is difficult, because the stochastic flows include the effect of Polley Lake weir regulation. The most appropriate comparison is the annual flow values. Average values show good agreement with the derived Hazeltine flows (Table 16); however, the range of variability of the stochastic flows for the 0.5 percentile and the 99.5 percentile is somewhat less than the variability predicted from frequency analysis (Table 17).

Table 17: Generated Stochastic Monthly and Annual Flows

Month	Polley Lake Outflow (m^3/s)			Upper Hazeltine Creek (H1) (m^3/s)			Lower Hazeltine Creek (H2) (m^3/s)		
	Average	0.5%	99.5%	Average	0.5%	99.5%	Average	0.5%	99.5%
Jan	0.15	0.07	0.19	0.15	0.08	0.19	0.16	0.08	0.20
Feb	0.15	0.07	0.19	0.15	0.08	0.19	0.16	0.08	0.20
Mar	0.20	0.09	0.52	0.20	0.09	0.55	0.21	0.09	0.57
Apr	0	0	0.31	0.04	0.01	0.40	0.08	0.03	0.49
May	0.01	0	0.38	0.08	0.02	0.52	0.16	0.04	0.70
Jun	0.05	0	0.77	0.09	0.01	0.92	0.14	0.02	1.07
Jul	0.17	0	0.64	0.19	0.01	0.71	0.21	0.01	0.78
Aug	0.19	0.02	0.54	0.20	0.02	0.57	0.20	0.02	0.59
Sep	0.28	0.09	0.94	0.29	0.09	0.97	0.30	0.09	1.00
Oct	0.32	0.13	0.79	0.33	0.14	0.81	0.34	0.14	0.84
Nov	0.35	0.15	0.85	0.36	0.16	0.88	0.37	0.16	0.91
Dec	0.15	0.07	0.19	0.15	0.08	0.19	0.16	0.08	0.20
Annual	**0.17**	**0.09**	**0.29**	**0.19**	**0.10**	**0.32**	**0.21**	**0.11**	**0.35**

5.6.3 Catchment Areas

To model runoff, direct precipitation, and evaporation, the catchment areas for each storage element were defined in the model. Delineated catchments are shown in Figure 12; catchment areas are shown in Table 18. A total area of 2,892,500 m^2 or 22% of the total Mine area reports directly to the TSF.

Table 18: Catchment Areas for Storage/Conveyance Elements

Storage/ Conveyance Element	Total Reporting Area (m^2)
South Seepage Pond	385
Main Embankment Seepage Pond	376,900
TSF upstream catchment	622,800
TSF	2,269,700
PETBP (includes foundation failure Sump)	524,300
Central Collection Sump	438,600
Bootjack Creek Sump	175,200
SERDS Ditch	1,537,600
Mill Site Sump	1,630
Cariboo Pit Sump	1,320,400
Mine Drainage Creek Sump	1,115,900
Long Ditch	2,494,000
Springer Pit	651,900
Northwest Sump	330,200
9K km Sump	698,800
Wight Pit	413,900
Boundary Pit	23,400
Total Reporting Area (m^2)	**12,995,500**

TSF = Tailings Storage Facility; SERDS = Southeast Rock Dump Site.

5.7 Storage Capacities

Storage curves were available for the following major storage elements:

- Springer Pit
- Cariboo Pit
- TSF
- PETBP

Details regarding the storage-elevation curves can be found in the Attachment A. The maximum capacities for the facilities listed above are presented in Table 19.

Table 19: Maximum Capacities for Major Storage Facilities

Storage Facility	Maximum Capacity (Mm^3)
Springer Pit[a]	14.8
Cariboo Pit [a]	5.2
Combined Phase 4 Cariboo-Springer Pit (end of currently permitted Mine life)	30.3
TSF – current layout [b]	2.1
PETBP	0.17
CCS (current volume – to continue during 970- masl embankment raise)	0.051

a) Represents current individual pit volumes (i.e., before pits are combined or further mined).

b) Capacity changes over the course of operations as tailings are deposited.

CCS = Central Collection Sump; masl = metres above sea level.

LEGEND

- WATER CATCHMENT AREA
- WATER COLLECTION DITCH
- CONTOUR (10m)

0 750 1,500

1:30,000 METRES

REFERENCES

1. CONTOURS AND PROJECT IMAGERY OBTAINED FROM SNC LAVALIN (2014)
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. DATUM: NAD 1983 UTM ZONE 10N

CLIENT

MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT

WATER MANAGEMENT PLAN - SITE WATER BALANCE MODEL

TITLE

WATER CATCHMENT AREAS

CONSULTANT

Golder Associates

YYYY-MM-DD	2015-05-29
DESIGNED	JR
PREPARED	RH
REVIEWED	RM
APPROVED	JV

PROJECT NO.	CONTROL	REV.	FIGURE
14-11734	12000	0	**12**

PATH: \\golder.gds\gal\burnaby\CAD-GIS\Client\14138303\11411734\PRODUCTION\12000_WATER_MANAGEMENT\MXD\Report\Water_Balance_Modelling_Report\11411734_12000_FIG_11_CATCHMENT_AREA.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 1in

5.8 Flow Derivation and Logic

This section describes the model logic for pumped, seepage (from the TSF), groundwater, consumption, and transfer flows. The derivation of runoff flows were discussed in Section 5.6.

5.8.1 Pumped Flows

Maximum pumping rates for each pumped flow are shown in Attachment A. With the exception of flows P13, P15, P16, and P19, which were measured at 545 m^3/d, 2.5 m^3/d, 7,631 m^3/d, and 4,360 m^3/d respectively, all maximum pumping rates have been assumed. Although pump specifications were available for several pumps on site, not enough information was available to determine the energy losses of the pumping systems. Therefore, assumed maximum pumping capacities were based on Golder's engineering judgement. The assumed pumping rates would not materially affect the results of the Springer Pit water level, or the predicted dates of reaching critical elevations under any scenario.

5.8.1.1 Operational Pumping Rules – Restricted Operations and Full Operations

In general, all water management facilities are pumped dry within the SWWMB. However, certain facilities have special operational pumping logic to manage high flows:

- **Wight Pit**—The Wight Pit has a maximum pumping capacity to the mill process water tank of approximately 0.09 m^3/s (P16). If inflow rates exceed this, the remaining water is diverted into the Long Ditch (P21).
- **PETBP**—Water is sent to the Main Embankment Seepage Pond (provided this pond is below freeboard elevation) to provide flow for the turbomisters and sprinklers on the TSF (P25). All excess water is then pumped to the CCS to be pumped to the Springer Pit (P7). There is approximately 170,000 m^3 of contingency storage in the PETBP. If this contingency storage is depleted, the CCS is full, and the pumps to the Springer Pit are operating at maximum capacity, water is pumped to the TSF for temporary detention (P5).

5.8.1.2 Operational Pumping Rules – Closure/Post-closure

All pumped flows will be terminated as of Closure (1 July 2020, in the model), with the exception of the following:

- 9K Sump to NW PAG Sump (P20)
- NW Sump to Mine Drainage Creek Sump (P24)
- Mine Drainage Creek Sump to SERDS Ditch (P10)
- Bootjack Creek Sump to SERDS Ditch (P11)
- Wight Pit/Underground to Long Ditch (P21)
- South Embankment Seepage Collection Pond to Main Embankment Seepage Collection Pond (P6)
- Main Embankment Seepage Collection Pond to PETBP (P8)

5.8.1.3 Mill Process Flows – Restricted and Full Operations

The mill process water requirements are based on 2.0 m^3/t of tailings. Interstitial water sequestered in the deposited tailings is based on 0.347 m^3/t of tailings deposited.

5.8.2 Tailings Storage Facility Seepage Flows

Seepage flows from the TSF (S1 to S5) have been measured for post-TSF foundation failure conditions by MPMC staff, and constant seepage rates based on these measurements have been applied in the model. During closure, seepage has been estimated from a three-dimensional numerical groundwater flow model based on available data and conceptual understanding (Attachment F). Seepage from the TSF has been defined to flow year-round in the SWWBM. The TSF seepage rates are presented in Section 3.4.

5.8.3 Consumption Flows

Consumption flows were calculated by MPMC staff, and are modelled according to the following logic:

- turbomisters operate from May to October
- sprinklers operate from July to October
- water trucks withdraw water at variable rates from July through October

Consumption flow rates are presented in Attachment A.

5.9 Model Calibration/Validation – Existing Conditions

The ability of the GoldSim SWWBM to replicate site conditions was assessed based on measured flows from the NW Ditch and the Long Ditch, and measured water elevations in the Springer Pit. The calibration period is September 2014 to April 2015. The primary parameters for calibration are runoff coefficients, and base flows for waste rock areas (Section 5.6.1). The validation period is from May 2015 to April 2016, and is based on pit lake elevation and accumulated volume of water and tailings in Springer Pit.

5.9.1 Northwest Ditch

Spot-measurements were available for the NW Ditch for the months of September, October, and November 2014, and for March and April 2015. A comparison between these spot-measurements and the average monthly results is shown in Figure 13. The comparison shows that the SWWBM captures the range of flows that occur in the NW Ditch.

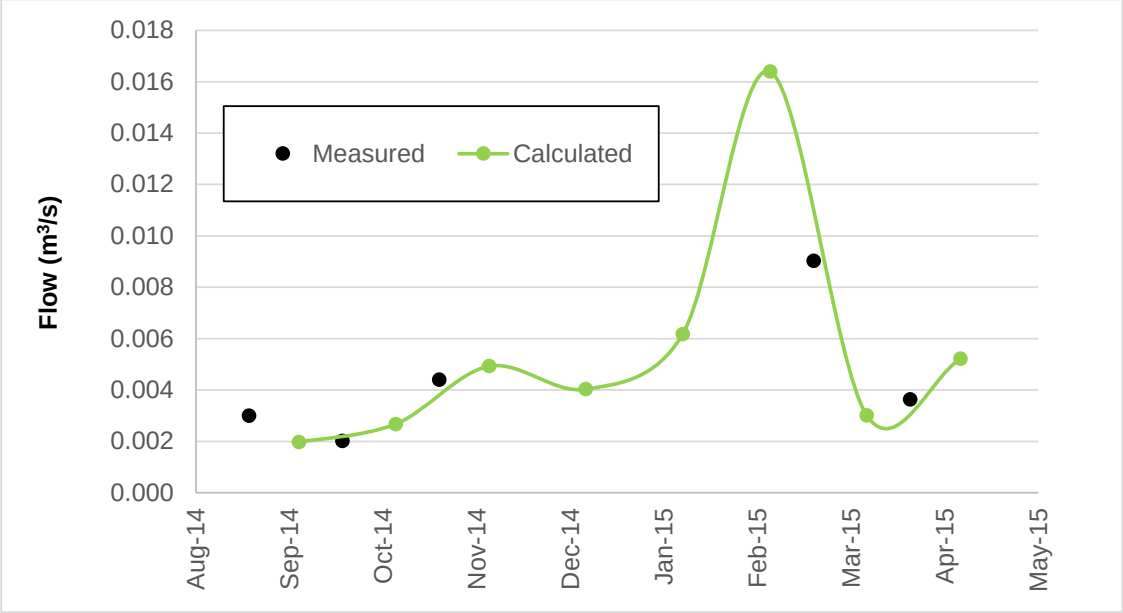


Figure 13: Northwest Ditch Measured Spot Flows and Calculated Flows between September 2014 and April 2015

5.9.2 Long Ditch

Spot-measurements were available for September 2014, as well as March and April 2015, for Long Ditch. A comparison between these spot-measurements and the average monthly results are shown in Figure 14. The SWWBM appears to possibly underestimate the flows in the freshet (although it is possible the synoptic measurements did not capture variability of freshet), but reasonably represents the flows during the dryer months of September 2014, as well as April 2015.

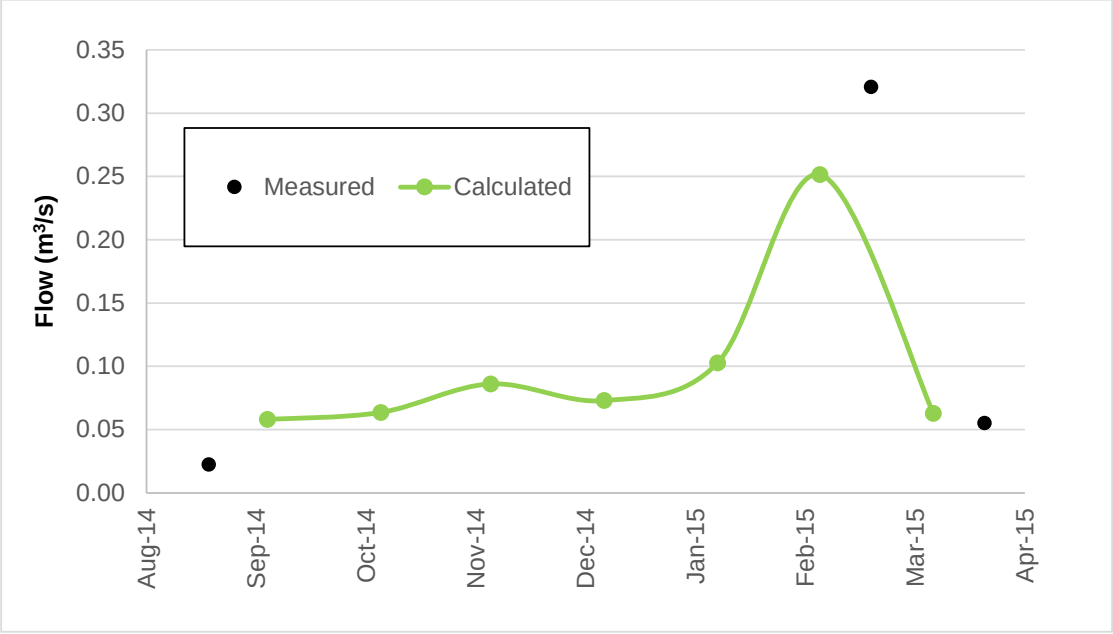


Figure 14: Long Ditch Measured Spot Flows and Calculated Flows between September 2014 and April 2015

5.9.3 Springer Pit

The measured and simulated Springer Pit lake elevations for the post-TSF foundation failure conditions through to April 1, 2016, are shown in Figure 15, and in Figure 16 for accumulated volume (water plus tailings solids). Simulated values have used measured monthly rainfall and snowmelt data provided by MPMC. The initial water elevation is 957.6 masl at the end of September 2014.

There is generally good agreement between simulated and modelled levels and volumes, although the water balance tends to overpredict water volume, and therefore produces conservatively high values. The largest discrepancy was during May and June 2015, when the measured inflow was 0.44 Mm^3, while the model predicted 1.32 Mm^3 of inflow (Table 20). Note that this was during an unusual period of weather in 2015, with early snowmelt (snowpack melted by end of March 2015) and extreme dry conditions from April 2015 through June 2015 (104 mm of rainfall or 57% of normal). For other months, the agreement between measured and calculated is generally good (Figure 17).

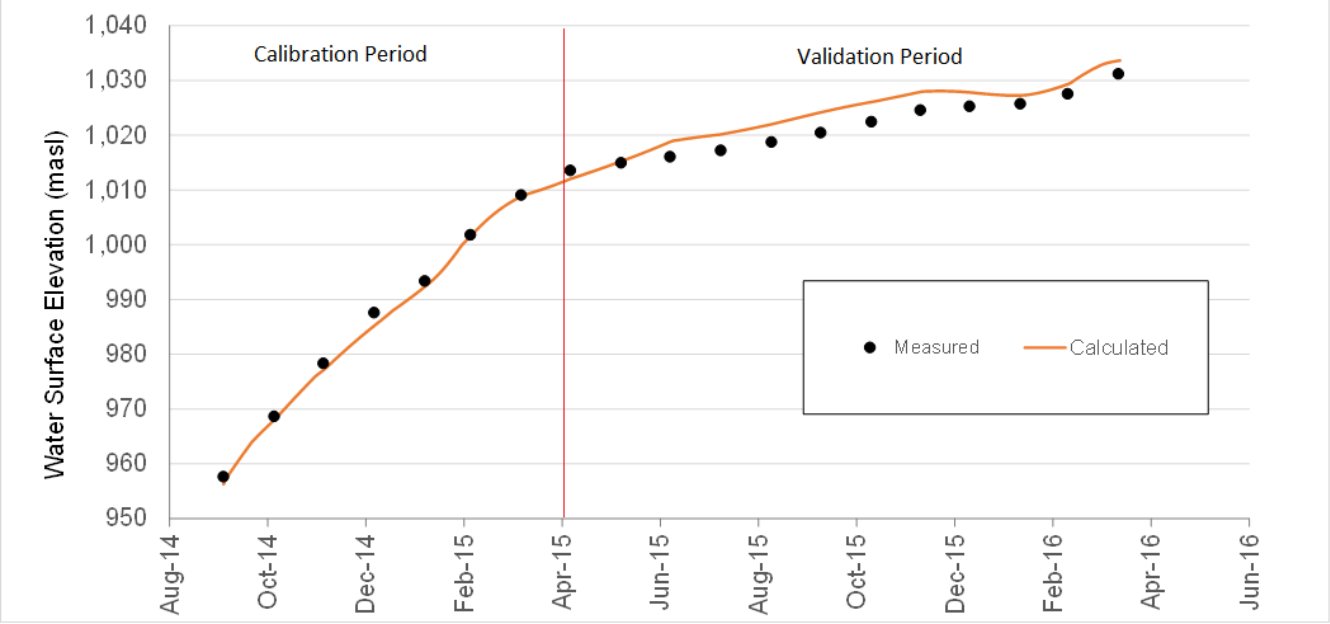


Figure 15: Comparison of Measured and Calculated Water Elevations for Springer Pit

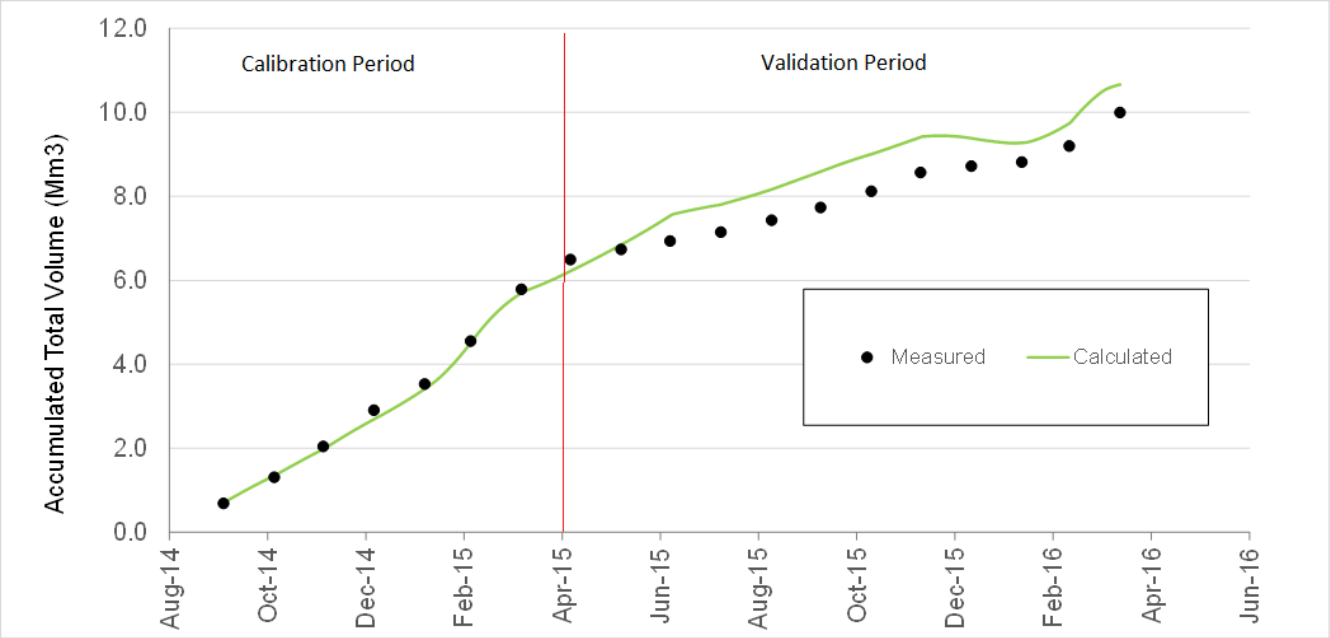


Figure 16: Springer Pit Accumulated Water Volume (Mm^3) since September 2014

Table 20: Monthly Changes in Springer Pit Lake, Total Volume (Mm^3).

Date	Period	Measured (1)	Calculated	Difference
Oct-15	Calibration	0.62	0.66	0.04
Nov-14		0.73	0.63	-0.10
Dec-14		0.87	0.71	-0.16
Jan-15		0.62	0.72	0.10
Feb-15		1.02	1.09	0.07
Mar-15		1.24	1.19	-0.05
Apr-15		0.71	0.53	-0.18
May-15	Validation	0.24	0.63	0.39
Jun-15		0.20	0.69	0.49
Jul-15		0.21	0.26	0.05
Aug-15		0.29	0.36	0.08
Sep-15		0.30	0.43	0.12
Oct-15		0.39	0.41	0.03
Nov-15		0.45	0.40	-0.05
Dec-15		0.15	-0.02	-0.18
Jan-16		0.09	-0.11	-0.20
Feb-16		0.38	0.46	0.08
Mar-16		0.80	0.92	0.12
	Total	**9.31**	**9.98**	**0.66**

1) Based on changes in lake elevation.

A statistical measure of model performance is the Nash-Sutcliffe efficiency (NSE) (Nash and Sutcliffe 1970). The NSE is similar to the coefficient of determination (r^2), but is a measure of the explained variance about the line of perfect agreement (Figure 17), rather than about the linear regression. Based on all months, the calculated NSE is 0.6686, with 1.0 being perfect model prediction.

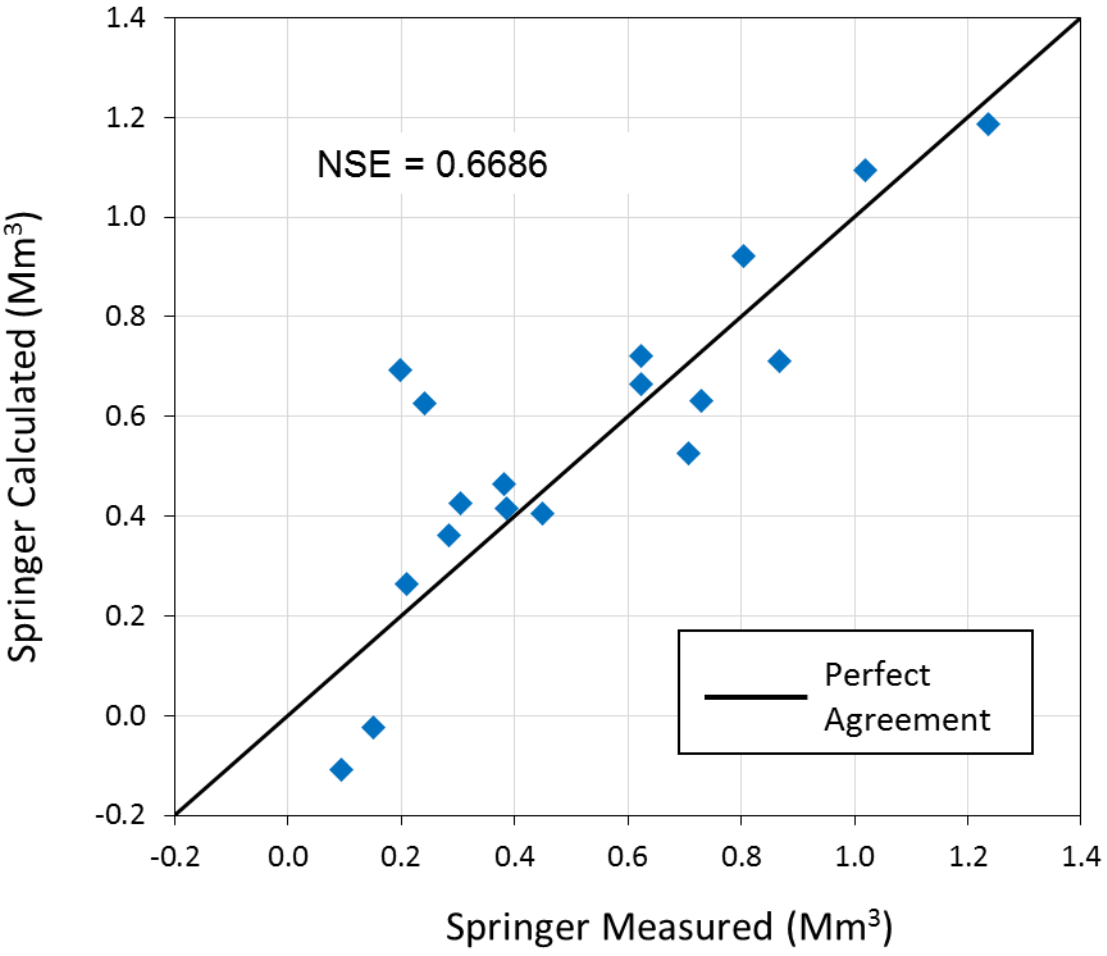


Figure 17: Monthly Change (Mm^3) in Springer Pit Lake Volume (water plus solids)

5.10 Model Simulation

The simulation was carried out for the period of 1 April 2016, to 31 December 2024, to capture the following Mine life stages:

- restricted operations–to 30 June 2016
- full operations–1 July 2016 to 30 June 2020
- closure/post-closure–1 July 2020 until attainment of steady state conditions

The model was run with probabilistic climate inputs for the purposes of this assessment. For each facility, water levels relating to the mean, 90th and 99.5 percentile climate conditions are shown. These results correspond to average, 1-in-10-year wet, and 1-in-200-year wet conditions, respectively. The model assumes that the current CCS and PETBP would remain in operation.

Model pond volumes and elevations were provided initial values as of 1 April 2016. The initial values are based on survey measurements provided by MPMC.

5.10.1 Assumptions

The following assumptions are incorporated into the model simulations:

- initial Springer Pit Lake volume as of 1 April 2016—9,997,500 m^3
- initial Cariboo Pit Lake volume as of 1 April 2016—364,600 m^3
- tailings tonnage stored in Springer Pit as of 1 April 2016—3.46 Mt
- snowpack as of as of 1 April 2016: stochastic generated
- volume stored in Polley Lake (live storage) as of 1 April 2016—0 m^3
- no rewetting of existing drained tailings in the TSF (also see Contingency 1, Section 6.5)
- WTP capacity as of 1 April 2016—0.30 m^3/s
- WTP capacity after 1 July 2016—0.33 m^3/s
- discharge of effluent to Hazeltine Creek channel until November, 2017
- direct pipeline from WTP to diffuser in Quesnel Lake operational 1 December 2017

6.0 RESULTS

Results are summarized in this section for the following:

- discharge quantity of treated Mine effluent
- Springer Pit dewatering
- TSF pond elevation and volume
- PETBP volume
- Polley Lake makeup water volume
- pit lake water elevation during closure

6.1 Discharge Quantity of Treated Mine Effluent

6.1.1 Full Operations

The daily variation in the total Mine water discharge for the mean, the 90th, and the 99.5 percentiles[2] during full operations is shown in Figure 18. Annual discharge volumes are shown in Table 21.

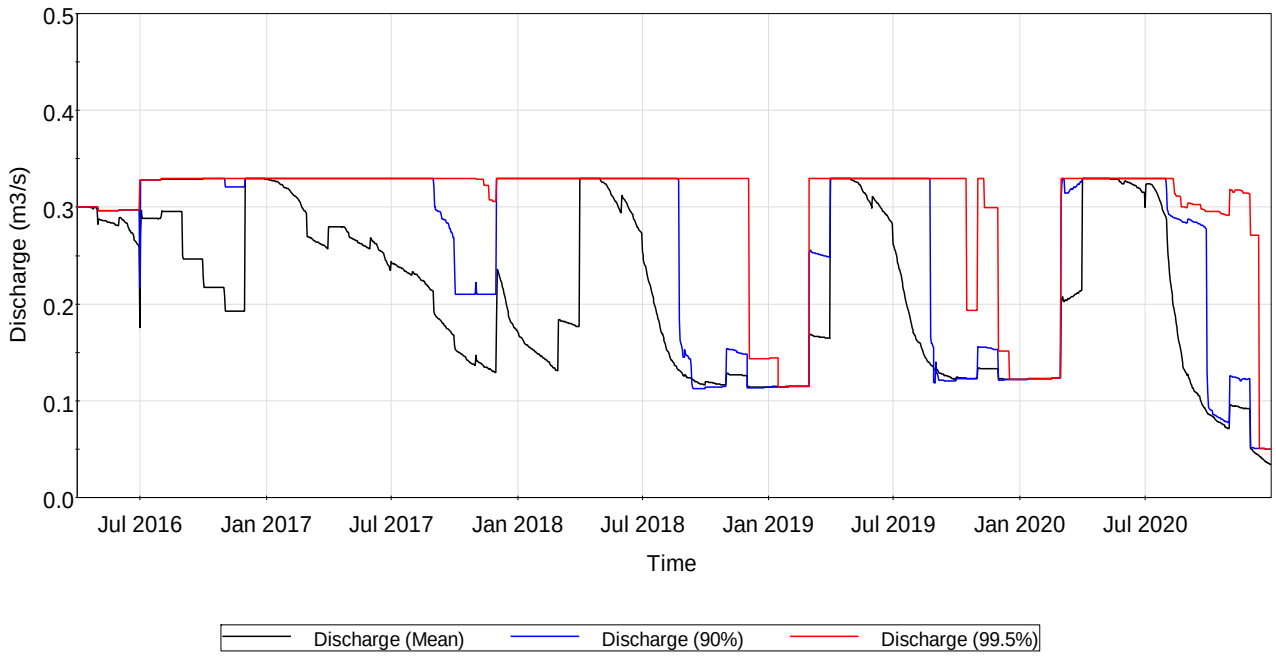


Figure 18: Discharge of Mine Water during Full Operations

[2] 90 and 99.5 percentiles correspond approximately to the 1:10-year wet and 1:200-year wet return periods, respectively.

Table 21: Annual Discharge of Mine Water during Full Operations

Year	Annual Discharge					
	Mean		90th Percentile		99.5 Percentile	
	m^3	m^3/s	m^3	m^3/s	m^3	m^3/s
2016	7,662,800	0.24	8,470,300	0.27	8,765,300	0.28
2017	7,379,300	0.23	8,864,200	0.28	9,914,100	0.31
2018	5,896,800	0.19	7,181,000	0.23	9,128,500	0.29
2019	5,805,000	0.18	6,573,600	0.21	7,912,900	0.25
2020	5,904,300	0.19	6,800,700	0.22	8,105,100	0.26

6.1.2 Closure/Post-closure

The daily variation in the total of treated plus bypassed Mine water discharge for the mean, the 90th, and the 99.5 percentiles during closure and post-closure to 2050 is shown in Figure 19. Annual discharge volumes are shown in Table 22. Annual discharge is reduced from 2020 to 2021 as the open pits are allowed to fill.

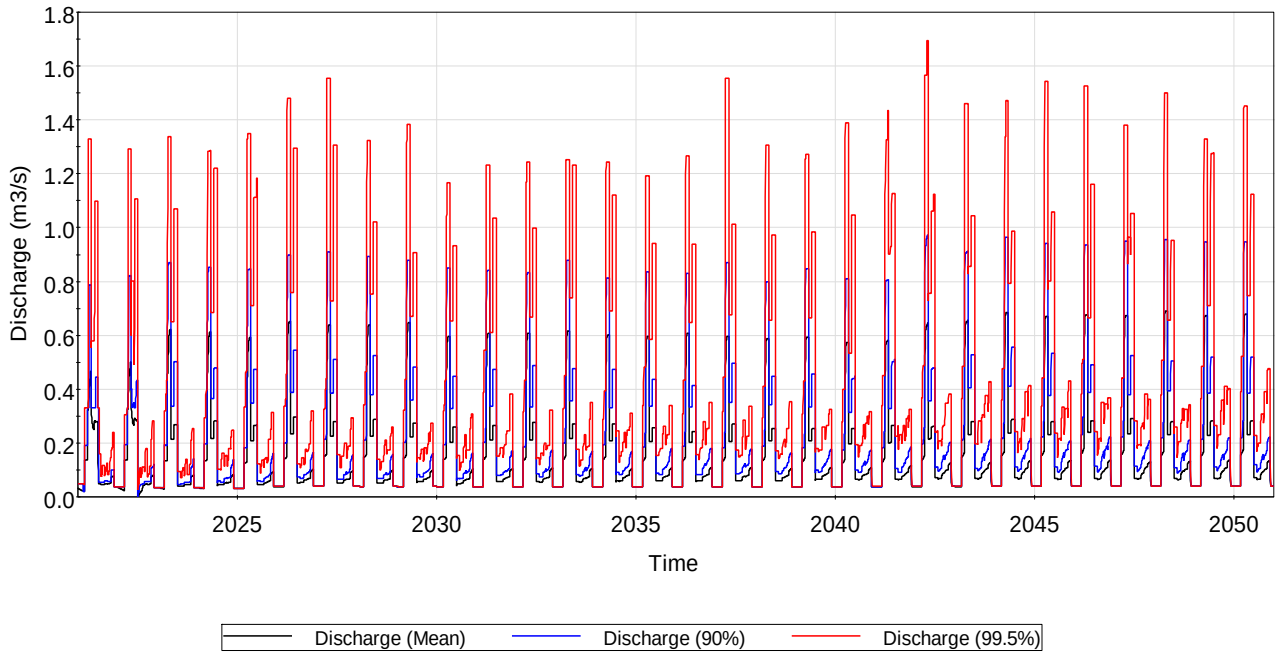


Figure 19: Discharge of Mine Water during Closure and Post-Closure

Table 22: Annual Discharge of Mine Water during Closure and Post-closure

Year	Annual Discharge					
	Mean		90th Percentile		99.5 Percentile	
	m^3	m^3/s	m^3	m^3/s	m^3	m^3/s
2021	3,853,100	0.12	4,889,900	0.16	6,534,800	0.21
2022	3,821,900	0.12	4,913,900	0.16	6,491,600	0.21
2023	4,003,800	0.13	4,999,400	0.16	6,945,300	0.22
2024	4,109,800	0.13	5,164,400	0.16	6,709,100	0.21
2025	4,049,100	0.13	5,269,700	0.17	6,908,200	0.22
2030	4,213,500	0.13	5,201,100	0.16	6,349,700	0.20
2035	4,356,600	0.14	5,315,600	0.17	6,932,800	0.22
2040	4,303,400	0.14	5,241,600	0.17	6,592,300	0.21
2045	5,009,500	0.16	6,198,500	0.20	7,755,800	0.25
2050	5,034,500	0.16	6,184,400	0.20	8,447,000	0.27

6.2 Springer Pit Dewatering

Simulated Springer Pit lake water elevations are shown in Figure 20 for the mean, and 90th, and 99.5 percentiles. The simulations are run from initial value on 1 April 2016, volume of 9,997,500 m^3.

The mean projection is for the Springer Pit to be dewatered to the elevation of the tailings by first quarter of 2018, although under extreme wet conditions (99.5 percentile), the pit lake could persist until late 2018.

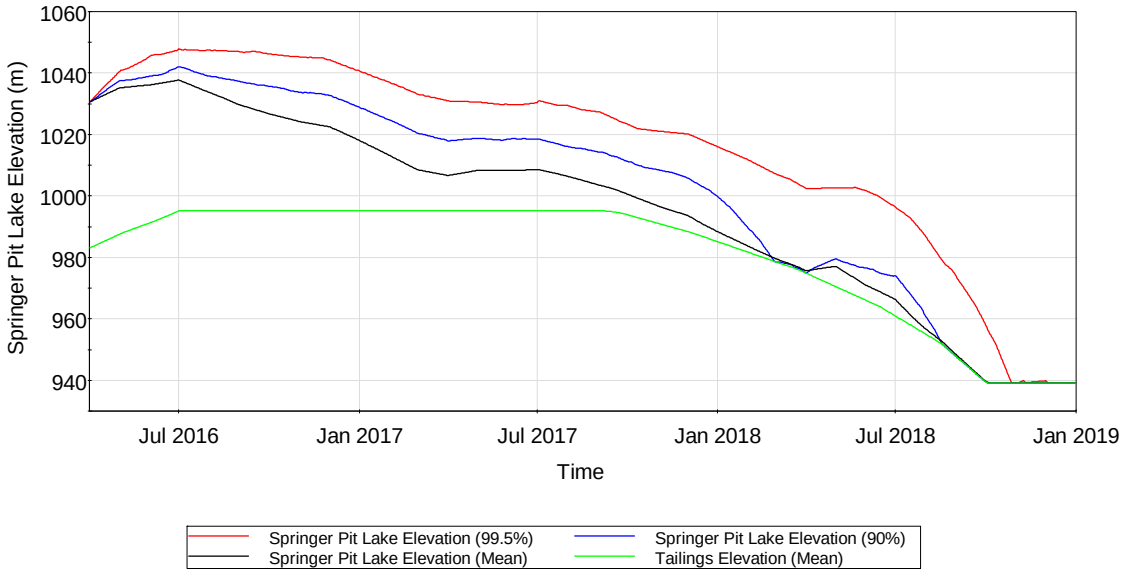


Figure 20: Springer Pit Water Elevations Simulated from 1 April 2016

Once the Springer Pit is dewatered, it is expected that temporary ponding will occur during freshet, as options for dewatering are limited (Figure 21). During the freshet, runoff to the CCS is given priority for treatment and discharge through the WTP, and therefore pumping from the Springer Pit is curtailed. It is assumed that there is no pumping from the Springer Pit to the TSF. Under extreme conditions, water would be pumped from the TSF to the Springer Pit during the freshet to maintain sufficient TSF freeboard. Temporary ponding of water in the Springer Pit represents a potential operational water management issue that can be addressed though pit mining operations and construction of pit sumps. This accumulation can likely be reduced with further optimization of the pumping logic and operational water management.

From third quarter of 2020, the Springer Pit begins to refill with water (Figure 21).

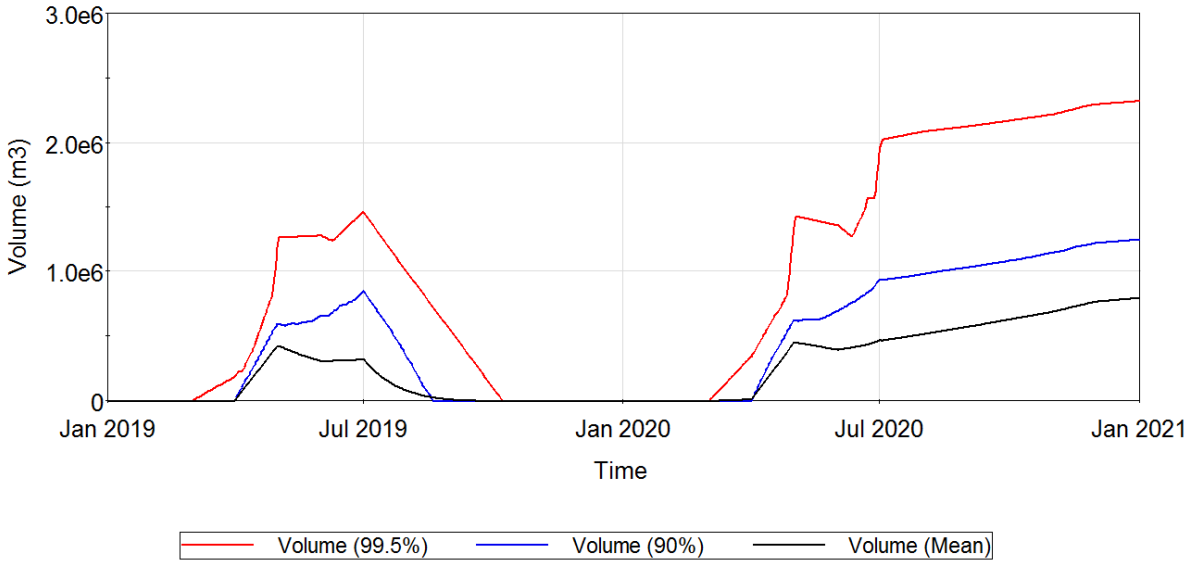


Figure 21: Springer Pit Sump Water Volume (Mm^3)

6.3 Tailings Storage Facility

Temporary detention of water will be necessary to manage the large runoff volumes generated during freshet (typically April to June, inclusive). The inflows during freshet will exceed treatment and discharge capacities, and detention volume is required to prevent uncontrolled release from the PETBP and to equalize the flow for treatment. Because of the large freshet volumes, it will be necessary to utilize the TSF for temporary detention; however, a principal objective of the LTWMP is to not accumulate water on site (including in the TSF), and to not carry over water from year to year, even under extreme wet conditions. The SWWBM has been used to assess the required detention volume external to the TSF, while also assessing the corresponding detention volume required in the TSF under average to extreme wet conditions. Figure 22 shows the water volume in the TSF throughout full operations and into closure.

During full operations, the mean pond level reaches a maximum (99.5 percentile) of about 1.5 Mm^3 (950 masl) by 1 July 2016. During 2017, discharge from Mine is constrained by natural flows in Hazeltine Creek, and therefore the accumulated volume in the TSF is generally higher than in subsequent years (Figure 22). When the volume of water in the TSF reaches 3.5 Mm^3, water is pumped to the Springer Pit. Under 99.5 percentile extreme wet conditions, there is potential for a small volume of water to be carried over from 2017 to 2018. In subsequent years, if the proposed direct pipeline to the diffuser in Quesnel Lake is operational, the TSF pond is reduced to the minimum volume before the subsequent freshet.

During closure, the maximum pond volume at the spillway invert is approximately 250,000 m^3. The pond is expected to spill annually. In most years, the pond volume is reduced to zero by seepage and evaporation losses.

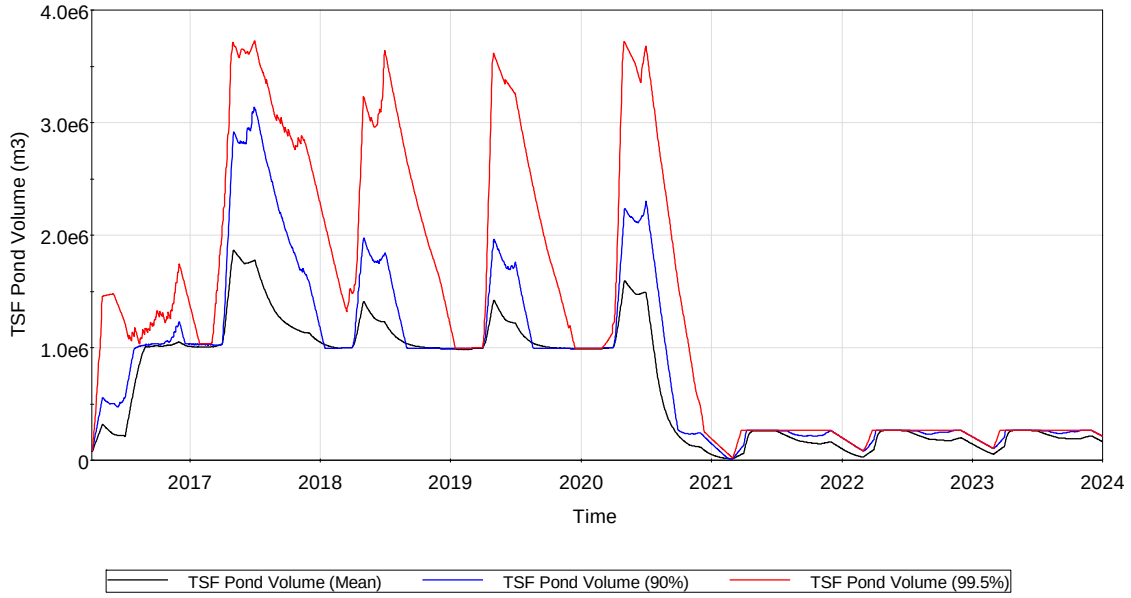


Figure 22: Tailings Storage Facility Water Volumes during Full Operations and into Closure

The maximum TSF pond elevation in closure (2020) is 969.2 masl for extreme 99.5 percentile wet conditions. This provides 0.8 m of freeboard to 970 masl (Figure 23). During post-closure, the maximum water elevation is controlled by the spillway invert at 965.7 masl.

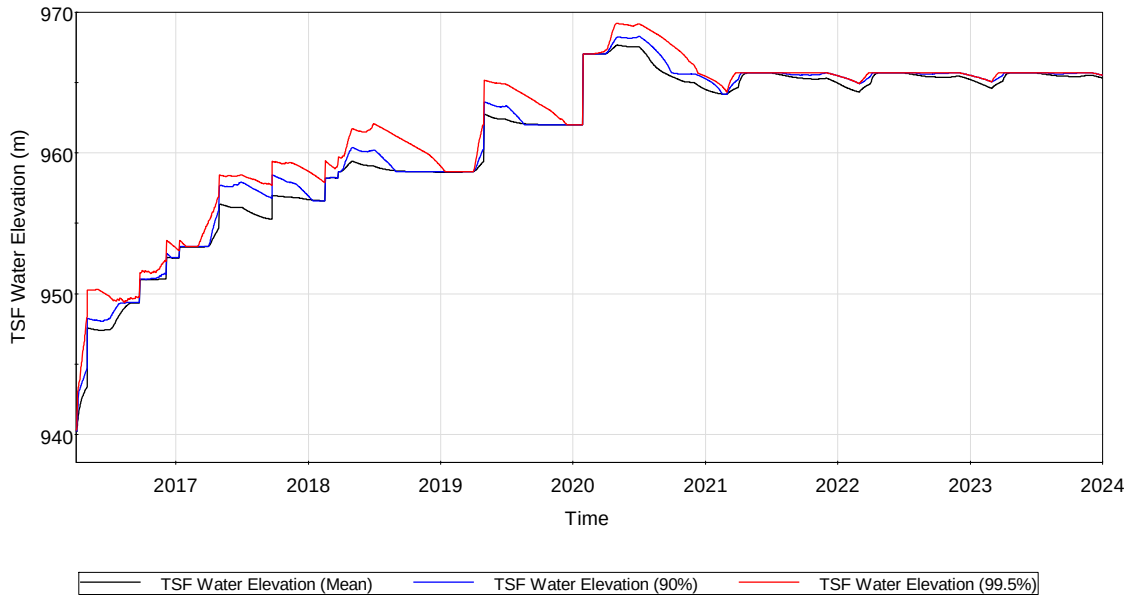


Figure 23: Tailings Storage Facility Water Elevations during Full Operations and into Closure

6.4 Perimeter Embankment Till Borrow Pond

Water flows from the CCS to the PETBP by gravity through an open channel, with culverts under the Hazeltine Creek access road. Because the buttress extension may cover the existing inflow ditch, culverts and a rock drain may be required at the base of the Corner 1 upon the final design PETBP (Golder 2015a).

The current maximum capacity of the PETBP is 170,000 m^3. When the water volume in the PETBP exceeds 150,000 m^3, pumps to the TSF are activated to avoid overflow. Under average climate conditions during full operations, the volume in the pond approaches 80,000 m^3 during the freshet. During closure, the pond will be allowed to fill and is assumed to discharge to the environment after treatment; however, this component of the model will be refined as the closure/post-closure water treatment and discharge system is tested and designed. During full operations, there are no occurrences of overflow from the PETBP under the simulated conditions (Figure 24).

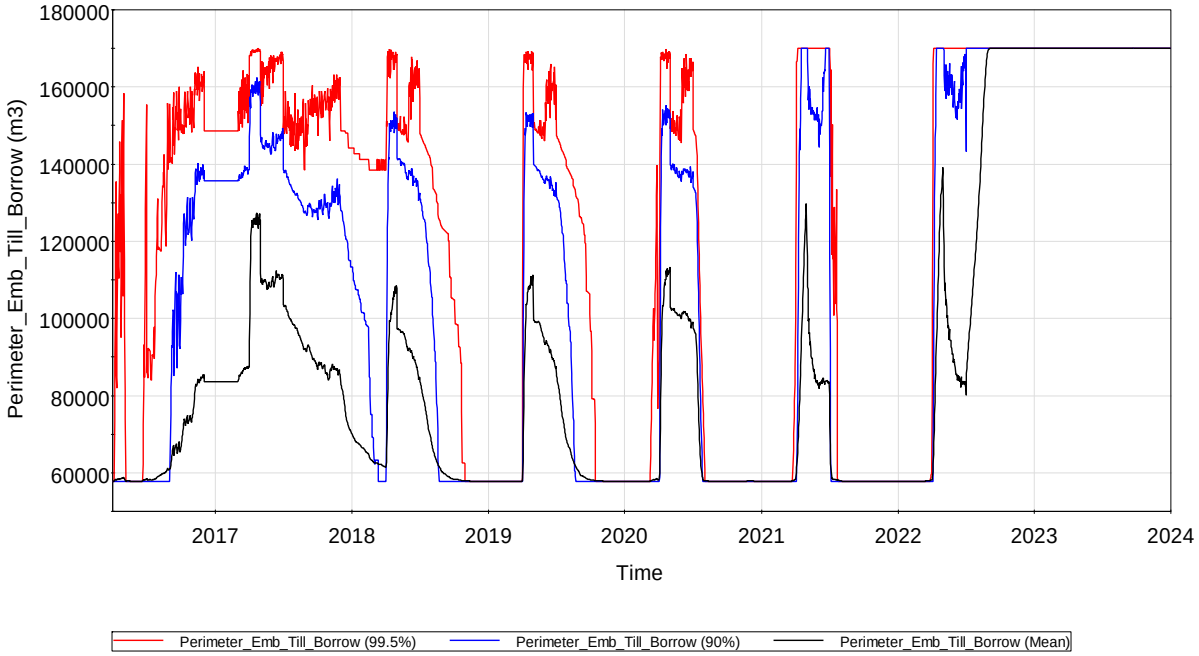


Figure 24: Perimeter Embankment Till Borrow Pond Water Volumes

6.4.1 Polley Lake Makeup Water

Typically during fall and winter months, runoff to the TSF and CCS is not sufficient to meet process water makeup requirements. Prior to July 2017, makeup water requirements can be met from the Springer Pit. Subsequently, makeup water will be supplied from Polley Lake. This water usage is currently permitted under MPMC's existing Conditional Water License 101763.

The daily variation in makeup water supply is shown in Figure 25 for mean, and 90th and 99.5 percentiles. Annual makeup volumes drawn from Polley Lake are shown in Table 23. Note that the 90th and 99.5 percentiles refer to extreme dry conditions.

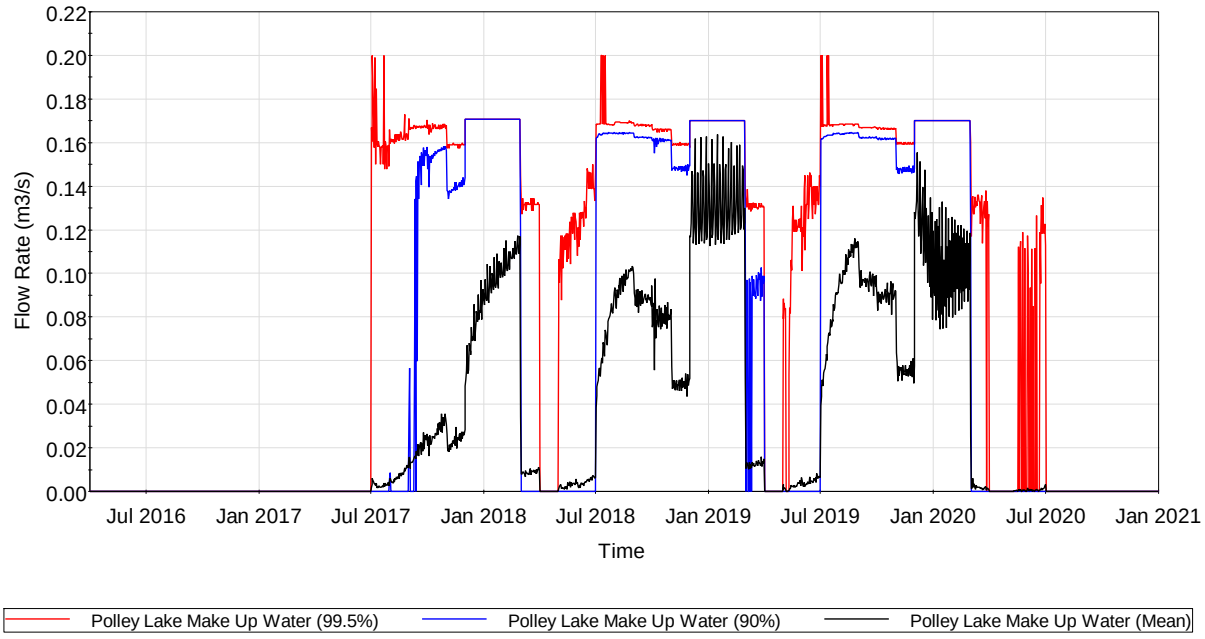


Figure 25: Polley Lake Makeup Water (m^3/s)

Table 23: Annual Volume of Makeup Water Drawn from Polley Lake

Year	Total Makeup Volume (m^3)		
	Mean	90th Percentile	99.5 Percentile
2017	401,200	936,600	1,473,900
2018	1,921,700	2,400,600	2,655,600
2019	2,164,500	2,550,300	2,819,300
2020	544,000	563,200	630,900

6.5 Contingency Scenarios

Results presented above reflect the Base Case. In addition, the following contingency scenarios have been assessed:

1) Base Case with tailings rewetting.

2) Base Case with Care and Maintenance starting 1 July 2017.

3) Base Case with no discharge from the Mine during April and May 2017.

4) Base Case with no controlled discharge from the Mine after 30 March 2017.

Results are presented for the full operations phase.

6.5.1 Contingency 1: Base Case with Tailings Rewetting

The Base Case simulation does not account for water re-infiltrating and rewetting the existing tailings in the TSF, and is therefore conservative from the perspective of the volume of free water to be managed and discharged.

An exponential tailings drain down curve was developed for the TSF following the 2014 foundation failure (Golder, 2015c). On the basis of the drain down curve, approximately 4 Mm^3 of water has drained from the existing tailings in the TSF since the foundation failure in August 2014 until July 2016. Contingency 1 assumes that rewetting of the tailings occurs at an annual rate of 1 Mm^3/y throughout operations, which gives a total volume "lost" to the existing tailings of approximately 3.8 Mm^3 throughout the full operation phase. The rate and total amount of water that will be lost to re-wetting is somewhat uncertain, because the amount of water that re-enters the drained tailings will not necessarily be the same as the volume that drained from them. This scenario provides an estimate of a fully rewetted condition; in reality, the outcome is expected to be somewhere in between the conservative Base Case and this scenario. For this reason, the Base Case has been used as a conservative estimate for the TAR.

The daily variation in discharge for the mean, the 90th, and the 99.5 percentiles is provided in Figure 26, and discharge volumes are presented in Table 24. There is a modest reduction in the annual discharge volume relative to the Base Case during full operations (Table 21).

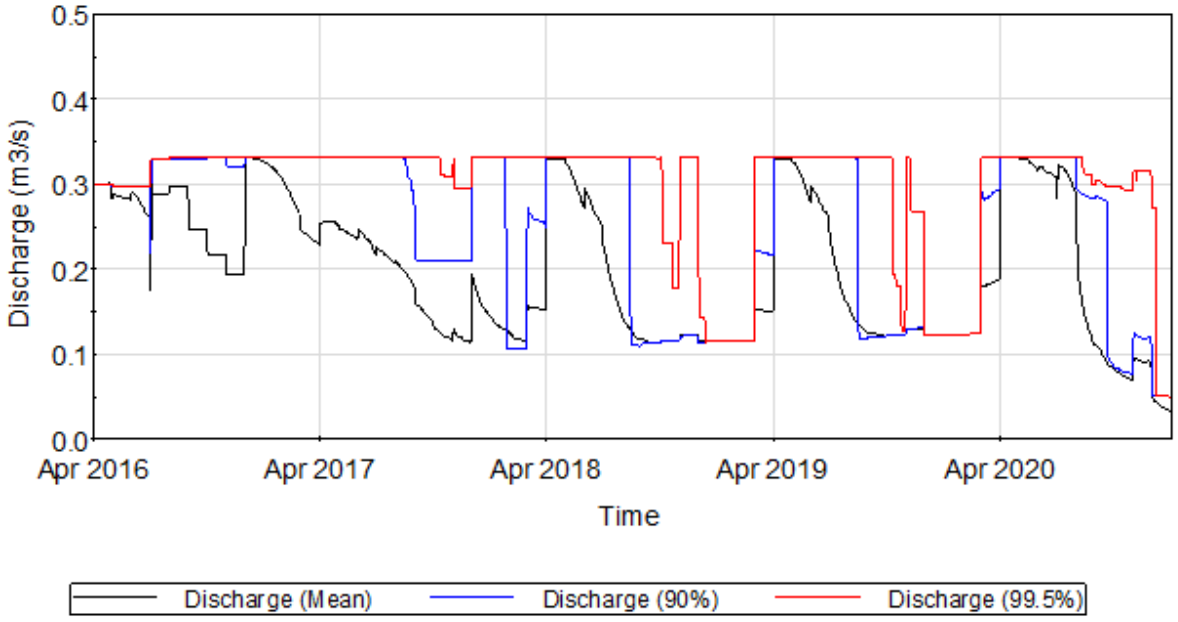


Figure 26: Discharge of Mine Water for Contingency 1

Table 24: Annual Discharge of Mine Water for Contingency 1

Year	Annual Discharge (m^3)		
	Mean	90th Percentile	99.5 Percentile
2016	7,658,000	8,451,700	8,745,500
2017	6,630,900	8,319,400	9,240,500
2018	5,462,400	6,328,800	7,972,400
2019	5,564,400	6,306,800	7,476,000
2020	5,681,200	6,537,900	7,931,100

Projected Springer Pit water levels are shown in Figure 27. Generally the time to dewater to the elevation of the deposited tailings is reduced by about two months compared to the Base Case (Figure 20).

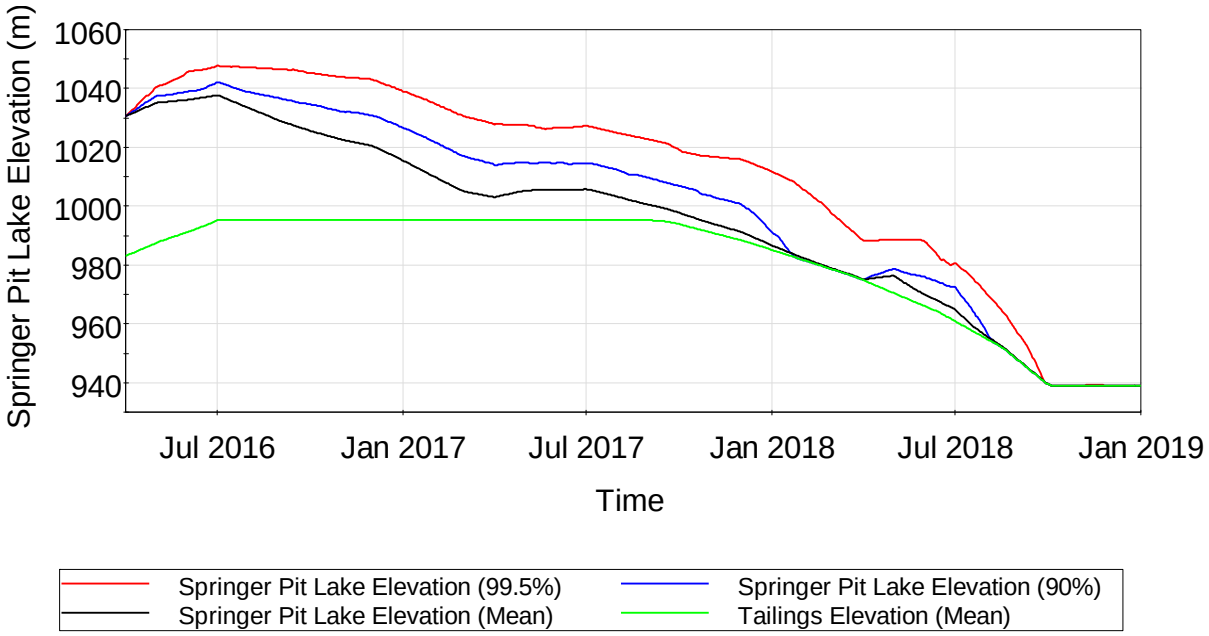


Figure 27: Springer Pit Water Elevations for Contingency 1

The projected TSF water volumes for Contingency 1 are shown in Figure 28. The peak volumes are reduced from the Base Case (Figure 22), and notably, for Contingency 1 there is no projected carry over under extreme wet conditions from 2017 to 2018.

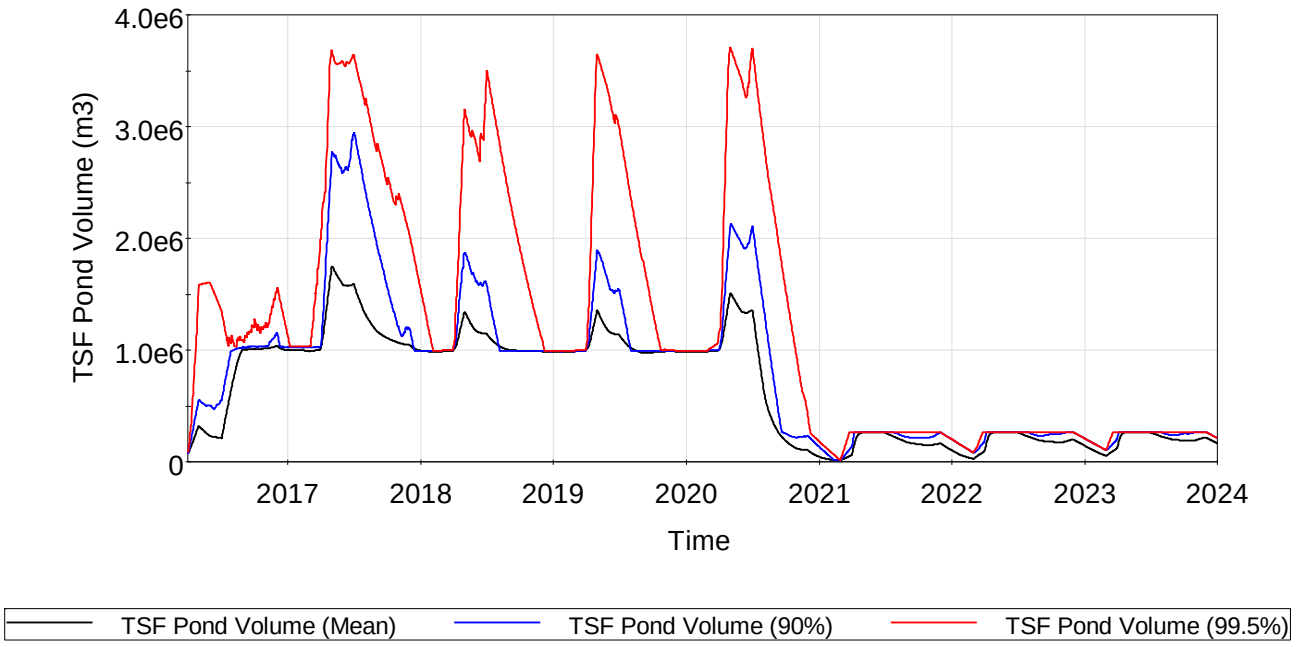


Figure 28: Tailings Storage Facility Water Volumes during Full Operations and into Closure for Contingency 1

6.5.2 Contingency 2: Base Case with Care and Maintenance Starting July 1, 2017

Contingency 2 represents a scenario whereby the Mine is put into Care and Maintenance as a consequence of low metal prices, or other economic, regulatory, or environmental reasons. Treatment and discharge continues as in the Base Case; however, there is no mining, milling, or deposition of tailings in the TSF. A five-year shut down is assumed.

The daily variation in discharge for the mean, the 90th, and the 99.5 percentiles is provided in Figure 29 and discharge volumes in Table 25. There is a modest reduction in the annual discharge volume relative to the Base Case during the full operations phase (Table 21).

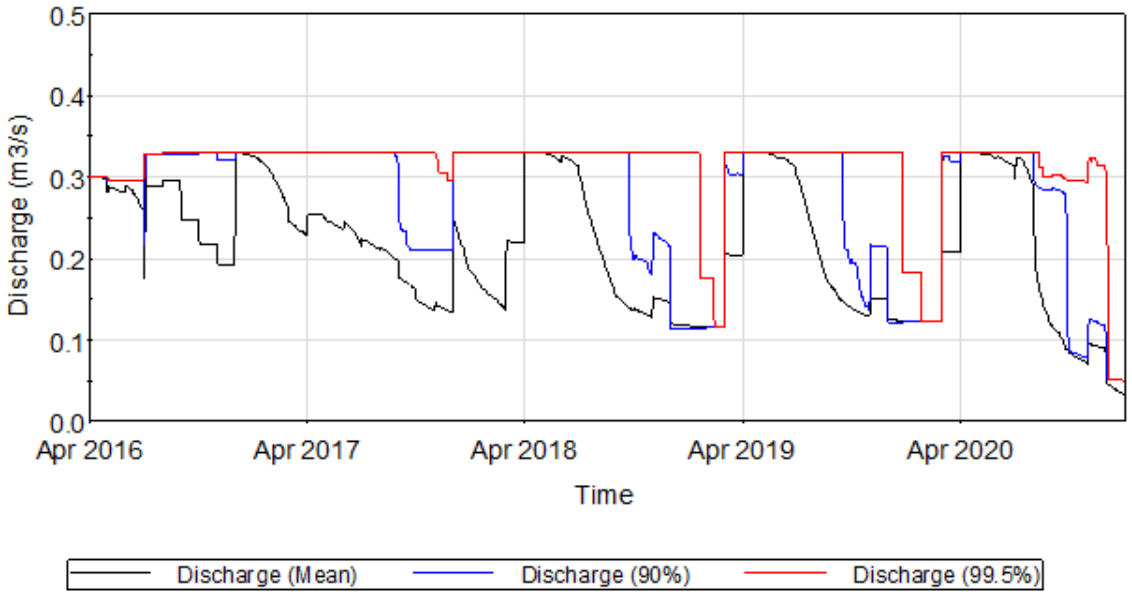


Figure 29: Discharge of Mine Water for Contingency 2

Table 25: Annual Discharge of Mine Water for Contingency 2

Year	Annual Discharge (m^3)		
	Mean	90th Percentile	99.5 Percentile
2016	7,658,000	8,451,700	8,745,500
2017	6,959,100	8,735,100	9,763,700
2018	6,580,600	8,016,900	10,305,000
2019	6,375,900	7,310,100	8,925,200
2020	5,817,700	6,698,000	8,031,000

Projected Springer Pit water levels are shown in Figure 30. Results indicate that water volumes would be reduced during Care and Maintenance and remain below 1,030 masl.

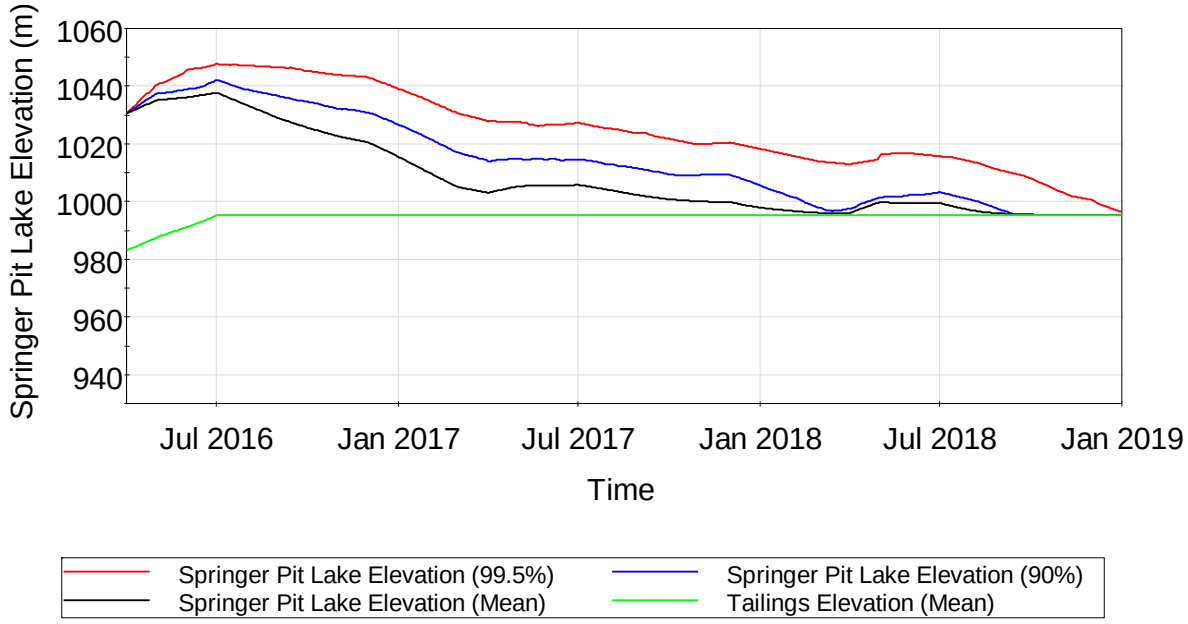


Figure 30: Springer Pit Water Elevations for Contingency 2

The projected TSF water volumes for Contingency 2 are shown in Figure 31. The peak volumes in 2017 are increased from the Base Case (Figure 22), and there continues to be carry over under extreme wet conditions from 2017 to 2018.

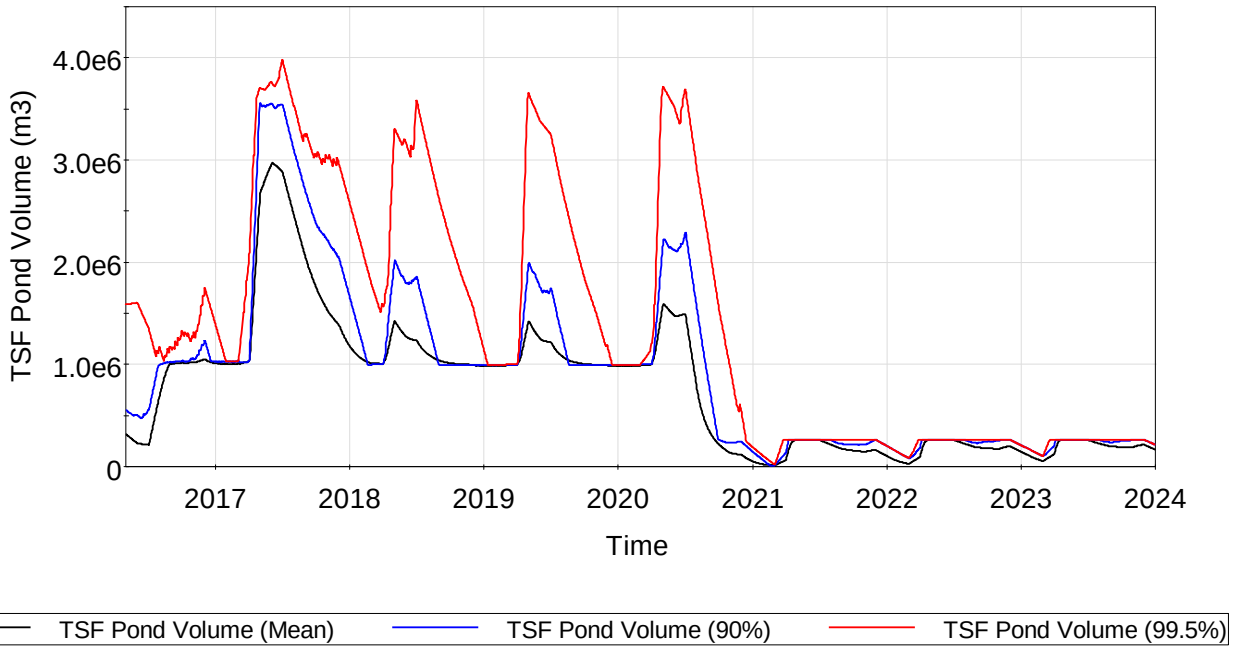


Figure 31: Tailings Storage Facility Water Volumes during Full Operations and into Closure for Contingency 2

6.5.3 Contingency 3: Base Case with No Discharge during April and May 2017

Contingency 3 represents an upset scenario where discharge of water from the Mine is interrupted for two months during the freshet of 2017. This scenario most likely represents a mechanical failure of the water treatment and discharge system.

The daily variation in discharge for the mean, the 90th, and the 99.5 percentiles is provided in Figure 32 and discharge volumes in Table 26. There is a reduction in the annual discharge volume relative to the Base Case in 2017, and an compensatory increase in discharge in 2018 (Table 21). In other years the discharge is essentially unchanged.

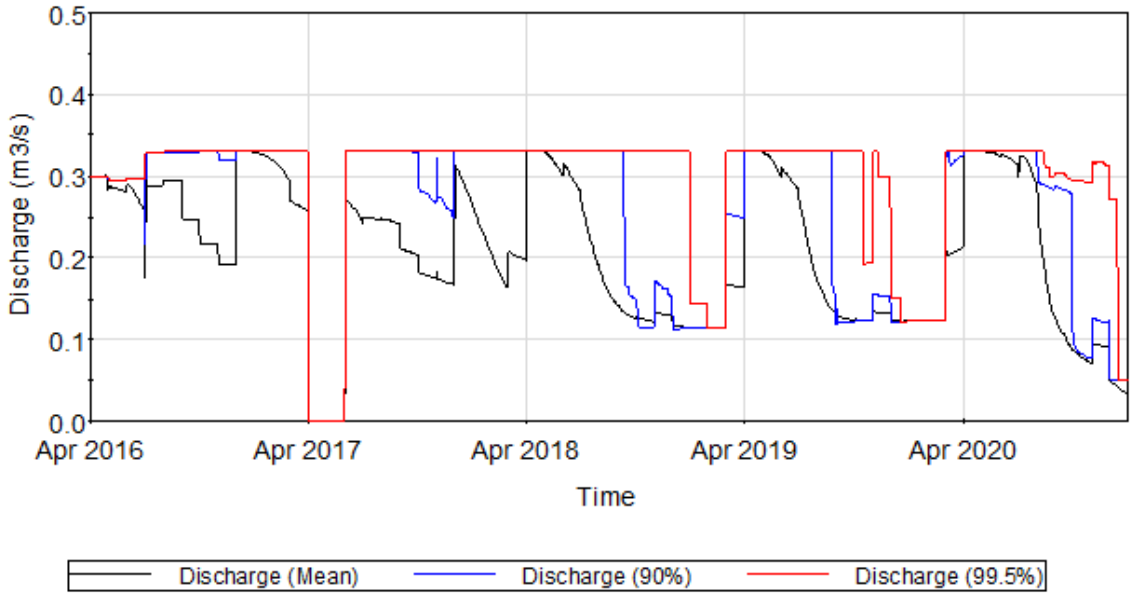


Figure 32: Discharge of Mine Water during Operations for Contingency 3

Table 26: Annual Discharge of Mine Water for Contingency 3

Year	Annual Discharge (m^3)		
	Mean	90th Percentile	99.5 Percentile
2016	7,662,800	8,470,300	8,765,300
2017	6,550,000	7,745,200	8,433,000
2018	6,436,400	8,201,900	10,266,400
2019	5,806,800	6,574,000	7,914,200
2020	5,903,200	6,796,700	8,100,100

Projected Springer pit water levels are shown in Figure 33. Generally the time to dewater to the elevation of the deposited tailings is not substantially affected, except under extreme wet conditions (99.5 percentile), where dewatering to the base of Springer Pit is delayed by about two months compared to the Base Case (Figure 20).

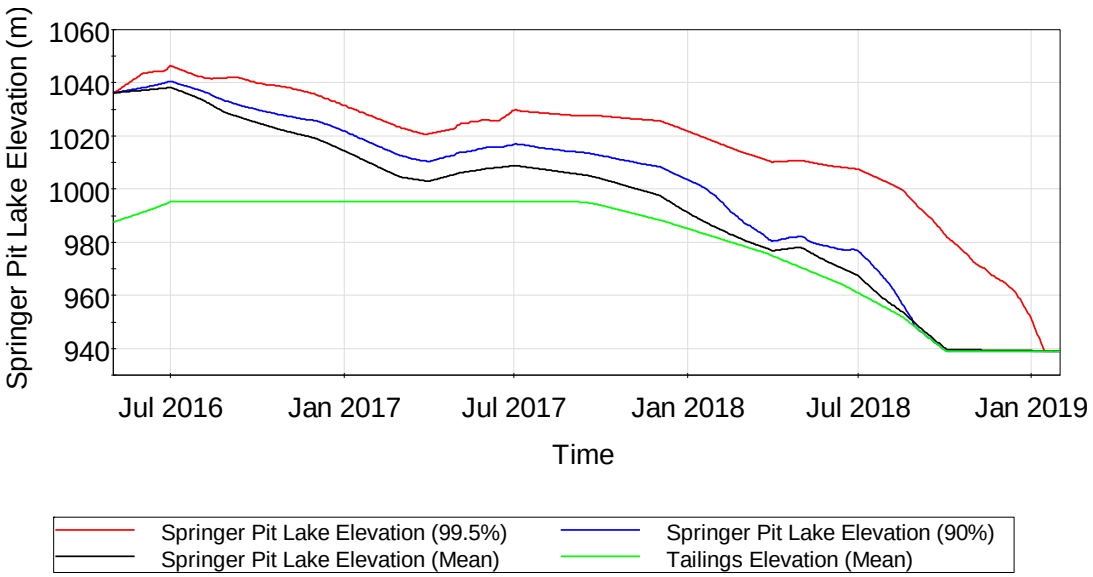


Figure 33: Springer Pit Water Elevations for Contingency 3

The projected TSF water volumes for Contingency 3 are given in Figure 34. The peak volumes are similar to the Base Case (Figure 22), and there continues to be carry over under extreme wet conditions from 2017 to 2018.

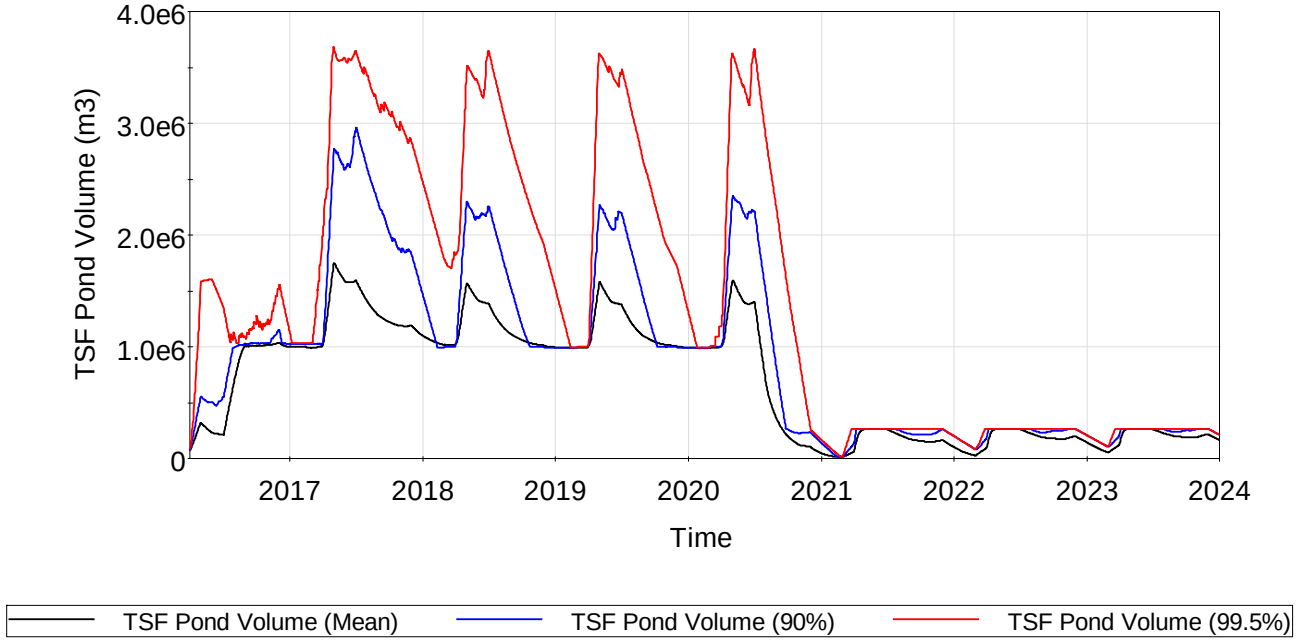


Figure 34: Tailings Storage Facility Water Volumes during Full Operations and into Closure for Contingency 3

6.5.4 Contingency 4: Base Case with No Controlled Discharge after 30 March 2017

Under the Contingency 4 scenario, discharge of treated water from the Mine is stopped after 30 March 2017. This hypothetical scenario is to assess the period of time that the Mine could continue to operate with no uncontrolled surface discharge (spills) from site. This scenario assumes all surplus water is pumped to and stored in the Springer Pit (not the TSF).

The daily variation in discharge for the mean, the 90th, and the 99.5 percentiles is provided in Figure 35 and discharge volumes in Table 27. From April 2017 through April 2018 there is no discharge from the Mine (Figure 35). Beginning in May 2018, for extreme wet conditions, the Springer Pit lake elevation reaches the overflow elevation of 1,050 masl (Figure 36), and uncontrolled discharge is simulated. For the mean scenario, the Springer Pit Lake reaches 1,050 masl by May 2019 (Figure 36).

Discharge in 2018 and 2019 (Figure 35, Table 27) represent uncontrolled discharge.

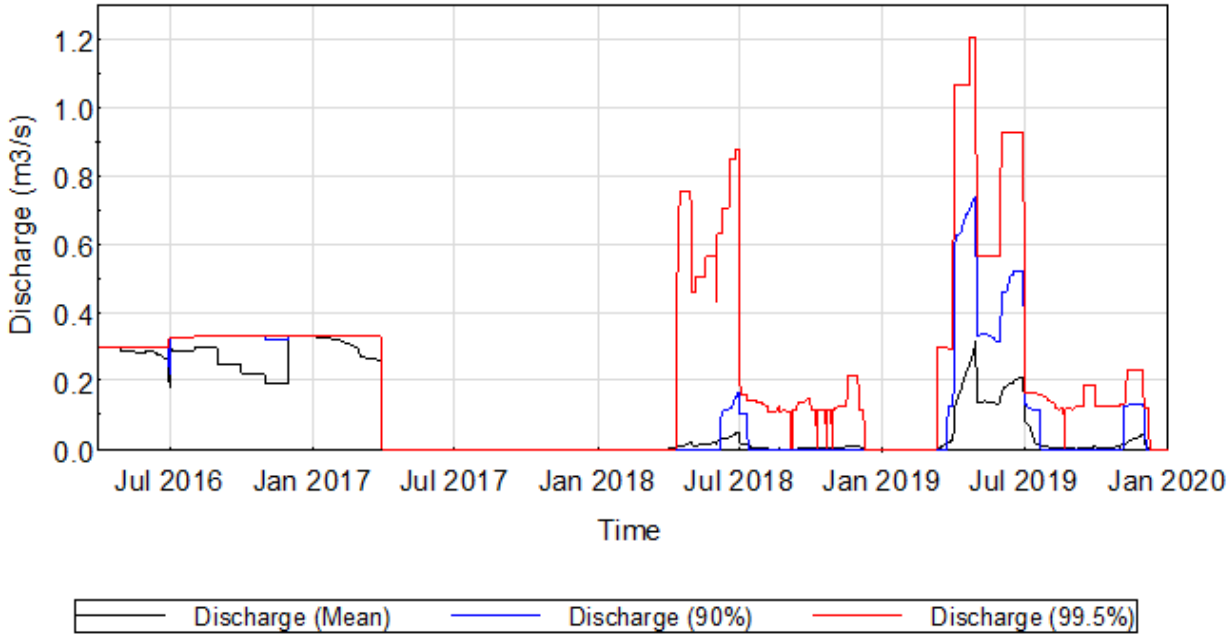


Figure 35: Discharge of Mine Water for Contingency 4

Table 27: Annual Discharge of Mine Water for Contingency 4

Year	Annual Discharge (m^3)		
	Mean	**90th Percentile**	**99.5 Percentile**
2016	7,662,700	8,470,300	8,765,300
2017	2,281,800	2,509,100	2,509,100
2018	277,700	1,056,500	3,641,300
2019	2,205,500	3,891,600	6,423,400

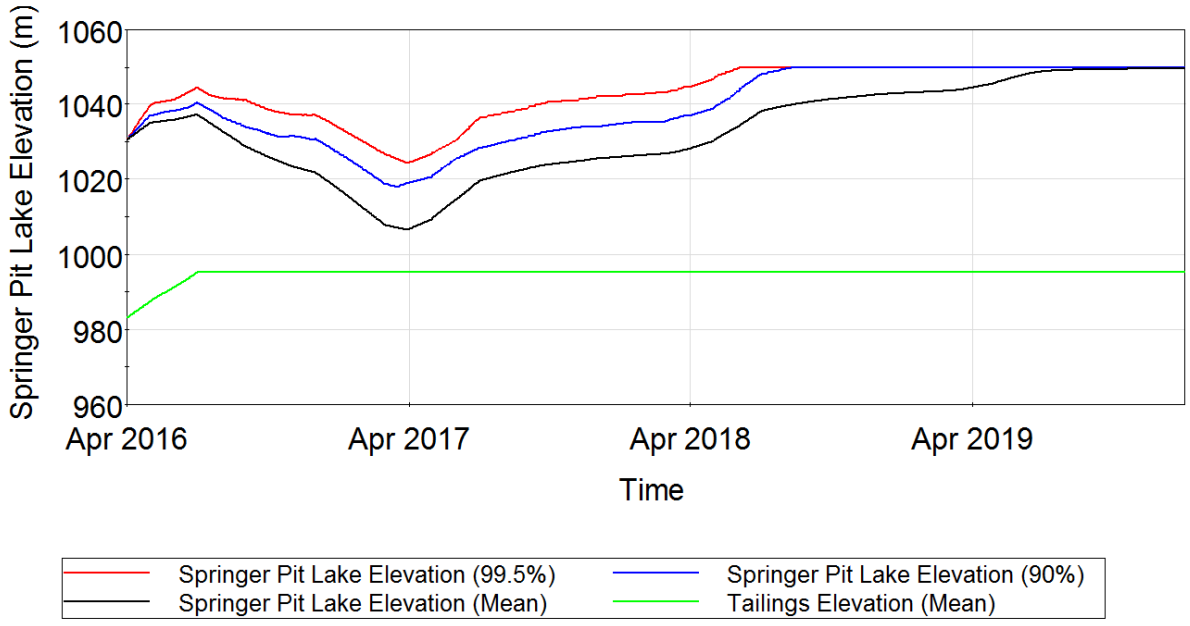


Figure 36: Springer Pit Water Elevations for Contingency 4

The projected TSF water volumes for Contingency 4 are shown in Figure 37. The peak water volumes for Contingency 4 for extreme wet conditions (99.5 percentile) are similar to the Base Case (Figure 37), however the mean peak water levels are generally higher.

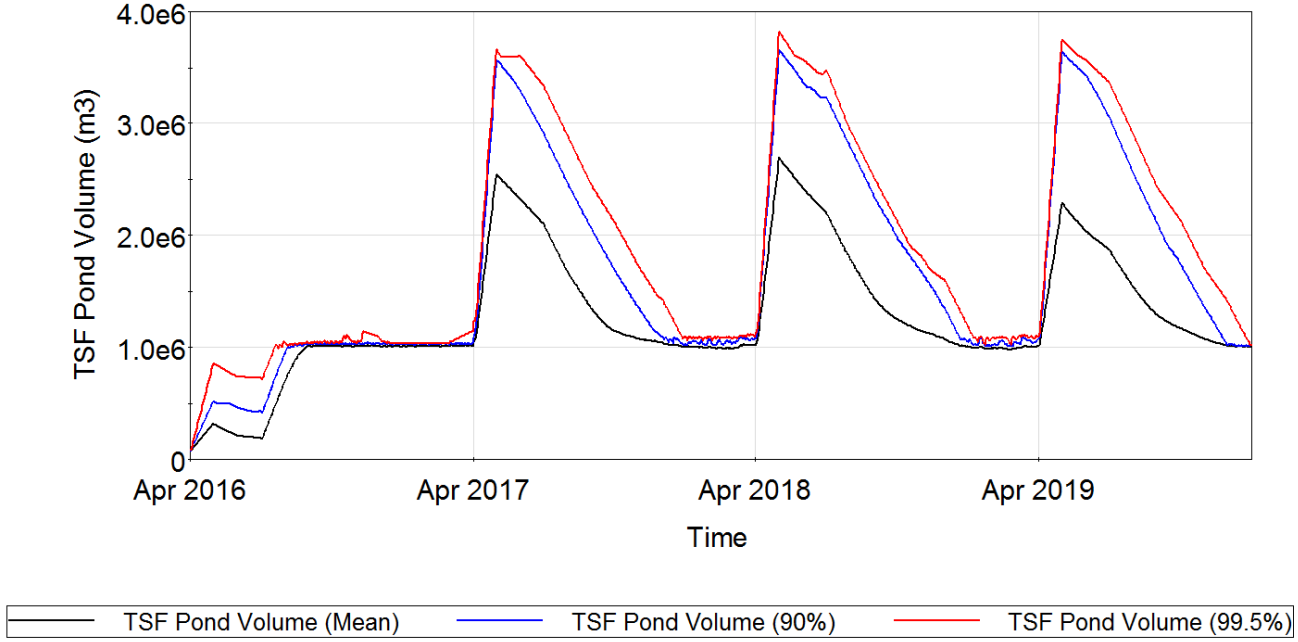


Figure 37: Tailings Storage Facility Water Volumes for Contingency 4

6.6 Pit Lakes during Closure

The formation of pit lakes in the combined Cariboo-Springer Pit, the Boundary Pit, and the Wight Pit were assessed during closure. Stochastic simulation results for mean, and 90th and 99.5 percentiles are provided. The simulations consider direct rainfall and runoff, groundwater seepage in and out of the pit, and evaporation losses.

6.6.1 Combined Cariboo-Springer Pit

The assumed final elevation of PAG material in the combined Phase 4 Cariboo-Springer Pit is 1,004 masl, which is based on uniform deposition across the Springer and Cariboo pits. Results of the simulation indicate that the water level will rise to cover the PAG material by approximately 2023 (Figure 38). If PAG material was placed only in the Springer Pit, the final elevation would be 1,017 masl, and it would be inundated by approximately 2025.

The pit lake is projected to reach the overflow elevation of 1,050 masl between 2042 and 2044 (Figure 38). The model assumed that, for centralized treatment and discharge, overflow is directed to the Mine Drainage Creek Sump, and then to the SERDS Ditch. Alternatively, if water quality were to meet discharge requirements, the overflow could be discharged directly to Bootjack Lake. Refinements to the model will be made as the closure/post-closure LTWMP is tested and designed.

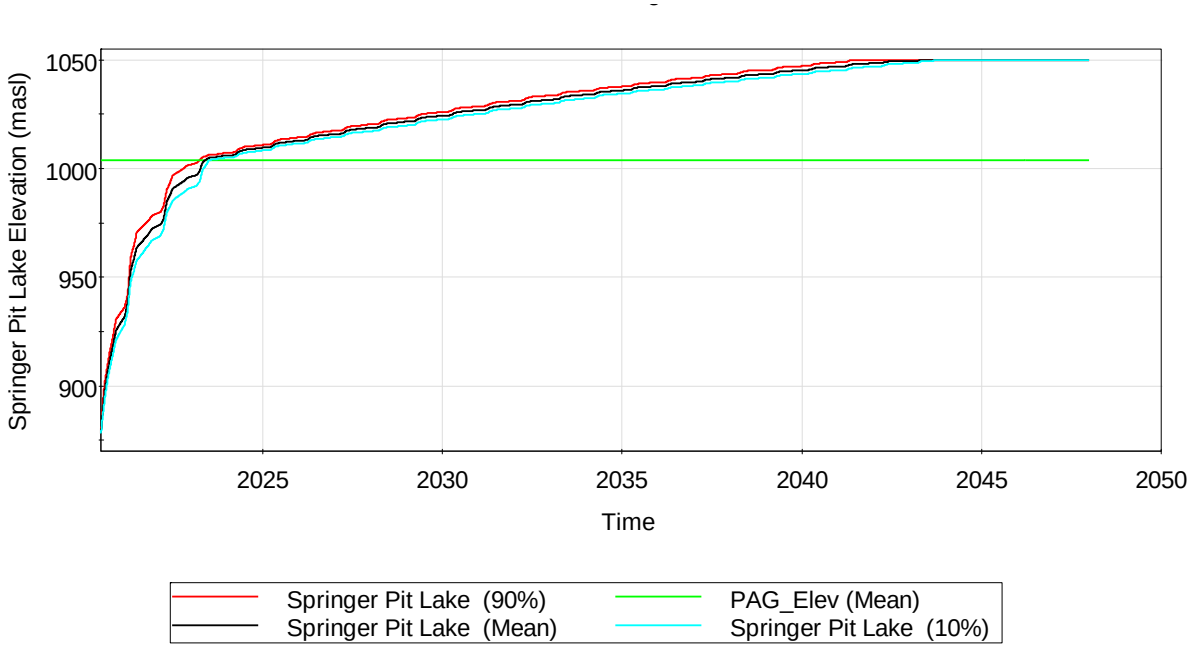


Figure 38: Springer Pit Lake Elevation (masl).

To assess the sensitivity of pit lake filling on future potential climate change, future precipitation and evaporation were adjusted based on the RCP 8.5 climate scenario (Section 3.1.4, Table 6). Monthly values were interpolated between Current, 2025, 2055, and 2085 values to provide monthly times series out to 2085. Average monthly precipitation accounting for climate change was input to the stochastic climate simulator of the SWWBM. Simulation of the Springer Pit filling during post-closure indicates that even for the conservative RCP 8.5 scenario, there is only a small effect on the pit lake development with projected fill times being affected by only a few months. With adjustment for climate change, the pit lake is projected to reach the overflow elevation of 1,050 masl between 2042 and 2044 (Figure 39).

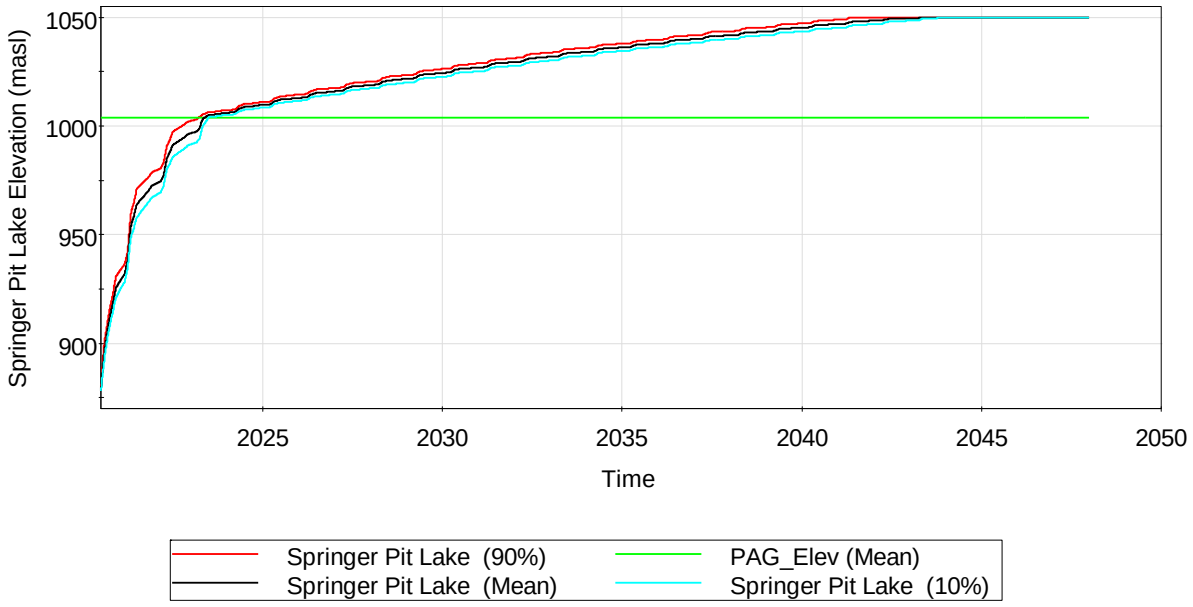


Figure 39: Filling of Springer Pit under the RCP 8.5 Climate Change Scenario

6.6.2 Boundary Pit

A seasonal pond will develop in the Boundary Pit, and the pond elevation is not expected to reach the overflow elevation of 1,073 masl (Figure 40). Seepage from the Boundary Pit is assumed to contribute to inflow to the Wight Pit.

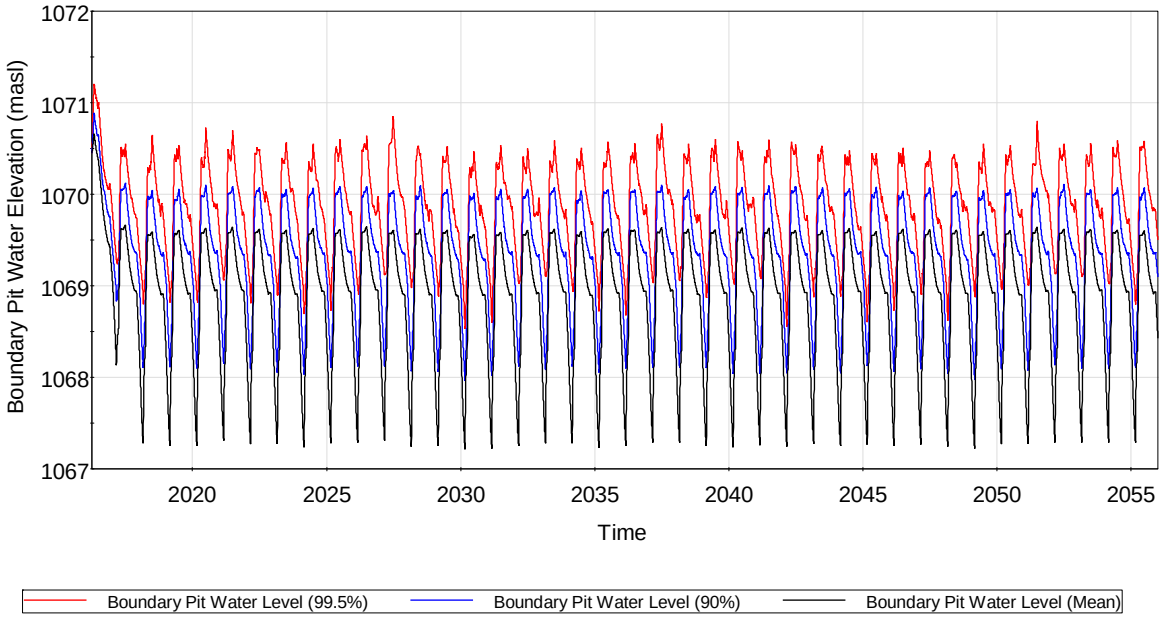


Figure 40: Seasonal Boundary Pit Lake Elevation (masl)

6.6.3 Wight Pit

The Wight Pit lake is projected to reach the overflow elevation of 926 masl before 2026 (Figure 41). For centralized treatment and discharge, the overflow is directed to the Long Ditch. Alternatively, if water quality were to meet discharge requirements, the overflow could be discharged directly to Polley Lake. Refinements to the model will be made as the closure/post-closure LTWMP is tested and designed.

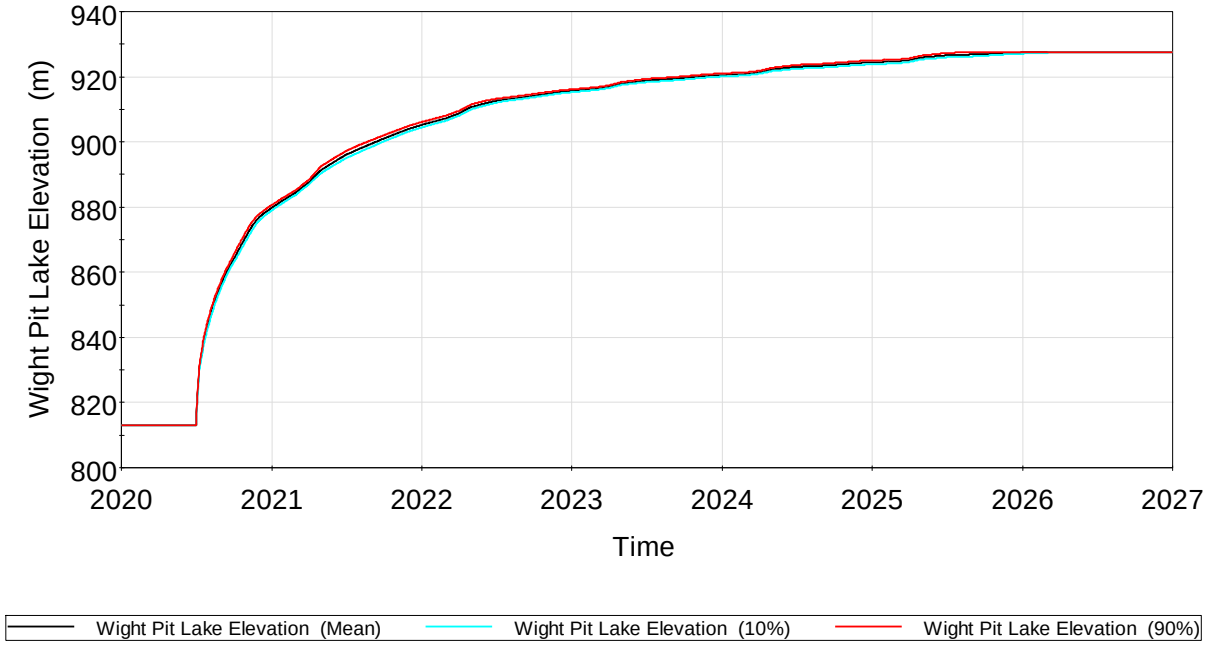


Figure 41: Wight Pit Lake Elevation (masl)

7.0 SUMMARY

A SWWBM was developed for the Mount Polley Mine using GoldSim (Version 11.1). The water balance is being used to support short- and long-term water management planning and will form the basis of effluent treatment and discharge options.

Two operational Mine management scenarios were evaluated with this water balance:

- restricted operations until June 2016 (for validation of model performance)
- full operations until July 1 2020

Additional scenarios were evaluated for the closure and post-closure phase. Closure is defined here as the first two years (3 July 2020 to June 2022) following the projected end of operations, followed by post-closure from July 2022 onwards.

The model was calibrated and validated based on past and current Mine conditions and used to generate a range of stochastic climate scenarios (0.5 percentile to 99.5 percentile) to probabilistically assess Mine water management. The main conclusions for the Base Case are as follows:

- During dewatering of the Springer Pit (2016 and 2017), the mean annual discharge is approximately 7.5 Mm^3.
- During full operations (2018 to 2020), the mean annual discharge is approximately 5.9 Mm^3.
- During closure (2021 and 2022), the mean annual discharge is approximately 3.8 Mm^3.
- The maximum annual discharge for 99.5 percentile extreme wet conditions is 9.9 Mm^3 in 2017.
- The Springer Pit is projected to be dewatered to the elevation of the deposited tailings by second quarter 2018, or as late as the fourth quarter 2018 under extreme wet (99.5 percentile) conditions.
- The mean pond volume in the TSF during full operations is expected to reach approximately 1.5 Mm^3 on 1 July each year.
- The maximum TSF pond elevation during full operations (99.5 percentile) is approximately 3.7 Mm^3.
- Because discharge from the Mine is constrained in 2017 by natural flows in Hazeltine Creek, there is some potential for carry-over volume in the TSF to 2018 under extreme wet conditions. In all other years there is no carry over.
- During full operations, the mean annual volume of makeup water drawn from Polley Lake is approximately 2.0 Mm^3. Under extreme dry conditions (99.5 percentile), the estimated annual makeup water volume is 2.8 Mm^3.
- Permanent pit lakes are projected to develop in the combined Phase 4 Cariboo-Springer Pit and the Wight Pit.

- The combined Phase 4 Cariboo-Springer Pit Lake is projected to reach the overflow elevation of 1,050 masl between 2042 and 2044. The effect of climate change was assessed using the conservative RPC 8.5 scenario, and this affected Springer Pit Lake filling to 1,050 masl in only a few months.
- The Wight Pit Lake is projected to reach the overflow elevation of 926 masl by 2026.
- A seasonal pond will develop in the Boundary Pit, which will not reach the overflow elevation of 1,073 masl.
- PAG material placed in the combined Phase 4 Cariboo-Springer Pit will have a final elevation of 1,004 masl. This will be inundated and covered by the pit lake before 2025.

In addition to the Base Case, four additional contingencies were evaluated:

1) Base Case with tailings rewetting in the TSF
2) Base Case with Care and Maintenance starting 1 July 2017
3) Base Case with no discharge from the Mine during April and May 2017
4) Base Case with no controlled discharge from the Mine after 30 March 2017

8.0 CLOSURE

The reader is referred to the Study Limitations, which precedes the text and forms an integral part of this report.

We trust this report satisfies your current requirements. If you have any questions or require further assistance, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Julio Portocarrero, MEng
Water Resources Specialist

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA Dr. R. G. MILLAR # 25722

PROFESSIONAL GEOSCIENTIST PROVINCE OF BRITISH COLUMBIA R.G. MILLAR 25722

Oct 17 2016

Robert Millar, PhD, PGeo/PEng
Associate, Senior Water Resources Engineer

APB/JP/JV/RGM/it/kp/jc

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

\\golder.gds\gal\burnaby\final\2014\1421\1411734\1411734-167-r-rev0-16000\1411734-167-r-rev0-16000-sitewidewtrblnce 17oct_16.docx

REFERENCES

Chylek P, J Li, MKM Dubey, M Wang, G Lesins. 2011. Observed and model simulated 20th century Arctic temperature variability: Canadian Earth System Model CanESM2. Atmos. Chem. Phys. Discuss., 11, 22893–22907.

Daley C, WP Gibson, GH Taylor, GL Johnson, P Pasteris. 2002. A Knowledge-based Approach to Statistical Mapping of Climate. Climate Research, 22, 99-113.

Golder. (Golder Associates Ltd.). 2015b. Polley Lake Outlet and Hazeltine Creek Design Flows. Technical Memorandum. Golder Doc. No. 1411734-003-TM-Rev1-7000. April 22, 2015.

Golder. 2015c. Mount Polley Mining Corporation: Site Wide Water Balance Model. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-034-R-Rev0-12000. May 29, 2015.

Golder. 2015a. Tailings Storage Facility – Life of Mine Feasibility Design. Prepared for Mount Polley Mining Corporation. 1413803-074-R-Rev0-3000. November 3, 2015.

Golder. 2016. Mount Polley Mine Permit Amendment Application Technical Assessment Report: Climate Change Projections. Prepared for Mount Polley Mining Corporation. No. 1411734-202-TM-RevD-1600. September 26, 2016.

Inman, M. 2011. Opening the future. Nature Climate Change, 1, 7-9.

KP (Knight Piésold Limited). 2004. Mount Polley Water Balance. Letter report prepared for Mount Polley Mine - Imperial Metals Corporation on July 30, 2004.

KP. 2014. Hazeltine Creek Hydrologic Analysis. Prepared for Mount Polley Mining Corporation. VA101-1/32-1. May 14, 2014.

MEND (Mine Environment Neutral Drainage). 2015. In-Pit Disposal of Reactive Mine Wastes: Approaches, Update and Case Study Results. MEND Report 2.36.1b. Prepared by Arcadis, June 2015. 250 pp.

Moss R H, M Babiker, S Brinkman, E Calvo, T Carter, J Edmonds, I Elgizouli, S Emori, L Erda, K Hibbard, R Jones, M Kainuma, J Kelleher, JF Lamarque, M Manning, B Matthews, J Meehl, L Meyer, J Mitchell, N Nakicenovic, B O'Neill, R Pichs, K Riahi, S Rose, P Runci, R Stouffer, D van Vuuren, J Weyant, T Wilbanks, JP van Ypersele, M Zurek. 2008. Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies. Intergovernmental Panel on Climate Change, Geneva, 132 pp.

MPMC (Mount Polley Mining Corporation). 2009. Mount Polley Mine Technical Assessment Report for a Proposed Discharge of Mine Effluent. July 2009.

MPMC. 2015. Mine Reclamation and Closure Plan – Update November 2015. Prepared for Ministry of Energy, Mines and Natural Gas. Submitted November 2, 2015.

Nash J E, JV Sutcliffe. 1970. River flow forecasting through conceptual models part I — A discussion of principles. Journal of Hydrology, 10 (3), 282–290.

Penman HL 1948. Natural evaporation from open water, bare soil and grass. Proc. Roy. Soc. London A (194), S. 120-145.

Wang T, A Hamann, D Spittlehouse, S Aitken. 2012. ClimateBC/WNA/NA, Centre for Forest Conservation Genetics, Faculty of Forestry, University of British Columbia. Available at http://cfcg.forestry.ubc.ca/projects/climate-data/climatebcwna/. Accessed on August 15, 2016.

ATTACHMENT A

Model Inputs

1.0 FLOW INVENTORY

A description of the model flows for different mine phases are provided in Table A1 to Table A4. Direct precipitation, runoff and environmental discharge flows are numbered according to their associated elements, and are therefore not described herein.

Table A1: Description of Flows for Restricted Operations

Flow Group	Component	Flow Label
Hydrology	Precipitation	N/A[(a)]
	Evaporation	N/A[(a)]
	Runoff	All flows labelled R[(b)]
Consumption	Turbomisters	C1
	Water Truck Usage	C2, C5, C4
	Sprinklers	C3,C7
Seepage (from Tailings Storage Facility)	To South Seepage Pond	S1
	To Main Embankment Seepage Pond	S2, S3
	To Perimeter Embankment Till Borrow Pond (PETBP)	S4, S5
	To Environment/Hazeltine Creek	S14
Seepage (From other Facilities)	SERDS Dump to SERDS Ditch	S6
	North Bell Dump to Wight Pit (via Joes Creek Pipe)	S7
	East RDS to SERDS Ditch	S8
	NEZ Dump to SERDS Ditch	S9
	Temp. PAG Stockpile to 9km Sump	S10
	Temp. PAG Stockpile to NW Sump	S11
	to Mine Drainage Creek Sump	S12
	To Bootjack Creek Sump	S13
Groundwater Flows	Wight Pit Groundwater Inflow	GW1
	Springer Pit Groundwater Inflow	GW2
	Cariboo Pit Groundwater Inflow	GW3
	Springer Pit Groundwater Outflow	GW4
	Cariboo Pit Groundwater Outflow	GW6
	Boundary Pit to Wight Pit	GW7
Pumped Flows - Outflows from Wight Pit	Process Water	P16
	Dewatering to Long Ditch	P21
Pumped Flows – Inflows to Springer Pit	Tailings Slurry from the Mill	P2
	Pumped flow from Central Collection Sump	P9
	Pumped flow from Mill Site Sump	P14
	Pumped flow from Cariboo Pit Sump	P17
	Pumped flow from NW Sump	P18
	Pumped flow from Mine Drainage Creek Sump	P19

Flow Group	Component	Flow Label
Pumped Flows – Pit Dewatering	Springer Pit lake Dewatering to SERDS	P23
	Springer Pit lake Dewatering to Bypass	P29
Pumped Flows - Process Plant	Process Water from Central Collection Sump	P1
Pumped Flows - Sumps	Geology Domestic Water Effluent to Mill Site Sump	P15
	Mill Domestic Water into Mill Site Sump	P13
	9km Sump to NW Sump	P20
	NW Sump to Mine Drainage Creek Sump	P24
	Mine Drainage Creek Sump to SERDS Ditch	P10
	PETBP to Central Collection Sump	P7
	South Seepage Pond to Main Embankment Seepage Pond	P6
	Main Embankment Seepage Pond to PETBP	P8
	Bootjack Creek Sump to SERDS Ditch	P11
Transfers	Long Ditch to Central Collection Sump	T1
	SERDS ditch to Long Ditch	T2
	Central Collection Sump	T3
	Tailings Drainage to Central Collection Sump	T5
	Treated Discharge to Environment from PETB	T6

a) Evaporation and direct precipitation flows not shown on process flow diagram.

b) No flows were assigned specifically for snowpack. Instead, snowpack was accumulated in the model and applied to the runoff flows as snowmelt.

N/A = not applicable; TSF = Tailings Storage Facility; PETBP = Perimeter Embankment Till Borrow Pond; CCS = Central Collection Sump; SERDS = Southeast Rock Dump.

Table A2: Description of Flows for Future Operations

Flow Group	Component	Flow Label
Hydrology	Precipitation	N/A[(a)]
	Evaporation	N/A[(a)]
	Runoff	All flows labelled R[(b)]
Consumption	Turbomisters	C1, C9
	Water Truck Usage	C2, C4, C5, C8
	Sprinklers	C3,C7
	Snowmakers	C10
	Big Gun Sprinklers	C11
Seepage (from Tailings Storage Facility)	To South Seepage Pond	S1
	To Main Embankment Seepage Pond	S2, S3
	To Perimeter Embankment Till Borrow Pond (PETBP)	S4, S5
	To Environment/Hazeltine Creek	S14

Flow Group	Component	Flow Label
Seepage (From other Facilities)	SERDS Dump to SERDS Ditch	S6
	North Bell Dump to Wight Pit (via Joes Creek Pipe)	S7
	East RDS to SERDS Ditch	S8
	NEZ Dump to SERDS Ditch	S9
	Temp. PAG Stockpile to 9km Sump	S10
	Temp. PAG Stockpile to NW Sump	S11
	to Mine Drainage Creek Sump	S12
	To Bootjack Creek Sump	S13
Groundwater Flows	Wight Pit Groundwater Inflow	GW1
	Springer Pit Groundwater Inflow	GW2
	Cariboo Pit Groundwater Inflow	GW3
	Springer Pit Groundwater Outflow	GW4
	Cariboo Pit Groundwater Outflow	GW6
	Boundary Pit to Wight Pit	GW7
Pumped Flows - Outflows from Wight Pit	Process Water	P16
	Dewatering to Long Ditch	P21
Pumped Flows – Inflows to Springer Pit	Pumped flow from Cariboo Pit Sump	P17
	Pumped flow from NW Sump	P18
	Emergency flow from PETBP	P5e
Pumped Flows – Pit Dewatering	Springer Pit lake Dewatering to SERDS	P23
	Springer Pit lake Dewatering to Bypass	P29
Pumped Flows – Process Plant Flows	Process flow from Tailings Storage Facility	P28
	Process Return to Tailings Storage Facility	P27
Pumped Flows - Sumps	PETBP to Tailings Storage Facility	P5
	South Seepage Pond to Main Embankment Seepage Pond	P6
	Main Embankment Seepage Pond to PETBP	P8
	Mine Drainage Creek Sump to SERDS Ditch	P10
	Bootjack Creek Sump to SERDS Ditch	P11
	Mill Domestic Water into Mill Site Sump	P13
	Geology Domestic Water Effluent to Mill Site Sump	P15
	9km Sump to NW Sump	P20
	Mill Site Sump to Tailings Storage Facility	P31
	Combined P27 and P31	P32

Flow Group	Component	Flow Label
Transfers	Long Ditch to Central Collection Sump	T1
	SERDS ditch to Long Ditch	T2
	Central Collection Sump	T3
	Tailings Drainage to Main Embankment Seepage Pond	T5a
	Treated Discharge to Environment from PETB	T6
Make Up Water	Tailings Storage Facility from Polley Lake	P33

a) Evaporation and direct precipitation flows not shown on process flow diagram.

b) No flows were assigned specifically for snowpack. Instead, snowpack was accumulated in the model and applied to the runoff flows as snowmelt.

N/A = not applicable; TSF = Tailings Storage Facility; PETBP = Perimeter Embankment Till Borrow Pond; CCS = Central Collection Sump; SERDS = Southeast Rock Dump.

Table A3: Description of Flows for Closure

Flow Group	Component	Flow Label
Hydrology	Precipitation	N/A[(a)]
	Evaporation	N/A[(a)]
	Runoff	All flows labelled R[(b)]
Seepage (from Tailings Storage Facility)	South Seepage Pond Inflow	S1
	Perimeter Embankment Till Borrow Pond (PETBP)	S4, S5
	Main Embankment Seepage Pond	S2, S3
	To Environment/Hazeltine Creek	S14
Seepage (From other Facilities)	SERDS Dump to SERDS Ditch	S6
	North Bell Dump to Wight Pit (via Joes Creek Pipe)	S7
	East RDS to SERDS Ditch	S8
	NEZ Dump to SERDS Ditch	S9
	Temp. PAG Stockpile to 9km Sump	S10
	Temp. PAG Stockpile to NW Sump	S11
	to Mine Drainage Creek Sump	S12
	To Bootjack Creek Sump	S13
Groundwater Flows	Wight Pit Groundwater Inflow	GW1
	Springer Pit Groundwater Inflow	GW2
	Springer Pit Groundwater Outflow	GW4
	Boundary Pit to Wight Pit	GW7
Pumped Flows - Sumps	9km Sump to NW Sump	P20
	Bootjack Creek Sump to SERDS Ditch	P11
	NW Sump to Mine Drainage Creek Sump	P24
Pumped Flows - Outflows from TSF	Dewatering to CCS for Spillway Construction	P34

Flow Group	Component	Flow Label
Overflow	South Seepage Pond to Main Embankment Seepage Pond	OF1
	Main Embankment Pond to Perimeter Embankment Seepage Pond	OF2
	From TSF to PETBP	OF4
	Mill Site Sump to Mine Drainage Creek Sump	OF10
	Mine Drainage Creek Sump to SERDS Ditch	OF12
	from Springer/Cariboo Pit to Mine Drainage Creek Sump	OF14
	form Wight Pit to Long Ditch	OF17
Transfers	Long Ditch to Central Collection Sump	T1
	SERDS Ditch to Long Ditch	T2
	Central Collection Sump to PETBP	T3
	Treated Discharge to Environment from PETB	T6

a) Evaporation and direct precipitation flows not shown on process flow diagram.

b) No flows were assigned specifically for snowpack. Instead, snowpack was accumulated in the model and applied to the runoff flows as snowmelt.

N/A = not applicable; TSF = Tailings Storage Facility; PETBP = Perimeter Embankment Till Borrow Pond; CCS = Central Collection Sump; SERDS = Southeast Rock Dump.

Table A4: Description of Flows for Post-Closure

Flow Group	Component	Flow Label
Hydrology	Precipitation	N/A[(a)]
	Evaporation	N/A[(a)]
	Runoff	All flows labelled R[(b)]
Seepage (from Tailings Storage Facility)	South Seepage Pond Inflow	S1
	Perimeter Embankment Till Borrow Pond (PETBP)	S4, S5
	Main Embankment Seepage Pond	S2, S3
	Seepage to Environment	S14
Seepage (From other Facilities)	SERDS Dump to SERDS Ditch	S6
	North Bell Dump to Wight Pit (via Joes Creek Pipe)	S7
	East RDS to SERDS Ditch	S8
	NEZ Dump to SERDS Ditch	S9
	Temp. PAG Stockpile to 9km Sump	S10
	Temp. PAG Stockpile to NW Sump	S11
	to Mine Drainage Creek Sump	S12
	To Bootjack Creek Sump	S13
Groundwater Flows	Wight Pit Groundwater Inflow	GW1
	Springer Pit Groundwater Inflow	GW2
	Springer Pit Groundwater Outflow	GW4
	Boundary Pit to Wight Pit	GW7

Flow Group	Component	Flow Label
Overflow	South Seepage Pond to Main Embankment Seepage Pond	OF1
	Main Embankment Pond to Perimeter Embankment Seepage Pond	OF2
	From TSF to PETBP	OF4
	Overflow to Environment/Hazeltine Creek from PETBP	OF5
	Mill Site Sump to Mine Drainage Creek Sump	OF10
	Mine Drainage Creek Sump to SERDS Ditch	OF12
	from Springer/Cariboo Pit to Mine Drainage Creek Sump	OF14
	NW Sump to Mine Drainage Creek Sump	OF15 / P24
	NW Sump to Mine Drainage Creek Sump	OF16 / P20
	form Wight Pit to Long Ditch	OF17
Transfers	Long Ditch to Central Collection Sump	T1
	SERDS Ditch to Long Ditch	T2
	Central Collection Sump to PETBP	T3

a) Evaporation and direct precipitation flows not shown on process flow diagram.

b) No flows were assigned specifically for snowpack. Instead, snowpack was accumulated in the model and applied to the runoff flows as snowmelt.

N/A = not applicable; TSF = Tailings Storage Facility; PETBP = Perimeter Embankment Till Borrow Pond; CCS = Central Collection Sump; SERDS = Southeast Rock Dump.

2.0 STOCHASTIC CLIMATE INPUTS

Monthly precipitation values were log-transformed, and the distribution of the values fit to a normal distribution. The arguments for the normal distribution are the mean and standard deviation. The monthly means and standard deviations of the log-transformed monthly precipitation values were therefore determined. The standard deviations were adjusted based on trial and error so that the annual mean of the stochastically generated results agreed with the mean of the historical data. Table A5 shows the input arguments (mean and standard deviations) used to define the normal distribution stochastic element in GoldSim.

Table A5: Stochastic Generator Normal Distribution Input Arguments

Month	Mean of the Log Transformed Monthly Precipitation Depths [(a)]	Adjusted Standard Deviation of the Log Transformed Monthly Precipitation Depths [(a)]
January	1.60	0.23
February	1.48	0.21
March	1.54	0.22
April	1.61	0.23
May	1.70	0.24
June	1.87	0.27
July	1.65	0.24
August	1.63	0.23
September	1.72	0.25
October	1.72	0.25
November	1.67	0.24
December	1.84	0.26

a) Unitless.

3.0 CATCHMENT AREAS – MINE WATER MANAGEMENT FACILITIES

Table A6 shows the catchment areas based on land type for the mine water management facilities.

Table A6: Catchment Areas Based on Land Type for Mine Water Management Facilities

Element	Rock Dump Storage Areas (m^2)	Disturbed Areas (m^2)	Pit Walls	Haul and Access Roads (m^2)	Undisturbed Areas (m^2)	Mill Site Areas	Maximum Pond Area (m^2)
South Seepage Pond	0	0	0	0	0	0	385
Main Embankment Seepage Pond + ABR	214,910	124,490	0	0	0	0	37,550
TSF Upstream Catchment	0	63,800	0	238,430	320,560	0	0
Perimeter Embankment Till Borrow Pit	100,540	193,080	0	96,350	65,060	0	69,310
Central Collection Sump	0	122,210	0	67,920	248,419	0	21,830
Bootjack Creek Sump	0	70,050	0	103,990	0	0	1,130
SERDS (includes Mill Site Area)	401,240	313,060	0	165,456	383,920	273,920	0
Mill Site Sump	0	0	0	0	0	0	1,630
Cariboo Pit Sump	922,700	0	268,208	0	0	129,440	0
Mine Drainage Creek Sump	437,190	114,980	137,340	111,140	0	314,170	1,130
Long Ditch	892,508	1,137,433	0	261,430	202,650	0	0
Springer Pit	0	156,100	495,789	0	0	0	0
NW Sump	205,920	60,210	0	63800	0	0	240
Nine KM Sump	497,430	60,740	0	0	140,280	0	400
Wight Pit	162022	0	251,888	0	0	0	0
Boundary Pit	3511	0	9616	0	10286	0	0
Total Area (m^2)	4,730,479	3,553,587	1,162,841	1,369,946	1,573,825	717,530	133,605

At closure, the land types are reclaimed according to the schedule below:

- Haul Roads: Converted to Disturbed Land type, with 14% being converted in the 3rd year of closure and 22% converted in the 4th. The rest of the Haul Roads remain in place for site access.
- Waste Dumps: Converted to Disturbed Land type over the first 4 years of closure with 22% converted in year 1, 37% in year 2, 61% in year 3, and 100% in year4.
- Disturbed Land: Converted to Undisturbed Land type in years 5 to 20 after closure, with 25% in year 5, 50% in year 10, 75% in year 15 and 100% in year 20.

4.0 FLOW RATES

4.1 Pumped Flows

Maximum pumping rates are shown in Table A7, with the exception of flows P10, P13, P15, P16, P21 and P23. Pump specifications were available for several pumps on site; however, no information was available regarding the energy losses of the pumping systems. Therefore maximum pumping capacities were assumed based on Golder's engineering judgement. The assumed pumping rates would not materially affect the results of Springer Pit water level, or the predicted dates of reaching critical elevations under any scenario. Flows P1, P2, P27 and P28 are defined based on the process flow requirements from the Mill and as such are discussed later in this section.

Table A7: Assumed Maximum Pumping Rates for Operational Flows

Flow ID	From	To	Assumed Flow Rate (m^3/s)
P5	Perimeter Embankment Till Borrow Pit	TSF	0.20
P5e	Perimeter Embankment Till Borrow Pit	Springer Pit/TSF	1.00
P6	South Seepage Pond	Main Embankment Seepage Pond	0.10
P7	Perimeter Embankment Till Borrow Pit	Central Collection Sump	0.20
P8	Main Embankment Seepage Pond	Perimeter Embankment Till Borrow Pond	0.10
P9	Central Collection Sump	Springer Pit	0.52
P10	Mine Creek Drainage Sump	SERDS Ditch	N/A [(a)]
P11	Bootjack Creek Sump	SERDS Ditch	0.10
P13	Mill Domestic Water	Mill Site Sump	N/A [(b)]
P14	Mill Site Sump	Springer Pit	0.10
P15	Geology/ Domestic Water	Mill Site Sump	N/A [(b)]
P16	Wight Pit	Mill Process Water Tank	N/A [(c)]
P17	Cariboo Pit	Springer Pit	0.16
P18	NW Sump	Springer Pit	0.11
P19	Mine Drainage Creek Sump	Springer Pit	0.05
P20	9 km Sump	NW Sump	0.16
P21	Wight Pit	Long Ditch	N/A[(d)]
P23	Springer Pit	Perimeter Embankment Till Borrow Pond	N/A [(d)]
P24	NW Sump	Mine Drainage Creek Sump	0.10
P29	Springer Pit	Environment via Bypass	0.12
P31	Mill Site Sump	TSF	0.10
P33	Polley Lake	TSF	0.20

a) No maximum pump rate applied. This pumping demand is dynamic, and dependent on the required pumping rate to dewater the Mine Drainage Creek Sump.

b) Pump rate defined by measured domestic flow rates.

c) Measured pump rates.

d) Pump demand based on process flow demands and target volume; no maximum pump rate was needed in the model.

e) Discussed in Section 4.4 of the report.

N/A = Not applicable

Flows P1, P2, P27 and P28 are defined as follows:

- P1 and P28 are defined as the process water demand subtract P16 (flows from Wight Pit)
- P2 and P27 are defined as process water (including interstitial water) in addition to tailings solids

Domestic flows from the Geology station and Mill Site have been estimated by MPMC staff, and are shown in Table A8.

Table A8: Domestic Flows into Mill Site Sump

Flow ID	Description	Flow Rate (m^3/s)
P13	Domestic Water from Mill Site	0.00003
P15	Domestic Water from Geology station	0.0063

Note: Flow units shown here as defined in the GoldSim model

4.2 Tailings Storage Facility Seepage Flows

MPMC staff has measured post breach seepage flows from the TSF, and these are presented in Table A9.

Table A9: Measured Seepage Flows from TSF Post-breach.

Flow ID	Description	Flow Rate (m^3/s)
S1	From TSF to South Seepage Pond	0.00095
S2	From TSF to Main Embankment Seepage Pond via South Toe Drain	0.006
S3	From TSF to Main Embankment Seepage Pond via Main Toe/ Foundation Drain	0.0061
S4	From TSF to Perimeter Embankment Till Borrow Pit via Perimeter Drain	0
S5	From TSF to Perimeter Embankment Till Borrow Pit via Toe Drains	0.080

Table A10: Modeled Seepage flows from the TSF for Closure.

Closure Year	To South Seepage Pond	To Main Embankment Seepage Pond via South Toe Drain	To PETBP via Perimeter Drain	To Hazeltine Creek/Environment
	S1 (m^3/s)	S2 (m^3/s)	S4 (m^3/s)	S14 (m^3/s)
1	0.0127	0.0081	0.0194	0.0033
2	0.0054	0.0058	0.0099	0.0032
3	0.0043	0.0052	0.0082	0.0030
4	0.0037	0.0048	0.0073	0.0029
5	0.0034	0.0045	0.0068	0.0028
6	0.0032	0.0043	0.0065	0.0027
7	0.0030	0.0040	0.0063	0.0026
8	0.0029	0.0039	0.0061	0.0026
9	0.0028	0.0037	0.0060	0.0025
10	0.0027	0.0036	0.0059	0.0024
11	0.0026	0.0034	0.0058	0.0024
12	0.0025	0.0033	0.0057	0.0024
13	0.0025	0.0032	0.0057	0.0023
14	0.0024	0.0031	0.0056	0.0023
15	0.0023	0.0030	0.0056	0.0022
16	0.0023	0.0029	0.0055	0.0022
17	0.0023	0.0028	0.0055	0.0022
18	0.0022	0.0028	0.0055	0.0022
19	0.0022	0.0027	0.0055	0.0021
20	0.0022	0.0026	0.0054	0.0021
21	0.0022	0.0026	0.0054	0.0021
22	0.0021	0.0026	0.0054	0.0020
23	0.0021	0.0025	0.0054	0.0020
24	0.0021	0.0025	0.0054	0.0020
25	0.0021	0.0024	0.0054	0.0020
26	0.0021	0.0024	0.0053	0.0020
27	0.0021	0.0024	0.0053	0.0020
28	0.0020	0.0024	0.0053	0.0020
29	0.0020	0.0023	0.0053	0.0020
30	0.0020	0.0023	0.0053	0.0019
31	0.0020	0.0023	0.0053	0.0019
32	0.0020	0.0023	0.0053	0.0019
33	0.0020	0.0023	0.0053	0.0019
34	0.0020	0.0022	0.0053	0.0019
35	0.0020	0.0022	0.0053	0.0019
36	0.0020	0.0022	0.0053	0.0019
37	0.0020	0.0022	0.0053	0.0019
38	0.0020	0.0022	0.0053	0.0019
39	0.0020	0.0022	0.0053	0.0019
40	0.0020	0.0022	0.0053	0.0018
41	0.0020	0.0022	0.0052	0.0018
42	0.0020	0.0021	0.0052	0.0018
43	0.0019	0.0021	0.0052	0.0018
44	0.0019	0.0021	0.0052	0.0018
45	0.0019	0.0021	0.0052	0.0018
46	0.0019	0.0021	0.0052	0.0018
47	0.0019	0.0021	0.0052	0.0018
48	0.0019	0.0021	0.0052	0.0018
49	0.0019	0.0021	0.0052	0.0018
+50	0.0019	0.0021	0.0052	0.0018

4.3 Consumption Flows

The flow parameters for the turbomisters are shown in Table A11 and Table A12. Moving the turbomisters from their current locations would not materially change the model results.

Table A11: Operational Days per Month for Turbomisters

Flow ID	From	Hours per Day					
		May	June	July	August	September	October
C1	Main Embankment Seepage Collection Pond	10	10	15	15	12	10

Table A12: Operational Flow Rates for Turbomisters

Flow ID	From	Evaporation Rates (m^3/hr)	
		May, June and October	July to September
C1	Main Embankment Seepage Collection Pond	5.5	12.7

The flow parameters for the Sprinklers are shown in Table A13 and Table A14.

Table A13: Operational Hours per Month for Sprinklers

Flow ID	From	Hours per Month					
		May	June	July	August	September	October
C3 [(a)]	Wight Pit	40	40	120	120	120	40
C7 [(b)]	Main Embankment Seepage Collection Pond	40	40	120	120	120	40

a) Combined hours per month for East RDS and NEZ Dumps.

b) Sprinkler Demand unknown at this time, and the consumption hours for C3 were applied to C7.

Table A14: Operational Flow Rates for Sprinklers

Flow ID	From	Evaporation Rates (m^3/hr)	
		May, June and October	July to September
C3 [(a)]	Wight Pit	11.4	22.7
C7 [(b)]	Main Embankment Seepage Collection Pond	11.4	22.7

The flow parameters for water trucks are shown in Table A15 and Table A16 below.

Table A15: Operational Days per Month for Water Trucks

Flow ID	From	Days per Month					
		May	June	July	August	September	October
C2	Springer Pit	N/A	N/A	N/A	N/A	N/A	N/A
C4	Wight Pit	10	5	20	20	15	10
C5	Main Embankment Seepage Collection Pond	10	5	20	20	15	10

Note: C2 currently not operational in SWWBM.

Table A16: Operational Flow Rates for Water Trucks

Flow ID	From	To	Flow Rates (m^3/day)
C2	Springer Pit	Water Trucks	N/A
C4	Wight Pit	Water Trucks	540
C5	Main Embankment Seepage Collection Pond	Water Trucks	270

4.4 Transfer Flows

The flow rates for the transfer flows were defined in the model as described in Table A17.

Table A17: Definitions of Transfer Flows in SWWBM

Flow ID	From	To	Flow Definition
T1	Long Ditch	Central Collection Sump	Flow rates determined by runoff and baseflow from the Long Ditch catchment
T2	SERDS Ditch	Central Collection Sump	Flow rates determined by runoff and baseflow from the SERDS ditch catchment
T3	Central Collection Sump	Perimeter Embankment Till Borrow Pond	Modelled as the overflow rate from the CCS
T5	TSF	Central Collection Sump	Tailings Sump Transfer to CCS (during Restricted operations)
T5a	TSF	Main Embankment Seepage Pond	Tailings Sump Transfer to Main Embankment Seepage Pond
T6	Perimeter Embankment Till Borrow Pond	Treatment Plant	Transfer for Treatment and Discharge

5.0 STORAGE CHARACTERIZATION

Measured stage-storage curves were available for the following storage elements:

- Tailings Storage Facility
- Perimeter Embankment Till Borrow Pit
- Cariboo Pit
- Springer Pit
- Wight Pit
- Boundary Pit

Table A18 to Table A25 shows the state-storage curves for the facilities mentioned above. Two stage-storage curves are presented for the TSF, one for start of future operations, and the other for the start of closure. A stage-storage curve for the combined Springer and Cariboo Pit is also presented.

Table A18: Stage-Storage Curve TSF Start of Future Operations (1 July 2016)

Elevation (masl)	Storage (m^3)
947.0	185,300
947.5	301,100
948.0	464,600
948.5	649,400
949.0	856,100
949.5	1,083,900
950.0	1,329,900

Table A19: Stage-Storage Curve TSF Start of Closure (1 July 2020)

Elevation (masl)	Storage (m^3)
963.0	0
964.0	7,300
965.0	93,200
966.0	374,700
967.0	953,200
968.0	1,917,500
969.0	3,349,200
970.0	5,118,500

Table A20: Stage-Storage Curve Perimeter Embankment Till Borrow Pond (PETBP)

Elevation (masl)	Storage (m^3)
917	0
918	2,714
919	20,341
920	40,371
921	62,011
922	85,409
923	112,779
924	148,489
925	190,344

Table A21: Stage-Storage Curve Cariboo Pit (Restricted Operations)

Elevation (masl)	Storage (m^3)
1040	15,300
1045	39,100
1050	69,400
1055	124,500
1060	190,400
1065	283,600
1070	387,400
1075	529,700
1080	688,400
1085	883,500
1090	1,078,600
1094	1,234,600

Table A22: Stage-Storage Curve Springer Pit (Restricted Operations)

Elevation (masl)	Storage (m^3)
939	0
940	47,600
952	467,300
964	1,079,000
976	1,884,900
988	2,941,200
1000	4,253,600
1012	6,216,300
1024	8,554,400
1036	11,178,200
1048	14,243,900
1050	14,806,100

Table A23: Stage-Storage Curve Combined Springer and Cariboo Pits (End of Operations)

Elevation (masl)	Storage (m^3)
878	0
879	10,800
880	21,800
885	79,300
890	141,300
895	225,300
900	321,200
905	441,200
910	587,400
915	755,500
920	954,100
925	1,168,400
930	1,424,900
935	1,709,300
940	2,044,500
945	2,451,700
950	2,888,200
955	3,415,300
960	3,988,200
965	4,627,400
970	5,334,600
975	6,083,400
980	6,930,000
985	7,830,400
990	8,871,400
995	10,007,600
1,000	11,255,500
1,005	12,665,100
1,010	14,138,200
1,015	15,796,300
1,020	17,531,000
1,025	19,359,900
1,030	21,292,500
1,035	23,321,800
1,040	25,596,500
1,045	27,934,800
1,050	30,387,800

Table A24: Stage-Storage Curve Wight Pit

Elevation (masl)	Storage (m^3)
805	0
810	2,700
820	12,000
830	29,000
840	70,100
850	139,600
860	241,100
870	382,500
880	595,800
890	965,000
900	1,466,200
910	2,124,400
920	3,292,000
930	4,484,100

Table A25: Stage-Storage Curve Boundary Pit

Elevation (masl)	Storage (m^3)
1067	0
1068	200
1069	1,000
1070	3,400
1071	7,400
1072	14,500

Maximum pond areas for the remaining mine storage facilities were determined based on ortho-imagery and LiDAR data (MPMC 2014). Stage storage curves were then estimated based on assumed depths for each facility. A side-slope of 2H:1V was also assumed for each facility. The assumptions and derived storage capacities of these ponds are summarized in Table A26.

Table A26: Estimated Storage Characteristics

Storage Element	Maximum Pond Area (m^2)	Assumed Depth (m)	Estimated Area at Bottom of Pond	Estimated Capacity (m^3)	Initial Pond Volume (m^3)
South Seepage Pond	385	1	244	314	0
Main Embankment Seepage Pond	37,546	2.5	33,771	89,146	0
Central Collection Sump	21,823	2.5	18,968	50,989	0
Bootjack Creek Sump	1,130	1.5	763	1,419	0
Mill Site Sump	1,628	1.5	1,180	2,106	0
Mine Drainage Creek Sump	1,125	1.5	759	1,413	0
NW Sump	231	1	174	203	0
Nine KM Sump	400	1	256	328	0

6.0 POTENTIAL RECEIVING ENVIRONMENTS

Table A27 shows the catchment areas for the potential receiving environments.

Table A27: Catchment Areas Based on Landtype for Potential Receiving Environment Waterbodies

Element	Total Watershed Area (m^2)	Disturbed (m^2)	Undisturbed Area (m^2)	Maximum Lake Area (m^2)
Bootjack Lake	10,269,400	0	7,571,400	2,698,000
Polley Lake (excluding Bootjack Creek Diversion)	18,536,500	0	14,767,500	3,769,000
Hazeltine Creek (excluding Polley Lake)	10,691,000	735,510	9,955,510	N/A
Bootjack Creek Diversion [(a)]	1,708,000	214,500	1,493,500	N/A
Edney Creek (at the mouth)	87,400,000	0	87,400,000	N/A
Total Area (m^2)	128,604,900	950,010	121,187,910	6,467,016

Note: Rock Disposal Sites, Haul and Access Roads, Pit Walls and Mill Site areas not shown, as none of the receiving environments drain these land types.

a) Not a receiving environment waterbody, but included in the GoldSim model as part of the area contributing to Polley Lake.

N/A = not applicable.

6.1 Bootjack Lake

A hydrodynamic model of Bootjack Lake has been built to address the impact of the mine discharge on Bootjack Lake. The only discharge from the Mine site to Bootjack Lake is a groundwater seepage from Springer Pit (GW4). The only other impact on Bootjack Lake from the mine site is that the natural catchment of Bootjack Lake is reduced due to the Mine Site interception ditches that run along the slopes to the East of Bootjack Lake.

ATTACHMENT B
Climate Data

		January			
Source	**Year**	**Total Rain (mm)**	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
Likely	1974				
	1975	0	67.1	67.1	
	1976	18.5	78.2	96.8	0
	1977	14.5	19.3	33.8	
	1978	2.4	37.5	39.9	47
	1979	0	43.2	43.2	55
	1980	7.4	15	22.4	29
	1981	12.7	4.4	17.1	21
	1982	0	192.2	192.2	93
	1983	25.4	29.5	54.9	6
	1984	30.6	43.5	74.1	42
	1985	27	20.6	47.6	60
	1986				20
	1987	5	29.8	34.8	
	1988	4.5	25.4	29.9	22
	1989	10	76.3	86.3	51
	1990	3.9	90.2	94.1	58
	1991	6.7	30.8	37.5	
	1992	34.5	55.5	90	16
	1993	0	34.8	34.8	57
MPMC	1995				
	1996				
	1997				
	1998		28.9	28.9	78.5
	1999		59.4	59.4	148.2
	2000		16	16	147
	2001		0	0	120
	2002		31	31	196
	2003		10	10	
	2004			0	
	2005		11	11	107
	2006	0	47	47	147
	2007	0		0	
	2008	0	71	71	206
	2009	0	0	0	103
	2010	0.8	0	0.8	99
	2011	0	103	103	160
	2012	0	0	0	76
	2013	0	27	27	139
	2014	0	195	195	339
	2015	0	113	113	145
	2016	31.5	67	98.5	167

February			
Total Rain (mm)	Total Snow (cm)	Total Precipitation (mm)	Snow Ground Last Day (cm)
1	45.7	46.7	
0	91.4	91.4	
11	21.6	32.6	
1.2	11.5	12.7	26
2	60.2	62.2	
18.8	12	30.8	19
18.9	16	34.9	10
3.8	58.7	62.5	84
27	5	32	1
8.3	20	28.3	31
12.9	66.7	79.6	80
4.8	16.1	20.9	24
10.8	32.9	43.7	25
1.3	81.7	83	41
13.4	15.1	28.5	45
2	57.8	59.8	67
7.9	5.2	13.1	27
10.8	14.3	25.1	
0	3.4	3.4	52
	58.1	58.1	136.6
	60.4	60.4	208.6
	51	51	198
	7	7	127
	38	38	234
	38.8	38.8	
		0	
	32	32	139
0	5	5	152
0		0	
0	0	0	177
0	0	0	99
1.0	24	25.0	123
0	35	35	195
0	117	117	193
20.2	0	20.2	123
0	5	5	344
16.6	0	16.6	113
26.4	106	132.4	219

March			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
9.9	30.2	40.1	
9.4	34.8	44.2	0
0	53.1	53.1	
27.5	4.3	31.8	0
21.2	8.4	29.6	
4.1	61.4	65.5	18
18.1	4.2	22.3	
0	16.4	16.4	60
35	5.1	40.1	
16.4	5.2	21.6	0
0.2	15.8	16	59
			0
28.4	23.8	52.2	
29.3	18.9	48.2	17
10.7	17.9	28.6	29
3.8	14.6	18.4	34
2	63.4	65.4	19
8.4	0	8.4	0
15.5	20.4	35.9	
	38.7	38.7	175.3
	34.5	34.5	243.1
	0	0	190
	6	6	133
	37	37	271
0.25	40	40.25	
		0	
	0	0	114
4.6	0	4.6	71
0		0	
0	227	227	227
0	78	78	177
20.6		20.6	
0	89	89	284
0	0	0	169
21.8	125	146.8	248
8.5	67	75.5	411
45.7	0	45.7	3
17.2	0	17.2	50

April			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
6.9	7.9	14.7	
46	26.4	72.4	0
21.6	9.8	31.4	0
26.2	2.3	28.5	0
29.8	20.5	50.3	0
24.3	0	24.3	0
39.4	22.7	62.1	0
8.6	14.4	23	0
16.6	0.2	16.8	
31.6	4.3	35.9	0
6.5	17.5	24	0
53.8	0.6	54.4	0
53.1	2.5	55.6	0
54.2	16.9	71.1	
13	9.8	22.8	0
45.7	2	47.7	0
22	3.6	25.6	0
50.5	2	52.5	0
80.1	0.2	80.3	0
49		49	
10		10	
19	0	19	0
35.5	0	35.5	0
45.1	0	45.1	0
106.8		106.8	
		0	
	0	0	0
29.8	0	29.8	0
123.0		123.0	
116.21	0	116.21	98
21.4	0	21.4	
26.8	0	26.8	28
71.4	0	71.4	31
121	0	121	0
76	0	76	0
37.4	0	37.4	0
20.4	0	20.4	0
33.9	0	33.9	0

May			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
39.1	1	40.1	0
24.9	0	24.9	0
66.2	0	66.2	0
59.9	0	59.9	0
47.5	0	47.5	0
59.5	0	59.5	0
59.3	0	59.3	0
68.8	0	68.8	0
24.9	0	24.9	0
85.1	0.2	85.3	0
35.1	5.1	40.2	0
56.4	0	56.4	0
58.8	0	58.8	0
94.5	0	94.5	0
57.8	0	57.8	0
72.4	0	72.4	0
15.7	0	15.7	0
42.9	1.4	44.3	0
67.9	0	67.9	0
45.3		45.3	
27		27	
65.5		65.5	
57		57	
35.5		35.5	
90.4		90.4	
58.5		58.5	
		0	
		0	
34.0		34.0	
21.8		21.8	
66		66	
55.2		55.2	
48.4		48.4	
92.8		92.8	
32.2		32.2	
67		67	
69.4		69.4	
36.2		36.2	
51		51	

June			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
75.2	0	75.2	0
123.2	0	123.2	0
39.7	0	39.7	0
72	0	72	0
87.1	0	87.1	0
110.1	0	110.1	0
84.9	0	84.9	0
31.1	0	31.1	0
144.5	0	144.5	0
103.8	0	103.8	0
90.6	0	90.6	0
46.1	0	46.1	0
43.9	0	43.9	0
64.2	0	64.2	0
77.6	0	77.6	0
93.8	0	93.8	0
88.6	0	88.6	0
37	0	37	0
140.2	0	140.2	0
51.8		51.8	
67.4		67.4	
97.8		97.8	
100.5		100.5	
111.3		111.3	
40.3		40.3	
60.75		60.75	
		0	
		0	
41.6		41.6	
68.0		68.0	
79.2		79.2	
42.8		42.8	
83.6		83.6	
80.2		80.2	
118.4		118.4	
95.8		95.8	
42.9		42.9	
48.2		48.2	

July			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
36.1	0	36.1	0
47.5	0	47.5	0
98	0	98	0
49.9	0	49.9	0
15.1	0	15.1	0
56.2	0	56.2	0
53.5	0	53.5	0
216.2	0	216.2	0
111.4	0	111.4	0
26.5	0	26.5	0
5.9	0	5.9	0
62.5	0	62.5	0
55.6	0	55.6	0
49.2	0	49.2	0
46.5	0	46.5	0
23.4	0	23.4	0
83.7	0	83.7	0
24.4	0	24.4	0
73	0	73	0
121.6		121.6	
43.4		43.4	
64.3		64.3	
65.7		65.7	
115.5		115.5	
27.8		27.8	
31.5		31.5	
		0	
65.81		65.81	
55.81		55.81	
27.80		27.80	
56		56	
38.2		38.2	
20.6		20.6	
104.1		104.1	
40		40	
3.8		3.8	
82.1		82.1	
63.8		63.8	

August			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
102.1	0	102.1	0
129.5	0	129.5	0
82.8	0	82.8	0
74.8	0	74.8	0
25.7	0	25.7	0
107.6	0	107.6	0
18.7	0	18.7	0
83.4	0	83.4	0
30.1	0	30.1	0
77.6	0	77.6	0
82.4	0	82.4	0
20.2	0	20.2	0
32.8	0	32.8	0
63.7	0	63.7	0
113.7	0	113.7	0
44	0	44	0
66.6	0	66.6	0
58.8	0	58.8	0
61.3	0	61.3	0
63.25		63.25	
41.6		41.6	
19		19	
33		33	
35.5		35.5	
59.8		59.8	
27		27	
19.5		19.5	
		0	
		0	
19.20		19.20	
16.4		16.4	
60.6		60.6	
15		15	
47.2		47.2	
63.2		63.2	
7.2		7.2	
39.2		39.2	
32.6		32.6	
20.8		20.8	

September			
Total Rain (mm)	Total Snow (cm)	Total Precipitation (mm)	Snow Ground Last Day (cm)
			0
18.3	0	18.3	0
20.8	0	20.8	0
43.9	0	43.9	0
72.4	0	72.4	0
52.9	0	52.9	0
85.8	0	85.8	0
83.5	0	83.5	0
76	0	76	0
54.3	0	54.3	0
89.3	0	89.3	0
129.9	0	129.9	0
56.2	0	56.2	0
8.4	0	8.4	0
38.8	0	38.8	0
24.8	0	24.8	0
6	0	6	0
27.4	0	27.4	0
77.8	0.4	78.2	0
13.4	0	13.4	0
89.75		89.75	
61.3		61.3	
13.8		13.8	
68		68	
		0	
		0	
46.3		46.3	
146.5		146.5	
		0	
19		19	
58.4		58.4	
2.6		2.6	
25.2		25.2	
47.4		47.4	
69.2		69.2	
19.4		19.4	
7.7		7.7	
59.1		59.1	
11.1		11.1	
61.6		61.6	

October			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
46.5	1.5	48	0
131.8	12.7	144.5	0
30.7	0	30.7	0
38.2	0.3	38.5	
58.2	0	58.2	0
38.2	0.6	38.8	0
15.8	0	15.8	0
67.6	0	67.6	0
49.4	0.4	49.8	0
	0		0
51.2	15.8	67	
107.3	23.7	131	
24.9	0.3	25.2	0
25.2	0	25.2	0
39.4	1.2	40.6	0
56.9	0	56.9	0
119.9	10.8	130.7	0
31.7	34.5	66.2	24
47	6.4	53.4	0
39.7	0	39.7	
86.5		86.5	
52.5		52.5	
81		81	
94.2		94.2	
63.3		63.3	
		0	
		0	
43.5		43.5	
208.5		208.5	
		0	
64.2		64.2	
39.8		39.8	
		0	
28.4		28.4	
58.4		58.4	
23.4		23.4	
35.2		35.2	
55.6		55.6	
39.5		39.5	
71.7		71.7	
61.5		61.5	

November			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
37.8	23.1	61	
3	41.1	44.2	
26.4	6.1	32.5	
16.6	35.4	52	12
3.4	41.9	45.3	20
8.7	4.9	13.6	
45	26.2	71.2	11
51.9	17.1	69	12
25.1	14.3	39.4	3
49.3	12.2	61.5	8
15.9	65.4	81.3	21
3.7	14.4	18.1	
44.6	51.5	96.1	21
31.8	20.7	52.5	
46.3	10.3	56.6	4
75.4	26.8	102.2	2
19.7	86.7	106.4	34
37.9	44	81.9	15
44.8	33.5	78.3	
30.6	18.1	48.7	
44.5		44.5	
34.75		34.75	
35.2		35.2	
62		62	
67	0	67	0
	0	0	0
6	0	6	0
49.5	0	49.5	0
15.5		15.5	
	0	0	0
35.6	0	35.6	
45.2	0	45.2	0
40.2	0	40.2	0
62	0	62	0
43.6	0	43.6	0
27.4	67	94.4	67
24	0	24	0
34	0	34	0
12.2	72	84.2	72
38.7	65	103.7	65
16.8	23	39.8	23

December			
Total Rain (mm)	**Total Snow (cm)**	**Total Precipitation (mm)**	**Snow Ground Last Day (cm)**
14.7	69.3	84.1	
8.4	57.9	66.3	
19.3	126.5	145.8	
28.2	72.8	101	28
0	52.6	52.6	41
28.3	58	86.3	23
44.5	103.3	147.8	36
0.2	58.7	58.9	17
18	11	29	4
0.3	49.8	50.1	33
6.8	122.2	129	
2.6	39.9	42.5	27
15	22.2	37.2	28
2.4	28.6	31	21
7	73.6	80.6	
11	51.8	62.8	27
1.6	128.1	129.7	80
15.4	53.9	69.3	20
0	98	98	52
14.1	31.4	45.5	
		0	
		0	
	49.6	49.6	49.6
	88.8	88.8	88.8
	131	131	131
	189	189	189
	88	88	88
15	0	15	0
		0	
	96	96	96
	100	100	
0	125	125	125
0	135	135	135
0.2	196	196.2	196
0	105	105	105
0.6	0	0.6	57
0	105	105	105
5.7	112	117.7	112
17.4	72	89.4	144
0	0	0	32
0	76	76	100

	January				
Year	Mean Maximum Temperature (°C)	Mean Min Temp (°C)	Mean Temperature (°C)	Extreme Maximum Temperature (°C)	Extreme Minimum Temperature (°C)
1974					
1975	-3.2	-13.8	-8.5	5	-34.4
1976	-0.9	-10.4	-5.7	9.4	-21.1
1977	-2	-9.1	-5.6	7.8	-17.8
1978	-7.7	-15.2	-11.5	2	-25.5
1979	-10.4	-21.1	-15.8	4	-34
1980	-5.4	-15.3	-10.4	8.5	-31
1981	2.4	-5.3	-1.5	11.5	-13
1982	-7.9	-18.6	-13.3	5	-34.5
1983	1.5	-5.1	-1.8	7.5	-16.5
1984	-1.3	-7.7	-4.5	4.5	-24
1985	-3.1	-9	-6.1	4	-23
1986	1.9	-6.3	-2.2	10.5	-24
1987	1.4	-6.1	-2.4	7	-16
1988	-3.3	-11.2	-7.3	9	-26.5
1989	-1.7	-10.9	-6.3	8	-30
1990	-1.2	-7.9	-4.6	7	-33
1991	-8.2	-17.3	-12.7	5.5	-37.5
1992	2.9	-2.8	0	10.5	-8
1993	-8.2	-18.5	-13.4	5	-30
1994					
1995					
1996			-10.41	8.7	-29.5
1997					
1998			-11.64	14.1	-30.6
1999					
2000			-7.65	4.5	-21.9
2001					-9.7
2002			-5.6	5.6	-24.6
2003			-3	8	-18.1
2004					
2005					
2006			-1.9	6.2	-6.8
2007			-5.3	3.7	-25.2
2008			-7.5	2.0	-33.7
2009			-7.5	2.9	-25.2
2010			-2.2	5.8	-18.8
2011			-7.3	3.7	-22.6
2012			-7.1	5.8	-32.5
2013			-4.7	5.8	-17.3
2014			-4.0	5.7	-18.7
2015			-3.6	5.4	-21.7
2016			-4.6	7.4	-20.6

February				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
-6.4	-17.6	-12	5.6	-28.3
0.5	-9.5	-4.5	7.2	-21.7
5	-4.4	0.3	12.2	-12.2
2.8	-9	-3.1	9	-22.5
-3	-14.8	-8.9	10	-34.5
1.4	-8.4	-3.5	9.5	-20
1.8	-6.7	-2.5	10.5	-23.5
-0.5	-12.9	-6.7	8.5	-29.5
4.4	-3.2	0.6	11.5	-13
4	-4.4	-0.2	8.5	-13
-1.2	-10.7	-6	10	-23.5
-1.7	-12.4	-7.1	14.5	-31
4.5	-4.3	0.1	12	-12
0.4	-8.5	-4.1	7	-26.5
-6.1	-17.4	-11.8	6	-34
-1.6	-12.6	-7.1	6	-34
4.7	-3.1	0.8	10.5	-9.5
3.9	-4.6	-0.3	11	-15
-1.2	-13.8	-7.5	7	-28
		-0.96	11.7	-11.8
				-7.3
		-3.8	7.1	-19.2
		-4	6.3	-17.7
		-5.2	5.4	-16.7
		-4.0	4.2	-13.5
		-3.4	7.4	-20.2
		-6.1	3.7	-22.6
		-1.9	6.2	-6.8
		-9.6	3.3	-26.1
		-3.3	4.5	-16.7
		-2.0	3.1	-8.8
		-10.3	1.6	-28.0
		-0.7	6.9	-13.2
		-0.4	8.5	-8.6

March				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
2.1	-9.7	-3.8	6.7	-21.7
2.4	-8.2	-2.9	13.9	-31.1
4.9	-4.7	0.1	9.4	-12.8
6	-6.2	-0.1	13.5	-20
7.5	-6.2	0.7	16	-14
3.2	-7.1	-2	9	-19
8.2	-4.7	1.8	13	-11
4.1	-10	-3	12.5	-21.5
7.2	-3.6	1.8	12.5	-11
7.5	-3.5	2	14	-9
5	-6.8	-0.9	11	-14
7.8	-2.3	2.8	13.5	-6
8.2	-3.1	2.6	14.5	-12.5
5.7	-4	0.9	10.5	-10
4.5	-8	-1.8	10	-26.5
5.7	-6.5	-0.4	10	-14.5
3.4	-10.7	-3.7	12.5	-28.5
10.9	-3.3	3.8	16	-8
6.1	-6.3	-0.1	11	-21
		0.13	19.9	-13
		0.5	15.9	-9.7
		-9.6	10.6	-24.7
		-2	12.8	-31.5
		-0.5	9.8	-14.1
		0.2	9.8	-10.0
		-1.7	6.6	-12.3
		-4.2	7.4	-26.1
		1.7	11.4	-10.0
		-1.6	8.2	-23.4
		-1.4	9.8	-14.1
		-0.6	11.6	-10.9
		-4.4	8.2	-22.8
		1.9	13.2	-13.3
		2.2	17.5	-6.8

April				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
10.6	-4.1	3.3	17.2	-13.9
10.9	-2.7	4.1	20.6	-10.6
12.7	-1	5.9	29.4	-5
11.4	-2.6	4.4	20.5	-6
9.8	-2.4	3.7	23	-11
13.9	-2.1	5.9	24	-8
9.5	-2.4	3.6	21	-7
8.3	-5.8	1.3	15.5	-12.5
13.1	-1.6	5.8	19.5	-6
10.8	-1.6	4.6	24	-5.5
8.8	-2.8	3	15	-7.5
10	-1.4	4.3	22	-5.5
13	-0.7	6.2	23	-5.5
11.9	-0.8	5.6	20.5	-6
12.9	-2.5	5.2	23	-6
11.8	-1.6	5.1	18	-6.5
12.5	-2.4	5.1	22	-5.5
12.4	-0.7	5.9	20	-9.5
11.1	-1.3	4.9	16.5	-6.5
		3.76	23.1	-8.6
		1.1	19.1	-7.3
		4.1	19.4	-7.1
		4.8	19.4	-4.8
		2.9	18.3	-14.7
		1.0	14.1	-10.6
		2.5	13.3	-8.4
		4.6	22.1	-5.8
		1.1	12.6	-5.8
		3.7	14.1	-5.3
		2.1	15.0	-8.2
		3.1	19.0	-6.5
		4.1	19.3	-4.5
		8.2	23.3	-1.0

May				
Mean Maximum Temperature (°C)	Mean Min Temp (°C)	Mean Temperature (°C)	Extreme Maximum Temperature (°C)	Extreme Minimum Temperature (°C)
15.2	1.2	8.2	23.9	-1.7
16.5	2.7	9.6	23.9	-1.1
14.3	2	8.2	20.6	-2.2
14.8	-0.1	7.4	25	-6
14.5	2	8.3	24	-2.5
17.6	3.9	10.8	27.5	-2
17.1	3.7	10.4	23	-1.5
14.9	-0.3	7.3	24.5	-5
18.9	2.7	10.8	35	-2
12.8	1.4	7.1	20	-2.5
17.8	2.4	10.1	27.5	-3.5
15.8	2.2	9	29.5	-3
16.8	2.9	9.9	27.5	-2.5
16.1	2.7	9.4	27.5	-4
17	2.1	9.6	25.5	-2
15.5	3.2	9.4	25.5	-2.5
17.4	1.9	9.6	24.5	-3
17.1	1.9	9.5	29	-3
20.2	4.5	12.4	29.5	-3
		16.49	31.6	7.3
		5.91	19.4	-5.4
		7.6	23.7	-2.8
		6.7	25.5	-2.1
		7.8	24.8	-4.5
		9.4	28.3	-3.4
		9.4	24.0	-0.2
			28.5	-2.6
		7.8	23.6	-1.5
		7.6	20.6	-2.9
		7.3	19.8	-0.2
		8.0	21.0	-1.5
		9.9	26.5	-2.8
		8.6	21.3	-2.0
		11.2	22.7	-1.6
		10.0	26.8	-0.5

June				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
18.1	**5.4**	**11.8**	**27.2**	**0**
16.6	**4.3**	**10.5**	**25**	**-0.6**
21	**5.8**	**13.4**	**28.9**	**0**
22.1	**5.6**	**13.9**	**30**	**-0.5**
18.6	**4.8**	**11.7**	**28.5**	**-0.5**
19.3	**6.4**	**12.9**	**26.5**	**-1.5**
16.9	**4**	**10.5**	**22.5**	**0**
24.1	**5.8**	**15**	**31.5**	**-3**
18.8	**7.3**	**13.1**	**25.5**	**3.5**
18.2	**5.5**	**11.9**	**25.5**	**-0.5**
19	**5.2**	**12.1**	**29.5**	**-1.5**
20.8	**5.9**	**13.4**	**26**	**-0.5**
22.2	**6.9**	**14.6**	**31**	**0**
19.7	**6.5**	**13.1**	**28**	**1.5**
20.9	**6.6**	**13.8**	**29.5**	**3**
19.1	**6.8**	**13**	**28**	**1.5**
18.9	**6.5**	**12.8**	**26**	**1.5**
24.1	**7.9**	**16**	**33**	**-1**
18.6	**6.7**	**12.7**	**26.5**	**2**
		13.83	**29.9**	**2.1**
		11.95	**31.7**	**2.6**
		10.6	**29.9**	**0.1**
		14.6	**33.2**	**-0.4**
		13.8	**29.1**	**3.2**
		14	**29.5**	**4.2**
		11.8	**29.1**	**3.3**
		13.2	**26.0**	**2.9**
		11.5	**22.9**	**2.5**
		11.1	**22.5**	**3.7**
		10.8	**25.2**	**2.0**
		12.5	**27.2**	**3.5**
		12.5	**23.8**	**1.9**
		15.1	**29.7**	**3.4**

July				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
24.6	9.6	17.1	33.9	2.8
20.9	7.7	14.3	26.7	2.8
20.7	7.7	14.2	32.2	4.4
24.7	8.8	16.8	29	4
24.8	8.1	16.5	33	3
21	7.5	14.3	26.5	3.5
22.4	7.8	15.1	27.5	3
21.1	8.3	14.7	30.5	4
21	8.2	14.6	30.5	5
22.9	7	15	31.5	2.5
26.1	7.4	16.8	32	2.5
20.2	8.2	14.2	29	4.5
23.4	9.2	16.3	31.5	2.5
22	7.8	14.9	30.5	2.5
23.5	8.5	16	31	4.5
24.7	8.4	16.6	32	4
22.1	8.3	15.2	31	3.5
24.8	8.2	16.5	34	4
20.3	7	13.7	24.5	3
		13.9	32.8	5
		14	30.5	4.5
		13.6	30.7	7.6
		15.6	34.6	2.4
		12.1	23.1	4.6
		13.26	22.9	5.4
		11.38	32.3	6.6
		16.99	32.3	7.4
			33	
		17.7	31.1	7.0
		16.0	28.3	3.7
		11.7	22.9	2.9
		16.9	27.9	5.0
		16.5	31.1	4.9
		17.9	32.9	8
		16.8	30.7	6.0

August				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
18.4	6.7	12.6	25	1.7
19.2	9.6	14.4	25	5.6
23.8	8.9	16.4	31.7	5
21.7	7.4	14.6	31.5	3.5
25.2	7.8	16.5	30.5	3
19.4	6.2	12.8	25	1.5
26	8.1	17.1	33	4
20	7.9	14	27	4
22.8	7.6	15.2	29	1
22.2	7.9	15.1	28	1.5
21.8	6.9	14.4	27.5	1.5
24.6	7.8	16.2	31	1.5
20.9	6.7	13.8	27	2
22	8	15	28.5	4
22	8.5	15.3	29.5	3
24.6	8.5	16.6	34	1
22.9	9.4	16.2	31.5	2
23.5	6.9	15.2	32	-2.5
22.6	7.3	15	30.5	1.5
		16.89	35.1	3.7
		15.8	33.4	2.9
		15.3	35.6	6.2
		14.7	30.4	2.5
		13.7	26.6	6.3
		14.5	26.7	4.2
		13.5	28.3	3.7
		14.1	29.1	2.9
		16.0	31.1	5.8
		14.7	27.9	4.2
		14.3	24.8	4.2
		15.9	29.9	4.2
		16.8	30.3	6.8
		16.8	29.5	6.1
		15.8	27.6	5.5

September				
Mean Maximum Temperature (°C)	Mean Min Temp (°C)	Mean Temperature (°C)	Extreme Maximum Temperature (°C)	Extreme Minimum Temperature (°C)
			23.3	-1.7
18.8	3.1	11	23.9	-0.6
18.1	4.8	11.5	23.3	0
15.3	3.8	9.6	20.6	-1.1
15.6	4.7	10.2	21	-2
19.5	5.1	12.3	28	1.5
16.1	5.1	10.6	23.5	-1
18.6	4.5	11.6	31.5	-2
17.6	6.1	11.9	25	-0.5
14.7	3.2	9	24	-5.5
14.9	2.4	8.7	21.5	-5.5
14.1	2.5	8.3	22	-3.5
15.7	3.3	9.5	24.5	-2
20.9	4.6	12.8	28	-0.5
17.6	3.4	10.5	34.5	-2.5
19.2	4.4	11.8	24.5	-1.5
21.3	4.5	12.9	26	-1.5
17.8	4.2	11	23.5	-1
13.8	3.5	8.7	24	-3
19.5	2.1	10.8	26	-4
		12.4	31.6	-0.3
		12.62	29.5	1.2
		9.7	28.1	-1.1
		8.4	22.4	-0.6
		10.4	28.9	-1.1
		6.6	15.2	0.3
		11.0	28.7	0.3
		11.1	22.5	5.0
		10.4	23.6	0.7
		12.2	27.2	-0.6
		8.5	21.7	0.3
		12.2	26.3	2.5
		12.5	26.3	0.7
		13.1	30.7	0.2
		11.1	26.0	-1.9
		8.5	24.5	-0.4

October				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
11.1	0.9	6	17.2	-3.9
9.3	1.3	5.3	21.7	-4.4
9.9	0.2	5.1	17.2	-5.6
11.2	0.4	5.8	15.6	-5
12.1	0.2	6.2	19.5	-5.5
12.3	1	6.7	20.5	-5
12.5	0	6.3	23.5	-6
10	-0.4	4.8	14.5	-7
10.3	1.3	5.8	16.5	-7
11	-0.2	5.4	15	-4.5
7.4	-2.2	2.6	21	-25
8.1	0.3	4.2	14	-7
13.1	0.2	6.7	18.5	-7
13.2	-0.7	6.3	23.5	-6.5
12.8	1.2	7	22	-7
11.1	1.6	6.4	18.5	-4.5
8	-0.3	3.9	16.5	-5.5
7.4	-3.1	2.2	19.5	-16.5
11	-0.4	5.2	20.5	-9.5
11	0.1	5.4	20	-4.5
		3.13	22.5	-8
		2.9	16.3	-5.6
		4.87	19.6	16.9
		3.71	18.8	-6
		2.3	17.7	-4.3
		2.9	15.9	-9.4
		5.6	23.9	-12.2
		4.2	15.6	-2.9
		3.7	16.4	-10.6
		3.9	23.6	-4.8
		1.6	12.9	-8.9
		5.9	22.1	-2.4
		3.8	12.9	-2.0
		2.5	15.9	-9.4
		4.7	16.0	-4.9
		6.6	17.7	-1.6
		3.9	12.7	-1.7

November				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
3.4	-3.6	-0.1	9.4	-12.2
3.4	-5.3	-1	16.7	-20.6
4.3	-2.4	1	11.7	-11.1
1.1	-6.6	-2.8	12.2	-19.4
-0.7	-7.6	-4.2	12	-25
4	-5.9	-1	11	-12
5.1	-2.3	1.4	15.5	-11
6.3	-2.1	2.1	15	-7
0.1	-6.3	-3.1	9.5	-16.5
4.7	-1.7	1.5	13	-11
1.5	-6	-2.3	7.5	-20.5
-8.9	-15.8	-12.4	7	-35.5
1.7	-5.9	-2.1	7	-21
6.1	-0.6	2.8	12	-10
4.8	-2.3	1.3	10.5	-9
3.2	-3.8	-0.3	8.5	-11
1.5	-6.2	-2.4	15	-20
3.6	-3.2	0.2	9	-17.5
2.4	-3.4	-0.5	6	-11
1.3	-5.8	-2.3	6	-23
		-1.05	15.5	-21.2
		-0.35	20.2	11.5
		-0.53	9.1	-9
		0.29	11.2	-11.9
		0	12.3	-21.9
		0.4	10	-10.4
		-5	4.9	-19.3
		-2.0	7.4	-14.7
		-2.0	10.6	-29.1
		-2.8	6.6	-16.7
		0.7	9.8	-6.31
		0.8	9.4	-10.0
		-4.7	13.7	-25.2
		-3.7	4.6	-16.7
		-1.7	8.5	-13.4
		-1.5	5.8	-8.26
		-4.5	8.6	-26.7
		-3.7	7.5	-14.8

December				
Mean Maximum Temperature (°C)	**Mean Min Temp (°C)**	**Mean Temperature (°C)**	**Extreme Maximum Temperature (°C)**	**Extreme Minimum Temperature (°C)**
2.2	-5	-1.4	8.3	-15.6
-0.6	-8.6	-4.6	5.6	-20.6
0.7	-5.5	-2.4	8.9	-14.4
-6.8	-16.4	-11.6	5.5	-33
-5.1	-13.5	-9.3	3	-37
1.6	-7.8	-3.1	7	-31
-3.7	-11.3	-7.5	11	-28
-2.6	-10.5	-6.6	8	-25
0.2	-6.1	-3	7	-14.5
-9.3	-15.8	-12.6	1	-30.5
-7.9	-15.2	-11.6	5	-38.5
-3	-8.5	-5.8	7	-27
0.7	-6.5	-2.9	8.5	-14
0.3	-6	-2.9	10.5	-14.5
-1.1	-6.4	-3.8	9	-20.5
1	-4.3	-1.7	9	-19.5
-5.4	-13.7	-9.6	7	-37.5
2.4	-4.9	-1.3	8.5	-13
-5.7	-13.2	-9.5	3	-28
1	-5.3	-2.2	8.5	-14.5
		-6.12	11.3	-31.8
		2.27	16.2	-13.2
		-6.25	5.1	-27.4
		-3.86	4.2	-13.5
		-6	2.4	-14.3
		-3	6.3	-14.5
		-3.4	6.2	-17.4
		-2.9	4.2	-12.3
		-12	4.5	-19.5
		-11.4	4.6	-29.1
		-10.5	2.5	-29.1
		-4.2	5.0	-17.4
		-3.8	3.7	-11.7
		-5.8	6.7	-18.5
		-6.6	3.8	-24.4
		-3.4	9.5	-20.8
		-4.3	6.0	-14.9

Monthly Evaporation

Month	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
January																		4.8	8	7.6
February																		12.8	19	18
March																		36	29.9	45.2
April																		74.6	86.9	95.8
May	47	40	47	64.3	21.5	47	47			55	66.9	53.4	47	61.7	70	46	119	105.2	147.2	125.3
June	71	139.9	105.8	105.5	89.9	98.3	112			73	49.5	66.5	112	77.2	98.1	71.4	133.8	140	195	
July	65.7	143.4	108.9	107	103.5	107	145		64.5	106	65.6	81.6	107	99.19	81	88.4	183.7	158.4	174.8	
August	94.2	144	110	92	78.8	92	145		79.6	66	60.4	35.3	92	81.9	60.6	65.3	136.6	128.7	118.9	
September	51.6	59	49	50	50	43.3	50		25.7	60	21.9	76.3	50	61.6	33.9	65.8	68.4	42.5	14.3	
October	14.9	16.7	26.9	15	26	22.5	15		17	27	18.9	5.25	15	38.7	12.9	21.3	27.9	34.6	11.8	
November	2.8																2.1	7.5	6.7	
December																	4.1	7.1	5.2	

ATTACHMENT C

Predictions of Hydrogeological Conditions near the Springer and Cariboo Pits - Long-Term Technical Assessment Report - Mount Polley Mine

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-151-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

FROM Willy Zawadzki and Don Chorley **EMAIL** Willy_Zawadzki@golder.com; Don_Chorley@golder.com

PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – TECHNICAL ASSESSMENT REPORT – MOUNT POLLEY MINE

1.0 INTRODUCTION

This technical memorandum presents seepage predictions for the Springer Pit and Cariboo Pit at the Mount Polley Mine, which is operated by Mount Polley Mining Corporation (MPMC). These predictions consider the mine plan that is incorporated into the Technical Assessment Report (TAR) being prepared for the mine by Golder Associates Ltd. (Golder). The predictions are based on the hydrogeological model (Figure 1) that was previously developed for the area adjacent to these open pits (Golder 2010, 2014) and that has been recently updated (Golder 2016) to include the results of the field program that was completed in the spring of 2015 (Golder 2015) and subsequent monitoring. The reader is referred to these documents for details of model development, the underlying assumptions, and the approach adopted to simulate open pit seepage.

This memorandum documents predictions of groundwater seepage near the Springer Pit and Cariboo Pit for the TAR. It is understood that the pit lake hydrology and the pit lake water quality and resulting seepage quality are assessed by concurrent studies conducted by MPMC and Golder.

2.0 MINE PLAN

MPMC provided the ultimate pit shells for the Springer and Cariboo pits that represent final configuration of the mine workings after four years of mining (Figure 2). From the perspective of seepage assessment, the key assumptions in the mine plan for these open pits are as follows:

- The Springer Pit and Cariboo Pit will be mined to the ultimate depths of approximately 878 m and 938 m elevation, respectively.
- The ground elevation along the pit wall separating the Springer Pit and Cariboo Pit will be approximately 1,028 m.
- Potentially acid generating materials will be placed in the Springer Pit and Cariboo Pit for subaqueous disposal up to an elevation of approximately 1,004 m.
- Tailings will not be deposited in the Springer Pit and Cariboo Pit (i.e., tailings currently deposited in the Springer Pit will be removed and transported to the Tailings Storage Facility).

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

3.0 SEEPAGE PREDICTIONS

The hydrogeological model was used to simulate groundwater conditions near the Springer Pit and Cariboo Pit for the scenario representing the fully dewatered conditions, scenarios representing rising pit lake levels up to the spillway elevation of 1,050 m, and fully developed pit lake with lake surface at 1,050 m elevation. In these model simulations, it was assumed that the potentially acid generating materials that will be placed in the Springer Pit have hydraulic conductivity significantly higher than the surrounding rockmass, and thus offer no resistance to seepage entering or exiting the pit lake.

For comparison purposes, Figure 3 and Figure 4 present hydrogeological conditions predicted by the calibrated model for the existing Springer Pit in mid-2014, when this pit was fully dewatered, and for July 2015, when the pit lake level was at an elevation of approximately 1,017.2 m. Figure 5 and Figure 6 present predictions for the fully dewatered Springer Pit at its ultimate configuration (Figure 5, panel A) and at increased pit lake levels up to the spillway elevation of 1,050 m (Figure 6, panel C). The corresponding seepage quantities predicted by the model are summarized in Table 1.

Table 1: Predicted Seepage Quantities for the Ultimate Configuration of the Springer Pit and Cariboo Pit

	Springer Pit		Cariboo Pit	
Pit Lake Elevation (m)	**Groundwater Flow (m^3/d)**		**Groundwater Flow (m^3/d)**	
	Into the Lake	**Out of the Lake**	**Into the Lake**	**Out of the Lake**
Base Case				
880 (dewatered pit)	520	0	600[a]	0[a]
940	510	0	610	0
960	490	0	610	0
980	460	0	590	0
1,000	420	0	540	0
1,020	320	10	460	0
1,030	300	100	420	0
1,040	280	250	380	0
1,050 (spillover elevation)	270	400	320	20
Upper Bound				
1,050 (spillover elevation)	440	880	500	90
Lower Bound				
1,050 (spillover elevation)	190	220	250	0

a) These values represent conditions when the Cariboo Pit is fully dewatered (i.e. the base of the Cariboo Pit is at ~938 m elevation).

Model results indicated that when the Springer Pit and Cariboo Pit are at the ultimate configuration and are fully dewatered, the respective groundwater inflow to these pits would be approximately 520 m^3/d and 600 m^3/d, respectively. When fully dewatered, both pits would act as strong groundwater sinks that would reverse groundwater flow between Bootjack Lake and the pit such that the seepage from Bootjack Lake to the underlying bedrock would occur. As the pit lake level is raised, the groundwater seepage into the pit lake was predicted to gradually decrease to approximately 270 m^3/d in the Springer Pit and 320 m^3/d in the Cariboo Pit once the spillway elevation of 1,050 m is reached.

In addition, as the pit lake level increases between 1,020 m and 1,030 m elevation, seepage in the range of 10 m^3/d to 100 m^3/d from the Springer Pit lake into the subsurface was predicted to occur. This seepage was found to gradually increase to approximately 400 m^3/d when the pit lake reaches the spillover elevation of 1,050 m. In the Cariboo Pit, seepage towards Bootjack Lake of approximately 20 m^3/d was predicted to occur only when the pit lake level approaches 1,050 m elevation. At this elevation, the pit lake was predicted to act as a "flow-through" lake with groundwater recharge occurring from the uplands located northeast from both pits and recharge to groundwater occurring towards the southwest.

Seepage pathways predicted for the conditions representing the pit lake at the spillway elevation are presented in Figure 7. Uncertainty in the predicted seepage rates, as presented in Table 1, was quantified using the same approach as the one that was adopted in previous analyses (e.g., Golder 2014).

4.0 CLOSURE

We trust that the above information is sufficient for your needs at this time. Should you have any questions or require clarification, please do not hesitate contact the undersigned at 604-296-4200.

GOLDER ASSOCIATES LTD.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
W. ZAWADZKI
25898
Oct. 17 2016
GEOSCIENTIST

Willy Zawadzki, PGeo
Principal, Senior Hydrogeologist

Don Chorley, PGeo
Principal, Senior Hydrogeologist

WZ/DWC/pn/jc

Attachments: Figure 1: Hydrogeological Model Extents
Figure 2: Ultimate Configuration of Springer Pit and Cariboo Pit
Figure 3: Hydrogeological Model Calibration – Mid-2014 Dewatered Conditions
Figure 4: Hydrogeological Model Calibration – July 2015 Pit Lake Conditions
Figure 5: Predicted Hydrogeological Conditions – Pit Lake Level 880 m to 980 m Elevation
Figure 6: Predicted Hydrogeological Conditions – Pit Lake Level 1,000 m to 1,050 m Elevation
Figure 7: Predicted Seepage Pathways for Springer Pit and Cariboo Pit Lake at 1,050 m Elevation
Attachment 1: Study Limitations

o:\final\2014\1421\1411734\1411734-151-tm-rev0-16000\1411734-151-tm-rev0-16000-springer gw 17oct_16.docx

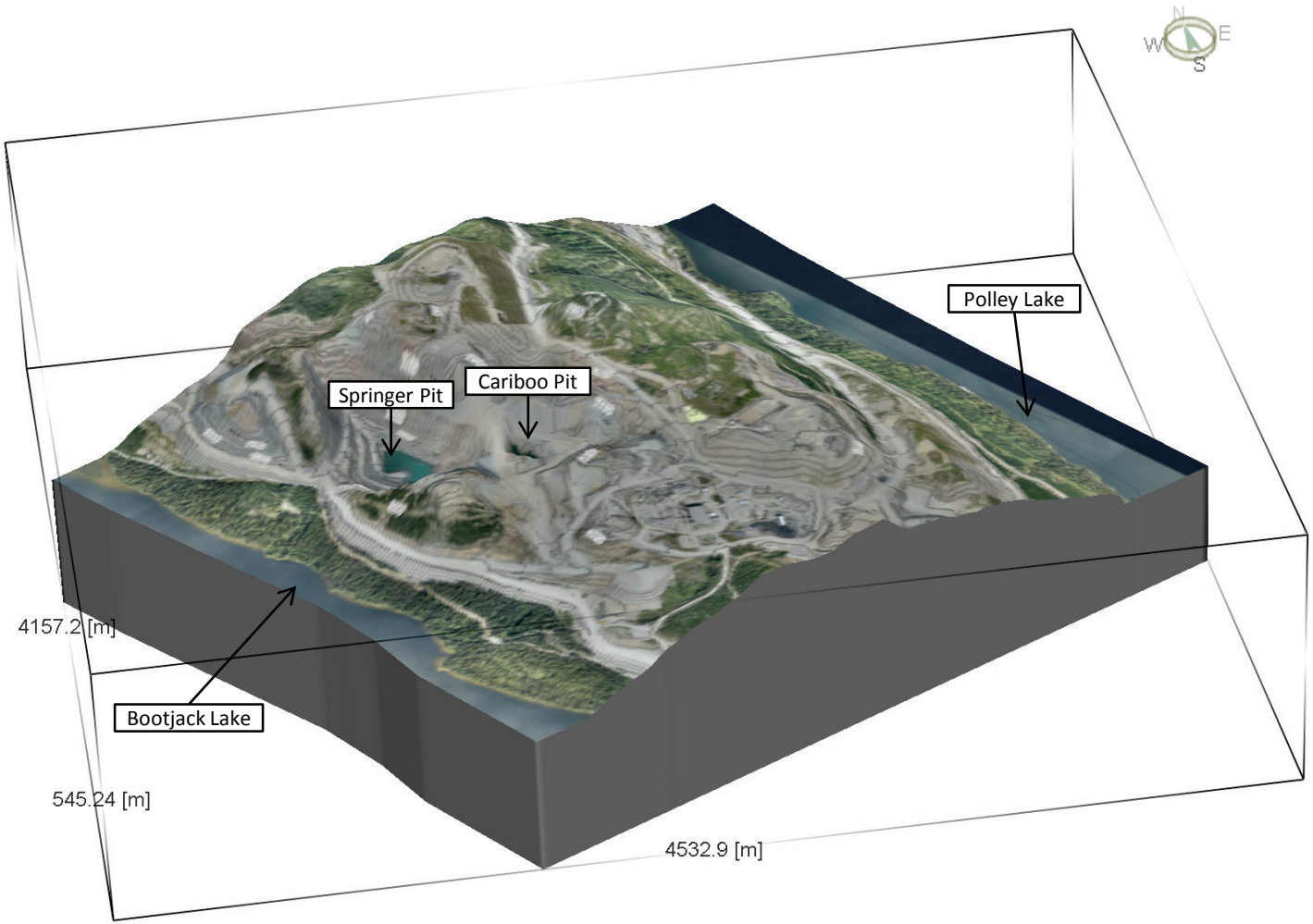
REFERENCES

Golder (Golder Associates Ltd.). 2010. *Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine.* Prepared for Mount Polley Mining Corporation. Golder Doc. No. 05-1413-0027/5600. August 19, 2010.

Golder. 2014. *Updated Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-002-TM-Rev0. December 16, 2014.

Golder. 2015. *Hydrogeological Investigations near the Springer Pit Lake – Mount Polley Mine*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-051-TM-Rev0. August 28, 2015.

Golder. 2016. *Mount Polley Mine – Prediction of Water Level and Seepage from the Springer Pit and Bootjack Lake Water Quality.* Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-123-TM-Rev0. March 7, 2016.



Notes:
Orthophoto was provided by MPMC

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-02-29
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

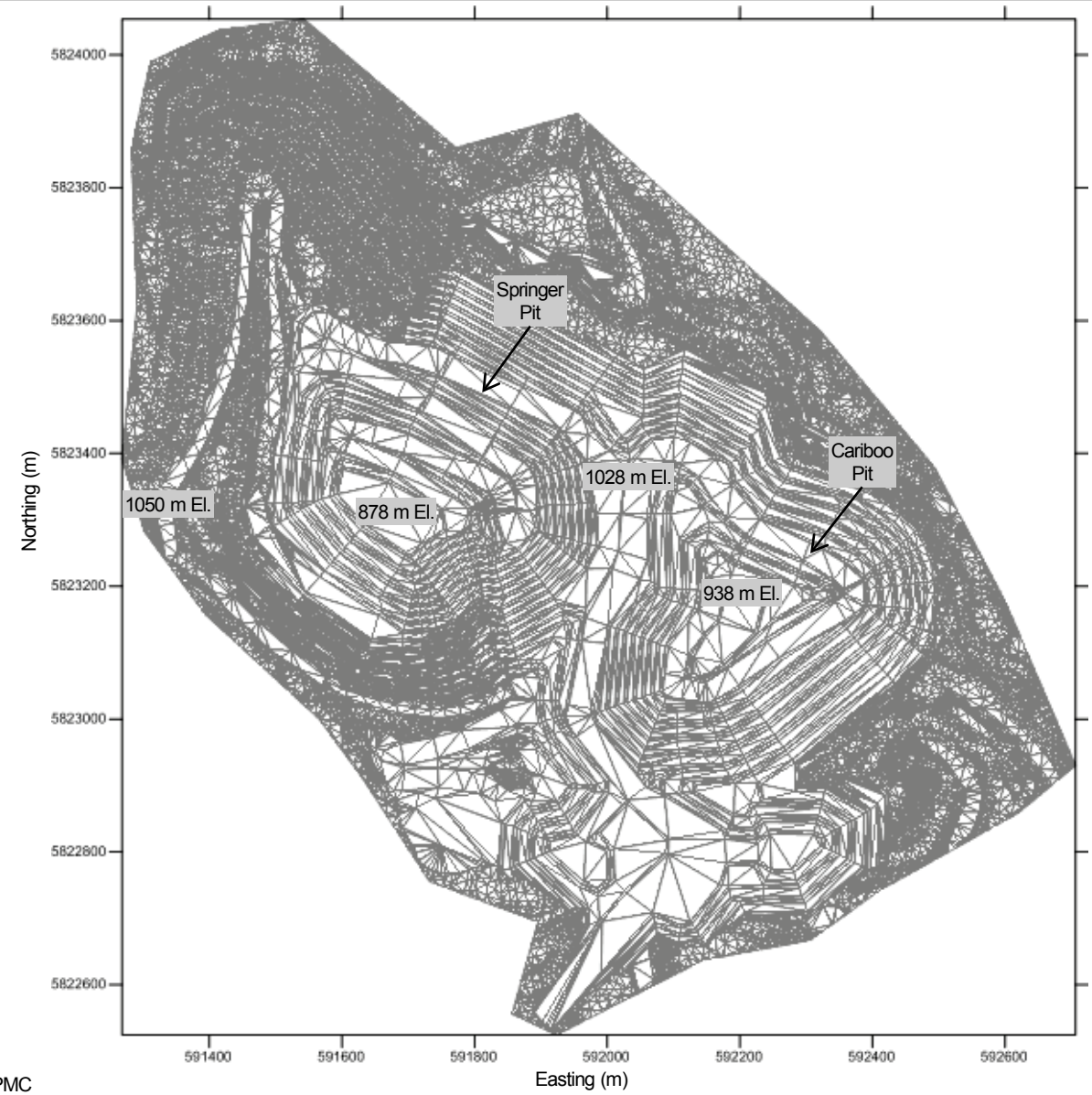
PROJECT
PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – LONG-TERM TAR

TITLE
HYDROGEOLOGICAL MODEL EXTENTS

PROJECT No.		Rev.	
1411734	**16000**	**0**	**1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 16000 LT TAR\4 - Hydrogeology 4001-4003\Open Pits\1 Springer-Cariboo\Mt Polley Figures May 2016 - Springer-Cariboo seepage.pptx



Notes:
AutoCad drawing was provided by MPMC in file Total Pit Walls - Cariboo-SP4.dxf

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

PROJECT
PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – LONG-TERM TAR

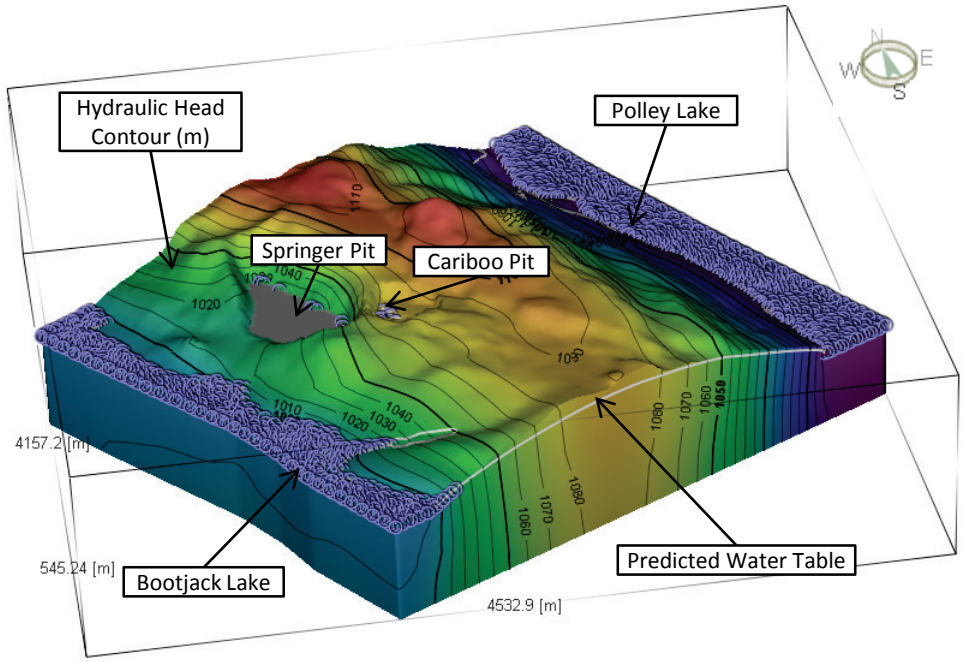
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-02-29
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

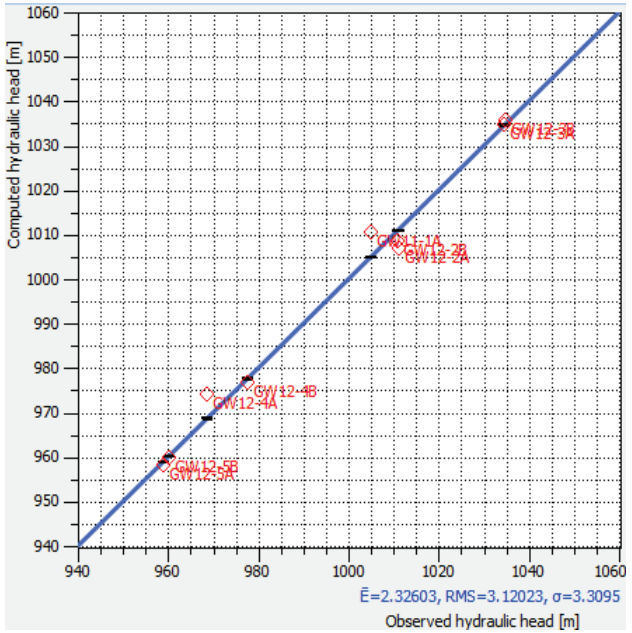
TITLE
ULTIMATE CONFIGURATION OF SPRINGER PIT AND CARIBOO PIT

PROJECT No. **1411734** **16000** Rev. **0** **2**

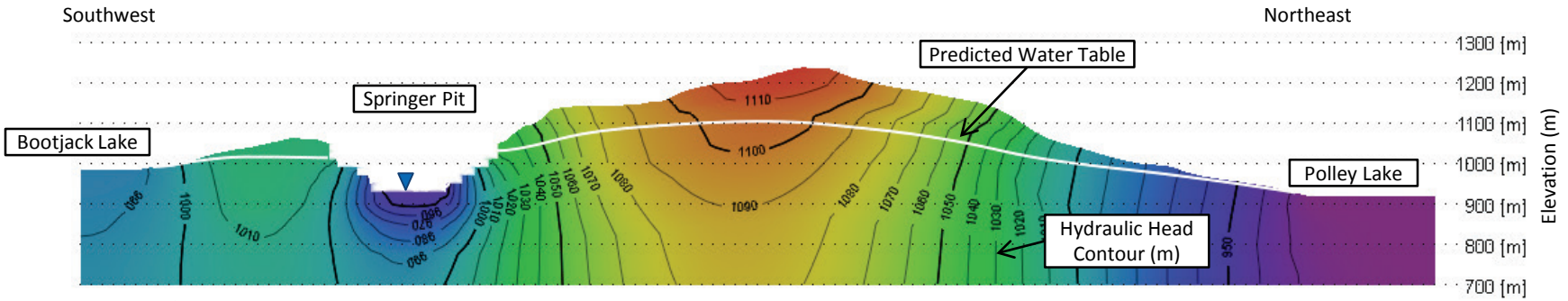
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0



A. Oblique View Looking Northeast



C. Comparison of Predicted vs. Observed Hydraulic Heads



B. SW-NE Cross-section

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

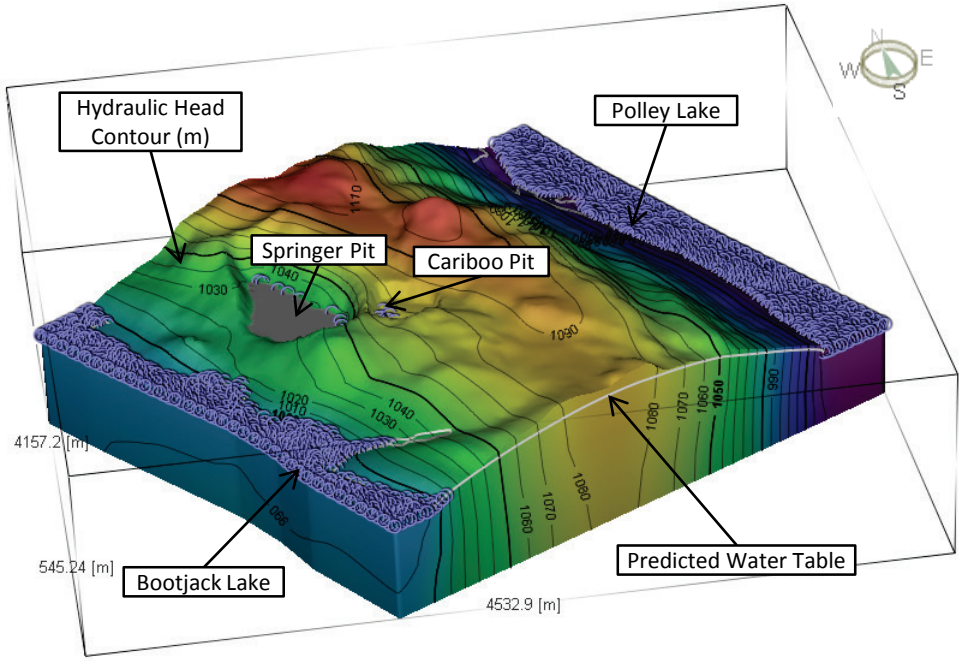
PROJECT
PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – LONG-TERM TAR

YYYY-MM-DD	2016-02-29
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

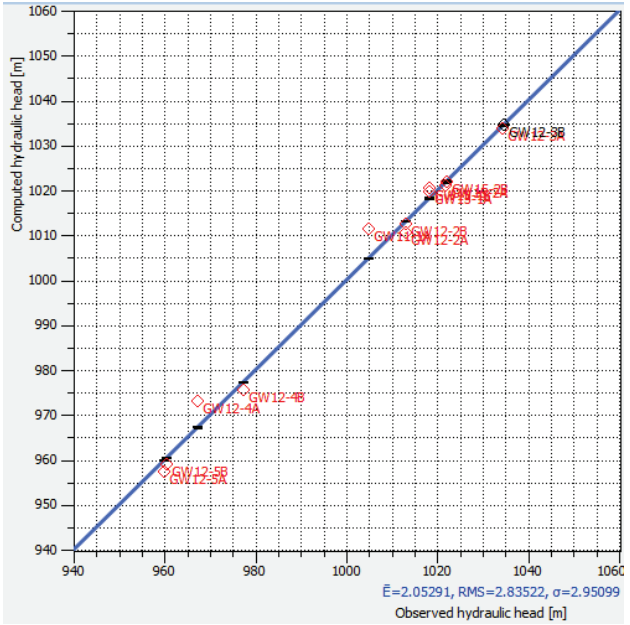
TITLE
HYDROGEOLOGICAL MODEL CALIBRATION MID-2014 DEWATERED CONDITIONS

PROJECT No. **1411734** **16000** Rev. **0**

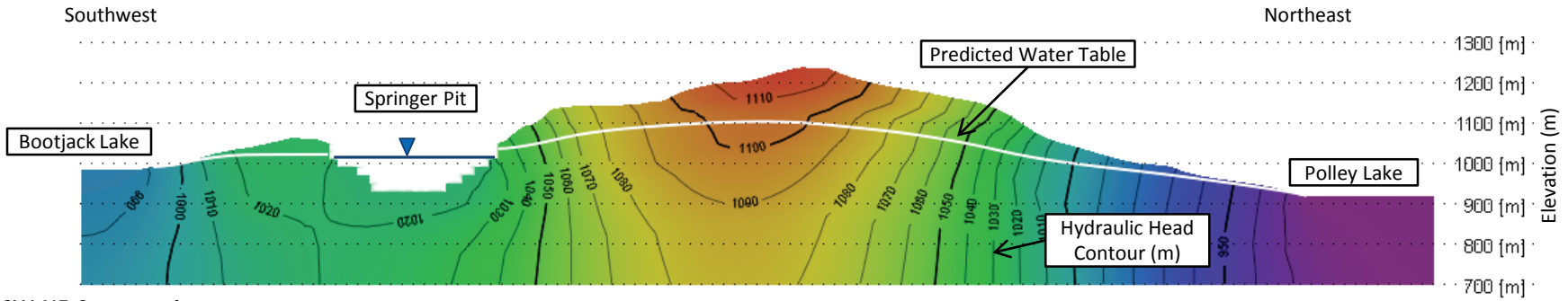
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0



A. Oblique View Looking Northeast



C. Comparison of Predicted vs. Observed Hydraulic Heads



B. SW-NE Cross-section

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

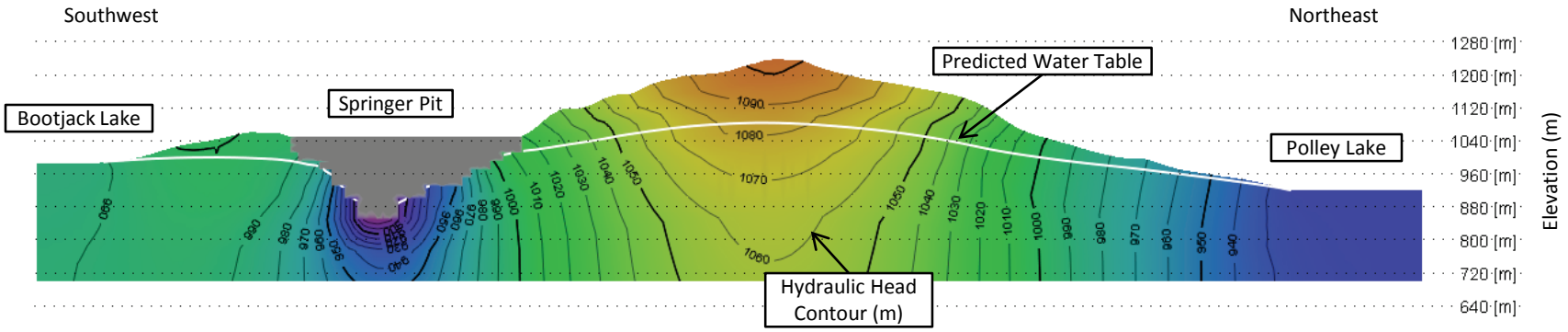
YYYY-MM-DD	2016-02-29
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

PROJECT
PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – LONG-TERM TAR

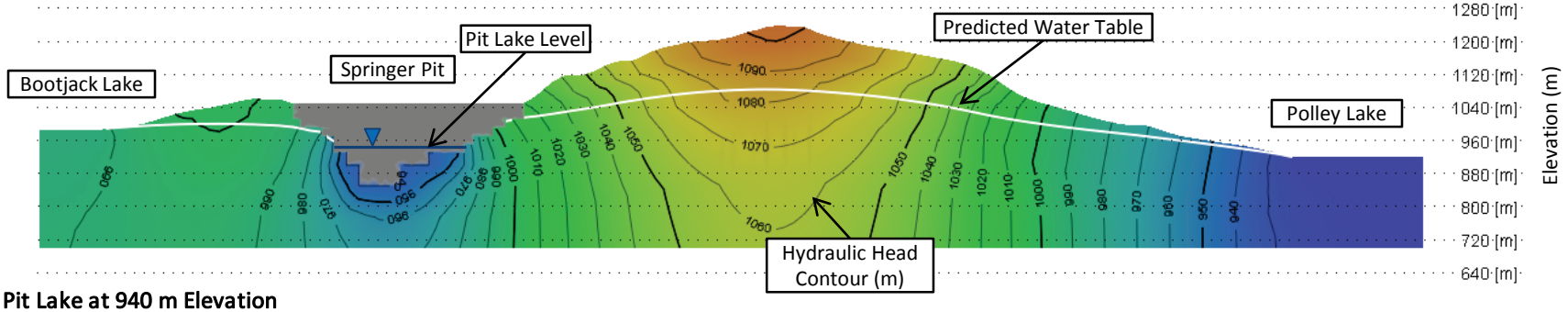
TITLE
HYDROGEOLOGICAL MODEL CALIBRATION JULY 2015 PIT LAKE CONDITIONS

PROJECT No.		Rev.	
1411734	**16000**	**0**	**4**

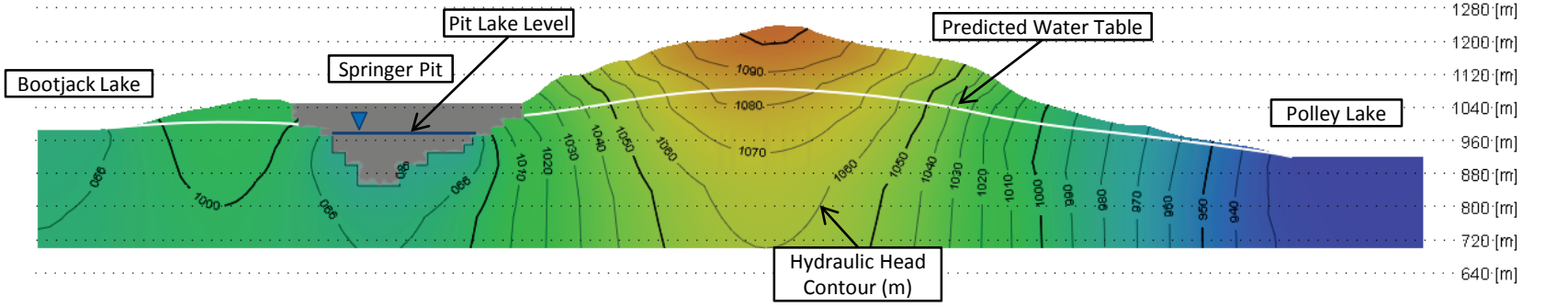
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0



A. Open Pits Fully Dewatered (880 m Elevation)



B. Pit Lake at 940 m Elevation



C. Pit Lake at 980 m Elevation

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

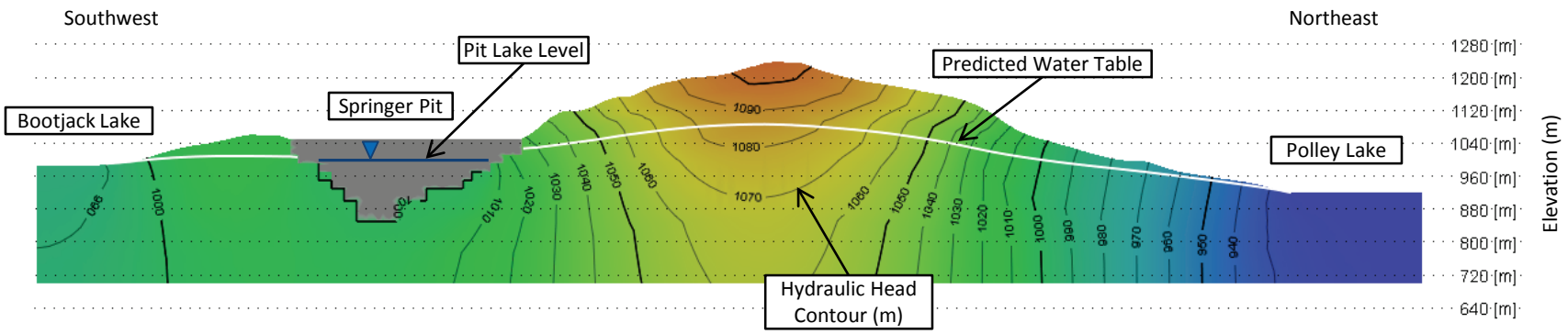
YYYY-MM-DD	2016-02-29
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

PROJECT
PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – LONG-TERM TAR

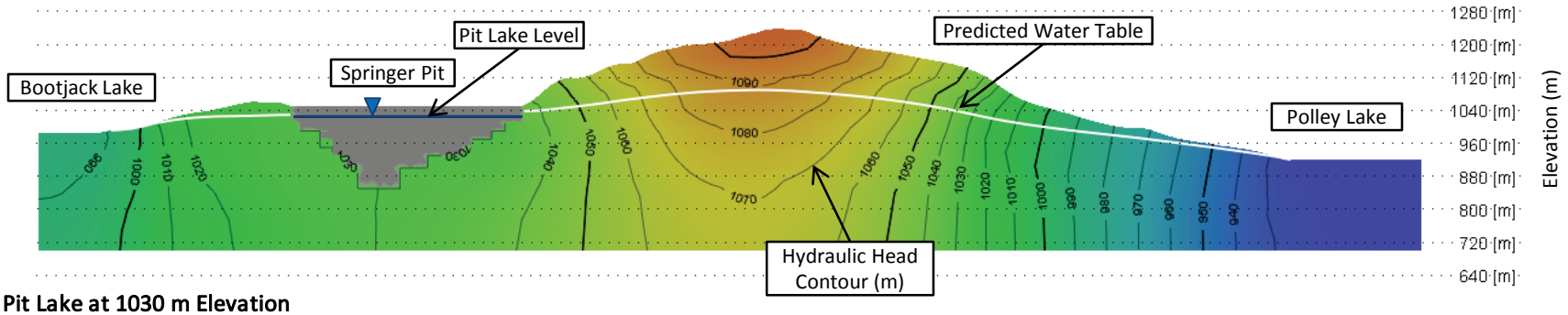
TITLE
PREDICTED HYDROGEOLOGICAL CONDITIONS – PIT LAKE LEVEL 880 M TO 980 M ELEVATION

PROJECT No.		Rev.	
1411734	**16000**	**0**	**5**

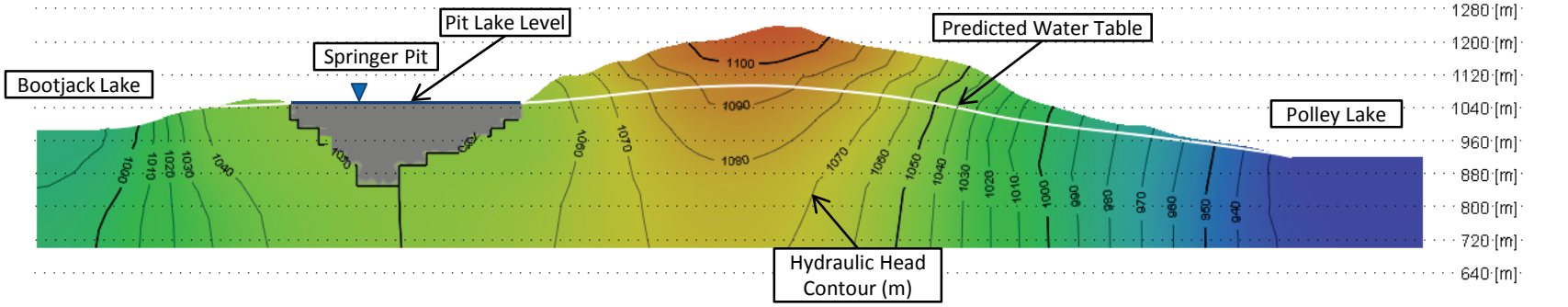
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0



A. Pit Lake at 1000 m Elevation



B. Pit Lake at 1030 m Elevation



C. Pit Lake at 1050 m Elevation

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

PROJECT
PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – LONG-TERM TAR

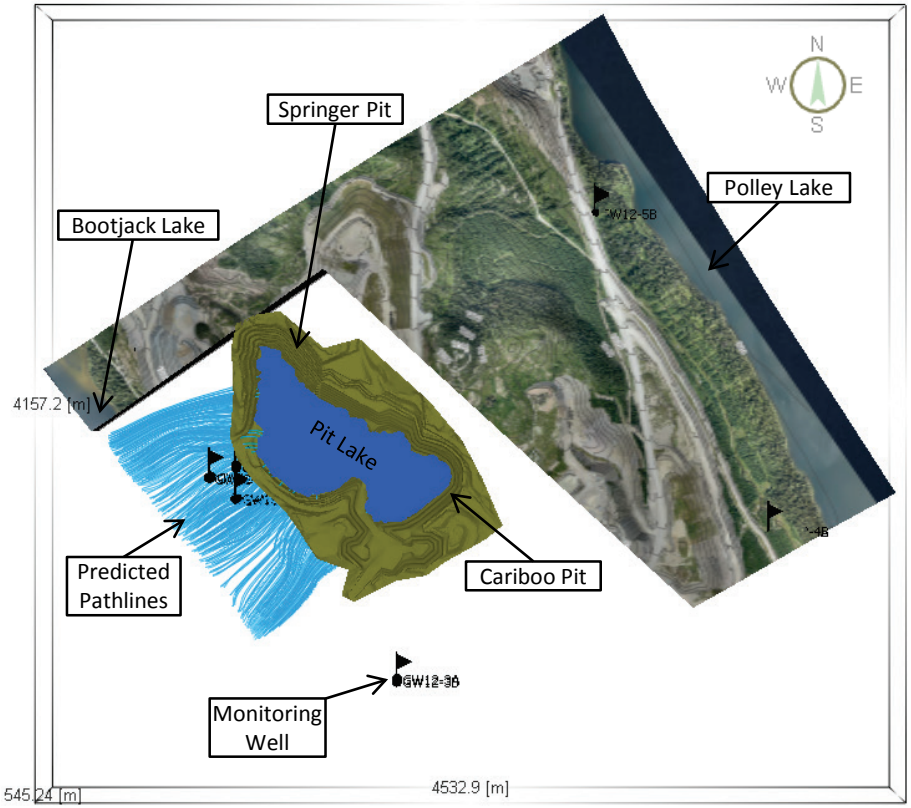
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-02-29
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

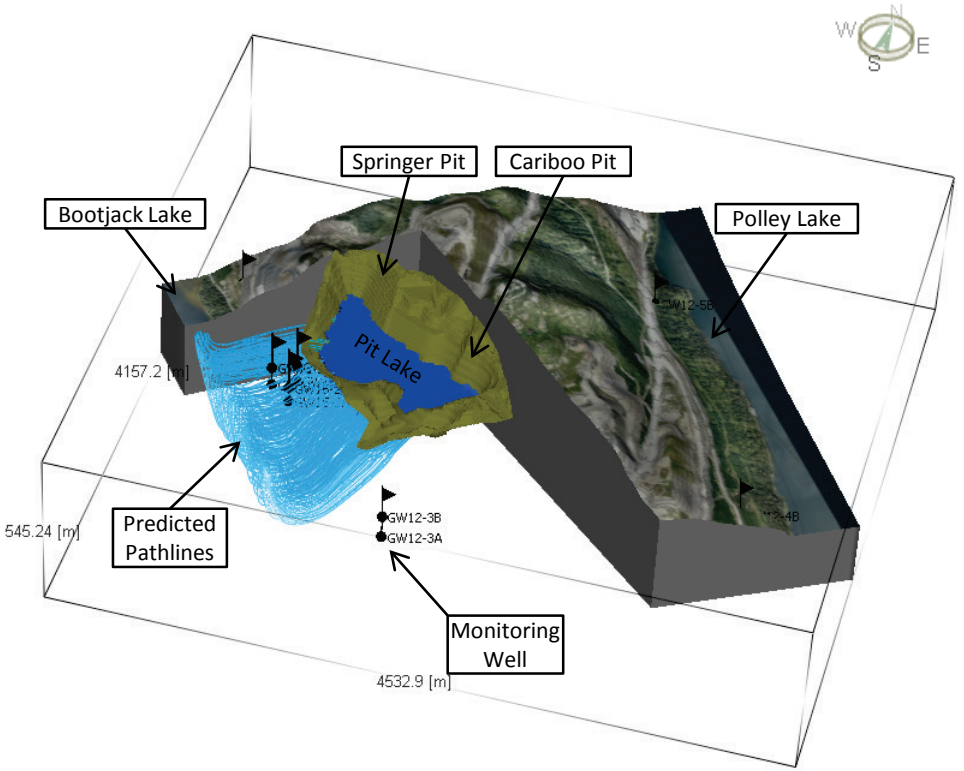
TITLE
PREDICTED HYDROGEOLOGICAL CONDITIONS – PIT LAKE LEVEL 1000 M TO 1050 M ELEVATION

PROJECT No. **1411734** **16000** Rev. **0**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0



A. Map View



B. Oblique View Looking Northwest

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in

CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-02-29
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

PROJECT
PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE SPRINGER AND CARIBOO PITS – LONG-TERM TAR

TITLE
PREDICTED SEEPAGE PATHWAYS FOR SPRINGER PIT AND CARIBOO PIT LAKE AT 1050 M ELEVATION

PROJECT No.		Rev.	
1411734	**16000**	**0**	**7**

Study Limitations

This document has been prepared for the exclusive use of Mount Polley. The factual information, descriptions, interpretations, and comments contained herein are specific to the project described in this document and do not apply to any other project or site. Under no circumstances may this information be used for any other purposes than those specified in the scope of work unless explicitly stipulated in the text of this document or formally authorized by Golder. This document must be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. As well, the final version of this document and its content supersedes any other text, opinion or preliminary version produced by Golder.

Golder shall not be held responsible for damages resulting from unpredictable or unknown underground conditions, from erroneous information provided by and/or obtained from other sources than Golder, and from ulterior changes in the site conditions unless Golder has been notified by Mount Polley of any occurrence, activity, information or discovery, past or future, susceptible of modifying the underground conditions described herein, and have had the opportunity of revising its interpretations, comments and recommendations. Furthermore, Golder shall not be held responsible for damages resulting from any future modification to the applicable regulations, standards and criteria, for any use of this document and its content by a third party, and/or for its use for other purposes than those intended. Golder shall not be held responsible for any decrease, real or perceived, of a property's value or any failure to complete a transaction, as a consequence of this document.

Hydrogeologic/hydrologic investigations and groundwater modelling are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that groundwater systems are complicated beyond human capability to evaluate them comprehensively in detail, and we invariably do not have sufficient data to do so. A groundwater model uses the laws of science and mathematics to draw together the available data into a mathematical or computer-based representation of the essential features of an existing hydrogeologic system. While the model itself obviously lacks the detailed reality of the existing hydrogeologic system, the behaviour of a valid groundwater model reasonably approximates that of the real system. The validity and accuracy of the model depends on the amount of data available relative to the degree of complexity of the geologic formations, the site geochemistry, the fate and transport of the dissolved compounds, and on the quality and degree of accuracy of the data entered. Therefore, every groundwater model is a simplification of a reality and the models described herein are not an exception.

The professional groundwater modelling services performed as described in this document were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the quantity and quality of available data, the time limits and financial and physical constraints applicable to the services. Unless otherwise specified, the results of previous or simultaneous work provided by sources other than Golder and quoted and/or used herein are considered as having been obtained according to recognised and accepted professional rules and practices, and therefore deemed valid. This model provides a predictive scientific tool to evaluate the impacts on a real groundwater system of specified hydrological stresses and/or to compare various scenarios in a decision-making process. However and despite the professional care taken during the construction of the model and in conducting the simulations, its accuracy is bound to the normal uncertainty associated to groundwater modelling and no warranty, expressed or implied, is made.

ATTACHMENT D

Preliminary Predictions of Groundwater Seepage for the Boundary Pit - Mount Polley Mine

17 October 2016
Reference No. 1411734-167-R-Rev0-16000

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-152-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

FROM Willy Zawadzki and Don Chorley **EMAIL** Willy_Zawadzki@golder.com; Don_Chorley@golder.com

PRELIMINARY PREDICTIONS OF GROUNDWATER SEEPAGE FOR THE BOUNDARY PIT – MOUNT POLLEY MINE

1.0 INTRODUCTION

This technical memorandum presents preliminary predictions of groundwater seepage for the Boundary Pit Lake at closure at the Mount Polley Mine, which is operated by the Mount Polley Mining Corporation (MPMC). These predictions were made in support of water balance studies for the site. It is understood that the Boundary Pit hydrology and resulting seepage quality is assessed by the concurrent studies conducted by MPMC and Golder Associates Ltd.

2.0 BACKGROUND

Surface mining of the Boundary Pit started in 2008. The pit floor reached an elevation of approximately 1,068 m, or about 14 m below the original ground surface at the northwest pit crest. Similar to the adjacent Wight Pit, most of mining at the Boundary Pit occurred in monzonite bedrock that was intruded by hydrothermal breccias and intersected by northeast striking faults.

At present, hydrogeological data specific to the Boundary Pit are not available. However, MPMC indicated that during mining seepage was not observed along the pit walls. This lack of seepage is considered reasonable due to the relatively shallow depth of this pit and depth to water table measured at monitoring wells that were installed near other mine facilities. It is thus considered likely that the water table was located near or below the floor of the Boundary Pit before mining at this location commenced.

Although seepage to the Boundary Pit from the surrounding rock mass is not expected, seepage out of this pit could occur due to water entering the pit via surface water run-off and direct precipitation. An estimate of these potential seepage rates out of the pit was made to provide input to the pit water balance and to characterize a potential seepage pathway originating from the Boundary Pit.

3.0 PRELIMINARY ESTIMATES OF SEEPAGE

The preliminary estimates of seepage from the Boundary Pit were based on the following assumptions:

- The pit bottom is located at an elevation of 1,068 m, or approximately 14 m below the ground surface at the northeast pit crest, and approximately 5 m below the lowest point along the pit crest (towards northeast). It is likely that the pit bottom does not extend to a significant depth below the water table.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way, Vancouver, BC, V5M 0C4
Tel: +1 (604) 296 4200 Fax: +1 (604) 298 5253 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

- If the Boundary Pit is flooded, seepage from this pit would be directed northeast towards the Wight Pit and discharge to that pit. This could occur not only during operation, when the Wight Pit is dewatered, but also during closure due to water table depression that would develop southwest of the Wight Pit after it is flooded to an elevation of 926 m (Golder 2015).
- Seepage from the Boundary Pit would occur via the upper bedrock zone, as incorporated in the groundwater model for the Springer and Cariboo pits (Golder 2014). This zone is assumed to extend 40 m below the surface with a bulk hydraulic conductivity of 1×10^{-6} m/s (lower bound of 6×10^{-7} m/s, upper bound of 3×10^{-6} m/s). Due to a decrease in permeability with depth, potential seepage via deeper bedrock is assumed to be negligible.
- Seepage would occur under an average hydraulic gradient of 0.1 m/m, which corresponds to the approximate slope in ground surface between the crest of the Boundary Pit and the crest of the Wight Pit.
- The maximum depth of flooding could be approximately 5 m, considering pit wall height northeast from the pit bottom (approximately 1,073 m elevation).

Based on the above assumption and a Darcy's Law calculation that considers changes in the dimensions of the seepage area as the pit is being flooded, the seepage rate from the Boundary Pit when the pit lake level is 5 m above its base is estimated at approximately 60 m^3/d, and could range between 40 m^3/d and 180 m^3/d due to uncertainty in bedrock permeability. Seepage is estimated to decrease as the height of water column above the pit bottom decreases (Table 1).

Table 1: Predicted Seepage Quantities from the Boundary Pit

Water Level above Boundary Pit Bottom (m)	Estimated Groundwater Seepage (m^3/d)		
	Lower Bound	Base Case	Upper Bound
0	2	3	10
1	6	10	29
2	12	20	61
3	16	26	79
4	32	53	159
5	35	59	177

4.0 CLOSURE

The reader is referred to the Study Limitations, which follows the text and forms an integral part of this memorandum.

We trust that the above information is sufficient for your needs at this time. Should you have any questions or require clarification, please do not hesitate contact the undersigned at 604-296-4200.

GOLDER ASSOCIATES LTD.

PROFESSIONAL GEOSCIENTIST PROVINCE OF BRITISH COLUMBIA W. ZAWADZKI 25898 Oct.17 2016

Willy Zawadzki, PGeo
Principal, Senior Hydrogeologist

Don Chorley, PGeo
Principal, Senior Hydrogeologist

WZ/DWC/pn/it/kp

Attachment: Study Limitations

o:\final\2014\1421\1411734\1411734-152-tm-rev0-16000\1411734-152-tm-rev0-16000-boundry pit - seepage 17oct_16.docx

REFERENCES

Golder (Golder Associates Ltd.). 2014. Updated Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-002-TM-Rev0. 16 December 2014.

Golder. 2015. Preliminary Predictions of Groundwater Seepage for the Wight Open Pit at Closure – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-070-TM-Rev0. 11 September 2015.

STUDY LIMITATIONS

This document has been prepared for the exclusive use of Mount Polley. The factual information, descriptions, interpretations, and comments contained herein are specific to the project described in this document and do not apply to any other project or site. Under no circumstances may this information be used for any other purposes than those specified in the scope of work unless explicitly stipulated in the text of this document or formally authorized by Golder. This document must be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. As well, the final version of this document and its content supersedes any other text, opinion or preliminary version produced by Golder.

Golder shall not be held responsible for damages resulting from unpredictable or unknown underground conditions, from erroneous information provided by and/or obtained from other sources than Golder, and from ulterior changes in the site conditions unless Golder has been notified by Mount Polley of any occurrence, activity, information or discovery, past or future, susceptible of modifying the underground conditions described herein, and have had the opportunity of revising its interpretations, comments and recommendations. Furthermore, Golder shall not be held responsible for damages resulting from any future modification to the applicable regulations, standards and criteria, for any use of this document and its content by a third party, and/or for its use for other purposes than those intended. Golder shall not be held responsible for any decrease, real or perceived, of a property's value or any failure to complete a transaction, as a consequence of this document.

Hydrogeologic/hydrologic investigations and groundwater modelling are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that groundwater systems are complicated beyond human capability to evaluate them comprehensively in detail, and we invariably do not have sufficient data to do so. A groundwater model uses the laws of science and mathematics to draw together the available data into a mathematical or computer-based representation of the essential features of an existing hydrogeologic system. While the model itself obviously lacks the detailed reality of the existing hydrogeologic system, the behaviour of a valid groundwater model reasonably approximates that of the real system. The validity and accuracy of the model depends on the amount of data available relative to the degree of complexity of the geologic formations, the site geochemistry, the fate and transport of the dissolved compounds, and on the quality and degree of accuracy of the data entered. Therefore, every groundwater model is a simplification of a reality and the models described herein are not an exception.

The professional groundwater modelling services performed as described in this document were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the quantity and quality of available data, the time limits and financial and physical constraints applicable to the services. Unless otherwise specified, the results of previous or simultaneous work provided by sources other than Golder and quoted and/or used herein are considered as having been obtained according to recognised and accepted professional rules and practices, and therefore deemed valid. This model provides a predictive scientific tool to evaluate the impacts on a real groundwater system of specified hydrological stresses and/or to compare various scenarios in a decision-making process. However and despite the professional care taken during the construction of the model and in conducting the simulations, its accuracy is bound to the normal uncertainty associated to groundwater modelling and no warranty, expressed or implied, is made.

ATTACHMENT E

Preliminary Predictions of Groundwater Seepage for the Wight Open Pit at Closure - Mount Polley Mine

17 October 2016
Reference No. 1411734-167-R-Rev0-16000

TECHNICAL MEMORANDUM

DATE September 11, 2015 **PROJECT No.** 1411734-070-TM-Rev0-15000

TO Katie McMahen, P.Ag.
Mount Polley Mining Corporation

FROM Willy Zawadzki
Don Chorley

EMAIL wzawadzki@golder.com

PRELIMINARY PREDICTIONS OF GROUNDWATER SEEPAGE FOR THE WIGHT OPEN PIT AT CLOSURE – MOUNT POLLEY MINE

1.0 INTRODUCTION

This technical memorandum presents preliminary predictions of groundwater seepage for the Wight Pit Lake at closure at the Mount Polley Mine that is operated by the Mount Polley Mining Corporation (MPMC). These predictions were made in support of the Reclamation and Closure Plan that is currently being prepared for the site. This Plan assumes that the Wight Pit will be allowed to flood to a spillover elevation of approximately 926 m.

This memorandum documents preliminary predictions of groundwater seepage from the Wight Pit Lake at closure. It is understood that the Wight Pit Lake hydrology, quality of pit lake water and resulting seepage quality is assessed by the concurrent studies conducted by MPMC and Golder.

2.0 BACKGROUND

Surface mining of the Wight Pit occurred between 1999 and 2009. The pit floor reached an elevation of approximately 804 m; however, since the mining stopped the pit has been partially filled with waste rock with the pit bottom presently at an elevation of approximately 875 m in the northwest and approximately 912 m in the southeast, as presented on Figure 1. In the northwest, the pit crest is located at a distance of approximately 200 m from the Polley Lake shore and in the southeast this distance is about 80 m. At both locations the pit bottom is below the average level of Polley Lake of approximately 920 m.

Similar to the nearby Springer Pit, the majority of the Wight Pit walls were excavated in monzonite bedrock that was intruded by hydrothermal breccias. Three northwest-southeast striking faults intersect the pit, and these faults have been intruded by thick and presently weathered mafic dykes. In 2014, groundwater seepage was observed in the southeast corner of the pit along the east-west striking dyke that is exposed in the pit wall (Golder, 2014a).

The southeast corner of the pit also intersected a relatively thick sequence of overburden deposits of glacio-lacustrine and glacio-fluvial origin. In 2004, Golder conducted hydrogeological investigations in these deposits that included installation and testing of two pumping wells (Golder, 2004) and in 2005 Golder assisted in the installation and testing of two dewatering wells that became part of pit wall dewatering/depressurization system (Golder, 2005). The location of these wells is presented in Attachment 1. Interpretation of hydrogeological data collected during these investigations suggested that the overburden southeast from the pit is highly variable, ranging in texture from silt/clay to sand/gravel, with coarser sediments present at depth and directly overlying bedrock.

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

MPMC provided information on the historical dewatering rates for the Wight Pit. In 2008, when the majority of the pit was mined out, MPMC estimated groundwater inflow to this pit to range between 950 m^3/day (175 USgpm) in winter and 1600 m^3/day (300 USgpm) during spring/summer. MPMC also indicated that in 2008 only one overburden dewatering well was operational; however, the dewatering records for this well are not available. In 2014, MPMC estimated that, during summer months, the groundwater inflow to the Wight Pit was approximately 1300 m^3/day (240 USgpm), and indicated that the dewatering wells were not active at this time.

3.0 PRELIMINARY ESTIMATES OF SEEPAGE AT CLOSURE

At present the hydrogeological data from the area of the Wight Pit is not sufficient for the development of a detailed hydrogeological model that could be used to estimate seepage near this pit during closure. Most importantly, current hydraulic head data from the overburden sediments and bedrock surrounding the dewatered pit are not available. However, the available information was considered sufficient for providing preliminary estimates of this seepage based primarily on the historical groundwater inflows to this pit and information from the nearby Springer Pit. These preliminary estimates relied on a simplified analytical model of groundwater seepage near the Wight Pit that was based on the following assumptions:

- Seepage in bedrock near the Wight Pit can be represented using the Thiem equation that describes radial flow of groundwater towards a circular sink under steady-state conditions. The portion of this seepage originating from the topographic high west of the pit was based on the effective radius to the inferred groundwater divide of approximately 700 m and hydraulic head near this divide of 1080 m elevation. The portion of this seepage originating from the east (i.e. from Polley Lake) was based on the effective radius to Polley Lake of 325 m and the Polley Lake level of 920 m;
- Seepage in the overburden along the southeast wall of the Wight Pit can be represented using Darcy's Law. The cross-sectional area for this seepage was estimated to be approximately 2000 m^2 based on Golder (2006) interpretation, and the effective distance between the seepage face along the pit wall and Polley Lake was assumed to be 80 m;
- Estimates of groundwater seepage to the Wight Pit in 2008 and 2014 ranging between 950 m^3/day (175 USgpm) and 1600 m^3/day (300 USgpm) were assumed to consist of 50% of inflow from bedrock and 50% inflow from the overburden, under the assumption that in 2008 only one dewatering well was operational (as indicated by MPMC) and that in 2014 the dewatering system was off. For the base case estimates of groundwater seepage, inflow to the dewatered pit originating from bedrock alone was thus assumed to be equal to 650 m^3/day (120 USgpm) or 50% of average inflow estimated in 2008 and 2014;
- Groundwater seepage from the overburden to the Wight Pit under dewatered conditions was assumed to be equivalent to the pumping rate of 1900 m^3/day (350 USgpm) that was utilized during testing of TW05-1 in 2005 (Golder, 2006).

The simplified analytical model was calibrated to the estimates of groundwater inflow during mining by adjusting hydraulic conductivity assigned to the overburden and bedrock. When these parameters for overburden and bedrock were set to 6×10^{-5} m/s and 2×10^{-7} m/s, respectively, the model calculated total inflow was 2,600 m^3/day (470 USgpm) and matched 700 m^3/day (120 USgpm) estimated to originate from bedrock and 1,900 m^3/day (350 USgpm) assumed to enter the pit from the overburden. The values of hydraulic conductivity adopted in the calibrated model are in good agreement with bulk hydraulic conductivity of bedrock estimated for the mine site (Golder, 2014b) and with results of overburden testing near the Wight Pit discussed in Golder (2004, 2006).

Following calibration, the simplified analytical model was used to predict groundwater seepage near the Wight Pit for the pit lake level ranging between 880 m (i.e. current pit bottom) to 926 m (i.e. spillover elevation). The results of these calculations are presented in Table 1. Groundwater inflow to the pit lake was predicted to gradually decrease as the pit lake level increases from approximately 2,600 m^3/day (470 USgpm) when the pit lake level is at 880 m elevation to about 600 m^3/day (100 USgpm) when the lake is at a spillover elevation of 926 m. Groundwater outflow from the pit lake was predicted to occur once the pit lake level is above the water level elevation of Polley Lake (i.e. approximately 920 m) and was calculated to reach approximately 500 m^3/day (90 USgpm) when the pit lake is at the spillover elevation. The majority of this outflow was calculated to occur via the overburden materials that are present in the southeast between the pit wall and Polley Lake.

Table 1: Predicted Groundwater Flows for Wight Pit Lake

Pit Lake Elevation (m)	Groundwater Flow (m^3/day)	
	Into the Lake	Out of the Lake
Base Case		
880	2600	0
900	2500	0
910	2100	0
920	800	0
926	600	500
Lower Reasonable Bound		
926	400	300
Upper Reasonable Bound		
926	700	800

Table 1 also presents a range of potential groundwater inflow and outflow from the Wight Pit Lake that could be expected considering the uncertainty in the understanding of hydrogeological conditions near the facility. This range was calculated by considering the estimated range of historical pit inflows and the results of testing conducted previously in the overburden. The analysis indicated that, for the pit lake level at spillover elevation, the groundwater inflow to the pit could range from 400 m^3/day to 700 m^3/day: whereas, the outflow from the pit towards Polley Lake could vary from 300 m^3/day to 800 m^3/day.

4.0 SUMMARY AND RECOMMENDATIONS

The simplified hydrogeological analysis that was carried out for the Wight Pit Lake indicates that groundwater inflow to this lake could range between approximately 2600 m^3/day (470 USgpm) when the pit lake level is at 880 m elevation and 600 m^3/day (110 USgpm) when the spillover elevation of 926 m is reached. Once the pit lake level is above the average water level in Polley Lake of 920 m, groundwater seepage from the pit lake towards Polley Lake would occur. When the Wight Pit Lake is at spillover elevation this outflow was calculated to be approximately 500 m^3/day (90 USgpm).

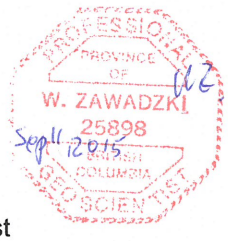
Due to limited hydrogeological data available for the Wight Pit, the above predictions should be considered only as preliminary estimates of actual groundwater fluxes that could occur at closure. At present there is lack of understanding of groundwater levels in the area surrounding the Wight Pit and the hydrogeological significance of faults intersecting the east pit wall. In the absence of this information more accurate predictions of these fluxes cannot be made. The following activities are recommended to address these data gaps so that the estimates of groundwater seepage could be refined:

- Borehole survey: During the 2004 and 2005 investigations, several boreholes and wells were completed between the crest of the Wight Pit and Polley Lake (Attachment 1). It is recommended that the condition of these boreholes be assessed for their suitability for hydraulic head monitoring and water quality sampling;
- Installation of monitoring wells: If the borehole survey finds that wells installed in 2004-2005 are no longer accessible and/or suitable for groundwater monitoring, two multi-level monitoring wells should be installed between the Wight Pit and Polley Lake. At each location the shallow piezometer should target the more permeable portion of the overburden and the deep piezometer should be completed in bedrock. One of the deeper installations should target the fault/dike structure that is present in the southeast corner of the pit;
- Seepage survey: A seepage survey, focusing on major structure identified along the pit walls, should be conducted. If practicable, quantitative measurements of groundwater seepage from the fault/dyke structure in the southeast corner of the pit (and other visible seepage) should be made to facilitate estimates of hydrogeological properties of this feature;
- Groundwater monitoring: Monitoring wells near the Wight Pit should be included in the groundwater monitoring program for the site. Hydraulic heads at these installations should be measured at least weekly and groundwater quality should be assessed on a quarterly basis. After one year of monitoring, the groundwater quality data should be assessed for seasonal variability and the monitoring frequency should be adjusted appropriately;
- The existing hydrogeological model should be expanded to include the Wight Pit and its calibration should be updated to include new data sources described above. The expanded model should be used to refine the predictions of groundwater seepage that could occur at closure.

5.0 CLOSURE

We trust that the above information is sufficient for your needs at this time. Should you have any questions or require clarification, please do not hesitate contact the undersigned at 604-296-4200.

GOLDER ASSOCIATES LTD.



Willy Zawadzki, P.Geo.
Principal, Senior Hydrogeologist

Don Chorley, P.Geo.
Principal, Senior Hydrogeologist

WZ/DWC/ch

Attachments: Figure 1: Site Plan
Attachment 1: Location of Pumping Wells Completed in the Overburden
Attachment 2: Study Limitations

o:\final\2014\1421\1411734\1411734-070-tm-rev0-15000\1411734-070-tm-rev0-15000_wight pit closure_11sept_2015.docx

6.0 REFERENCES

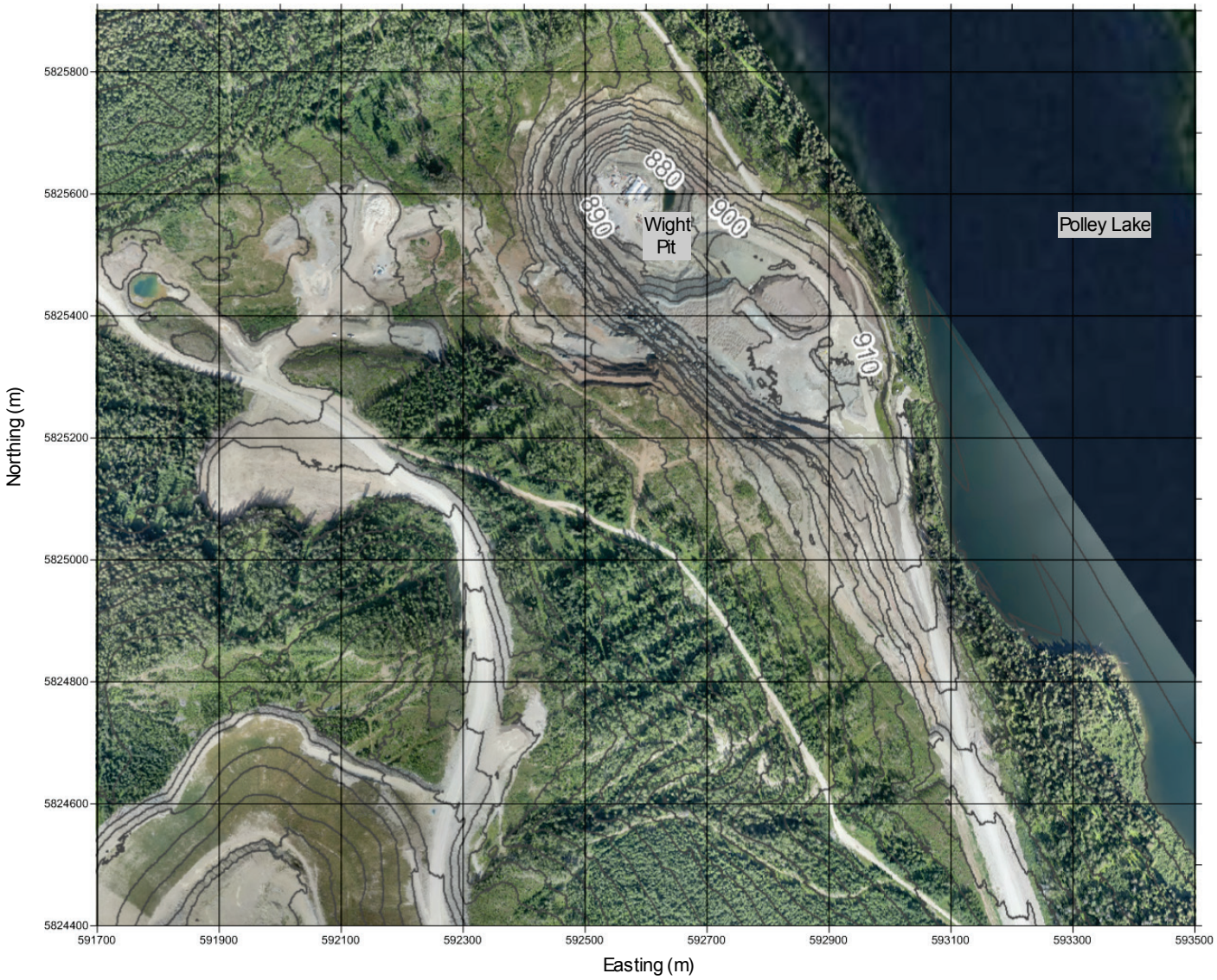
Golder Associates Ltd. 2004. *Report on Hydrogeological Investigation – Proposed Wishbone Open Pit – Mt. Polley Mining Corporation, Likely, B.C*. submitted to MPMC on October 18, 2004.

Golder Associates Ltd. 2006. *Preliminary Review of 2005 Hydrogeological Program – Dewatering Wells DW-2 and DW-3, Wight Pit, Mount Polley Mine Site*. submitted to MPMC on January 24, 2006.

Golder Associates Ltd. 2014a. *Review of Boundary Zone Underground Mine Blasting Effects on Wight Pit Slope Stability.* submitted to MPMC on January 7, 2014.

Golder Associates Ltd. 2014b. *Updated Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine*. submitted to Mount Polley Mining Corporation on December 16, 2014.

Q:\05-1413-027 MtPolley\Wight Pit Lake\Mt Polley Figures WightPit Sep 2015.pptx



CLIENT
MOUNT POLLEY MINING CORPORATION
LIKELY, BC

PROJECT
PRELIMINARY PREDICTIONS OF GROUNDWATER SEEPAGE FOR THE WIGHT OPEN PIT AT CLOSURE

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-09-03
PREPARED	WZ
DESIGN	WZ
REVIEW	DWC
APPROVED	DWC

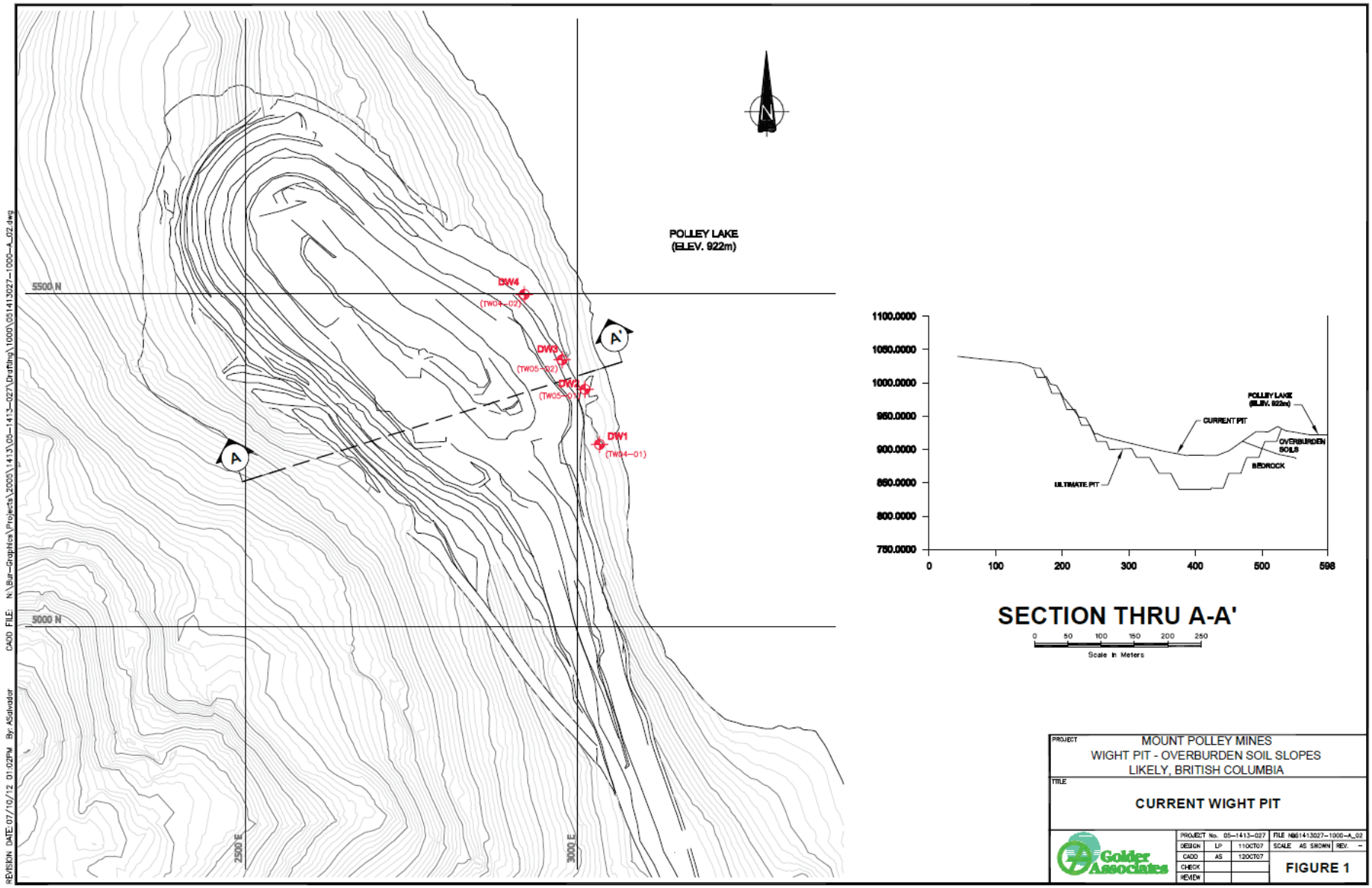
TITLE
SITE PLAN

PROJECT No. **1411734** **15000**
Rev. **0**
1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

ATTACHMENT 1

LOCATION OF PUMPING WELLS COMPLETED IN THE OVERBURDEN



Note: This figure is reproduced from Golder letter report to MPMC dated October 31, 2007.

ATTACHMENT 2
STUDY LIMITATIONS

Study Limitations

This document has been prepared for the exclusive use of Mount Polley. The factual information, descriptions, interpretations, and comments contained herein are specific to the project described in this document and do not apply to any other project or site. Under no circumstances may this information be used for any other purposes than those specified in the scope of work unless explicitly stipulated in the text of this document or formally authorized by Golder. This document must be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. As well, the final version of this document and its content supersedes any other text, opinion or preliminary version produced by Golder.

Golder shall not be held responsible for damages resulting from unpredictable or unknown underground conditions, from erroneous information provided by and/or obtained from other sources than Golder, and from ulterior changes in the site conditions unless Golder has been notified by Mount Polley of any occurrence, activity, information or discovery, past or future, susceptible of modifying the underground conditions described herein, and have had the opportunity of revising its interpretations, comments and recommendations. Furthermore, Golder shall not be held responsible for damages resulting from any future modification to the applicable regulations, standards and criteria, for any use of this document and its content by a third party, and/or for its use for other purposes than those intended. Golder shall not be held responsible for any decrease, real or perceived, of a property's value or any failure to complete a transaction, as a consequence of this document.

Hydrogeologic/hydrologic investigations and groundwater modelling are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that groundwater systems are complicated beyond human capability to evaluate them comprehensively in detail, and we invariably do not have sufficient data to do so. A groundwater model uses the laws of science and mathematics to draw together the available data into a mathematical or computer-based representation of the essential features of an existing hydrogeologic system. While the model itself obviously lacks the detailed reality of the existing hydrogeologic system, the behaviour of a valid groundwater model reasonably approximates that of the real system. The validity and accuracy of the model depends on the amount of data available relative to the degree of complexity of the geologic formations, the site geochemistry, the fate and transport of the dissolved compounds, and on the quality and degree of accuracy of the data entered. Therefore, every groundwater model is a simplification of a reality and the models described herein are not an exception.

The professional groundwater modelling services performed as described in this document were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the quantity and quality of available data, the time limits and financial and physical constraints applicable to the services. Unless otherwise specified, the results of previous or simultaneous work provided by sources other than Golder and quoted and/or used herein are considered as having been obtained according to recognised and accepted professional rules and practices, and therefore deemed valid. This model provides a predictive scientific tool to evaluate the impacts on a real groundwater system of specified hydrological stresses and/or to compare various scenarios in a decision-making process. However and despite the professional care taken during the construction of the model and in conducting the simulations, its accuracy is bound to the normal uncertainty associated to groundwater modelling and no warranty, expressed or implied, is made.

ATTACHMENT F

Predictions of Hydrogeological Conditions near the Tailings Storage Facility during Closure - Long-Term Technical Assessment Report – Mount Polley Mine

17 October 2016
Reference No. 1411734-167-R-Rev0-16000

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-161-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

FROM Jennifer Levenick and Willy Zawadzki **EMAIL** Jennifer_Levenick@golder.com; Willy_Zawadzki@golder.com

PREDICTIONS OF HYDROGEOLOGICAL CONDITIONS NEAR THE TAILINGS STORAGE FACILITY DURING CLOSURE– LONG-TERM TECHNICAL ASSESSMENT REPORT – MOUNT POLLEY MINE

1.0 INTRODUCTION

The following technical memorandum presents the results of a hydrogeological assessment of groundwater conditions that are expected to develop in the area of the Tailings Storage Facility (TSF) at the Mount Polley Mine during closure of the facility. Specifically, it addresses the approaches and assumptions adopted in the estimate of potential seepage rates from the TSF following closure, and the potential seepage pathways from the TSF to down-gradient discharge areas. This assessment utilized a three-dimensional numerical model representing the TSF and the surrounding areas that was developed based on the conceptual understanding of hydrogeological conditions derived using the available site data.

2.0 BACKGROUND

The Mount Polley Mine is a copper and gold mine operated by the Mount Polley Mining Corporation (MPMC). The mine is located 56 km northeast of Williams Lake, British Columbia. Mount Polley Mine began production in 1997 and operated until October 2001, when operations were suspended for economic reasons. In March 2005, the mine restarted production and it had been in continuous operation up to the time of the tailings embankment failure in August 2014.

An overview of the mine site is shown in Figure 1. The central area of the mine site is a topographic high consisting of Polley Mountain, which reaches an elevation of approximately 1,255 metres above sea level (masl). The TSF is located about 3 km southeast of the mill in a topographic low (approximately 920 to 940 masl). The TSF was designed to receive both tailings slurry from the mill and mine site runoff.

Seepage from the tailings through the embankment and foundation is collected into three seepage collection ponds situated next to the outer perimeter of the facility. Currently, seepage is pumped to the Perimeter Embankment Till Borrow Pond, from where it is used for process water or temporarily stored in the Springer Pit prior to treatment and discharge to Quesnel Lake.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

3.0 CONCEPTUAL HYDROGEOLOGICAL MODEL

The following section presents the conceptual hydrogeological model of the TSF that was developed based on available data for pre-breach (2014) conditions. A conceptual hydrogeological model is a pictorial and descriptive representation of the groundwater regime that organizes and simplifies the site conditions so that they can be readily modelled. The conceptual model must retain sufficient complexity so that the analytical or numerical models developed from it adequately simulate the actual components of the groundwater flow system to the degree necessary to satisfy the objectives of the study. The objectives of this study are to predict total seepage from the TSF during closure and to predict seepage pathways from the TSF over larger distances to down-gradient discharge zones.

3.1 Tailings Storage Facility

3.1.1 Description of Pre-Breach Tailings Storage Facility and Dam Embankments

This section describes the TSF as it was constructed up until the breach in 2014. Detailed description of the proposed TSF Design, which will raise the embankment to an elevation of 970 m, is presented in Golder (2015a).

The TSF includes one embankment that is approximately 4.8 km in length and is bounded to the west by rising natural ground. The embankment is subdivided into three sections, referred to as the Main Embankment, Perimeter Embankment, and South Embankment (Figure 1). The embankment has incorporated a staged expansion design utilizing modified centreline and centreline construction methods.

The TSF was generally constructed over low permeability glacial till. Where natural surficial glacial till cover was thin (less than 2 m) and was underlain by glaciofluvial/glaciolacustrine sediments, a low permeability glacial till basin liner was constructed (Knight Piésold 2011a).

The dam embankments are generally composed of five material zones: upstream fill, a till core, filter material, transition material, and rockfill. The thickness and distribution of these zones varies both laterally and vertically, but is shown in the annual inspection and construction reports. AMEC (2014) presents the Stage 9 as-built and annual review report, which is generally representative of pre-breach conditions.

A simplified conceptual cross-section of the embankments was prepared by the Independent Expert Engineering Investigation and Review Panel (herein referred to as the Panel) as part of its 2015 report (Panel 2015). The conceptual section, which is representative of pre-breach conditions, is presented in Figure 2, and a description of each material zone is provided below:

- **Upstream fill (U)**—this zone is generally composed of either tailings or rockfill material and was used to provide support to the upstream side of the core when a modified centreline construction method was adopted (Panel 2015). For the purpose of this assessment, the upstream fill was simplified and assumed to be 20 m wide along the height of the embankment, although in reality the actual thickness of the zone could be wider or narrower depending on the development stage (Figure 2).
- **Till core (S)**—this zone is composed of glacial deposits (till) excavated from selected borrow areas. The thickness of the core is variable, and is generally wider near the base of the embankment and thinner near the top (Figure 2). For this assessment, the core was simplified and assumed to be 5 m wide, which corresponds to the minimum thickness of the core, as indicated in annual construction reports.

- **Filter (F) and transition (T)**—these zones are transitional materials (processed sand and gravel to fine-grained rockfill) placed between the till core and rockfill. These zones are designed to prevent water seeping through the till core from carrying fine particles from the core to the filter and from the filter to the rockfill.
- **Rockfill (C)**—this zone is composed of rockfill and is designed to support the core, without which the core would not be stable (Panel 2015).

The tailings were discharged to the TSF as slurry via a pipeline from the mill. The tailings are generally inferred to have been deposited from spigot points located along the embankment crest, and thus there may be a potential fining of the tailings materials with increasing distance from the point of discharge.

3.1.2 Hydraulic Conductivity of Engineered Components

Laboratory tests conducted by Knight Piésold (1995a) on settled tailings estimated the vertical hydraulic conductivity of the tailings to be between approximately 1×10^{-7} m/s and 2×10^{-7} m/s, with the horizontal hydraulic conductivity expected to be higher. Knight Piésold reported that in practice, the permeability of the deposited tailings would likely be reduced due to ongoing consolidation. As part of its seepage analysis, Knight Piésold assumed that the hydraulic conductivity of the tailings would vary from 1×10^{-8} m/s near the base of the TSF to 5×10^{-8} m/s in the middle to 1×10^{-7} m/s near the surface of the TSF. These values were used in the conceptual hydrogeological model as starting estimate of the pre-breach hydraulic conductivity of the tailings.

Golder Associates Ltd. (Golder) conducted a falling head permeameter measurement of tailings as part of the *2015 Freshet Management Embankment Design* (Golder 2015b). The sample had a reported hydraulic conductivity of 2×10^{-6} m/s, which is higher than Knight Piésold estimates, and could be more representative of the post-breach tailings to be deposited in the TSF as part of the proposed 970 m design.

The hydraulic conductivity of the upstream fill has not been measured but is assumed to be generally higher than the general tailings due to the method of placement and deposition (Golder 2015a,b). As an initial estimate of hydraulic conductivity, the upstream fill was assumed to be approximately an order of magnitude higher than the post-breach tailings (i.e., 2×10^{-5} m/s).

The hydraulic conductivity of the till core was assumed to be 1×10^{-8} m/s, which is conservative with respect to previous estimates adopted as part of seepage analyses (1×10^{-9} m/s; Knight Piésold 2005a) and consistent with estimates for the till liner (1×10^{-8} m/s; Knight Piésold 2005a). As presented in Section 3.2.1, laboratory permeability tests on soil samples collected from test pits indicated the till, in the absence of glaciofluvial sediments has an even lower hydraulic conductivity (possibly on the order of 10^{-10} m/s; Knight Piésold 1990, 1995b). This suggests that a hydraulic conductivity value of 1×10^{-8} m/s is a conservative assumption for the till core with respect to the prediction of potential seepage rates from the TSF.

3.1.3 Seepage Collection

As part of the construction of the TSF, seepage collection systems have been installed upstream and downstream of the till core. These systems drain into three seepage collection ponds installed down-gradient of the South, Main, and Perimeter embankments. The primary seepage collection systems include:

- foundation drains that underlie the downstream shell of the dam
- upstream toe drains within South, Main, and Perimeter embankments
- pressure relief wells and trenches installed below the Main Embankment to reduce the artesian pressures and high hydraulic head observed along the foundation of the Main Embankment; the trenches and passive relief wells are reported (in the reports listed below) to be up to 20 m deep

Design drawings showing the construction, location, and general elevations of the drains and pressure relief wells/trenches are presented in annual construction and inspection reports by Knight Piésold (1997a/b, 1998, 1999, 2000a/b, 2001a/b, 2003, 2005b/c, 2006, 2007 a/b, 2008, 2009a/b, 2011 a/b), AMEC (2012, 2013, 2014), and BGC (2014). The seepage collection ponds are unlined and reported to be installed within till. The ponds are connected by both contact (unlined) and non-contact ditches, the locations of which are presented in Figure 2.2 in Attachment 3.

Figure 3 presents a time history of the measured seepage flow reporting to each of the three seepage collection ponds. In general, total seepage from the facility has increased as the pond elevation has risen. Prior to the breach, the approximate flows were reported in early 2014 for a pond elevation of approximately 964.4 were as follows m (AMEC 2014):

- Main Embankment seepage collection system – 5 L/s
- Perimeter Embankment seepage collection system – 30 L/s
- South Embankment seepage collection system – 50 L/s

AMEC (2014) reported that the flows were typically influenced by the upstream sand (tailings) placement, which likely explains the variability in flow observed to the perimeter and south embankment seepage collection ponds between 2011 and 2014. An additional seepage loss of 0.4 l/s to 3.4 L/s, not captured by the seepage collection system, has previously been estimated for the facility as part of historical seepage analysis (Knight Piésold 1995b, 2005a).

3.2 Hydrostratigraphy

3.2.1 Overburden

The overburden in the area of the TSF consists predominantly of glacial till with interbeds of glaciofluvial and glaciolacustrine sediments. The thickness of the overburden varies from approximately 5 m along a bedrock knoll near the South Embankment to approximately 50 m along portions of the Main Embankment. The relative distribution of the till, glaciofluvial, and glaciolacustrine sediments varies by location according to the depositional and erosional history of the area. Detailed description of this variation in surficial geology in the area of the TSF was provided in the geological overview report by Golder (2015c).

In situ hydraulic conductivity testing (packer tests and falling head permeability tests) has been conducted in the overburden near the TSF (Knight Piésold 1990; Imperial Metals Corporation 1990). Measured hydraulic conductivity values from the in situ packer tests ranged from 5×10^{-6} m/s to 1×10^{-8} m/s, with a geometric mean of approximately 2×10^{-7} m/s. Laboratory permeability tests on soil samples collected from test pits near the TSF indicated a lower hydraulic conductivity, with reported values on the order of 10^{-10} m/s (Knight Piésold 1990, 1995b). The wide range in hydraulic conductivity measurements is consistent with the variable composition and depositional history of the overburden.

For the purpose of this assessment, the overburden was treated as a single hydrostratigraphic unit. While variability in the overburden deposits may influence the groundwater flow conditions on the local scale, the objective of the assessment was to predict total seepage from the TSF and to predict seepage pathways from the TSF over larger distances to down-gradient discharge zones. For this scale of analysis, the seepage will be mainly controlled by the bulk properties of the overburden, and it was thus not considered necessary or practical to map out and include in the model the intricate interlayering of the glaciofluvial and glaciolacustrine deposits within the till.

The bulk horizontal hydraulic conductivity of the overburden near the TSF was assumed to be equal to the geometric mean of the in situ hydraulic conductivity measurements (2×10^{-7} m/s). Because of the observed heterogeneity, the vertical hydraulic conductivity was assumed to be an order of magnitude lower (2×10^{-8} m/s). This is considered reasonable based on the inferred interlayering of the less permeable deposits of glacial lacustrine origin within the overburden, which restrict the vertical movement of groundwater.

3.2.2 Weathered and Competent Bedrock

Bedrock underlying the TSF has been mapped and described as altered, deformed, and brecciated volcanic and plutonic igneous rocks, with local sandstone (Panel 2015). Drilling observations in the TSF footprint prior to mining indicated predominately volcanic conglomerate bedrock (Imperial Metals Corporation 1990). Bedrock and weathered bedrock may be difficult to distinguish from the surficial units that immediately overlie the bedrock due to the intensity of weathering (Panteleyev et al. 1996; Logan et al. 2007).

Bedrock elevations vary throughout the TSF, with the highest observed elevations in the range of 970 m along the southwest and north sides of the embankment. Lower elevations in the range of 870 m occur in the southeast corner of the Main Embankment.

In situ hydraulic conductivity testing has been conducted in the bedrock near the TSF (Knight Piésold 1990; Imperial Metals Corporation 1990). Measured hydraulic conductivity values ranged from 9×10^{-10} m/s to 1×10^{-7} m/s. The calculated geometric mean of the individual tests for weathered (shallow) and competent (deep) bedrock, approximately 1×10^{-7} m/s and 1×10^{-8} m/s respectively, were assumed in the conceptual hydrogeological model.

3.3 Recharge and Discharge Areas

The climate and hydrology for the mine site have been assessed as part of the water management plan for the TSF 970 m design (Golder 2015a). The mine site experiences high summer precipitation due to summer storms, with the lowest precipitation in February. Precipitation typically occurs as snowfall starting in November and accumulates until March. Average annual precipitation at Mount Polley is estimated to be 670 mm.

Groundwater recharge from precipitation in the area of the TSF is expected occur primarily along topographic highs, such as up-gradient of the western boundary of the TSF (between the TSF and Bootjack Lake). As an initial estimate, this recharge was assumed to be approximately 30% of average annual precipitation, a value similar to that estimated through the calibration of a numerical groundwater model for the Springer Pit/Cariboo Pit areas (Golder 2014).

The primary groundwater discharge areas near the TSF include Edney Creek, Edney Creek tributaries, and Hazeltine Creek. In addition, prior to construction, groundwater discharge was reported to occur within the footprint of the TSF, as indicated by the presence of a small pond and swamp/marsh-like areas.

3.4 Groundwater Flow Direction

3.4.1 Pre-development

Hydraulic head measurements were collected by Knight Piésold (1990) at 10 monitoring wells and piezometers prior to the TSF construction. The inferred groundwater flow directions based on these data are presented in Figure 4 (Panel A) and shown conceptually on a cross-section presented in Figure 5.

Based on the measured hydraulic heads, the groundwater flow direction prior to the development of the TSF was inferred to be from the west and northwest towards the east and southeast. The water table was observed to be near ground surface, with artesian pressures measured at MW89-236 and upward groundwater flow gradients measured along the main and perimeter embankments (MP89-231 and MP89-234). The observed upward gradients and artesian flow conditions are consistent with reported observations of two swampy areas and a small pond within the footprint of the TSF prior to development. A downward hydraulic gradient was observed at MP89-235, which is located near a bedrock ridge (topographic high) adjacent to and beneath the South Embankment.

3.4.2 Operational (Pre-breach)

Depth to water measurements were provided by MPMC for 14 monitoring wells that were operational in 2014 near the TSF (Figure 4, Panel B). These data, along with survey data provided by MPMC, were used to calculate the hydraulic heads at each of the well locations over the operational life of the TSF (approximately 1997 to 2015), a summary of which is included in Attachment 2.

The available information indicates that hydraulic heads near the TSF vary seasonally by up to approximately 2 m to 3 m. This variation is relatively small in comparison to the overall change in hydraulic head across the TSF, which for a shallow groundwater system ranges from approximately 970 m near the western edge of the facility to approximately 910 m near the Main Embankment. The small seasonal variation relative to the total head change across the facility suggests that these seasonal variations are unlikely to affect overall interpretation of groundwater flow directions near the TSF.

At GW96-3b, which is located near the South Embankment Seepage Collection Pond, large variations in hydraulic head were observed over time. At this location, the hydraulic head varied from approximately 885 m in 1997, to over 910 m throughout portions 2003 to 2014, with significant up and down variability between these values. The observed low hydraulic head values at GW96-3b contradicts the observation of artesian pressures below the Main Embankment (Golder 2015c), general wet or swampy conditions near surface, and reported installation of passive pressure relief wells below this embankment to lower artesian heads. The regularity of the water level fluctuation, however, implies that the variability could be real and not attributable to measurement error. At the time of this report, the source of the variability remains unknown.

The inferred groundwater flow directions during operational conditions are presented in Figure 4 (Panel B) and shown conceptually on a cross-section presented in Figure 6. The information presented in Figure 4 (Panel B) reflects the average hydraulic head calculated from measurements between May 2013 and May 2014. The TSF pond position presented in Figure 4 is taken from Drawing No. 2013AB.01 of AMEC (2014), which reported a pond elevation of 964.4 m in February 2014.

In 2014, prior to the breach, groundwater flow towards the TSF was generally from the northwest, originating from the area of Bootjack Lake and Polley Mountain. With the TSF pond at 964.4 m, groundwater within the TSF footprint was directed radially from the TSF towards Hazeltine Creek to the east, Edney Creek to the southeast, and Edney Creek tributaries to the southwest.

Upward vertical hydraulic gradients were observed along the South Embankment (GW00-2a/b and GW96-4a/b), whereas along the western boundary, Perimeter and Main Embankments a downward hydraulic gradient was observed. At GW96-2a/b, the water level recorded in the deep piezometer (901.32 m) was significantly lower than what would be expected based on nearby surface water elevations in Edney Creek and Hazeltine Creek, which were generally 10 m higher. This measurement suggests the well could be connected locally through an enhanced permeability zone to areas adjacent to the Hazeltine Creek further down-gradient. The borehole record for GW96-2a/b shows that the deeper well is screened in a material that was described as gravel with some coarse sand (possibly weathered bedrock), which could be indicative of a zone with enhanced permeability. Hydraulic conductivity testing has not been conducted at this location.

4.0 NUMERICAL HYDROGEOLOGICAL MODEL

The conceptual model of groundwater conditions at the TSF was used as a basis for the development of a three-dimensional numerical groundwater flow model for this facility. Following construction and calibration, this numerical model was used to evaluate total seepage from the facility and potential seepage pathways from the TSF to the down-gradient groundwater discharge areas at and after closure.

4.1 Model Selection

The numerical groundwater model was constructed using FEFLOW (Diersch 2016). This numerical code is capable of simulating variably saturated groundwater flow and solute transport in three dimensions, and in heterogeneous porous media under a variety of hydrogeological boundary conditions and hydraulic stresses. This code was selected as it is capable of simulating the key characteristics and features included in the conceptual model.

4.2 Model Extent and Mesh Configuration

The extent of the numerical model was based on the understanding of groundwater flow conditions near the TSF, with model boundaries set sufficiently distant from the TSF to allow adequate representation of these conditions prior to TSF construction and following closure. The extents of the model and the finite element mesh are presented in Figure 7.

The planar area of the model domain is approximately 18 km^2 and is roughly centred on the footprint of the TSF. The model is bounded by Bootjack Lake and Polley Lake to the west and northwest, tributaries of Edney Creek to the south, and Hazeltine Creek to the north and northeast.

The mesh consists of approximately 850,000 triangular elements, with approximately uniform element spacing of 40 m across most of the model domain. Near the TSF embankments, the element spacing was reduced to 2 m to represent the till core and the potential steep hydraulic gradients that may develop in this area for conditions when the TSF pond is located close to the embankment (i.e., 2014 pre-breach conditions).

Vertically, the model was discretized into 11 layers. The first five layers represent the TSF, and the bottom six layers represent the overburden (two layers), weathered bedrock (one layer), and competent bedrock (three layers). Portions of Layers 1 through 5 that are not part of the TSF were deactivated, such that the top of Layer 6 represented the ground surface everywhere within the model domain outside of the TSF. In addition, depending on the stage of development being simulated, portions of the model representing the TSF were also deactivated if they had not yet been constructed for the simulated development period (i.e., for the simulation of pre-development conditions, the top five layers representing the TSF were deactivated).

The top of Layer 1 was set equal to the elevation of the final tailings surface, as presented in the 970 m detailed design for the TSF with a 1% beach slope (Golder 2015b). The top of Layer 6 was set equal to the inferred original ground surface elevation prior to development, which for the TSF area was based on 1996 topographic data provided by MPMC. The bottom of the Layer 11 was set to between approximately 150 to 200 m below the pre-development ground surface. Seepage from the TSF is expected to be unaffected by groundwater flow at deeper depths, and therefore these vertical limits were considered reasonable for the simulation of hydrogeological conditions associated with the TSF. Overall, the horizontal and vertical mesh spacing is considered to be of appropriate detail for the simulation of hydrogeological conditions near and within the TSF.

4.3 Hydrostratigraphy and Model Parameters

The engineered components represented in the numerical model included the tailings, upstream fill, and the till core. The filter, transition, and rockfill zones were not represented in the model, as seepage through these more permeable features is expected to flow into the seepage collection systems and can therefore be represented through specified head boundary conditions (Section 4.4).

In addition to the engineering components, three hydrostratigraphic units were represented in the model: overburden, weathered bedrock, and competent bedrock.

A summary of the hydrogeological properties initially assigned to each unit is provided in Table 1, with the location of the units presented in Figure 8. Values of hydrogeological parameters were obtained from in situ hydrogeological testing, where available, as discussed in Section 3.0. Where in situ values were not available, values were derived from typical values published in literature (Maidment 1992; Stober and Bucher 2007).

Table 1: Initial Hydrogeological Parameters Used in Model

Hydrostratigraphic Unit	Elevation (masl)	Calibrated Hydraulic Conductivity (m/s)		Specific Storage (1/m)[(a)]	Specific Yield (-)[(a)]
		Horizontal	Vertical		
Overburden	-	2×10^{-7}	2×10^{-8}	1×10^{-4}	0.2
Weathered bedrock	-	1×10^{-7}	1×10^{-7}	1×10^{-5}	0.01
Competent bedrock	-	1×10^{-8}	1×10^{-8}	1×10^{-6}	0.001
Tailings	>946	1×10^{-7}	1×10^{-7}	1×10^{-4}	0.2
	937–946	5×10^{-8}	5×10^{-8}	1×10^{-4}	0.2
	<937	1×10^{-8}	1×10^{-8}	1×10^{-4}	0.2
Upstream fill	-	2×10^{-5}	2×10^{-5}	1×10^{-4}	0.01
Core	-	1×10^{-8}	1×10^{-8}	1×10^{-4}	0.15

a) Parameter values within ranges documented in literature (Maidment 1992; Stober and Bucher 2007).

Effective porosity assumed to be equal to specific yield.

masl = metres above sea level; - = not applicable (value applies to entire unit); > = greater than; < = less than.

4.4 Model Boundary Conditions

Model boundary conditions provide a link between the model domain and the surrounding hydrological and hydrogeological systems. Three types of flow conditions were used in the model: specified head, no-flow (zero-flux) boundaries, and specified flux. The locations of these boundaries are shown in Figure 9 and summarized below.

Specified head boundaries were assigned to the numerical model to represent the following features:

- Lakes, streams, and inferred groundwater discharge zones (e.g., seepage faces, marsh areas)—Where a drainage course was inferred to be potentially ephemeral, the drainage course was constrained to allow outflow only. The hydraulic head assigned to the boundaries corresponded to the topographic elevation.
- Toe drains, foundation drains and seepage collection sumps—With the exception of the sumps, which were unlined and therefore potentially connected to the local groundwater flow system, these boundaries were constrained to allow outflow only. The hydraulic heads assigned to these boundaries were assigned based on the elevation of the seepage collection feature and/or ground surface elevation (South Embankment Seepage Collection Pond).
- The filter, transition, and rockfill components of the dam embankment were not simulated in the model as it was assumed that water which flows into the permeable downstream portion of the dam would be effectively collected by the seepage collection systems. To represent the collection of this water, a seepage face (specified head boundary constrained to outflow only) was applied to the downstream face of the till core and to the base of the embankment (top of ground surface) in the area directly below the rockfill, filter, and transition zones of the dam embankments.

- Pressure relief wells and trenches—Specified head boundaries that were constrained to outflow only were assigned to represent the pressure relief wells and trenches. The depth of the individual wells/trenches are unknown but were reported to vary, on average, between 10 and 20 m deep. For the purpose of this assessment, the wells and trenches were assumed to penetrate midway through the overburden, which was generally between 10 and 20 m in depth. The specified head assigned to these features was the ground surface elevation at each well/trench location.
- Eastern model boundary—A specified head boundary was assigned to the eastern boundary of the model along an inferred equipotential line (line of equal hydraulic head). This boundary is approximately 3 km down-gradient of the TSF and is sufficiently far from the TSF that it is not expected to significantly affect the prediction of seepage pathways from the facility.

No-flow boundaries were used to represent inferred groundwater flow divides and flow lines along the perimeter of the model. A no-flow boundary was also applied along the bottom of the model at a depth of 150 to 200 m below the pre-development ground surface. Flow at greater depth is expected to be negligible and, therefore, to have negligible impact on model predictions.

Specified flux boundaries were assigned to the first active layer of the model to represent recharge from precipitation. Outside of the TSF, the recharge rate was initially set equal to approximately 200 mm/year or approximately 30% of the average annual precipitation (670 mm/year; Section 3.2.3). Within the TSF, the recharge rate was estimated from post-breach seepage collection rates and the area of the TSF to be approximately 65 mm/year.

4.5 Model Calibration

4.5.1 Calibration Targets

The numerical groundwater model was calibrated to hydraulic heads measured prior to development (1989) and to hydraulic heads and seepage collection measurements recorded in 2014 prior to the breach. These two time periods represent two extremes of groundwater conditions near the TSF and therefore were considered to be appropriate for the calibration of the numerical model. The locations of the calibration points are presented in Figure 4, and the seepage rates measured in the collection system are presented in Figure 3.

During calibration, the model was run repeatedly and the model parameters (e.g., hydraulic conductivity, recharge) were iteratively adjusted until a reasonable agreement between measured and predicted hydraulic heads and seepage rates was obtained. Both pre-development and 2014 (pre-breach) conditions were simulated under steady-state conditions. The approximation of steady-state conditions is considered reasonable as the rise of the pond in the TSF facility is gradual, which should allow time for equalization of the hydraulic heads in the vicinity of the TSF.

4.5.2 Calibration Results

During model calibration, some hydrogeological parameters were adjusted from the initial estimates presented in Table 1 in order to achieve a suitable match between model predictions and measurements of hydraulic heads and seepage rates. A summary of the parameters assigned to the calibrated model is shown in Table 2 and presented in Figure 8.

Table 2: Calibrated Hydrogeological Parameters Used in Model

Hydrostratigraphic Unit	Elevation (masl)	Calibrated Hydraulic Conductivity (m/s)		Specific Storage (1/m)[(a)]	Specific Yield (-)[(a)]
		Horizontal	Vertical		
Overburden	-	$\underline{5 \times 10^{-7}}$	$\underline{5 \times 10^{-8}}$	1×10^{-4}	0.2
Weathered bedrock	-	$\underline{3 \times 10^{-7}}$	$\underline{3 \times 10^{-7}}$	1×10^{-5}	0.01
Weathered bedrock (enhanced permeability)	-	$\underline{2 \times 10^{-4}}$	$\underline{2 \times 10^{-4}}$	1×10^{-5}	0.01
Competent bedrock	-	$\underline{3 \times 10^{-8}}$	$\underline{3 \times 10^{-8}}$	1×10^{-6}	0.001
Tailings	>946	$\underline{5 \times 10^{-6}}$	$\underline{3 \times 10^{-6}}$	1×10^{-4}	0.2
	937–946	5×10^{-8}	5×10^{-8}	1×10^{-4}	0.2
	<937	1×10^{-8}	1×10^{-8}	1×10^{-4}	0.2
Upstream fill	-	$\underline{1.5 \times 10^{-5}}$	$\underline{8 \times 10^{-6}}$	1×10^{-4}	0.01
Core	-	1×10^{-8}	1×10^{-8}	1×10^{-4}	0.15

a) Parameter values within ranges documented in literature (Maidment 1992; Stober and Bucher 2007).

Effective porosity assumed to be equal to specific yield.

Underlined values indicate the parameter was adjusted during model calibration from the initial value assumed in Table 1.

masl = metres above sea level; - = not applicable (value applies to entire unit) ; > = greater than; < = less than.

Initial calibration simulations conducted for the pre-development conditions using the parameters presented in Table 1 significantly over predicted hydraulic heads in the overburden, weathered bedrock, and competent bedrock, with the water table predicted to be above ground surface through a significant portion of the model domain. To improve the match between measured and predicted hydraulic heads, the following adjustments were made to the model parameters:

- The hydraulic conductivity of the overburden, weathered bedrock, and competent bedrock was increased by a factor of two to three to lower the predicted water table. This is considered reasonable, as in Golder's experience, in situ hydraulic conductivity tests that are conducted on local scale (i.e., packer tests) typically underestimate bulk hydraulic conductivity that controls groundwater movement over longer distances.
- Recharge from precipitation was reduced from 200 mm/year (30% of average annual precipitation) to approximately 120 mm/year (20% of the average annual precipitation) in areas of inferred groundwater recharge (i.e., topographic highs within the model domain). This value is considered reasonable because the geology in the main site is different from the geology in the area of the TSF (i.e., exposures of weathered bedrock along the topographic highs near the open pits that are not blanketed by lower-permeability till could allow higher recharge).
- In and near areas of inferred groundwater discharge (i.e., within the TSF footprint and along surface water features) the recharge rate was reduced to 30 mm/year (approximately 5% of the average annual precipitation). This is considered reasonable as the water table in these areas was observed to be at or near ground surface, with ephemeral ground discharges observed in the TSF footprint during pre-development conditions.

Initial calibration simulations for the 2014 (pre-breach) conditions underestimated the measured seepage from the TSF, particularly in the South Embankment seepage collection system. To improve the match between measured and predicted seepage, the following adjustments were made to the model parameters:

- The horizontal hydraulic conductivity of the shallow tailings (greater than 946 masl) was increased from 1×10^{-7} m/s to 5×10^{-6} m/s, and the vertical hydraulic conductivity was set to 3×10^{-6} m/s (previously assumed to be isotropic). This hydraulic conductivity is slightly higher than what was measured in Golder (2015a; 2×10^{-6}) and is considered reasonable to represent the bulk properties of shallow tailings.
- The horizontal hydraulic conductivity of the upstream fill was slightly reduced from 2×10^{-5} m/s to 1.5×10^{-5} m/s, and the vertical hydraulic conductivity was reduced to 8×10^{-6} m/s (previously assumed to isotropic).

The changes made to the hydraulic properties of the tailings and upstream fill resulted in improved calibration by increasing predicted seepage to the toe drain near the South Embankment while not increasing predicted seepage to the Perimeter Embankment toe drain, which was installed at lower elevation within the embankment.

A zone of enhanced permeability within the weathered bedrock southeast from the TSF was introduced in the calibrated model to better represent the low hydraulic heads observed at GW96-2b and the relatively strong downward hydraulic gradients recorded at this location. As discussed in Section 3.3.2, the hydraulic heads measured at this location were significantly lower than what would be expected based on nearby surface water elevations in Edney Creek (immediately to the west from GW96-2b) and Hazeltine Creek (immediately to the east of GW96-2b), which were generally 10 m higher. This finding suggests that this well could be hydraulically connected through a zone of enhanced permeability to portions of Hazeltine Creek farther downslope and towards the southeast. As a result of the introduction of the enhanced permeability zone, the model more reasonably predicted the low hydraulic head in the shallow bedrock at this location, in addition to adequately reproducing the downward hydraulic gradient. The calibration match could be further improved by further increasing the hydraulic conductivity of this area; however, it was decided to limit the increase to 2×10^{-4} m/s, a value that is nearly three orders of magnitude higher than the one adopted for weathered bedrock and near the upper bound of values that are typically encountered in highly fractured rock.

Figures 10 and 11 show groundwater flow patterns and water table elevations derived using the calibrated model under pre-development and 2014 (pre-breach) conditions, respectively. Figures 10 and 11 also show a comparison of measured versus model-predicted hydraulic heads for each of the observation points. The match between the model-predicted and measured heads was reasonable for both pre-development and pre-breach conditions, and the corresponding groundwater flow pattern predicted by the model reflected the pattern established in the conceptual model (Section 3.4). The mean error between measured and calculated heads under predevelopment conditions was approximately 3.3 m, with a weighted root-mean-square error of about 10%. The mean error under 2014 (pre-breach) conditions was 4.5 m, with a weighted root-mean-square error of approximately 8%.

Figure 11 shows a comparison between measured and predicted seepage rates within the Main, Perimeter, and South Embankment seepage collection systems. In general, predicted seepage rates were within 1 to 5 L/s of the observed values, indicating a good match between measured and predicted values. The total predicted seepage from the TSF was 80 L/s, which is within 6% of the total observed seepage (85 L/s). Considering the reasonable match between measured and predicted hydraulic heads and tailings seepage, the hydrogeological model was assumed to be reasonably well calibrated for the purposes of predicting TSF seepage at closure.

4.6 Model Predictions – Base Case Scenario

The following sections present the predicted hydrogeological conditions and closure seepage rates for the 970 m design based on the hydraulic parameters discussed in Section 4.5 and presented in Table 2. These predictions are hereafter referred to as Base Case predictions. Uncertainty in the predicted groundwater conditions and seepage rates resulting from the uncertainty in the hydraulic parameters is discussed in Section 4.7.

4.6.1 Closure Design and Initial Conditions

The 970 m design represented in the model is described in Golder 2015c for a 1% beach slope and final pond elevation of 965.7 masl. Model boundary conditions were modified prior to the simulation to represent the seepage collection system in the 970 m design which includes the construction of a new upstream drain to promote drainage and consolidation of the newly placed tailings. The hydraulic conductivity of these tailings was assumed to be equivalent to the calibrated hydraulic conductivity of the shallow tailings (i.e., tailings greater than 946 masl).

As initial conditions for these simulations, it was assumed that tailings within the TSF would be fully saturated up to an elevation of 965.7 masl. It was also assumed that after closure the extent of the tailings pond will be as presented in Figure 12 (according to the 970 m design) and that the water level in this pond will remain at 965.7 masl elevation. The model simulations were then used to predict the drain down of the tailings with progressive years of closure.

4.6.2 Predicted Hydrogeological Conditions and Seepage Rates

Base Case predictions of seepage rates and hydrogeological conditions for closure are presented in Figure 12 and 13. Similar to pre-breach operational conditions, groundwater flow towards the TSF was predicted to be generally from the northwest, originating from the area of Bootjack Lake and Polley Mountain. Predicted groundwater flow within the TSF footprint was directed radially from the TSF towards Hazeltine Creek to the east, Edney Creek to the southeast, and Edney Creek tributaries to the southwest.

The predicted average total seepage from the TSF in the first year of closure was approximately 47.2 L/s. Of this seepage, approximately 3.6 L/s (8% of total) was predicted to bypass the seepage collection system and migrate to creeks down-gradient of the TSF. The remainder, in combination with a small component of groundwater originating from upstream of the facility, was predicted to be intercepted by the collection systems (43.6 L/s). It should be noted that this seepage rate is highly conservative due to assumed full saturation of tailings immediately after closure. In reality, and depending on progress of tailings deposition, a portion of the tailings materials could be desaturated, which would result in lower than predicted initial seepage rates.

With progressive drain down of the tailings, the seepage rates were predicted to decrease until long-term steady-state conditions were established. For the Base Case predictions this was predicted to take approximately 70 years with total seepage decreasing to approximately 14.9 L/s. Of this flow, approximately 1.8 L/s (12% of total) was predicted to bypass the seepage collection system and flow to creeks down-gradient of the TSF. The remainder of the flow, in combination with a small component of groundwater, was predicted to be intercepted by the collections system (13.1 L/s).

The model results indicated that seepage from the TSF would predominately migrate towards Hazeltine Creek, as shown in Figure 12 and 13. Long-term tailings seepage to Hazeltine Creek was estimated to be 1.8 L/s, whereas seepage loss to Edney Creek and Edney Creek tributaries was estimated to be less than 0.1 L/s. The majority of seepage was predicted to originate from the TSF area near the Perimeter Embankment, which is where downward hydraulic gradients were observed both prior to and during TSF operation (Section 3.4). This predicted seepage pathway was significantly affected by the zone of enhanced permeability that was assumed to be present within the weathered bedrock in order to reproduce the vertical hydraulic gradients in this area. If there is a different source contributing to the downward gradient (i.e., an enhanced permeability fault rather than enhanced weathering), the direction and extent of this pathway could be different from the one modelled. However, the amount of total seepage loss is not likely to be significantly affected by the assumed location of the enhanced permeability zone, as the hydraulic properties of the overburden and tailings were predicted to predominantly control the total seepage rate from the TSF.

4.7 Sensitivity Analysis – Uncertainty in Model Predictions

Due to the inherent uncertainty in the subsurface conditions and parameters controlling groundwater flow and tailings seepage, uncertainty exists in the model predictions such that the actual seepage could be higher or lower than the Base Case predictions. This uncertainty was evaluated using sensitivity analysis where selected model parameters were systematically varied from the Base Case values to identify the parameters to which predicted seepage rates were most sensitive, as well as to estimate the effects of that uncertainty on predicted values.

The following model input parameters were included in the sensitivity analysis:

Bedrock and overburden hydraulic conductivity—Hydraulic conductivity of weathered bedrock and overburden were varied by a factor of three from Base Case values.

Tailings hydraulic conductivity—Hydraulic conductivity of the tailings was increased and decreased by a factor of three from Base Case values.

Specific yield—Specific yield of the tailings was reduced to 0.1 and increased to 0.3 relative to the base case value of 0.2.

Weathered bedrock (enhanced permeability)—The zone of enhanced permeability in the weathered bedrock was removed.

The sensitivity factors summarized above were selected to adequately represent potential uncertainty in each model parameter. During analysis, six simulations were completed (one simulation for each parameter adjustment considered). At the end of each simulation, predicted long-term (steady-state) seepage rates were compared to values predicted in the Base Case.

Table 3 presents a summary of the sensitivity analysis. These results indicated that the quantity of seepage from the TSF after near steady-state conditions are reached was sensitive to the tailings hydraulic conductivity and to the bedrock and overburden hydraulic conductivity. Considering the uncertainty in these parameters, the predicted seepage from the TSF under long-term conditions was predicted to range between 10.3 and 27.7 L/s, approximately 31% lower and 86% higher than the base case value of 14.9 L/s.

Table 3: Sensitivity Results for Long-Term Steady-State Conditions Following Closure

Simulation		Total Tailings Seepage (L/s)	Seepage Collection Systems (L/s)	Seepage Loss to Down-Gradient Creeks (L/s)	Years to Steady-State Conditions
Base Case	-	14.9	14.6	1.8	70
Bedrock and overburden hydraulic conductivity	factor of 3 higher	20.1	17.0	4.0	70
	factor of 3 lower	13.1	13.8	0.5	70
Tailings hydraulic conductivity	factor of 3 higher	27.7	27.2	2.3	50
	factor of 3 lower	10.3	10.4	1.8	135
Tailings specific yield	increased to 0.3	14.9	14.6	1.8	105
	decreased to 0.1	14.9	14.8	1.8	45
Weathered bedrock (enhanced permeability)	removed	14.9	16.4	0.5	70

The results of sensitivity analysis also showed that the time it takes for near steady-state conditions to be established following closure was affected by both the hydraulic conductivity and the specific yield of the tailings. Considering the uncertainty in these parameters, the time to near steady-state conditions following closure could take between approximately 45 and 135 years. In all model simulations, however, the most significant changes in predicted seepage occurred in the first 10 to 20 years, with subsequently smaller changes occurring as the hydraulic gradient within the TSF diminishes outside of the immediate area of the pond.

Predicted seepage loss from the TSF to down-gradient creeks was most sensitive to the hydraulic conductivity of the bedrock and overburden, and to the presence of the assumed enhanced zone of permeability within the weathered bedrock. Considering the uncertainty in these parameters, the predicted seepage loss from the TSF under long-term conditions was predicted to range between 0.5 and 4 L/s, or approximately 72% lower or 122% higher than the base case value of 1.8 L/s. Figure 15 presents the predicted seepage pathways for the TSF assuming the zone of enhanced permeability in the weathered bedrock removed. In general, the sensitivity analysis demonstrates that, although the amount of seepage loss from the facility could be higher or lower than the predicted Base Case values, the majority of seepage bypassing the collection system would migrate towards Hazeltine Creek.

5.0 CONCLUSION

The results of the hydrogeological modelling were used to estimate the seepage from the TSF during closure. In the Base Case predictions, the average seepage from the TSF was predicted to decrease from approximately 47.2 L/s in the first year of closure to 14.9 L/s after 70 years, which is representative of long-term steady conditions. Of this long-term flow, approximately 1.8 L/s was predicted to bypass the seepage collection system and migrate to creeks down-gradient of the TSF. The remainder of this seepage, in combination with a small component of groundwater originating up-gradient of the TSF, was predicted to be intercepted by the seepage collections systems (13.1 L/s).

Results of the sensitivity analysis showed that total seepage from the TSF was most sensitive to the hydraulic conductivity of tailings and to the hydraulic conductivity of the bedrock and overburden. Considering the uncertainty in these parameters, the predicted seepage from the TSF under long-term conditions was predicted to range between 10.3 and 27.7 L/s, or approximately 31% lower and 86% higher than the Base Case value of 14.9 L/s.

The seepage loss to down-gradient creeks was primarily sensitive to the hydraulic conductivity of the bedrock and overburden. Considering the uncertainty in this parameter, the predicted seepage loss from the TSF under long-term conditions was predicted to range between 0.5 and 4 L/s, or approximately 72% lower or 122% higher than the base case value of 1.8 L/s.

The time it takes following closure for long-term steady-state conditions to be established was predicted to be affected by both the hydraulic conductivity and the specific yield of the tailings. Considering the uncertainty in these parameters, the time to achieve near steady-state conditions following closure could take between approximately 45 and 135 years. In all model simulations, however, the most significant changes in predicted seepage occurred in the first 10 to 20 years, with subsequently smaller and smaller changes occurring as the hydraulic gradient within the TSF diminishes outside of the immediate area of the pond.

6.0 CLOSURE

We trust that the above information is sufficient for your needs at this time. Should you have any questions or require clarification, please do not hesitate contact the undersigned at 604-296-4200.

GOLDER ASSOCIATES LTD.

Jennifer Levenick, PEng
Associate, Senior Hydrogeologist

Willy Zawadzki, PGeo
Principal, Senior Hydrogeologist

JL/WA/syd/cf/pn/kp

Attachments:
Figure 1: TSF Study Area
Figure 2: Simplified Cross-Section Through TSF Embankment
Figure 3: Measured TSF Seepage Collection Rates
Figure 4: Groundwater Flow Conditions Pre-Development and 2014 (Pre-breach)
Figure 5: Conceptual Hydrogeological Model – Pre-development
Figure 6: Conceptual Hydrogeological Model – TSF Operational
Figure 7: Finite Element Mesh
Figure 8: Calibrated Hydraulic Conductivity Values
Figure 9: Boundary Conditions
Figure 10: Model Calibration Results – Pre-Development
Figure 11: Model Calibration Results – 2014 (Pre-breach)
Figure 12: Predicted Hydraulic Head and Seepage Rates 970 m Design – Post Closure
Figure 13: Predicted Seepage Pathways for TSF 970 m Design Closure – Year 1
Figure 14: Predicted Seepage Pathways for TSF 970 m Design Closure – Year 70
Figure 15: Predicted Seepage Pathways for TSF 970 m Design Closure – No Enhanced Permeability Zone in Weathered Bedrock – Year 70
Attachment 1: Study Limitations
Attachment 2: Historical Hydraulic Head Elevations Provided by MPMC
Attachment 3: Site Water Management Plan

o:\final\2014\1421\1411734\1411734-161-tm-rev0-16000\1411734-161-tm-rev0-16000-pred tsf hydrogeo conditions 17oct_16.docx

REFERENCES

AMEC (AMEC Environment & Infrastructure). 2012. Mount Polley Mine Tailings Storage Facility 2011 Construction As-Built and Annual Review (VM00560A.A.1). March 30, 2012.

AMEC. 2013. Mount Polley Mine Tailings Storage Facility Stage 8/8A 2012 As-built Report (VM00560A). March 27, 2013.

AMEC. 2014. Mount Polley Mine Tailings Storage Facility Stage 9 2013 As-Built and Annual Review Report. March 12, 2014.

(BCG) BCG Engineering Inc. 2013. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility 2012 Annual Review (Doc. No. MP13-01). April 8, 2013.

Diersch HG. 2016. FEFLOW v.6 Finite Element Subsurface Flow and Transport Simulation System. DHI-WASY Institute for Water Resources Planning and System Research Ltd., Berlin, Germany.

Golder (Golder Associates Ltd.). 2014. Updated Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine. Prepared for Mount Polley Mining Corporation. December 16, 2014.

Golder. 2015a. Tailings Storage Facility Detailed Design to Elevation 970 m. November 3, 2015.

Golder. 2015b. 2015 Freshet Management Embankment Design. May 8, 2015.

Golder. 2015c. Surficial Geology and Quaternary Geological Overview of the Mt. Polley Tailings Storage Facility (TSF) Area, British Columbia. July 6, 2015.

Imperial Metals Corporation. 1990. Mount Polley Project Stage I Environmental and Socioeconomic Impact Assessment Volume 1 of II. July 1990.

Knight Piésold (Knight and Piésold Ltd.). 1990. Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility. February 19, 1990.

Knight Piésold (Knight Piésold Ltd.). 1995a. 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility. March 14, 1995.

Knight Piésold (Knight Piésold Ltd.) 1995b. Tailings Storage Facility Design Report (REF. No. 1625/1) Volume 1 – Main Report, May 26, 1995.

Knight Piésold (Knight Piésold Ltd.). 1997a. Mount Polley Mining Corporation Mount Polley Project Tailings Storage Facility and Ancillary Features May 1, 1997 Site Inspection (REF. No. 1627/4) June 3, 1997.

Knight Piésold (Knight Piésold Ltd.). 1997b. Mount Polley Mining Corporation Mount Polley Project Tailings Storage Facility Report on Stage Ia/Ib Construction (REF. No. 10162/7-5) August 14, 1997.

Knight Piésold (Knight Piésold Ltd.). 1998. Mount Polley Mining Corporation Mount Polley Project Tailings Storage Facility 1998 Annual Inspection Report (REF. No. 10162/9-5) June 26, 1998.

Knight Piésold (Knight Piésold Ltd.). 1999. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 1998 Construction and Annual Inspection (REF. No. 11162/10-1) June 16, 1999.

Knight Piésold (Knight Piésold Ltd.). 2000a. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 1999 Construction (REF. NO. 11162/13-5) August 30, 2000.

Knight Piésold (Knight Piésold Ltd.). 2000b. Mount Polley Mining Corporation Mount Polley Mine Report on 1999 Annual Inspection (REF. No. 11162/13-9) October 16, 2000.

Knight Piésold (Knight Piésold Ltd.). 2001a. Mount Polley Mining Corporation Mount Polley Mine Report on 2000 and 2001 Annual Inspection (REF. No. 11162/14-2) October 3, 2001.

Knight Piésold (Knight Piésold Ltd.). 2001b. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on Stage 3 Construction (REF. NO. 11162/14-3) October 19, 2001.

Knight Piésold (Knight Piésold Ltd.). 2003. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 2002 Annual Inspection (REF. No. VA101-00001/3-1) April 30, 2003.

Knight Piésold (Knight Piésold Ltd.). 2005a. Mount Polley Mine Design of the Tailings Storage Facility to Ultimate Elevation. March 14, 2005.

Knight Piésold (Knight Piésold Ltd.). 2005b. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 2004 Annual Inspection (REF. No. VA101-01/7-1) February 8, 2005.

Knight Piésold (Knight Piésold Ltd.). 2005c. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on Stage 3C Construction (REF. NO. VA101-1/5-2) September 23, 2005.

Knight Piésold (Knight Piésold Ltd.). 2006. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 2005 Annual Inspection (REF. No. VA101-01/11-1) May 3, 2006.

Knight Piésold (Knight Piésold Ltd.). 2007a. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on Stage 4 Construction (REF. NO. VA101-1/10-1) March 13, 2007.

Knight Piésold (Knight Piésold Ltd.). 2007b. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 2007 Annual Inspection (REF. No. VA101-01/20-1) December 19, 2007.

Knight Piésold (Knight Piésold Ltd.). 2008. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on Stage 5 Construction (REF. NO. VA101-1/14-1) March 27, 2008.

Knight Piésold (Knight Piésold Ltd.). 2009a. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on Stage 6A Construction (REF. NO. VA101-1/23-1) July 10, 2009.

Knight Piésold (Knight Piésold Ltd.). 2009b. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 2009 Annual Inspection (REF. No. VA101-01/27-1) December 18, 2009.

Knight Piésold (Knight Piésold Ltd.). 2011a. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on Stage 6B Construction (REF. NO. VA101-1/29-1) January 25, 2011.

Knight Piésold (Knight Piésold Ltd.). 2011b. Mount Polley Mining Corporation Mount Polley Mine Tailings Storage Facility Report on 2010 Annual Inspection (REF. No. VA101-01/29-1) January 25, 2011.

Logan JM, Bath AB, Mihalynuk MG, Rees CJ. 2007. Regional Geology of the Mount Polley Area, Central British Columbia. BC Ministry of Energy and Mines. Geoscience Map 2007-1. Scale 1:50,000.

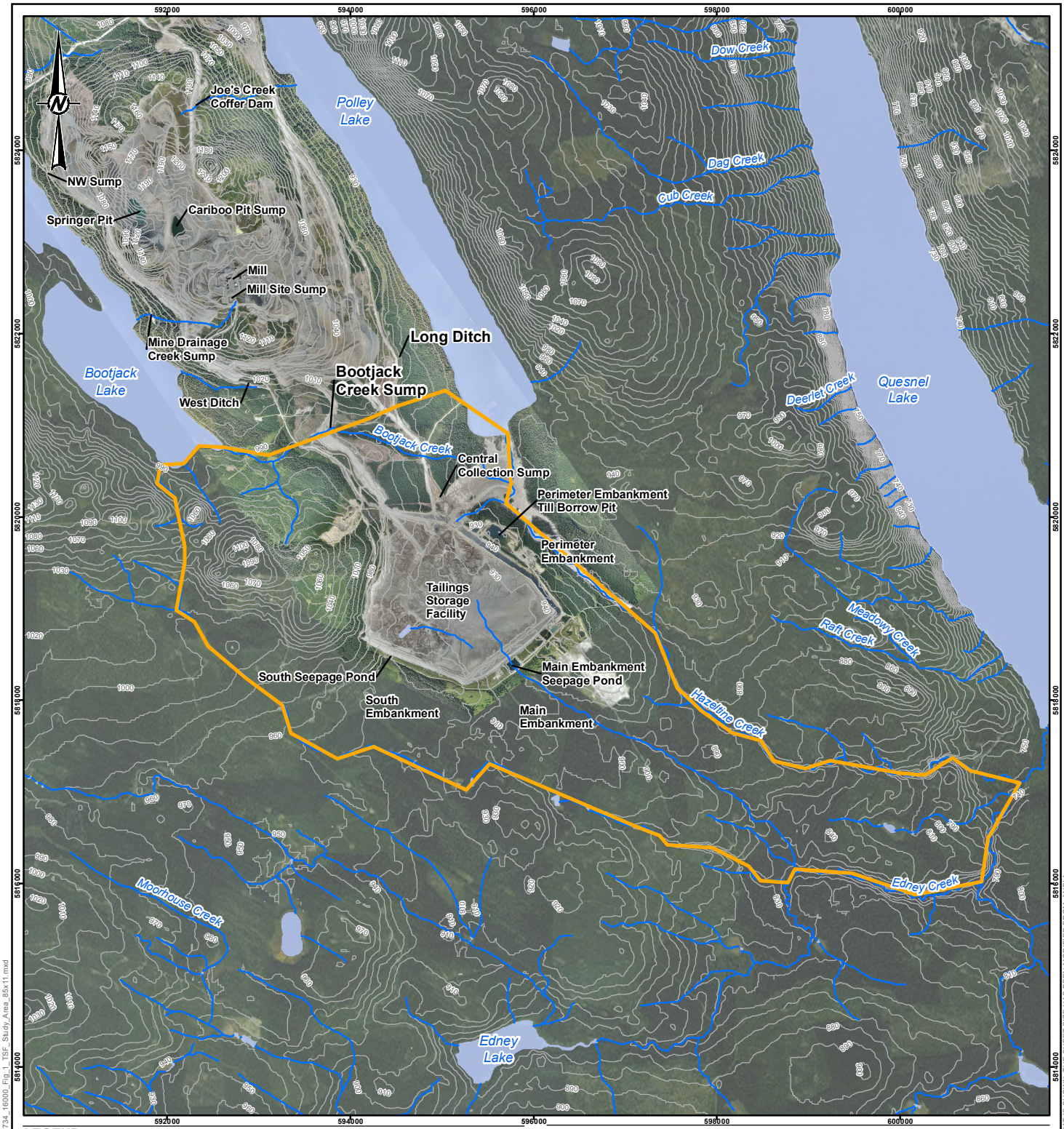
Maidment DR. 1992. Handbook of Hydrology. McGraw-Hill, New York, USA.

Stober I, Bucher K. 2007. Hydraulic properties of the crystalline basement. Hydrogeol J. 15:213-224.

Panel (Independent Expert Engineering Investigation and Review Panel). 2015. Report on Mount Polley Tailings Storage Facility Breach. January 30, 2015.

Panteleyev A, Bailey DG, Bloodgood MA, Hancock KD. 1996. Geology and Mineral Deposits of the Quesnel River – Horsefly Map Area, Central Quesnel Trough, British Columbia. BC Ministry of Energy and Mines. Bulletin 97. 1:100,000.

FIGURES



LEGEND

- TSF STUDY AREA
- CONTOUR (10 m)
- WATERCOURSE
- WATERBODY

0 1,200 2,400

1:60,000 METRES

REFERENCES

1. ROADS, CONTOURS AND PROJECT IMAGERY OBTAINED FROM SNC LAVALIN (2014)
2. WATER CATCHMENT AREAS INTERPOLATED BY GOLDER ASSOCIATES LTD.
3. BASE IMAGERY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
4. ROAD AND WATER FEATURE OBTAINED FROM CANVEC.
5. DATUM: NAD 1983 CSRS UTM ZONE 10N

CLIENT
MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS

PROJECT
MINE WATER MANAGEMENT PLAN

TITLE
TSF STUDY AREA

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-19
DESIGNED	JL
PREPARED	MH
REVIEWED	
APPROVED	

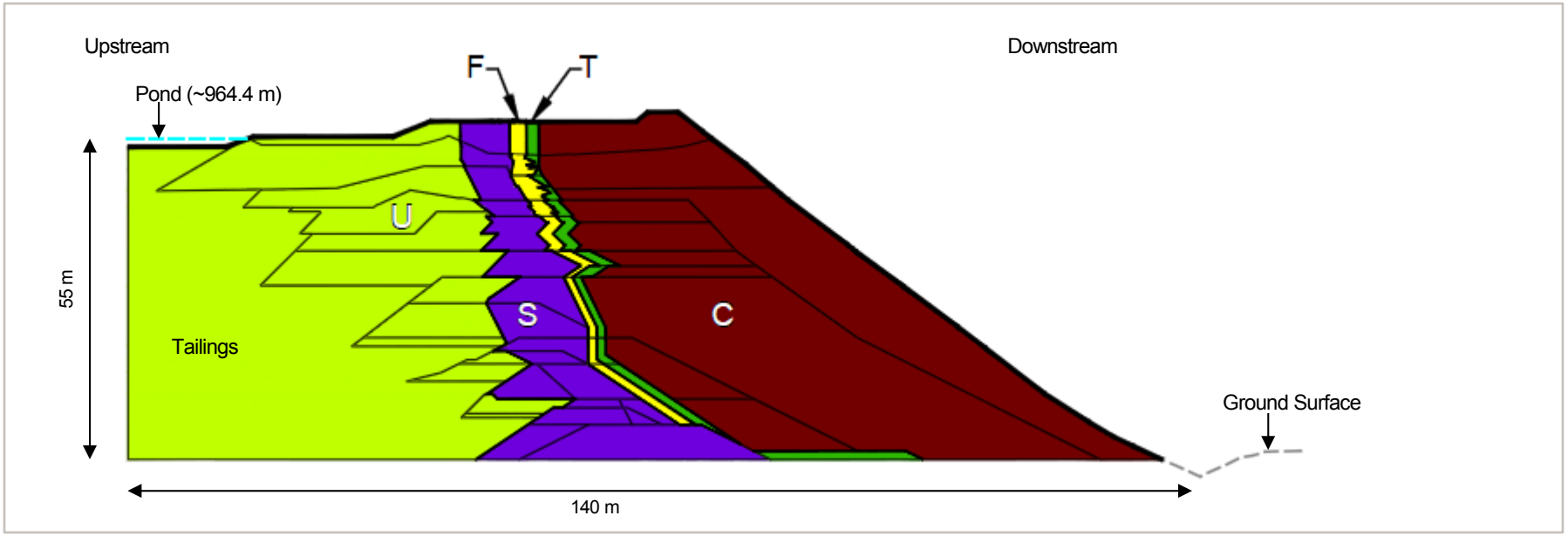
PROJECT NO.	PHASE	REV.	FIGURE
1411734	16000	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

25mm

0

PATH: Y:\burnaby\CAD-GIS\Client\1413803\1411734\PRODUCTION\16000\MXD\Report\1411734_16000_Fig_1_TSF_Study_Area_85x11.mxd



LEGEND

U = UPSTREAM FILL
S = TILL CORE
F = FILTER
T = TRANSITION
C = ROCK FILL

NOTES

1. SIMPLIFIED CONCEPTUAL CROSS-SECTION ADAPTED FROM INDEPENDENT EXPERT ENGINEERING INVESTIGATION AND REVIEW PANEL REPORT ON MOUNT POLLEY TAILINGS STORAGE FACILITY BREACH, 2015. (FIGURE 4.1.1)
2. CONCEPTUAL SCHEMATIC ONLY. SCALE IS APPROXIMATE AND ZONE THICKNESS AND DIMENSIONS VARY WITH POSITION ALONG DAM EMBANKMENT.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

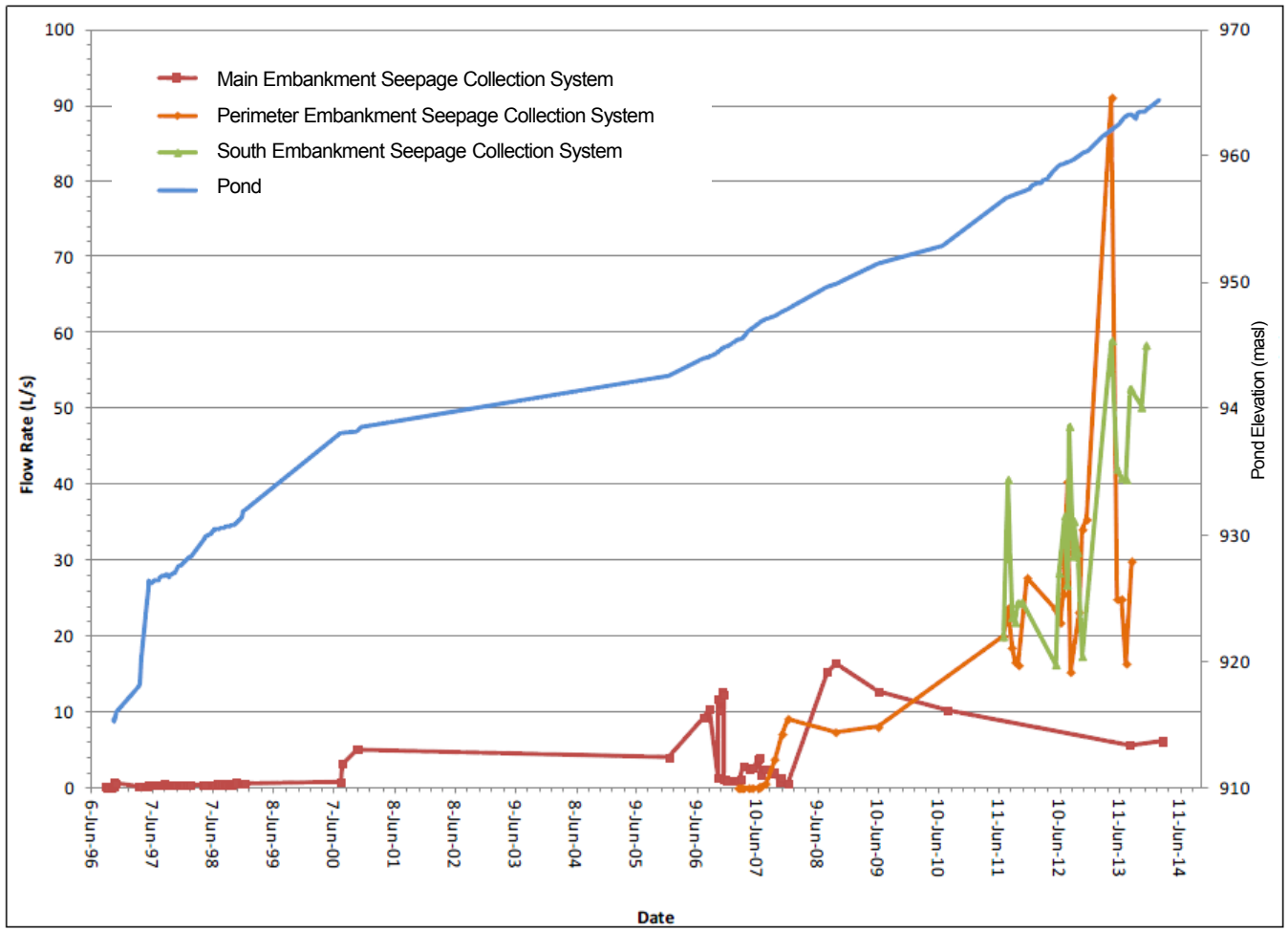
YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
SIMPLIFIED CROSS-SECTION THROUGH TSF EMBANKMENT

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0



NOTES

1. ME = Main Embankment; PE = Perimeter Embankment, SE = South Embankment.
2. Chart taken from AMEC Environment & Infrastructure, Mount Polley Tailings Storage Facility Stage 9 2013 As-built and Annual Review Report, March 12, 2014.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

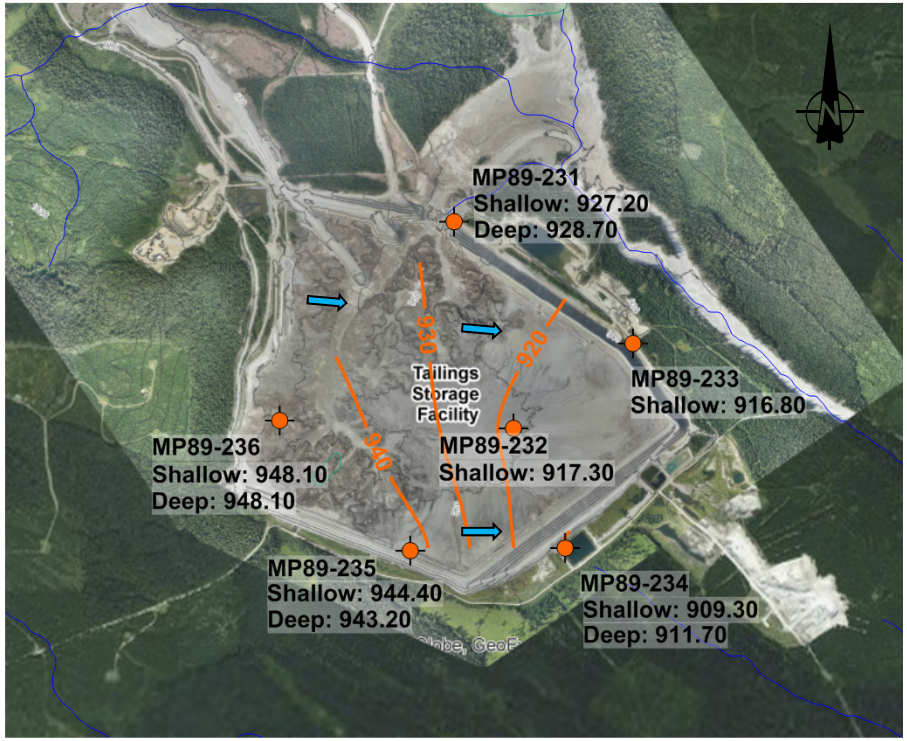
TITLE
MEASURED TSF SEEPAGE COLLECTION RATES

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**3**

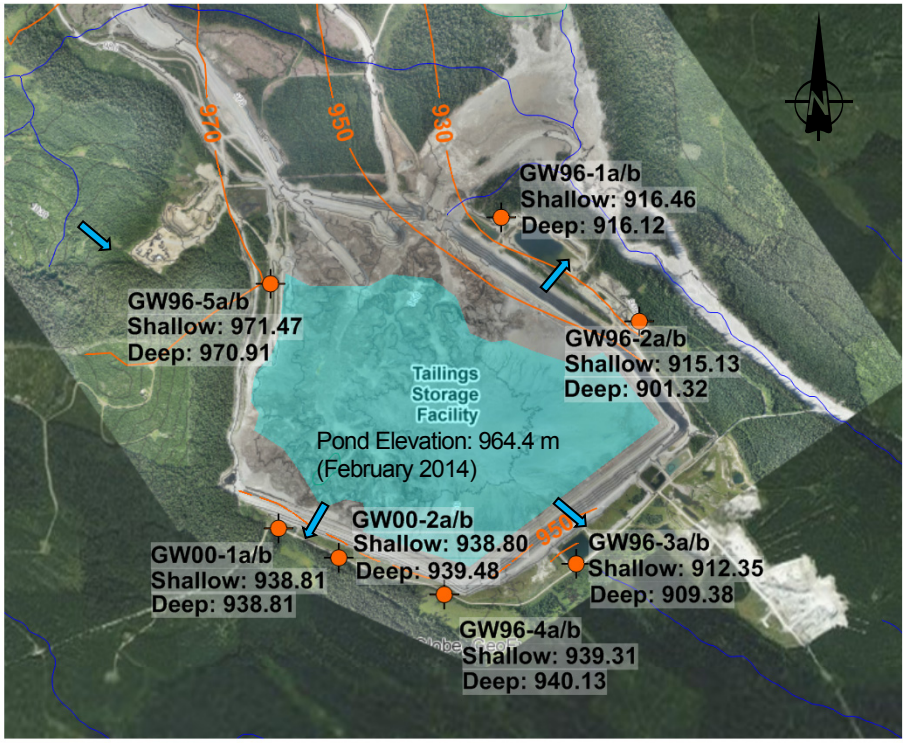
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 16000 LT TAR\4 - Hydrogeology 4001-4003\TSF Groundwater\1411734_16000_Fig_2_to_15_.pptx

Panel A: Pre-Development Hydraulic Head (1989)



Panel B: Pre-Breach Hydraulic Head (Average of May 2013 to May 2014 Measurements)



LEGEND

0 1000 2000

- MONITORING WELL
- SHALLOW HYDRAULIC HEAD CONTOURS (MASL)
- INFERRED SHALLOW GROUNDWATER FLOW DIRECTION

948.10 HYDRAULIC HEAD (MASL). SHALLOW = OVERBURDEN OR SHALLOW BEDROCK WELL. DEEP = BEDROCK WELL

0 1000 2000
SCALE (METRES)

NOTES

1. SHALLOW HYDRAULIC HEAD MEASUREMENTS FROM OVERBURDEN OR SHALLOW BEDROCK WELLS. DEEP WATER HYDRAULIC HEAD MEASUREMENTS FROM BEDROCK WELLS.
2. MASL = METRES ABOVE SEA LEVEL.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

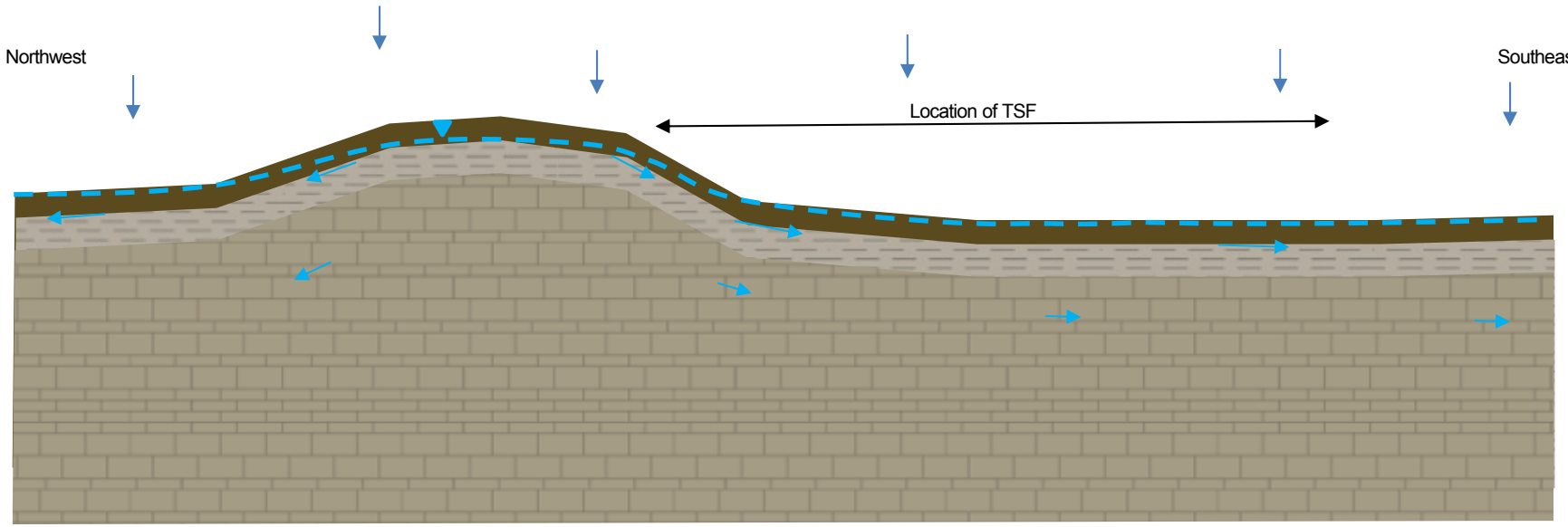
PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
GROUNDWATER FLOW CONDITIONS PRE-DEVELOPMENT AND 2014 (PRE-BREACH)

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**4**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 16000 LT TAR\4 - Hydrogeology 4001-4003\TSF Groundwater\1411734_16000_Fig_2_to_15_.pptx



Legend

- Recharge from Precipitation
- Overburden
- Weathered Bedrock
- Competent Bedrock
- Water Table
- Inferred Groundwater Flow Direction

NOTES:
Conceptual Only. Not to Scale.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

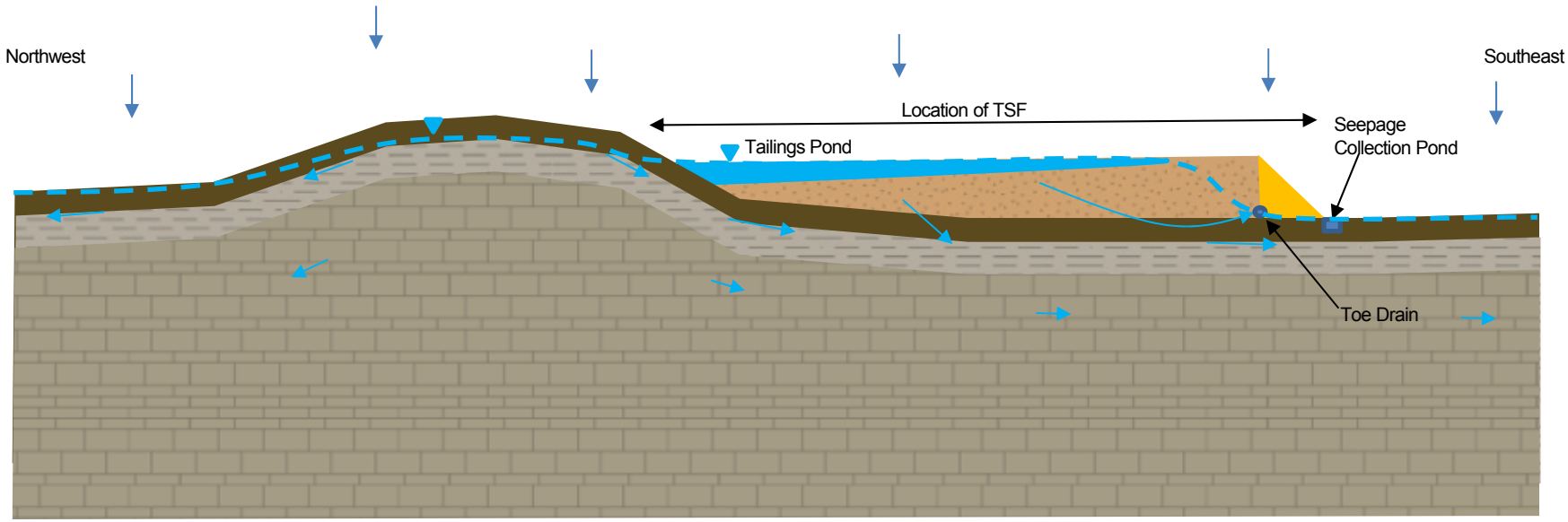
PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
CONCEPTUAL HYDROGEOLOGICAL MODEL – PRE-DEVELOPMENT

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**5**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 16000 LT TAR\4 - Hydrogeology 4001-4003\TSF Groundwater\1411734_16000_Fig_2_to_15_.pptx



Legend

- Recharge from Precipitation
- Overburden
- Weathered Bedrock
- Competent Bedrock
- Tailings
- Embankment (Core, Filter, Transition, Rockfill)
- Water Table
- Inferred Groundwater Flow Direction

NOTES:
Conceptual Only. Not to Scale.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

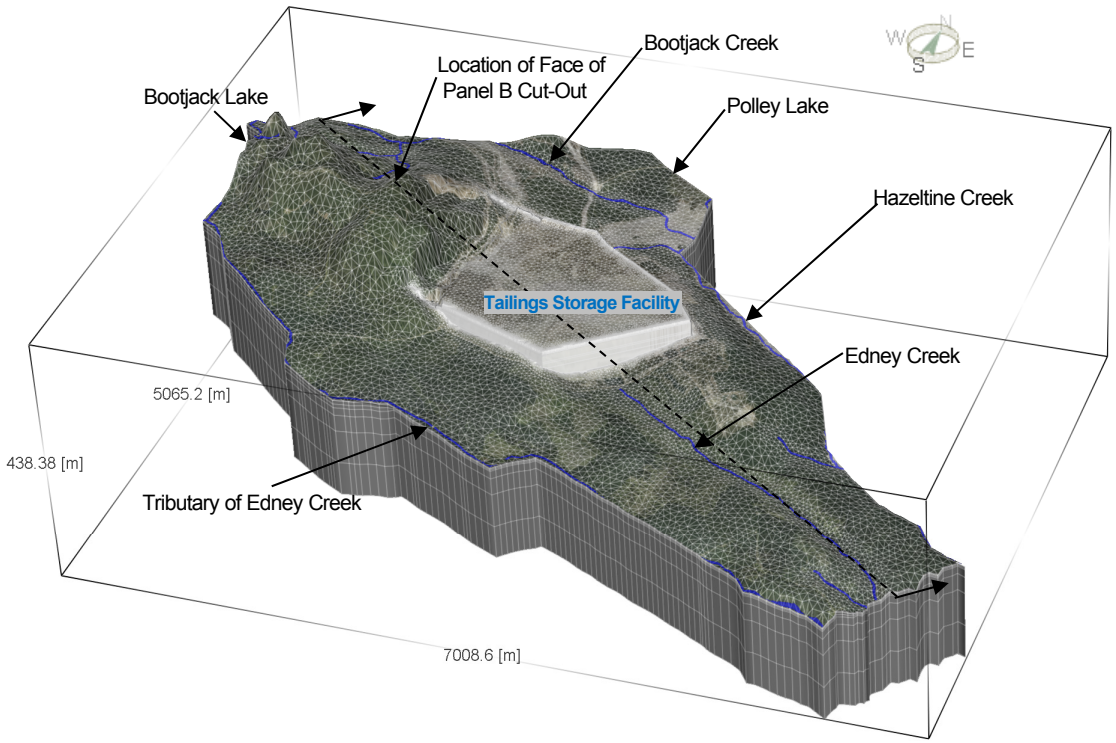
TITLE
CONCEPTUAL HYDROGEOLOGICAL MODEL – TSF OPERATIONAL

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**6**

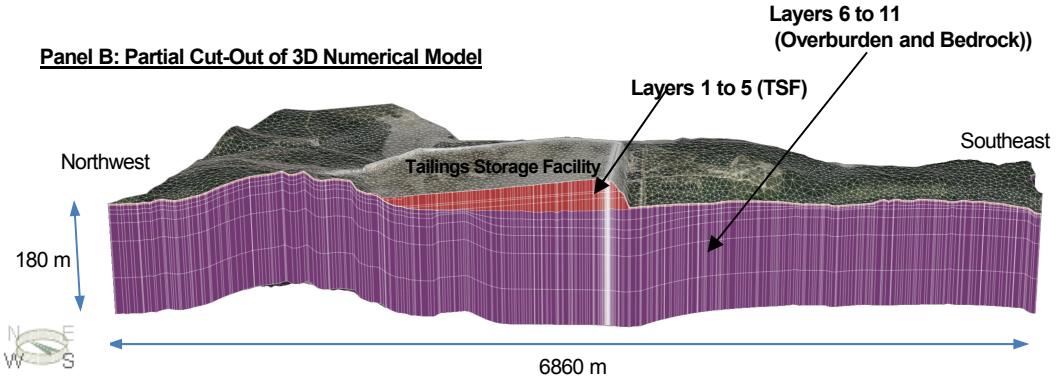
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 1500 Operations support\T3000 - Hydrogeology\Springer Groundwater - April 2016\for figures_rev0.pptx

Panel A: Oblique View of 3D Numerical Model



Panel B: Partial Cut-Out of 3D Numerical Model



CLIENT	MOUNT POLLEY MINING CORPORATION
CONSULTANT	Golder Associates
PROJECT	MINE WATER MANAGEMENT PLAN - TSF MOUNT POLLEY MINE CORPORATION LIKELY, BC
TITLE	**FINITE ELEMENT MESH**

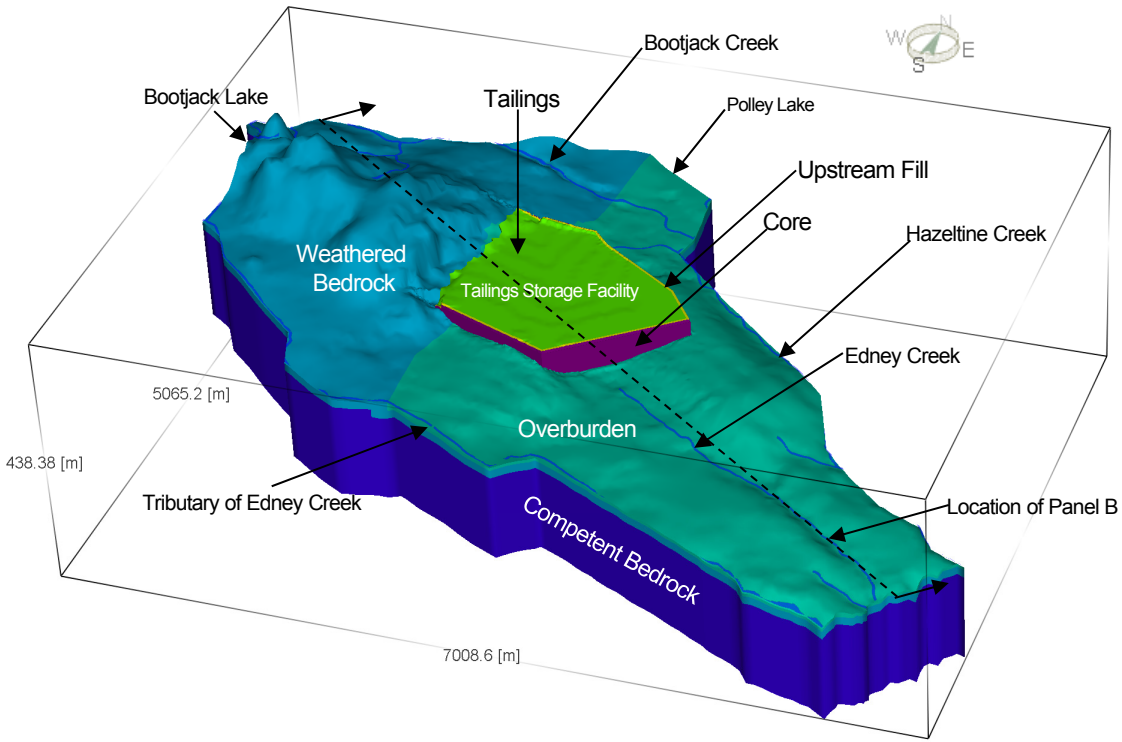
YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**7**

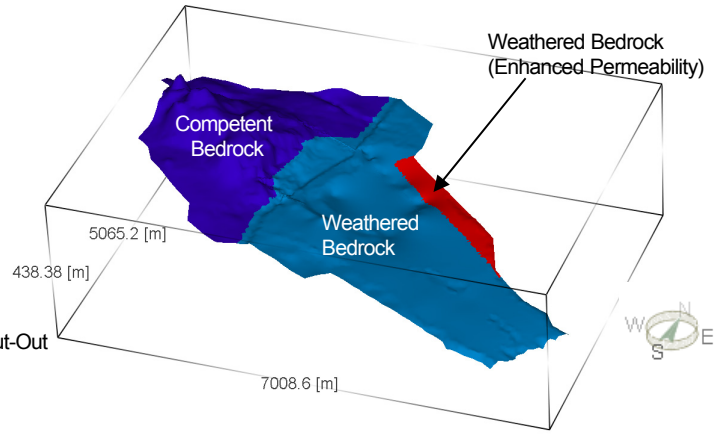
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 1500 Operations support\T3000 - Hydrogeology\Springer Groundwater - April 2016\for figures_rev0.pptx

Panel A: Oblique View of 3D Numerical Model



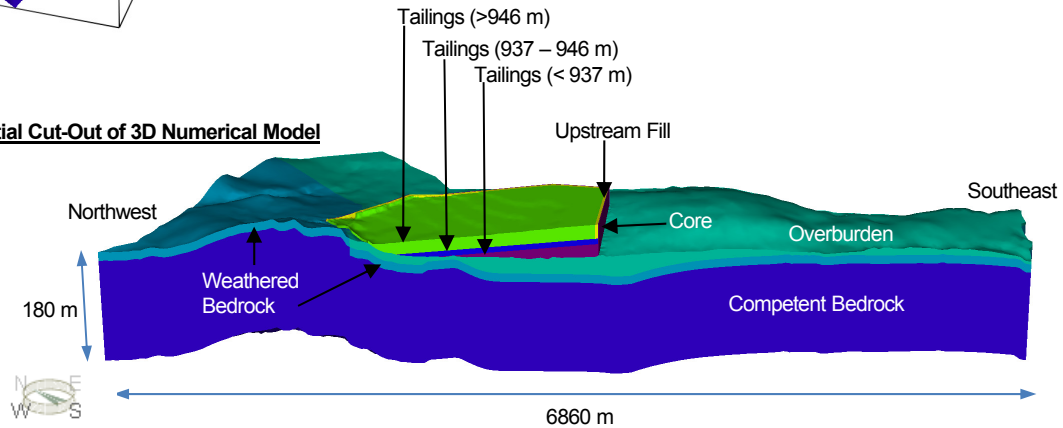
Panel C: Top of Layer 8 Showing Localized Adjustment to Weathered Bedrock during Model Calibration



Hydraulic Conductivity (m/s)

- 1 x 10^{-4}
- 1 x 10^{-5}
- 1 x 10^{-6}
- 1 x 10^{-7}
- 1 x 10^{-8}

Panel B: Partial Cut-Out of 3D Numerical Model



CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

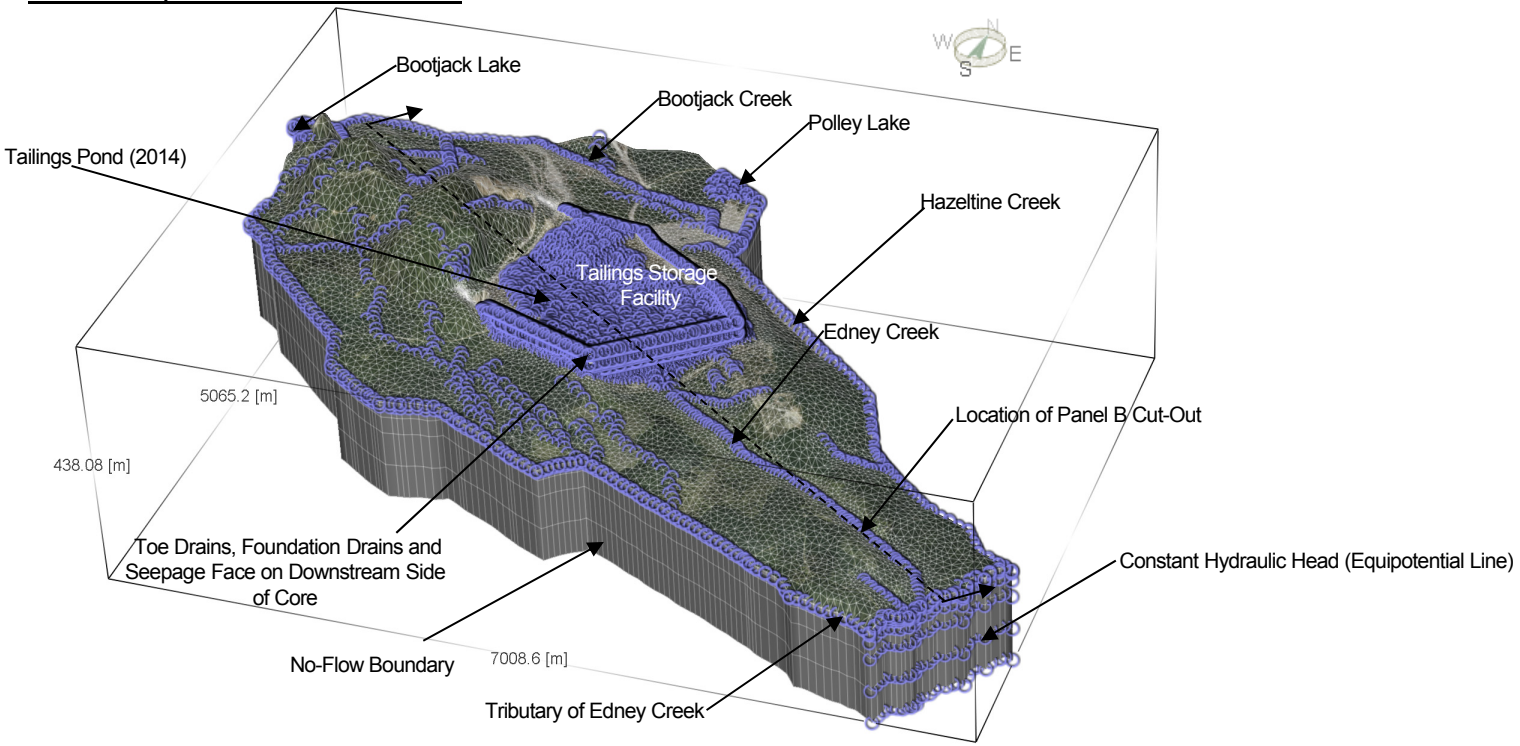
PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
CALIBRATED HYDRAULIC CONDUCTIVITY VALUES

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**8**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

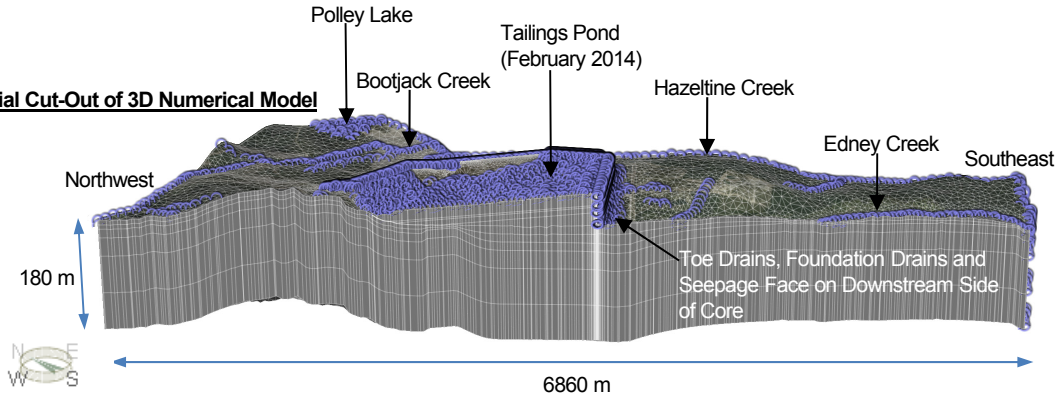
Panel A: Oblique View of 3D Numerical Model



NOTES

1. Lakes and creeks represented by specified head boundaries.
2. Specified flux applied to top of model to represent recharge from precipitation.

Panel B: Partial Cut-Out of 3D Numerical Model



CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

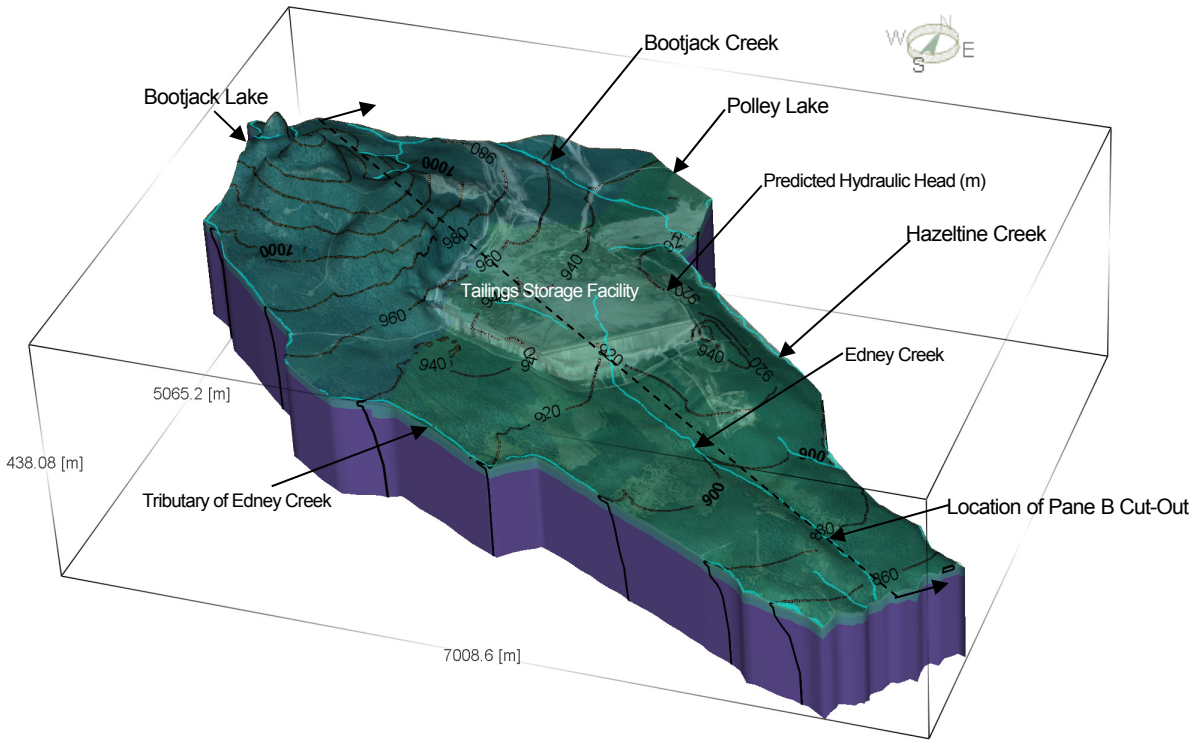
TITLE
BOUNDARY CONDITIONS

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**9**

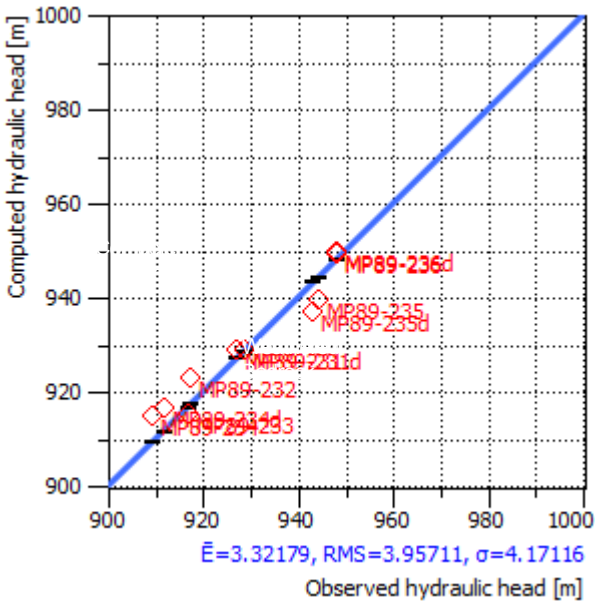
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 1500 Operations support\T3000 - Hydrogeology\Springer Groundwater - April 2016\for figures_rev0.pptx

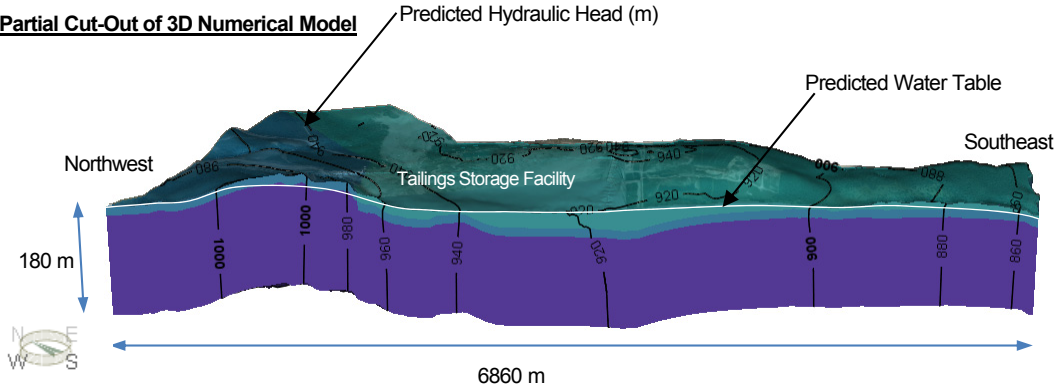
Panel A: Oblique View of 3D Numerical Model



Panel C: Measured Versus Predicted Hydraulic Head



Panel B: Partial Cut-Out of 3D Numerical Model



CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

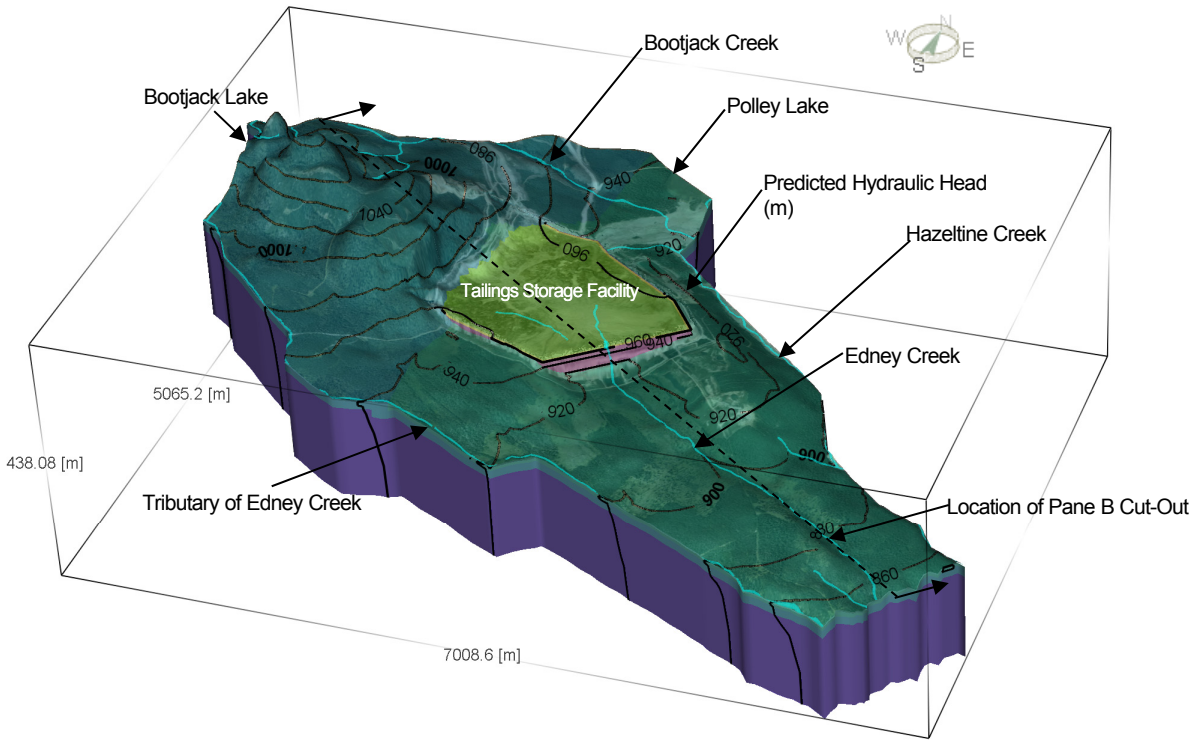
PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
MODEL CALIBRATION RESULTS – PRE-DEVELOPMENT

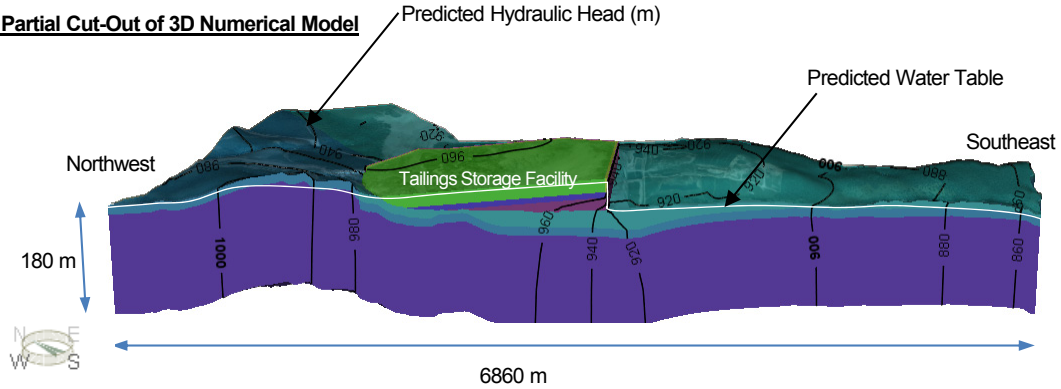
PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**10**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: A/B/J/A
1 in
0

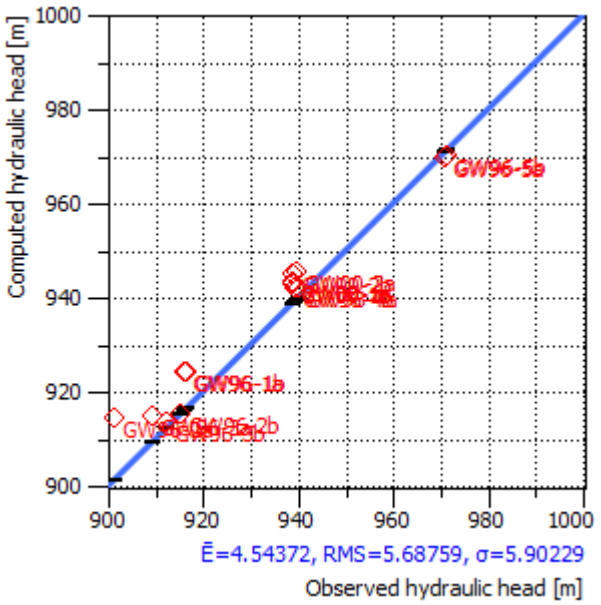
Panel A: Oblique View of 3D Numerical Model



Panel B: Partial Cut-Out of 3D Numerical Model



Panel C: Measured Versus Predicted Hydraulic Head



Seepage Collection System	Measured Seepage (l/s)	Predicted Seepage (l/s)
Main	5	6
Perimeter	30	25
South	50	49
Total	85	80

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

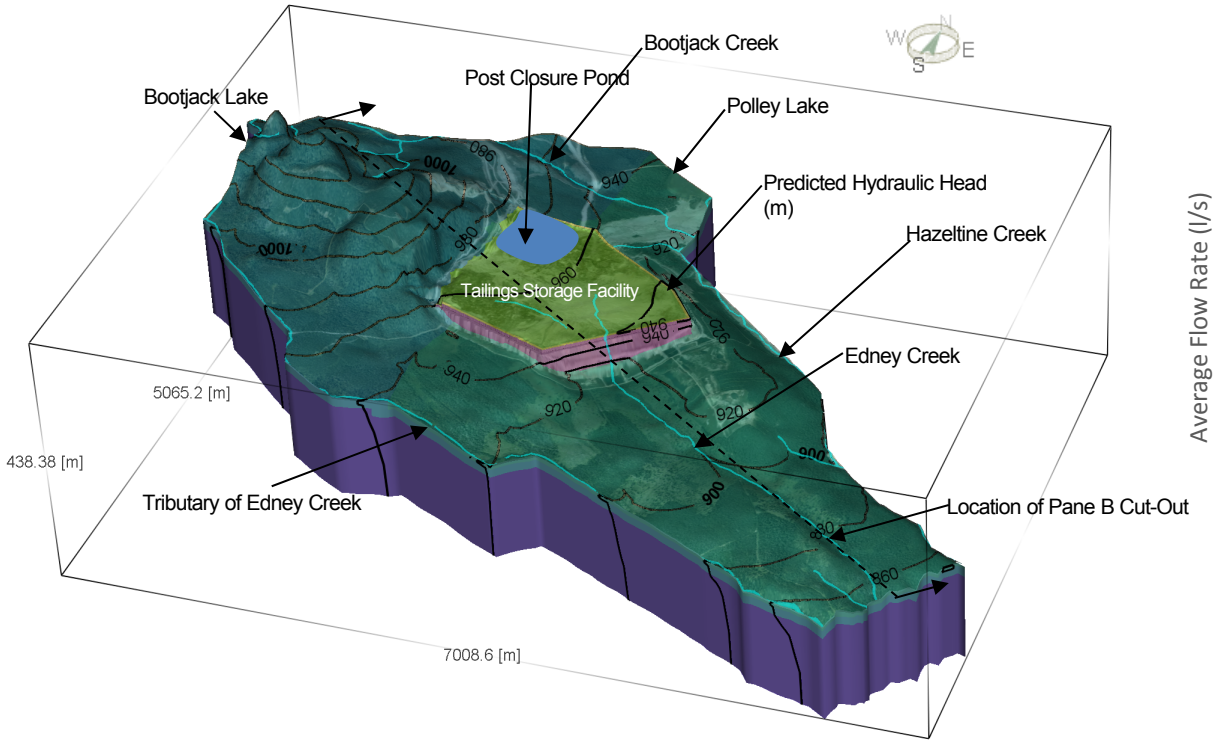
TITLE
MODEL CALIBRATION RESULTS – 2014 (PRE-BREACH)

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**11**

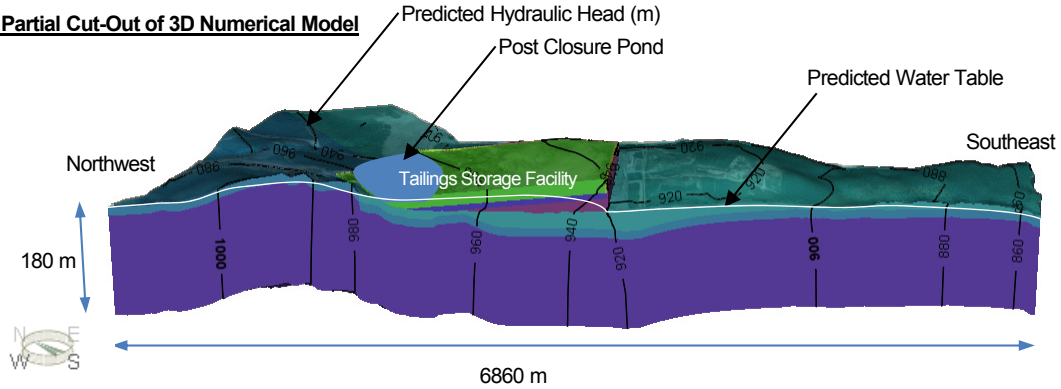
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 1500 Operations support\T3000 - Hydrogeology\Springer Groundwater - April 2016\for figures_rev0.pptx

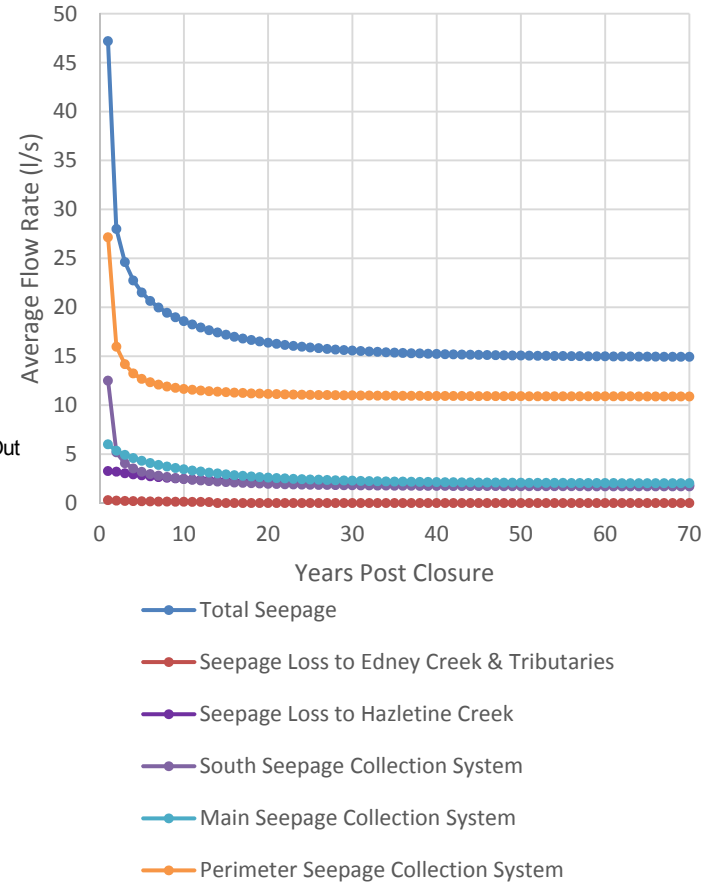
Panel A: Plan View of 3D Numerical Model



Panel B: Partial Cut-Out of 3D Numerical Model



Panel C: Predicted TSF Seepage



Note: Predicted hydraulic heads presented on Panel A and Panel B are representative of long term steady conditions following closure.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

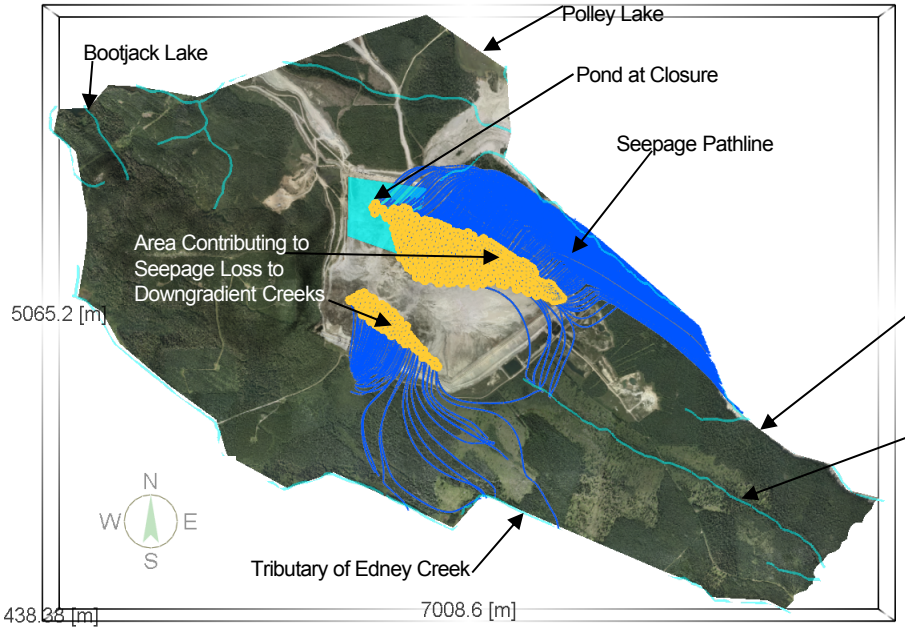
TITLE
PREDICTED HYDRAULIC HEAD AND SEEPAGE RATES
970 M DESIGN – POST CLOSURE

PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**12**

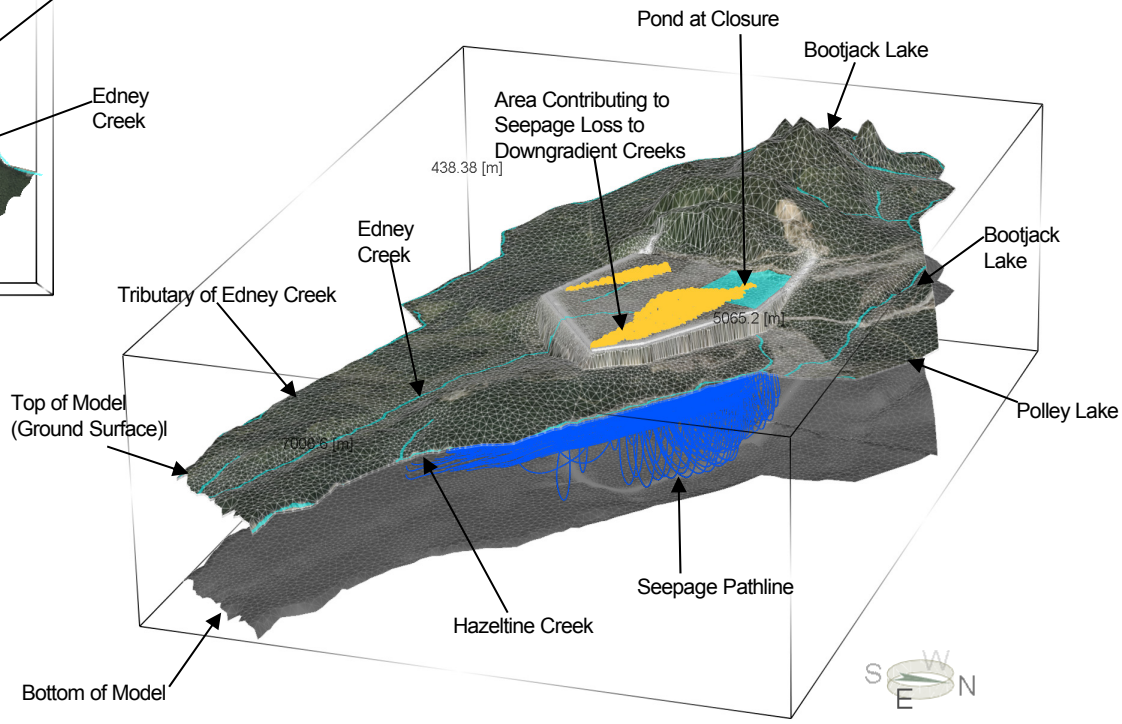
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

O:\Active_2014\1421\1411734 Mount Polley\Ph 1500 Operations support\T3000 - Hydrogeology\Springer Groundwater - April 2016\for figures_rev0.pptx

Panel A: Top View of 3D Numerical Model



Panel B: Oblique View of 3D Numerical Model



Predicted Seepage 1 Years Following Closure (L/s)	
From TSF	47.2
To Main Embankment Seepage Collection System	6
To Perimeter Embankment Seepage Collection System	27.1
To South Embankment Seepage Collection System	12.5
To Edney Creek & Tributaries	0.3
To Hazletine Creek	3.3

NOTES

1. For clarity, only pathlines to creeks and tributaries are presented in Panel A and B. Pathlines to the seepage collection system are not shown
2. Seepage collection systems also collect a small portion of groundwater (i.e., from the pressure relief wells and trenches)

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

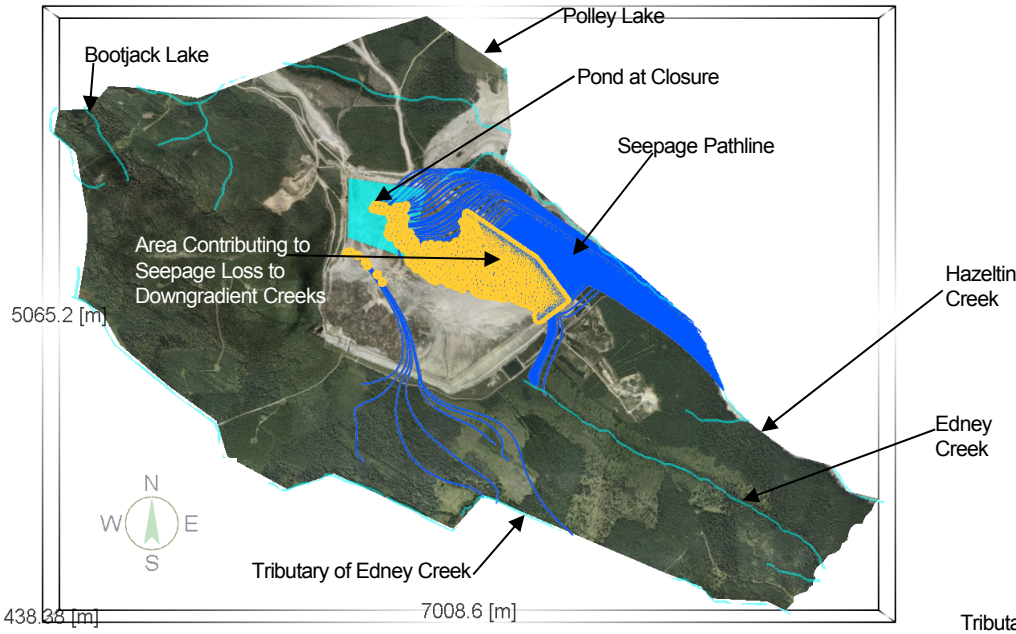
PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
PREDICTED SEEPAGE PATHWAYS FOR TSF 970 M DESIGN CLOSURE – YEAR 1

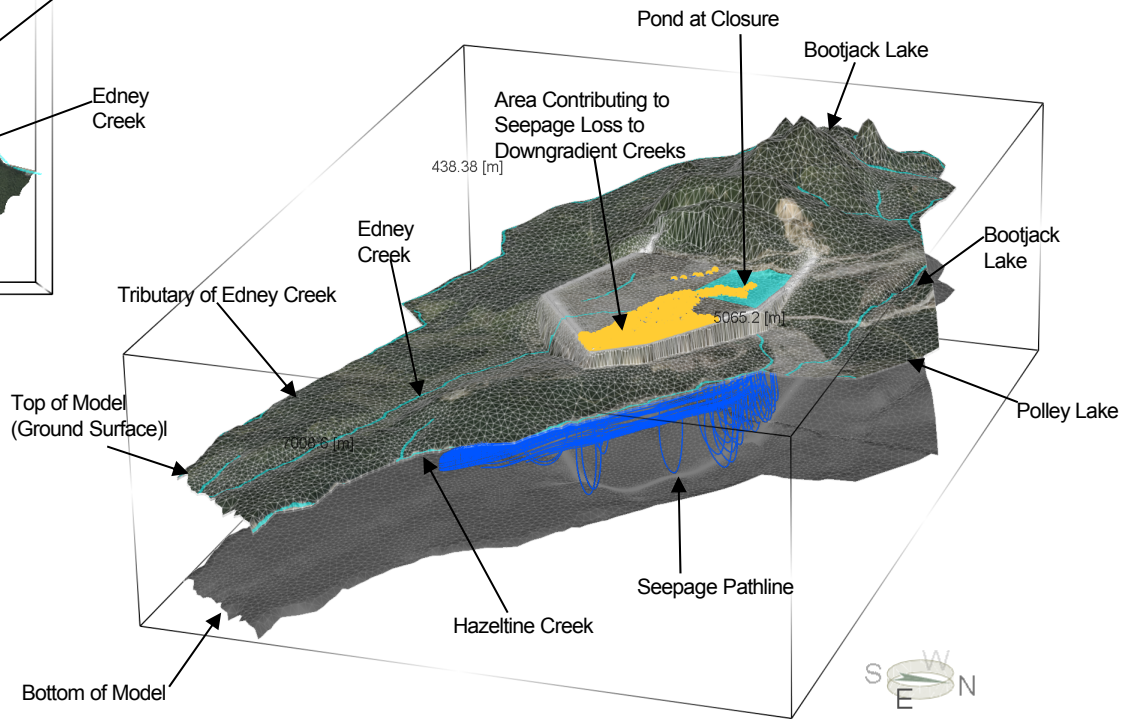
PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**13**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
0

Panel A: Top View of 3D Numerical Model



Panel B: Oblique View of 3D Numerical Model



Predicted Seepage 70 Years Following Closure (L/s)	
From TSF	14.9
To Main Embankment Seepage Collection System	2.0
To Perimeter Embankment Seepage Collection System	10.9
To South Embankment Seepage Collection System	1.7
To Edney Creek & Tributaries	<0.1
To Hazletine Creek	1.8

NOTES

1. For clarity, only pathlines to creeks and tributaries are presented in Panel A and B. Pathlines to the seepage collection system are not shown
2. Seepage collection systems also collect a small portion of groundwater (i.e., from the pressure relief wells and trenches)

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

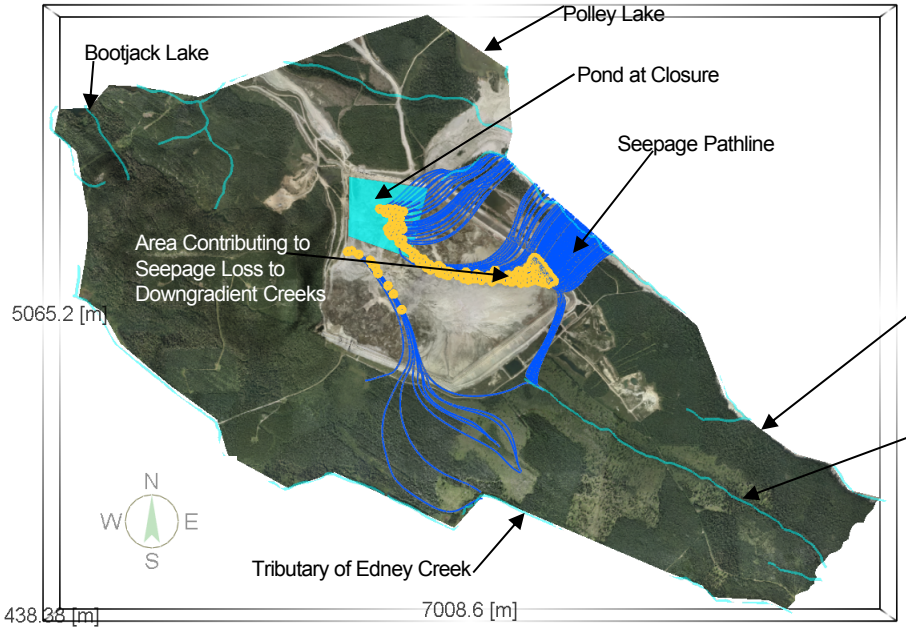
PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
PREDICTED SEEPAGE PATHWAYS FOR TSF 970 M DESIGN CLOSURE – YEAR 70

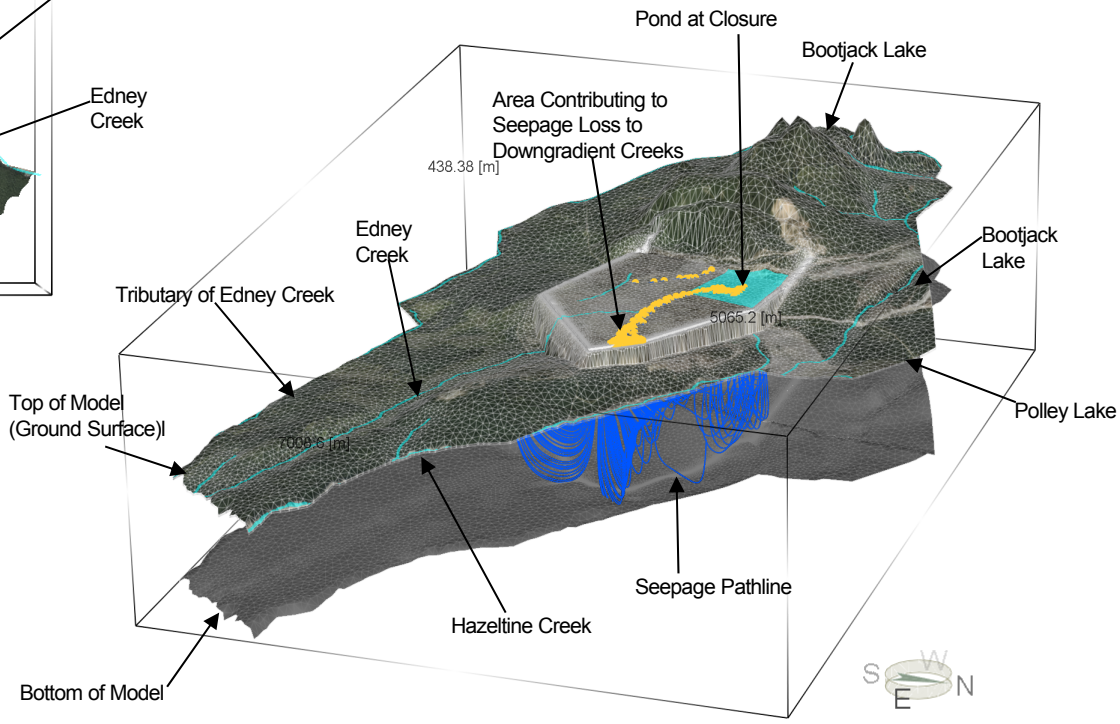
PROJECT No.	PHASE	Rev.	Figure
1411734	**16000**	**0**	**14**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A
1 in
0

Panel A: Top View of 3D Numerical Model



Panel B: Oblique View of 3D Numerical Model



Predicted Seepage 70 Years Following Closure (L/s)	
From TSF	14.9
To Main Embankment Seepage Collection System	2.4
To Perimeter Embankment Seepage Collection System	12.2
To South Embankment Seepage Collection System	1.8
To Edney Creek & Tributaries	<0.1
To Hazletine Creek	0.5

NOTES

1. For clarity, only pathlines to creeks and tributaries are presented in Panel A and B. Pathlines to the seepage collection system are not shown
2. Seepage collection systems also collect a small portion of groundwater (i.e., from the pressure relief wells and trenches)

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-05-16
PREPARED	JL
DESIGN	JL
REVIEW	WZ
APPROVED	WZ

PROJECT
MINE WATER MANAGEMENT PLAN - TSF
MOUNT POLLEY MINE CORPORATION
LIKELY, BC

TITLE
PREDICTED SEEPAGE PATHWAYS FOR TSF 970 M DESIGN CLOSURE – NO ENHANCED PERMEABILITY ZONE IN WEATHERED BEDROCK - YEAR 70

PROJECT No.	PHASE	Rev.	Figure
1411734	16000	0	15

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: A/B/J/A
1 in
0

ATTACHMENT 1
Study Limitations

STUDY LIMITATIONS

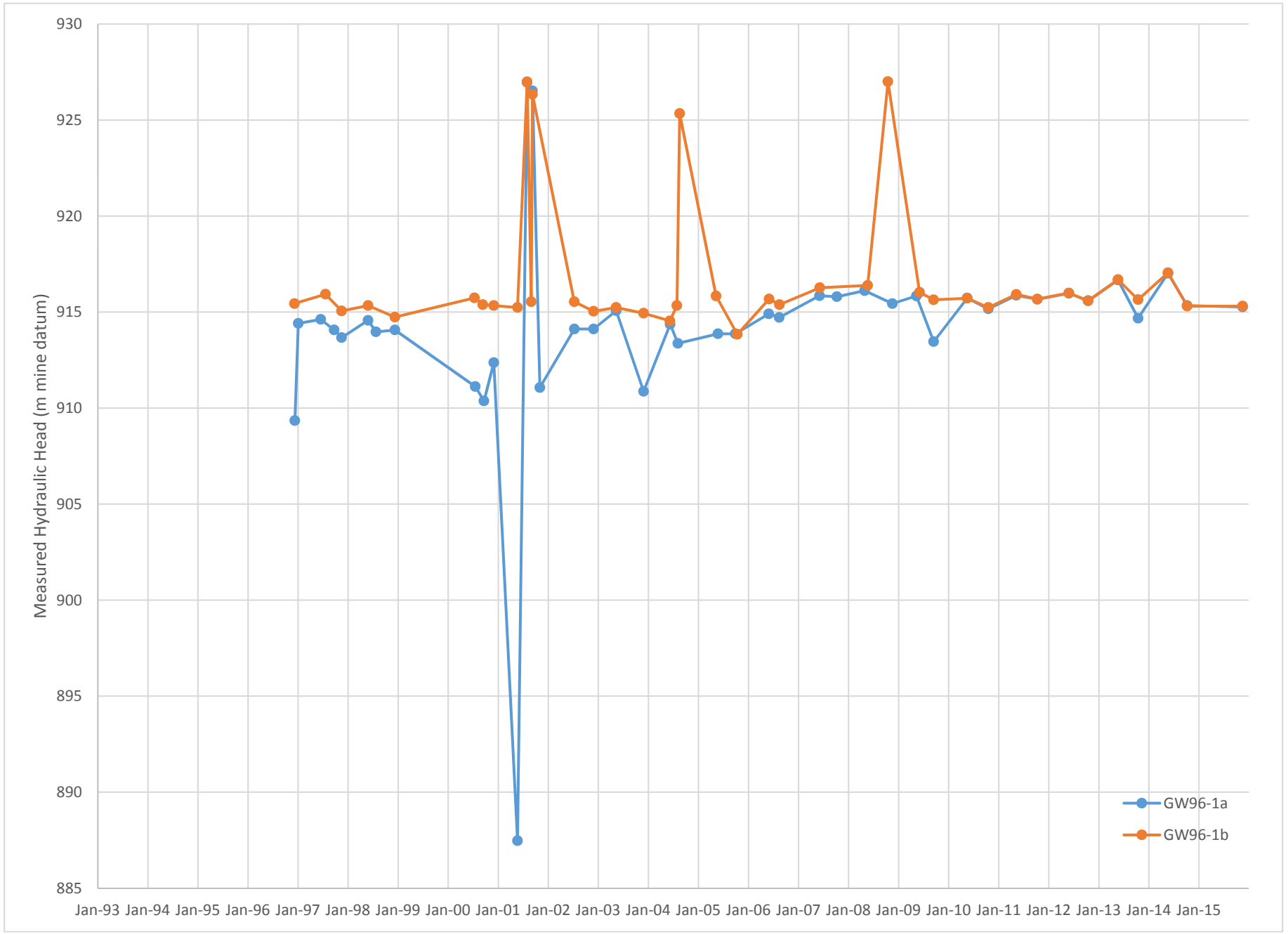
This document has been prepared for the exclusive use of Mount Polley. The factual information, descriptions, interpretations, and comments contained herein are specific to the project described in this document and do not apply to any other project or site. Under no circumstances may this information be used for any other purposes than those specified in the scope of work unless explicitly stipulated in the text of this document or formally authorized by Golder. This document must be read in its entirety as some sections could be falsely interpreted when taken individually or out-of-context. As well, the final version of this document and its content supersedes any other text, opinion or preliminary version produced by Golder.

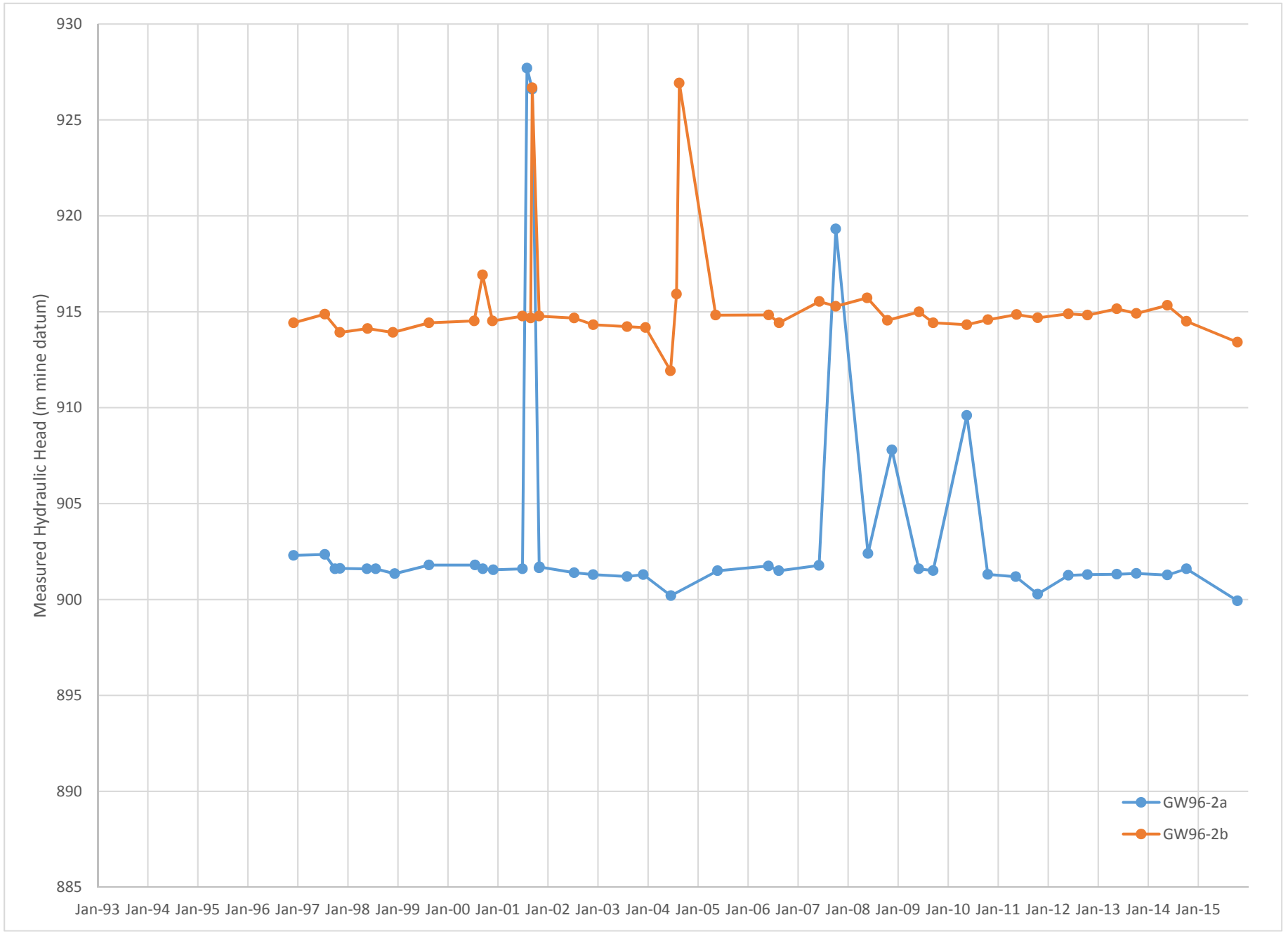
Golder shall not be held responsible for damages resulting from unpredictable or unknown underground conditions, from erroneous information provided by and/or obtained from other sources than Golder, and from ulterior changes in the site conditions unless Golder has been notified by Mount Polley of any occurrence, activity, information or discovery, past or future, susceptible of modifying the underground conditions described herein, and have had the opportunity of revising its interpretations, comments and recommendations. Furthermore, Golder shall not be held responsible for damages resulting from any future modification to the applicable regulations, standards and criteria, for any use of this document and its content by a third party, and/or for its use for other purposes than those intended. Golder shall not be held responsible for any decrease, real or perceived, of a property's value or any failure to complete a transaction, as a consequence of this document.

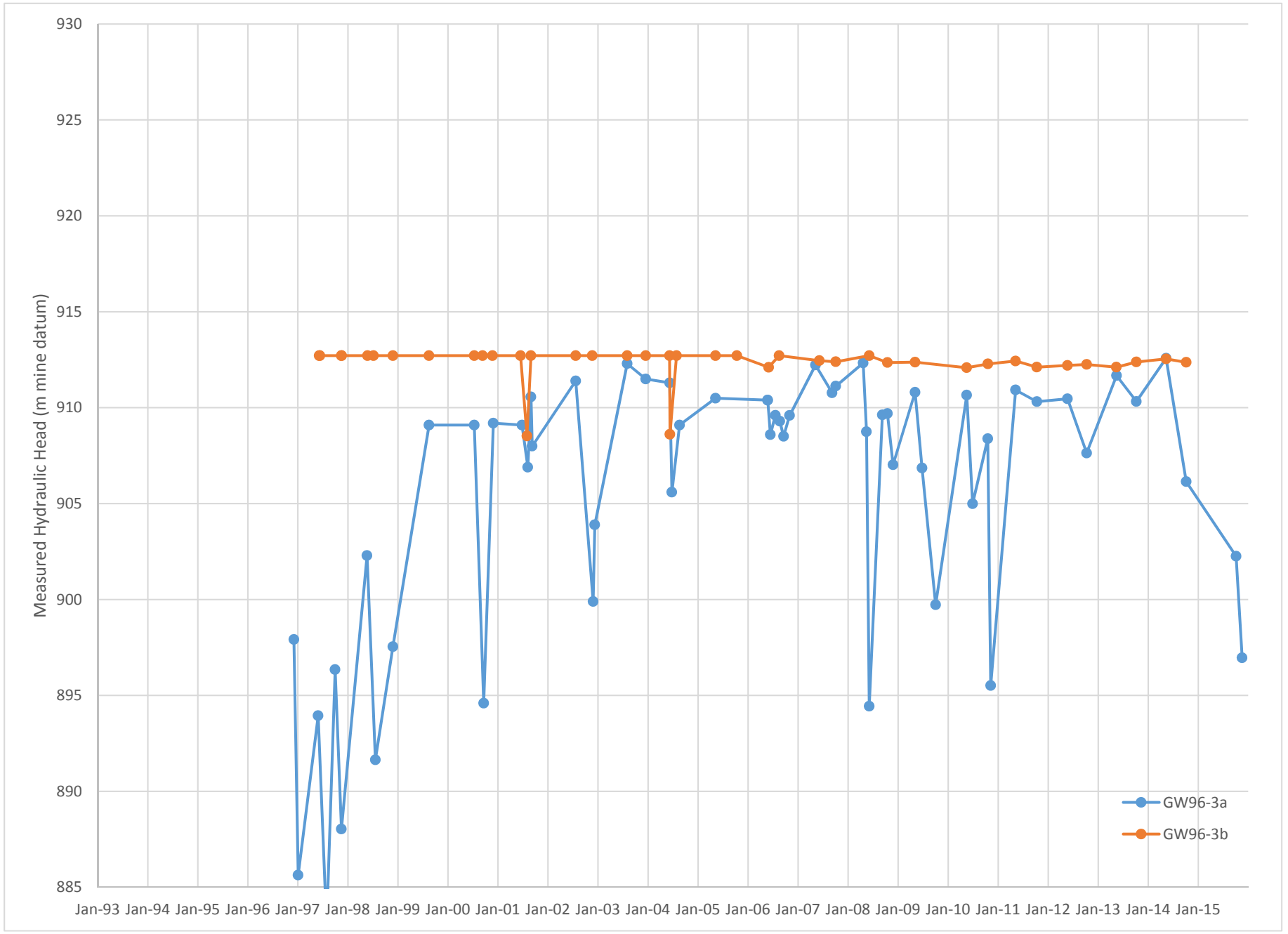
Hydrogeologic/hydrologic investigations and groundwater modelling are dynamic and inexact sciences. They are dynamic in the sense that the state of any hydrological system is changing with time, and in the sense that the science is continually developing new techniques to evaluate these systems. They are inexact in the sense that groundwater systems are complicated beyond human capability to evaluate them comprehensively in detail, and we invariably do not have sufficient data to do so. A groundwater model uses the laws of science and mathematics to draw together the available data into a mathematical or computer-based representation of the essential features of an existing hydrogeologic system. While the model itself obviously lacks the detailed reality of the existing hydrogeologic system, the behaviour of a valid groundwater model reasonably approximates that of the real system. The validity and accuracy of the model depends on the amount of data available relative to the degree of complexity of the geologic formations, the site geochemistry, the fate and transport of the dissolved compounds, and on the quality and degree of accuracy of the data entered. Therefore, every groundwater model is a simplification of a reality and the models described herein are not an exception.

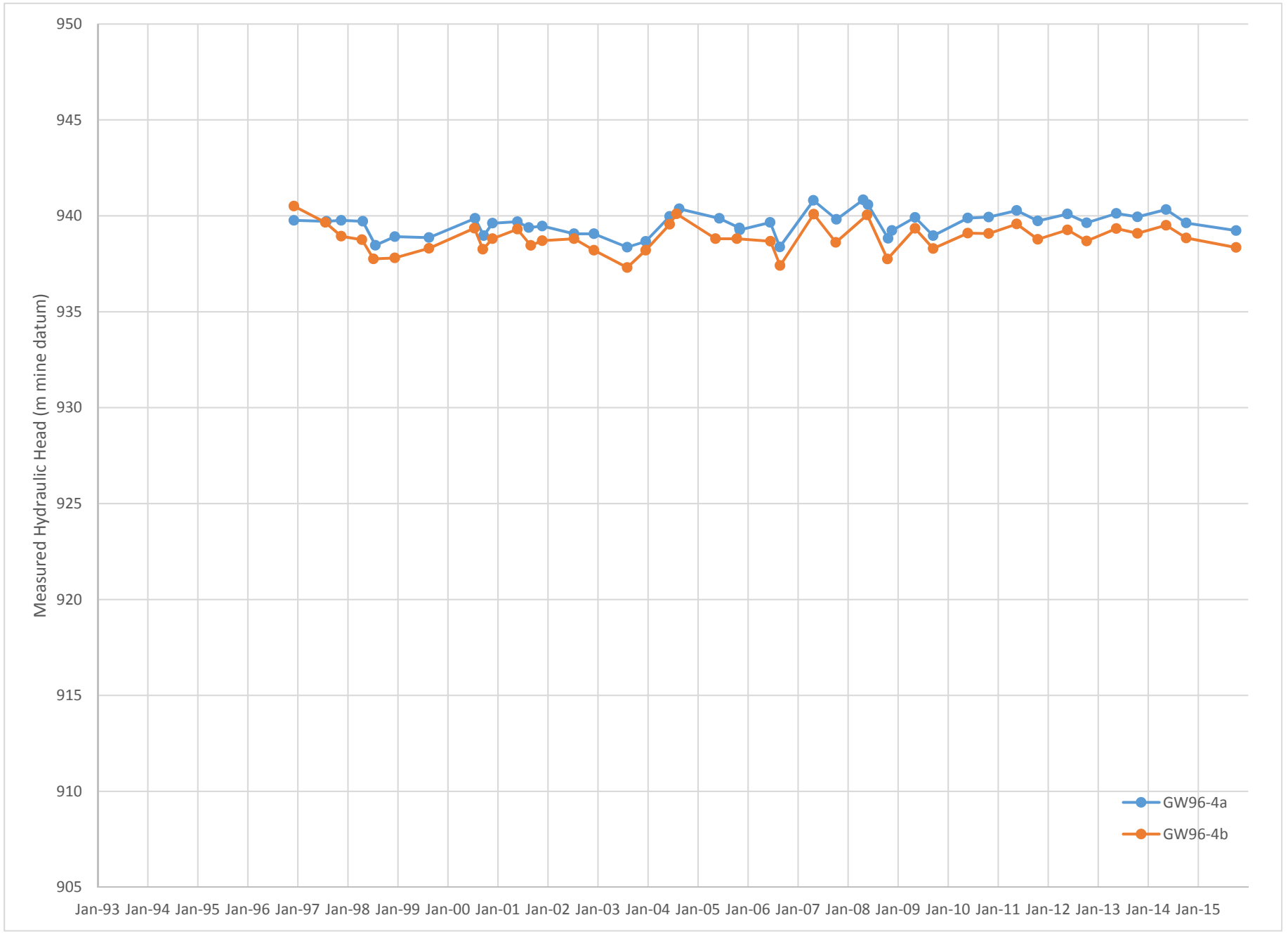
The professional groundwater modelling services performed as described in this document were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the quantity and quality of available data, the time limits and financial and physical constraints applicable to the services. Unless otherwise specified, the results of previous or simultaneous work provided by sources other than Golder and quoted and/or used herein are considered as having been obtained according to recognised and accepted professional rules and practices, and therefore deemed valid. This model provides a predictive scientific tool to evaluate the impacts on a real groundwater system of specified hydrological stresses and/or to compare various scenarios in a decision-making process. However and despite the professional care taken during the construction of the model and in conducting the simulations, its accuracy is bound to the normal uncertainty associated to groundwater modelling and no warranty, expressed or implied, is made.

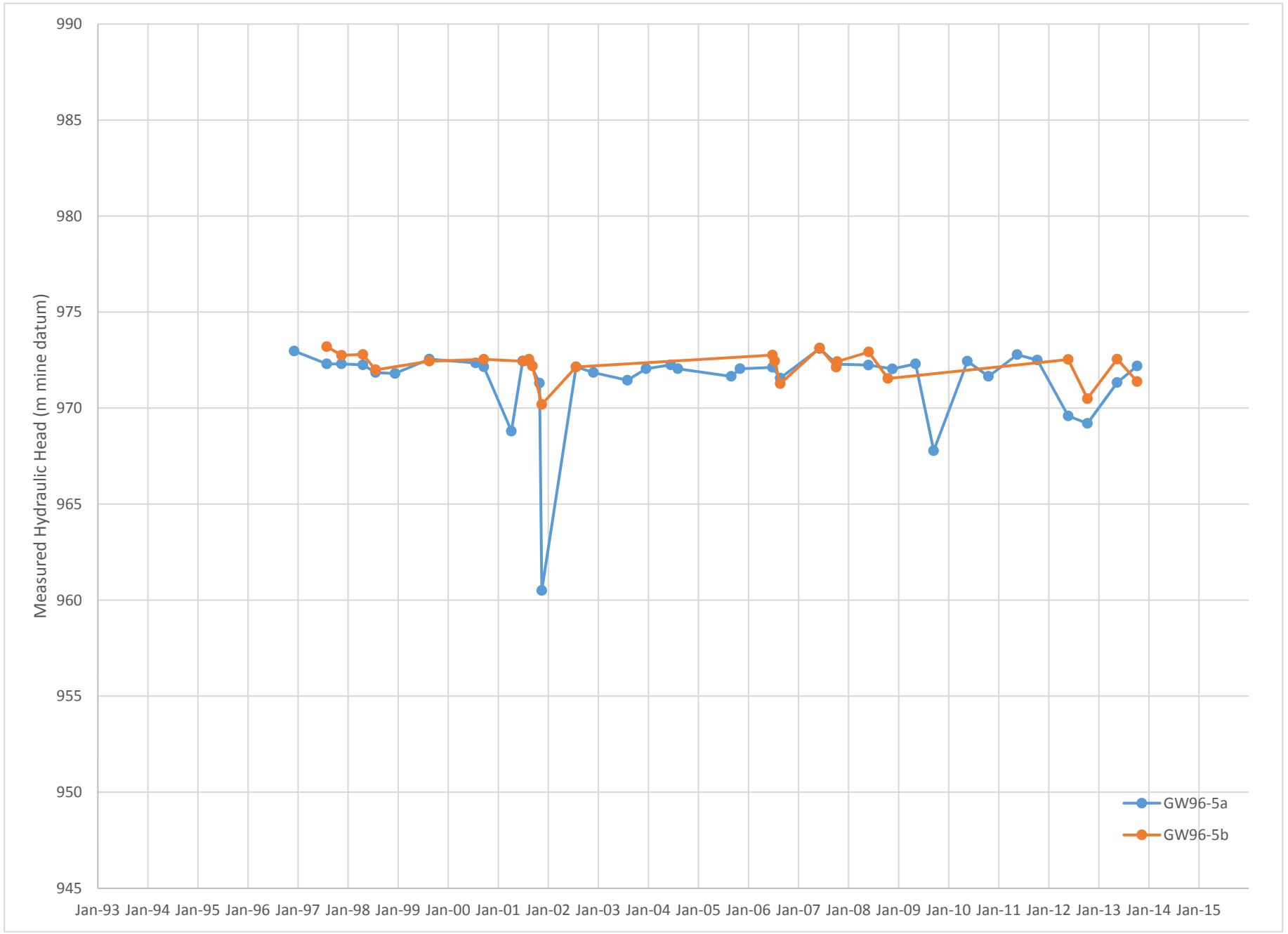
ATTACHMENT 2
Historical Hydraulic Head Elevations Provided by MPMC

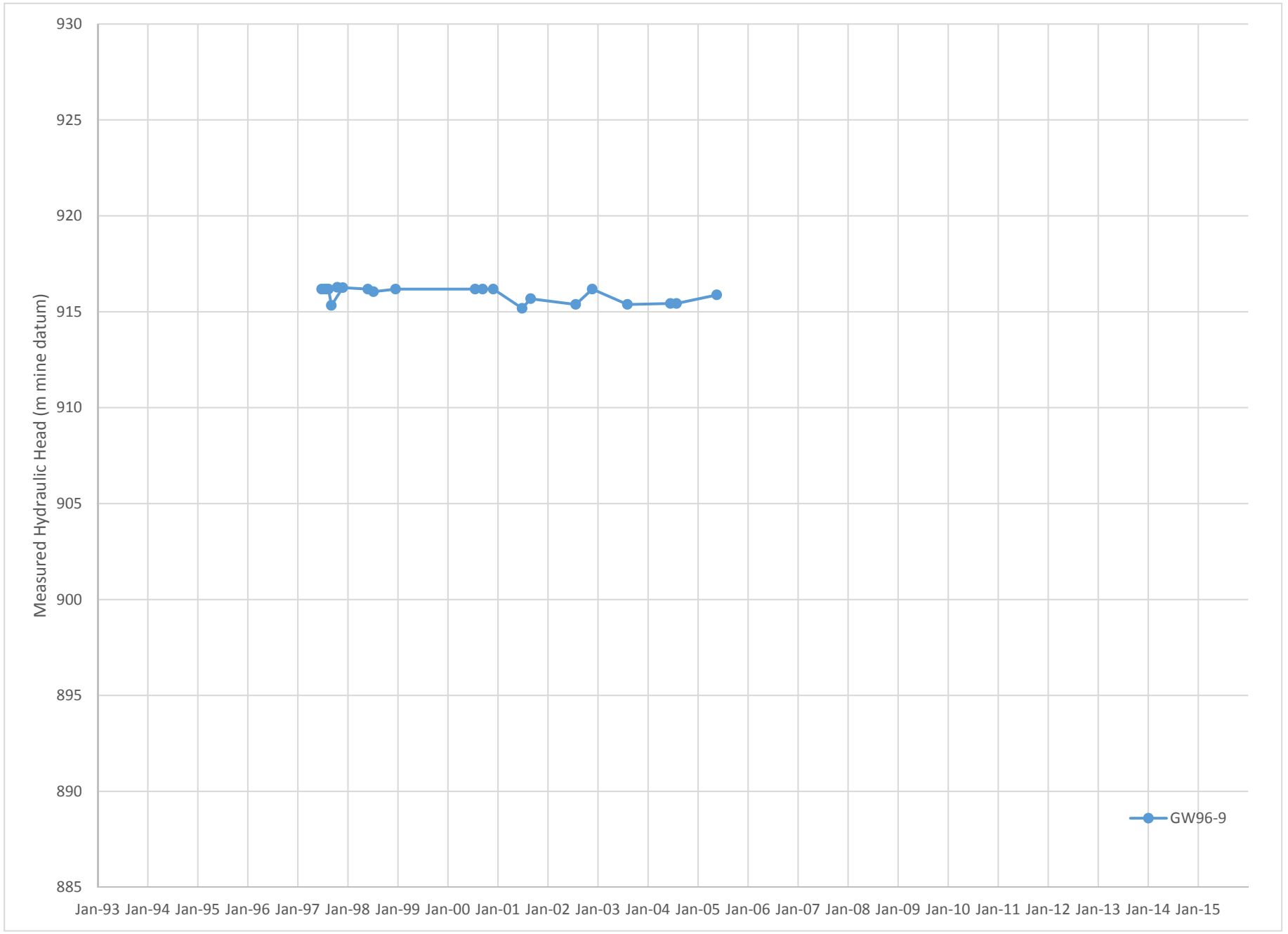

930
925
920
915
910
905
900
895
890
885
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW96-1a
GW96-1b

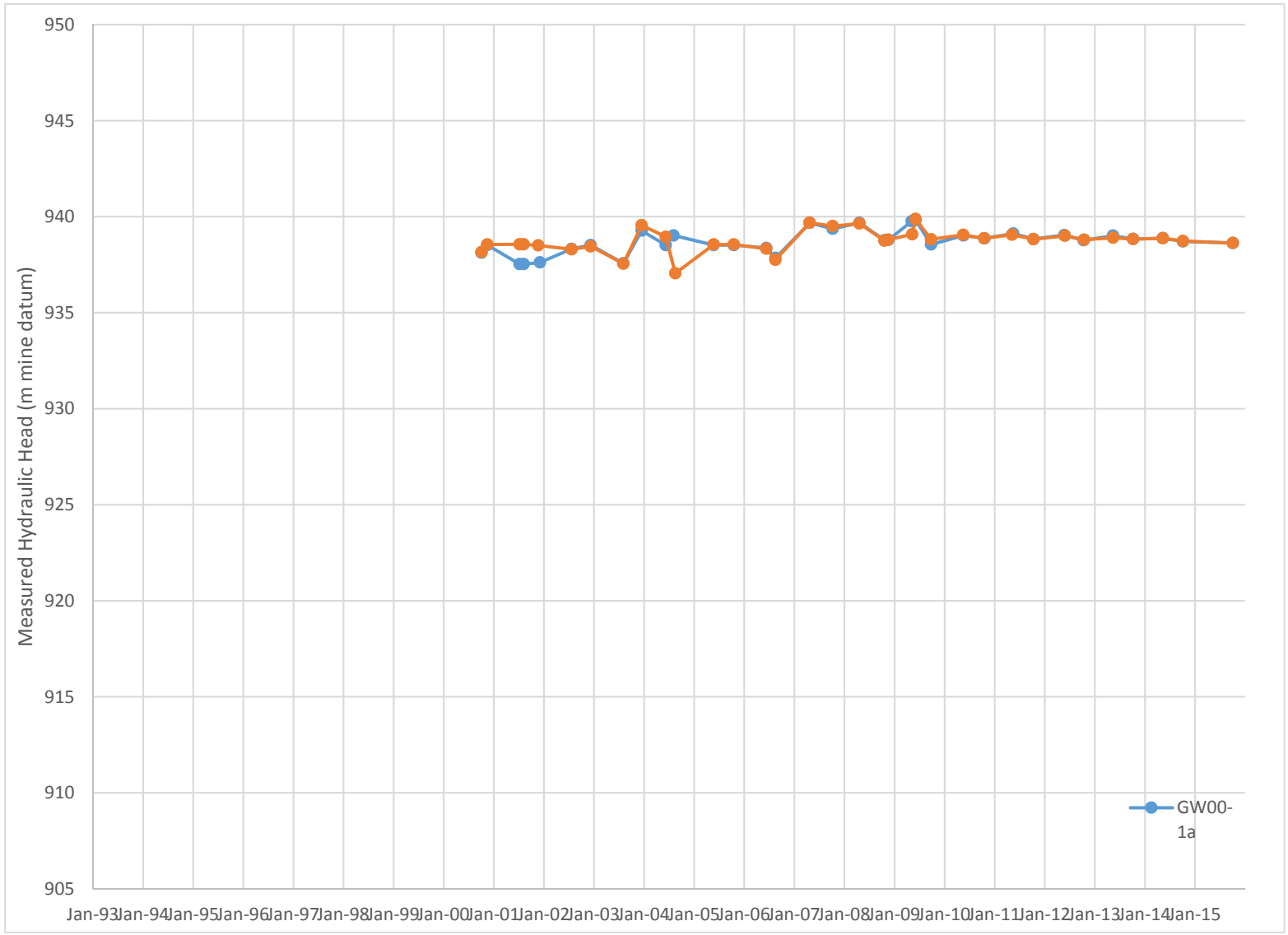

930
925
920
915
910
905
900
895
890
885
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW96-2a
GW96-2b

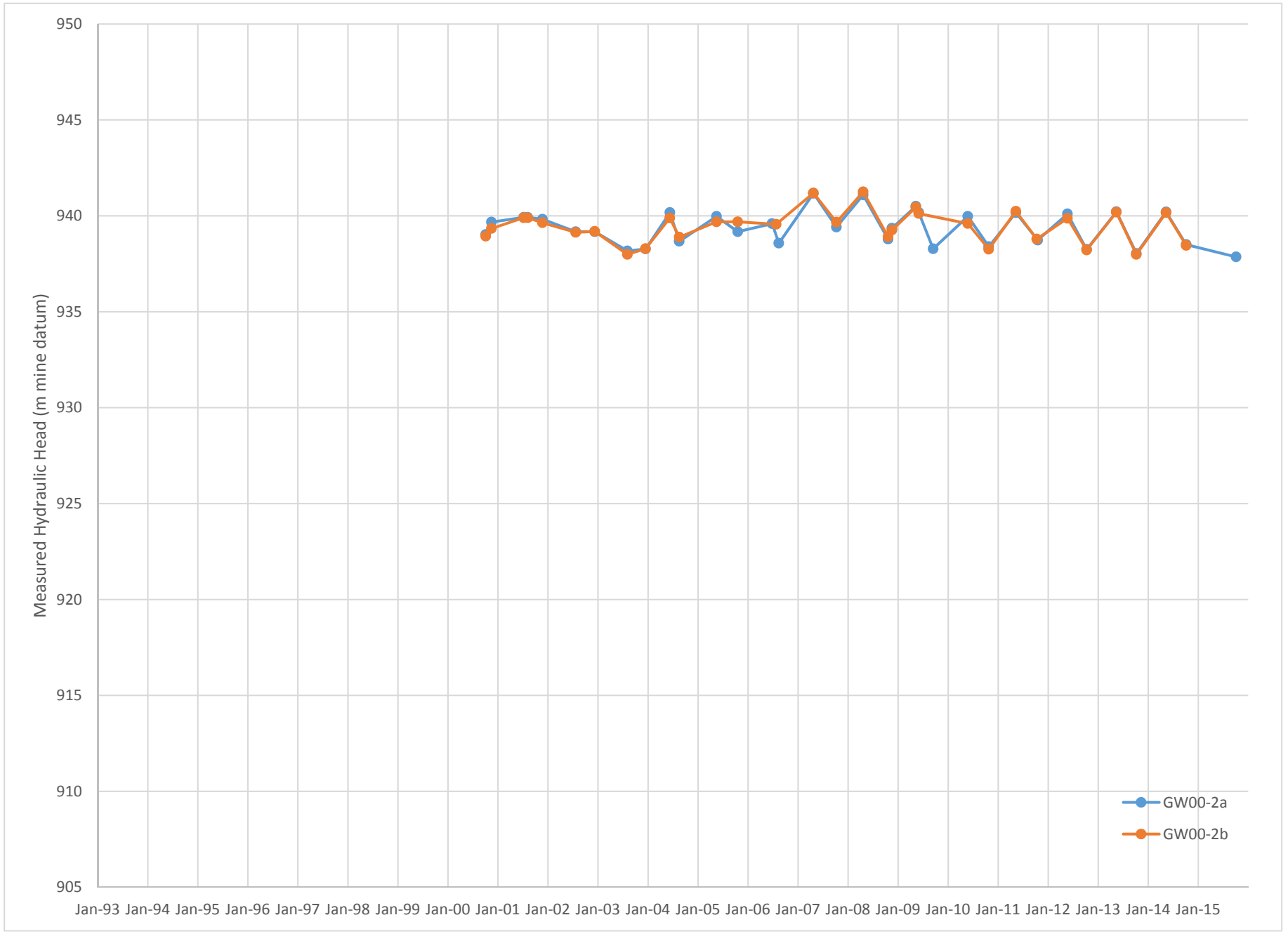

930
925
920
915
910
905
900
895
890
885
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW96-3a
GW96-3b

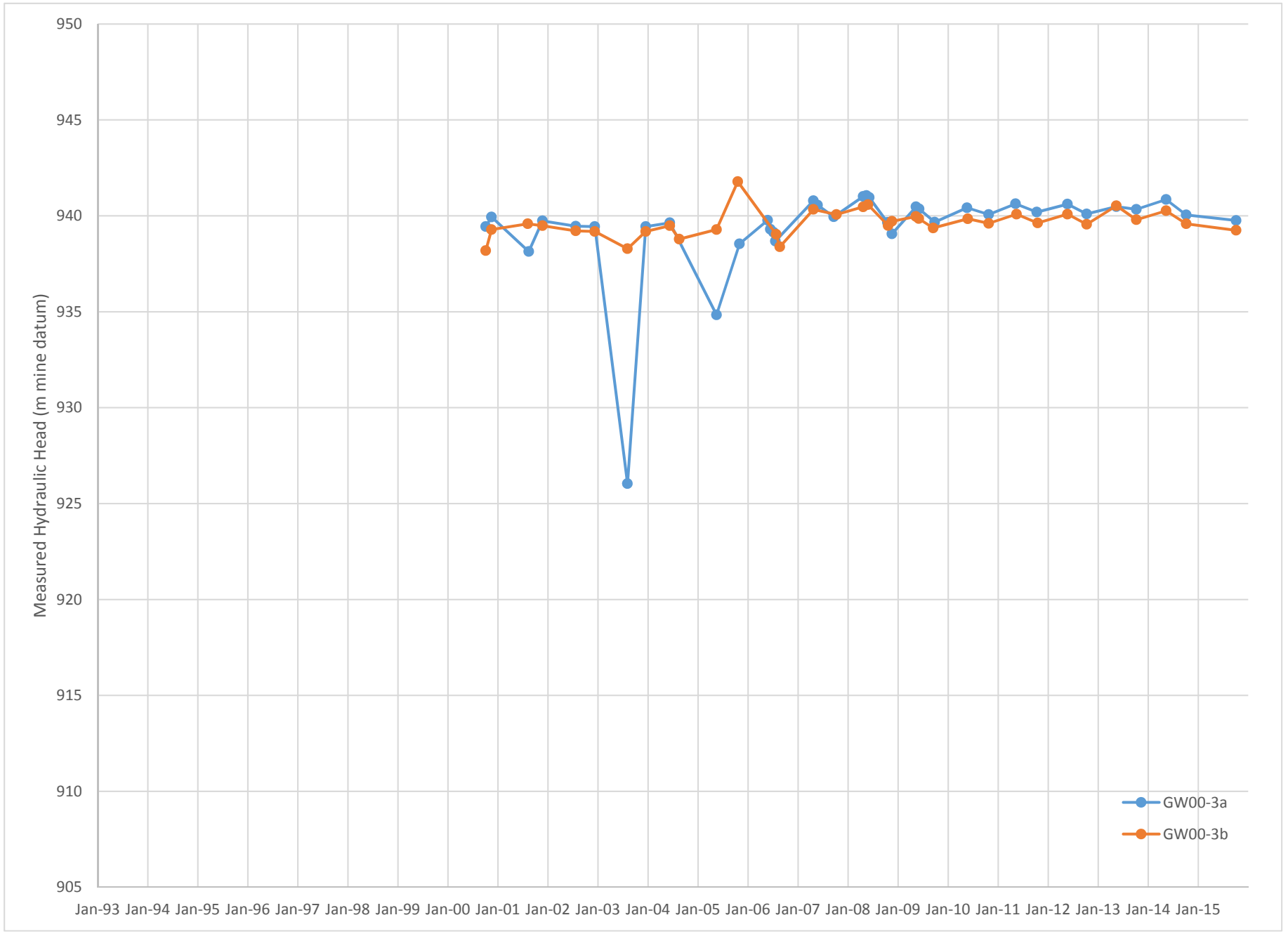

950
945
940
935
930
925
920
915
910
905
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW96-4a
GW96-4b


990
985
980
975
970
965
960
955
950
945
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW96-5a
GW96-5b


930
925
920
915
910
905
900
895
890
885
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW96-9


950
945
940
935
930
925
920
915
910
905
Measured Hydraulic Head (m mine datum)
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
GW00-1a


950
945
940
935
930
925
920
915
910
905
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW00-2a
GW00-2b


950
945
940
935
930
925
920
915
910
905
Measured Hydraulic Head (m mine datum)
Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15
GW00-3a
GW00-3b

ATTACHMENT 3
Site Water Management Plan

Date: 29-Oct-2015

Drawn by: KM

Water Collection Systems

- Clean Water Ditch
- Contact Water Ditch
- Pipeline
- Pipes and Culverts
- Sumps

MOUNT POLLEY MINING CORPORATION

Figure 2.2
Site Water Management

0 250 500 1,000 1,500 2,000 Meters

ATTACHMENT G

Mount Polley Mine Technical Assessment Report: Climate Change Projections.

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-202-TM-Rev0-16000

TO Luke Moger
Mount Polley Mining Corporation

FROM Robert Millar and Rowland Atkins **EMAIL** Robert_Millar@golder.com; Rowland_Atkins@golder.com

MOUNT POLLEY MINE PERMIT AMENDMENT APPLICATION TECHNICAL ASSESSMENT REPORT: CLIMATE CHANGE PROJECTIONS

1.0 INTRODUCTION

Mount Polley Mining Corporation (MPMC) has retained Golder Associates (Golder) to assess future climate change effects on meteorological inputs to the site-wide water balance model for the Mount Polley Mine (the Mine) in British Columbia. This assessment is in support of the technical assessment report (TAR) for the Long-term Water Management Plan for the Mine.

This Technical Memorandum (memo) presents future projected values out to 2085 for:

- average annual and monthly temperature
- average annual and monthly precipitation as rain and snow
- average annual and monthly lake (open water) evaporation

2.0 EFFECT OF CLIMATE CHANGE

The effect of climate change on precipitation and temperature can be assessed using results from global circulation models (GCMs) that have been run to forecast changes under different climate scenarios. The resolution of these models is typically quite coarse spatially. For example, the Canadian Earth System Model CanESM2 (Chylek et al. 2011) has a horizontal resolution of 310 km (2.81 degrees), which limits the application to local changes, particularly in mountainous environments. Statistical downscaling and interpolation techniques are available to provide better resolution. One approach used in British Columbia is PRISM (Parameter-elevation Regressions on Independent Slopes Model), which is an expert system that uses point data and a digital elevation model to generate gridded estimates of climate parameters (Daley et al. 2002). In British Columbia and western North America, PRISM-generated data for historical conditions and for future climate scenarios are available from the ClimateBC online resource (Wang et al. 2012).

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way, Vancouver, BC, V5M 0C4
Tel: +1 (604) 296 4200 Fax: +1 (604) 298 5253 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

PRISM-generated data from ClimateBC have been used to assess future changes to temperature and precipitation at the Mine. Results from the CanESM2 are available for two scenarios, RCP 4.5 and RCP 8.5. RCPs (Representative Concentration Pathways) refer to climate scenarios and indicate the additional climate forcing (W/m^2) in the year 2100 (e.g., 4.5 W/m^2). RCP 8.5 is the more conservative (warmer) scenario (Figure 1), although there are indications that the projected carbon dioxide (CO_2) forcings for RCP 8.5 are too extreme to be realized (Inman, 2011).

The values from the ClimateBC 1981 through 2010 Climate Normal scenario (Wang et al. 2012) are assumed to reflect Current (2016) conditions at the Mine. Changes relative to the 1981 through 2010 Climate Normal scenario in the monthly climate values were determined for the RCP 4.5 and RCP 8.5 scenarios for years 2025, 2055, and 2085. The relative changes determined from the ClimateBC data were added to the Current (2016) Mine monthly values to derive future values for 2025, 2055, and 2085.

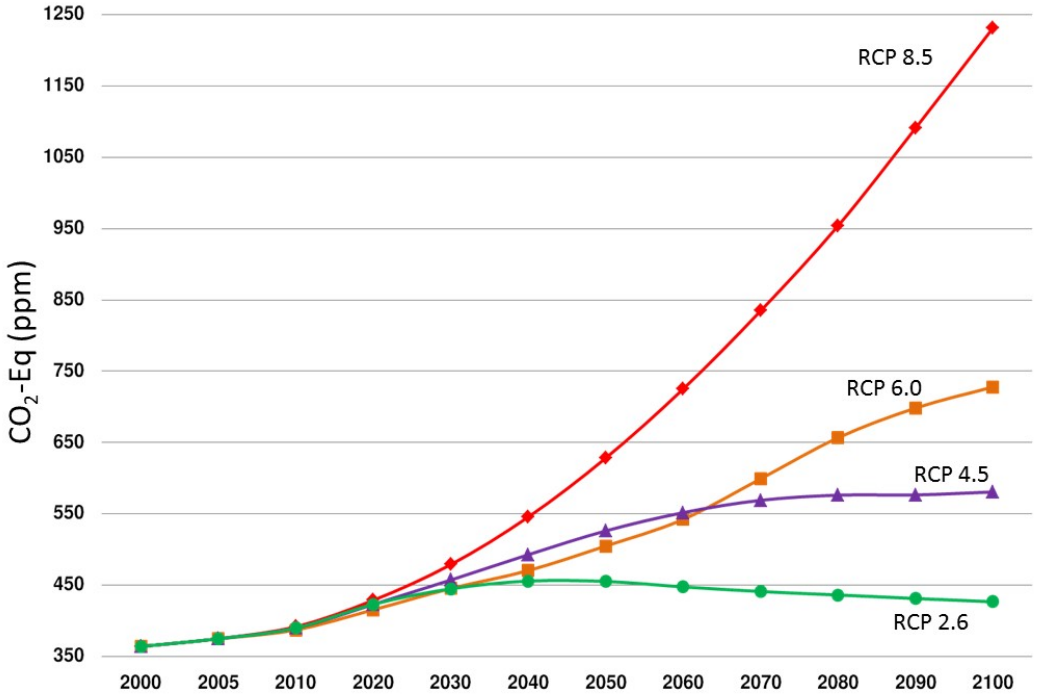


Figure 1: $C0_2$ Equivalent Climate Forcings for Representative Concentration Pathway (RCP) Scenarios (after Moss et al. 2008).

2.1 Average Temperature

Average temperatures are projected to rise, with RCP 8.5 scenarios showing the largest rise (Table 1). By 2085, under the RCP 8.5 scenario, the mean annual temperature is projected to increase by 6.7°C, from 4.4 to 11.1°C (Table 1).

Table 1: Mount Polley Mine, Average Temperature (°C)

Scenario	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Current	2016	-6.6	-4.5	-0.8	4.0	9.1	12.8	15.1	15.1	10.7	4.7	-1.3	-5.6	4.4
RCP 4.5	2025	-6.4	-3.0	0.3	5.0	10.7	15.4	17.6	17.6	12.7	6.5	-0.3	-5.3	5.9
	2055	-5.7	-1.1	1.7	6.1	12.0	17.1	19.5	19.6	14.1	7.3	0.9	-3.6	7.3
	2085	-4.6	-0.4	2.3	7.0	13.1	17.6	20.7	20.5	14.8	7.9	1.6	-2.7	8.1
RCP 8.5	2025	-6.7	-2.7	0.6	4.9	10.8	15.3	17.8	18.0	12.8	6.4	-0.1	-4.7	6.0
	2055	-4.6	-0.6	2.3	6.9	13.3	18.0	21.3	20.9	15.3	8.4	2.2	-2.3	8.4
	2085	-2.3	1.7	4.7	9.8	15.9	20.5	25.0	24.8	18.6	10.6	4.3	-0.3	11.1

2.2 Precipitation

Total precipitation, as combined rain and snowfall, is forecast to increase under both RCP 4.5 and RCP 8.5 scenarios. By 2085, total annual precipitation is projected to increase from the Current value of 670 millimetres (mm) to 742 mm in 2085 under the RCP 8.5 scenario (Table 2). In general, monthly average precipitation increases, with the exception of July and August, in which is projected to decrease by approximately 50% by 2085 under the RCP 8.5 scenario.

Based on the average monthly temperatures (Table 1), precipitation is assumed to fall as rain if the average monthly temperature is higher than 0°C, as snow if the average monthly temperature is less than -2°C, and an equal mixture of rain and snow if the temperature is between -2°C and 0°C. Presently at the Mine, precipitation is predominantly rain from April through October, snow from December through February, and a mixture of rain and snow in November and March (Table 3). By 2085, under the RCP 8.5 scenario, precipitation is projected to fall as rain from February through November, as snow in January, and as a mixture of rain and snow in December.

Snowfall values at the Mine are based on snowcourse measurements, and therefore reflect the net snowfall after sublimation loss. All snowfall values reported in this memo include sublimation loss and no direct accounting for changes in sublimation have been made. From the perspective of the water balance and water management at the Mine, it is the net snowfall after sublimation loss that is most relevant.

Rainfall is forecast to increase under both RCP 4.5 and RCP 8.5 scenarios. By 2085, total annual rainfall is projected to increase from the Current value of 447 mm to 626 mm in 2085 under the RCP 8.5 scenario (Table 4).

The increase is a combination of increased total precipitation (Table 2) and the greater proportion of precipitation as rain due to warmer temperatures (Table 3).

Snowfall is forecast to decrease under both RCP 4.5 and RCP 8.5 scenarios. By 2085, total annual snowfall (after sublimation loss) is projected to decrease from the Current value of 223 mm to 116 mm in 2085 under the RCP 8.5 scenario (Table 5). This is a reflection of warming temperatures.

Table 2: Mount Polley Mine, Average Monthly and Annual Precipitation: Combined Rain and Snow[1] (mm)

Scenario	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Current	2016	50.8	37.5	42.8	49.5	53.5	78.2	58.9	52.2	48.2	58.2	53.5	85.6	670
RCP 4.5	2025	59.8	48.5	42.8	53.5	52.5	69.2	49.9	58.2	52.2	57.2	50.5	97.6	692
	2055	56.8	51.5	42.8	51.5	58.5	78.2	35.9	46.2	50.2	63.2	55.5	104	694
	2085	59.8	50.5	43.8	57.5	65.5	77.2	36.9	48.2	55.2	64.2	57.5	105	721
RCP 8.5	2025	56.8	47.5	41.8	52.5	53.5	77.2	46.9	52.2	53.2	60.2	47.5	100	689
	2055	59.8	49.5	44.8	56.5	63.5	81.2	33.9	49.2	51.2	67.2	56.5	105	718
	2085	64.8	55.5	46.8	63.5	75.5	84.2	23.9	33.2	48.2	78.2	66.5	102	742

Note 1. After sublimation loss.

Table 3: Mount Polley Mine, Estimated Monthly Distribution of Rain (R) and Snow (S)[1]

Scenario	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Current	2016	S	S	R/S	R	R	R	R	R	R	R	R/S	S
RCP 4.5	2025	S	S	R	R	R	R	R	R	R	R	R/S	S
	2055	S	R/S	R	R	R	R	R	R	R	R	R	S
	2085	S	R/S	R	R	R	R	R	R	R	R	R	S
RCP 8.5	2025	S	S	R	R	R	R	R	R	R	R	R/S	S
	2055	S	R/S	R	R	R	R	R	R	R	R	R	S
	2085	S	R	R	R	R	R	R	R	R	R	R	R/S

Note 1. Based on Monthly Average Temperatures (Table 1).

Table 4: Mount Polley Mine, Average Monthly and Annual Rainfall (mm)

Scenario	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Current	2016	0	0	21.4	49.5	53.5	78.2	58.9	52.2	48.2	58.2	26.8	0	447
RCP 4.5	2025	0	0	42.8	53.5	52.5	69.2	49.9	58.2	52.2	57.2	25.3	0	461
	2055	0	25.8	42.8	51.5	58.5	78.2	35.9	46.2	50.2	63.2	55.5	0	508
	2085	0	25.3	43.8	57.5	65.5	77.2	36.9	48.2	55.2	64.2	57.5	0	531
RCP 8.5	2025	0	0	41.8	52.5	53.5	77.2	46.9	52.2	53.2	60.2	23.8	0	461
	2055	0	24.8	44.8	56.5	63.5	81.2	33.9	49.2	51.2	67.2	56.5	0	529
	2085	0	55.5	46.8	63.5	75.5	84.2	23.9	33.2	48.2	78.2	66.5	50.8	626

Table 5: Mount Polley Mine, Average Monthly and Annual Snow[1] (mm SWE[2])

Scenario	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Current	2015	50.8	37.5	21.4	0	0	0	0	0	0	0	26.8	85.6	223
RCP 4.5	2025	59.8	48.5	0	0	0	0	0	0	0	0	25.3	97.6	231
	2055	56.8	25.8	0	0	0	0	0	0	0	0	0	104	186
	2085	59.8	25.3	0	0	0	0	0	0	0	0	0	105	190
RCP 8.5	2025	56.8	47.5	0	0	0	0	0	0	0	0	23.8	99.6	228
	2055	59.8	24.8	0	0	0	0	0	0	0	0	0	105	189
	2085	64.8	0	0	0	0	0	0	0	0	0	0	50.8	116

Note 1. After Sublimation Loss

2. Snow water equivalent (SWE)

2.3 Lake Evaporation

Lake (open water) evaporation is forecast to increase under both RCP 4.5 and RCP 8.5 scenarios. By 2085, total annual evaporation is projected to increase from the Current value of 404 mm to 644 mm under the RCP 8.5 scenario Table 6). The increase is a combination of an additional evaporation due to warmer temperatures, and a prolonged open-water season.

Table 6: Mount Polley Mine, Average Monthly and Annual Lake Evaporation (mm)

Scenario	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Current	2015	0	0	0	0	52	94	102	89	48	18	0	0	404
RCP 4.5	2025	0	0	0	1	55	107	120	100	53	20	0	0	457
	2055	0	0	31	3	56	112	132	110	58	21	0	0	524
	2085	0	0	31	3	58	114	138	113	59	21	9	0	547
RCP 8.5	2025	0	0	0	0	55	105	120	103	54	20	0	0	458
	2055	0	0	31	2	59	116	141	115	61	22	9	0	557
	2085	0	15	33	8	66	126	159	132	70	24	10	0	644

3.0 SUMMARY

The projected annual climate parameters for Current (2016) conditions and for scenarios RCP 4.5 and RCP 8.5 for 2025, 2055, and 2085 are summarized in Table 7. The climate change scenarios are based on the CanESM2 model values provided from the ClimateBC online resource (Wang et al, 2012). In general, the future climate change scenarios indicate warmer, wetter conditions, with increased evaporation and reduced snowfall. Snowfall is projected to decline from approximately 33% of annual precipitation in 2016, to 16% in 2085 under the RCP 8.5 scenario (Table 7).

Table 7: Projected Annual Average Mount Polley Mine Climate from CanESM2 Model

Scenario	Year	Annual Temp (C)	Change in Annual Temp (C)	Precipitation (mm)	Rainfall (%)	Snowfall (%)[1]	Evaporation (mm)
Current	2016	4.4	0	670	67	33	404
RCP 4.5	2025	5.9	1.5	692	67	33	457
	2055	7.3	2.9	694	73	27	524
	2085	8.1	3.7	721	74	26	547
RCP 8.5	2025	6.0	1.6	689	67	33	458
	2055	8.4	4.0	718	74	26	557
	2085	11.1	6.7	742	84	16	644

Note 1. After sublimation loss.

4.0 CLOSURE

We trust that the information presented in this memo is sufficient for your present requirements. If you have any questions or concerns, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA Dr. R. G. MILLAR # 25722

PROFESSIONAL GEOSCIENTIST PROVINCE OF BRITISH COLUMBIA R.G. MILLAR 25722

Oct 17, 2016

Robert Millar, PhD, PEng/PGeo
Associate, Senior Hydrotechnical/Water Resources Engineer

Rowland Atkins, MSc, PGeo
Principal, Senior Geoscientist

RGM/RA/jc/kp

o:\final\2014\1421\1411734\1411734-202-tm-rev0-16000\1411734-202-tm-rev0-16000-climate change 17oct_16.docx

REFERENCES

Chylek P, J Li, MKM Dubey, M Wang, G Lesins. 2011. Observed and model simulated 20th century Arctic temperature variability: Canadian Earth System Model CanESM2. Atmos. Chem. Phys. Discuss., 11, 22893–22907.

Daley C, WP Gibson, GH Taylor, GL Johnson, P Pasteris. 2002. A Knowledge-based Approach to Statistical Mapping of Climate. Climate Research, 22, 99-113.

Inman M. 2011. Opening the future. Nature Climate Change, 1, 7-9.

Moss R H, M Babiker, S Brinkman, E Calvo, T Carter, J Edmonds, I Elgizouli, S Emori, L Erda, K Hibbard, R Jones, M Kainuma, J Kelleher, JF Lamarque, M Manning, B Matthews, J Meehl, L Meyer, J Mitchell, N Nakicenovic, B O'Neill, R Pichs, K Riahi, S Rose, P Runci, R Stouffer, D van Vuuren, J Weyant, T Wilbanks, JP van Ypersele, M Zurek. 2008. Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies. Intergovernmental Panel on Climate Change, Geneva, 132 pp.

Wang T, A Hamann, D Spittlehouse, S Aitken. 2012. ClimateBC/WNA/NA, Centre for Forest Conservation and Genetics, University of British Columbia, Faculty of Forest. Available at: http://cfcg.forestry.ubc.ca/projects/climate-data/climatebcwna/ Accessed on 25 August 2016.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates

APPENDIX C

Derivation of Geochemical Source Terms, Mount Polley Mine - SRK

Derivation of Geochemical Source Terms, Mount Polley Mine

Prepared for

Mount Polley Mining Corporation

Prepared by

SRK Consulting (Canada) Inc.
1CI008.007
September 2016

Derivation of Geochemical Source Terms, Mount Polley Mine

September 2016

Prepared for

Mount Polley Mining Corporation
580 Hornby Street
Vancouver, BC V6C 3B6
Canada

Tel: +1 604 669 8959
Web: www.imperialmetals.com

Prepared by

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2
Canada

Tel: +1 604 681 4196
Web: www.srk.com

Project No: 1CI008.007

File Name: MPSourceTerms_Report_1CI008007_20160928_SJD

Copyright © SRK Consulting (Canada) Inc., 2016

srk consulting

Executive Summary

Mount Polley Mining Corporation is submitting a Technical Assessment Report as part of a permit amendment application to discharge water from the site which includes modelling of water quality at the site and in the receiving environment. Inputs to this model are geochemical source terms which are predictions of the chemistry of water in contact with materials and surfaces exposed by mining activity. Source terms mainly consider the potential for metal leaching and acid rock drainage (ML/ARD). This report describes the derivation and use of the source terms.

The Mount Polley deposit is classified as an alkalic porphyry copper gold deposit. With the exception of the distinctive small Pond Zone skarn deposit, it has been mined from several mineralized zones (Springer, Cariboo, Bell, Southeast, Northeast, Boundary) with common geological features including mainly a monzonitic plutonic host rock, association with breccia bodies in the intrusion, dominantly potassic hydrothermal alteration, lack of pronounced pyrite haloes, enrichment in copper and selenium relative to global norms, pervasive calcite, and natural oxide alteration. As a result, geochemical characteristics are consistent between zones, allowing a site-wide approach to geochemical characterization.

Potentially ARD generating (PAG) and non-PAG waste rock materials occur locally as pyrite zones but non-PAG dominates. ARD potential was used to segregate waste rock, with non-PAG waste rock being placed in several waste rock dumps and PAG waste rock either deposited in completed pits that are projected to flood at the closure of the mine (in accordance with the management practice of subaqueous disposal) or placed in a temporary stockpile for final disposal in the Springer Pit. Based on review of operational processes and data, non-PAG waste rock is expected to be non-acidic in perpetuity because the classification approach tended to result in non-PAG waste rock reporting to PAG waste rock disposal locations rather than the reverse.

Tailings are classified as non-PAG based on operational monitoring and testing of tailings spilled into Hazeltine Creek in August 2014.

Major geochemical sources were identified as waste rock stockpiles and the tailings. Other sources include backfilled waste rock, ore processing, pit walls, ore stockpiles, the sulphur stockpile and magnetite stockpiles. Source terms were mainly developed from conceptual geochemical models then interpretation of rock geochemical characteristics and seepage data rather than scale-up of laboratory kinetic test data. Pit wall source terms (including PAG walls) were obtained by scaling of kinetic test data. Source terms were not specifically developed for the magnetite and sulphur stockpiles because they are small sources and assumed to influence seep data used as a basis for waste rock source terms.

Table of Contents

1 Introduction 1
1.1 Background 1
1.1.1 General 1
1.1.2 Geological Setting 1
1.1.3 Mining History and Closure 4
1.1.4 Waste Rock Management 5
1.1.5 Rock Geochemical Characteristics 8
1.1.5.1 Introduction 8
1.1.5.2 ARD Potential 9
1.1.5.3 Trace Element Content 12
1.1.5.4 Extraction Tests 13
1.1.5.5 Kinetic Testing 13
1.1.6 Tailings Geochemical Characteristics 16
1.1.6.1 Static Characteristics 16
1.1.6.2 Kinetic Characteristics 16
1.1.7 Other Sources 20
1.2 Scope 20
1.3 Acknowledgements 20
2 Conceptual Geochemical Models 20
2.1 Purpose 20
2.2 Sources 20
2.3 Ex-Pit NAG Waste Rock and Construction Fills 21
2.4 Ex-Pit PAG Waste Rock 22
2.5 Ore Stockpiles 22
2.6 Pit Backfill 22
2.7 Pit Walls 23
2.8 Ore Processing 23
2.9 Tailings Solids 23
2.10 Sulphur Stockpile 24
2.11 Magnetite Stockpiles 25
2.12 Nitrogen Leaching 25
3 Source Terms 25
3.1 General Approach 25
3.2 Incorporating Uncertainty 26
3.3 NAG Waste Rock 26

3.3.1 Method 26
3.3.2 Inputs 28
3.3.2.1 Mineral Partitioning During Blasting 28
3.3.2.2 Potential for Acidification 30
3.3.2.3 Waste Rock Seepage Database 32
3.3.3 Results 39
3.4 Ex-Pit PAG Waste Rock 39
3.5 Ore Stockpiles 39
3.6 Pit Backfill 39
3.7 Pit Walls 39
3.7.1 Method 39
3.7.2 Inputs 40
3.7.3 Results 43
3.8 Ore Processing 43
3.8.1 Method 43
3.8.2 Inputs 43
3.8.3 Results 43
3.9 Tailings 43
3.9.1 Method 43
3.9.2 Inputs 44
3.9.3 Results 46
3.10 Sulphur Stockpile 46
3.11 Magnetite Stockpiles 46
3.12 Nitrogen Leaching 46
4 Conclusions 47
5 References 49

List of Figures

Figure 1. Geological Map of the Mount Polley Mine (Rees 2013) 3

Figure 2. Pyritic Zones in the South and West Walls of the Springer Pit 4

Figure 3. Pits and Waste Rock Dump Features 7

Figure 4. Comparison of Total Carbon and Total Carbonate 9

Figure 5. Sulphur Forms (top), NP Compared to Carbonate (bottom left) and ARD Potential (bottom right) by Zone 10

Figure 6. Blast Hole ABA Results for Springer (top left), Cariboo (top right), Boundary (bottom left), Southeast (bottom middle) and Pond Zones (bottom right) 11

Figure 7. Box-and-Whisker Plots for Selenium and Selenium-to-Sulphur Ratios 12

Figure 8. Correlation of Sulphur Content with Oxidation Rate 15

Figure 9. Static Geochemical Characteristics of Tailings (SRK 2015) 16

Figure 10. Selected Leachate Chemistry for Tailings Humidity Cells 18

Figure 11. Selected Leachate Chemistry for Tailings Columns 19

Figure 12. Box and Whisker Distributions for the Cation Ratio 27

Figure 13. Results of Testing of Blast Rock Size Fractions 29

Figure 14. Acid-Base Account for PAG-NAG Mixing 31

Figure 15. Seep Sampling Locations 33

Figure 16. Se/SO_4 Ratios in Seepage 35

Figure 17. NO_3 in Seepage 35

Figure 18. Selected Saturation Indices 36

Figure 19. Relationships between Selenium Concentrations and Saturation Indices for Gypsum, $CaMoO_4$, Barite and Tenorite 38

Figure 20. Gypsum Saturation Indices for Tailings Seepage and Column Data 45

Figure 21. Comparison of P95 and P99 Statistics for Ratio of Column/Seepage 45

Figure 22. Tailings Aluminum Concentrations on Log Scale Compared to pH. 46

List of Tables

Table 1. Major Waste Rock Disposal Locations 6
Table 2. Static Test Inventory 8
Table 3. Characteristics of Samples in Waste Rock Humidity Cells 14
Table 4. Waste Rock Seepage Statistics 34
Table 5. Humidity Cell Rates (mg/kg/week) Used for Pit Wall Terms 42
Table 6. Waste Rock Nitrogen Source Terms 47

Appendices

Appendix A – ML/ARD Management Procedure Manual
Appendix B – Waste Rock Inventory
Appendix C – Operational Waste Rock Monitoring Database
Appendix D – Evaluation of Delay to Onset of Acidification
Appendix E – Waste Rock Seepage Chemistry Database
Appendix F – NAG Waste Rock Source Terms
Appendix G – Pit Wall Source Terms
Appendix H – Tailings Seepage Water Chemistry Database
Appendix I – Tailings Source Terms

List of Abbreviations

ABA	acid-base accounting
AP	acid potential
ARD	acid rock drainage
CGM	conceptual geochemical model
Golder	Golder Associates Ltd.
HCT	humidity cell test
LSW	low sulphur waste
ML	metal leaching
MPIC	Mount Polley Intrusive Complex
MPMC	Mount Polley Mining Corporation
MPM	Mount Polley Mine
NAG	non-ARD generating
NP	neutralization potential
NPR	neutralizing potential ratio
PAG	potentially ARD generating
SFE	shake flask extraction
TAR	Technical Assessment Report
TIC	total inorganic carbon
TSF	Tailings Storage Facility

1 Introduction

1.1 Background

1.1.1 General

Mount Polley Mining Corporation (MPMC), a wholly owned subsidiary of Imperial Metals Corporation, has been operating the Mount Polley Mine (MPM), located approximately 56 km northeast of Williams Lake and approximately 15 km southwest of the community of Likely in British Columbia, Canada, since 1996. MPMC recovers copper and gold from porphyry-style mineralization by open pit and underground mining. The plant is capable of processing 22,000 t/d of ore using standard mineral flotation technology.

As a condition of *Environmental Management Act* Permit 11678, MPMC is submitting a Technical Assessment Report (TAR) for a long-term water management plan, which includes modelling of water quality at the site and in the receiving environment. Inputs to this model are geochemical source terms which are predictions of the chemistry of water in contact with materials and surfaces exposed by mining activity. Source terms mainly consider the potential for metal leaching and acid rock drainage (ML/ARD). The purpose of this report is to describe the derivation and use of the source terms.

1.1.2 Geological Setting

Understanding of the geological setting is provided below for context in the consideration of ML/ARD potential.

The Mount Polley deposit is classified as an alkalic porphyry copper gold deposit (BC MINFILE No. 093A 008). With the exception of the distinctive small Pond Zone, it has been mined from several mineralized zones which have the following common features:

- The host rock for porphyry mineralization is the Mount Polley Intrusive Complex (MPIC) which intruded into Nicola Group Volcanics (Figure 1). The intrusion is primarily monzonite to monzo-diorite in composition. Smaller phases vary in composition from diorite to syenite.
- Mineralization is associated with magmatic-hydrothermal breccias. Alteration and mineralization occurs in the matrix of the breccias, and in veins and swarms distributed around the breccias. BX1 is the main host for the bulk of the mineralization at MPM which is mined in the Cariboo and Springer Pits (Figure 1). BX1 is characterized by alteration which resulted in the strongest destruction of both primary and breccia textures. Breccia bodies BX2 host satellite mineralization in the Southeast Zone, Wight Pit and Boundary Zone. BX2 is less intensively altered and original textures are more apparent. BX3 is unmineralized and has not been mined.
- Alteration at MPM is classified as potassic (sodic and calcic) with salmon pink potassium feldspar as the main alteration mineral. Biotite is less common. Sodic alteration is defined by albite and calcic alteration (actinolite, diopside, epidote, clinozoisite, and sporadic andraditic garnet). Calcite is pervasive. Alteration is zoned with the strongest calcic-potassic alteration

in the core associated with BX1. Nicola Group rocks and fringing MPIC rocks are propylitically-altered and characterized by stronger epidote and pyrite.

- Like other alkalic porphyry deposits (e.g. Copper Mountain, Brenda), MPM lacks the strong hydrothermal alteration zoning that is commonly observed in calc-alkalic porphyry deposits (e.g. Highland Valley Copper, Island Copper, Gibraltar). In particular, phyllic alteration is absent at MPM. A common feature of calc-alkalic porphyry deposits is often a pronounced pyritic halo that surrounds the copper mineralization and is associated with phyllic and propylitic alteration. At MPM, discontinuous pyritic zones are present but do not appear to be mineralization halos. MPM geological staff identified a pyritic zone in the south wall of the Springer Pit which extends into the adjacent Cariboo Pit (Figure 2). Samples from Bell Pit blast holes collected in the early years of operations were identified as being from a Pyrite Zone but the location of this feature is not known.

- Sulphide mineralization consists mainly of chalcopyrite ($CuFeS_2$) and pyrite (FeS_2), with lesser bornite (Cu_5FeS_4), covellite (CuS), and digenite (Cu_9S_5). Bornite is relatively more abundant in the Northeast and Boundary Zones.

- Carbonate mineralization is principally calcite, with occurrences of malachite ($Cu_2CO_3(OH)_2$) formed as a natural weathering product; iron carbonates have not been reported.

- A significant portion of the copper at the MPM is not associated with sulphides (upwards of 50% in the upper portions of each pit). This fraction has been termed ‘copper oxide’ by MPM personnel and is associated primarily with chrysocolla ($(Cu,Al)_2H_2Si_2O_5(OH)_4 \cdot nH_2O$) and malachite ($Cu_2CO_3(OH)_2$) in equal proportions (Henry 2009). Recent investigations (SRK 2015a) have shown that chlorite is a significant host for copper. It is assumed that chlorite formed hydrothermally and incorporated copper as part of the mineralizing event rather than due to weathering. Suarez et al. (2009) found that the form of copper in chlorite at the Aguablanca Ni-Cu-PGE Sulfide Deposit was native copper between silicate layers rather than as a substitution in the crystal lattice. The mineral is suspected to have formed during hydrothermal alteration rather than by natural weathering processes. It is not known whether this same form of copper is also present at MPM.

The small Pond Zone is andradite-clinopyroxene-magnetite skarn mineralization occurring at the contact between a diorite to monzodiorite intrusion and Nicola Group volcanic rocks of andesite to basalt composition. It appears to be linked to the presence of a limestone unit in the Nicola Group.

From an ML/ARD perspective, a significant feature of the Mount Polley mineralization is the lack of reported arsenic, lead and zinc minerals which are commonly associated with porphyry deposits elsewhere in British Columbia and globally. Since arsenic, zinc, and associated cadmium are relatively mobile under non-acidic conditions, the lack of the minerals hosting these elements indicates that potential for leaching concerns is lower than other porphyries. Based on the copper sulphide and copper oxide dominated mineralogy, the primary metal leaching concern is expected to be for copper.

In addition, the lack of a distinctive pyrite halo means that pyrite abundance is lower than other porphyry deposits and ARD potential is expected to be lower.

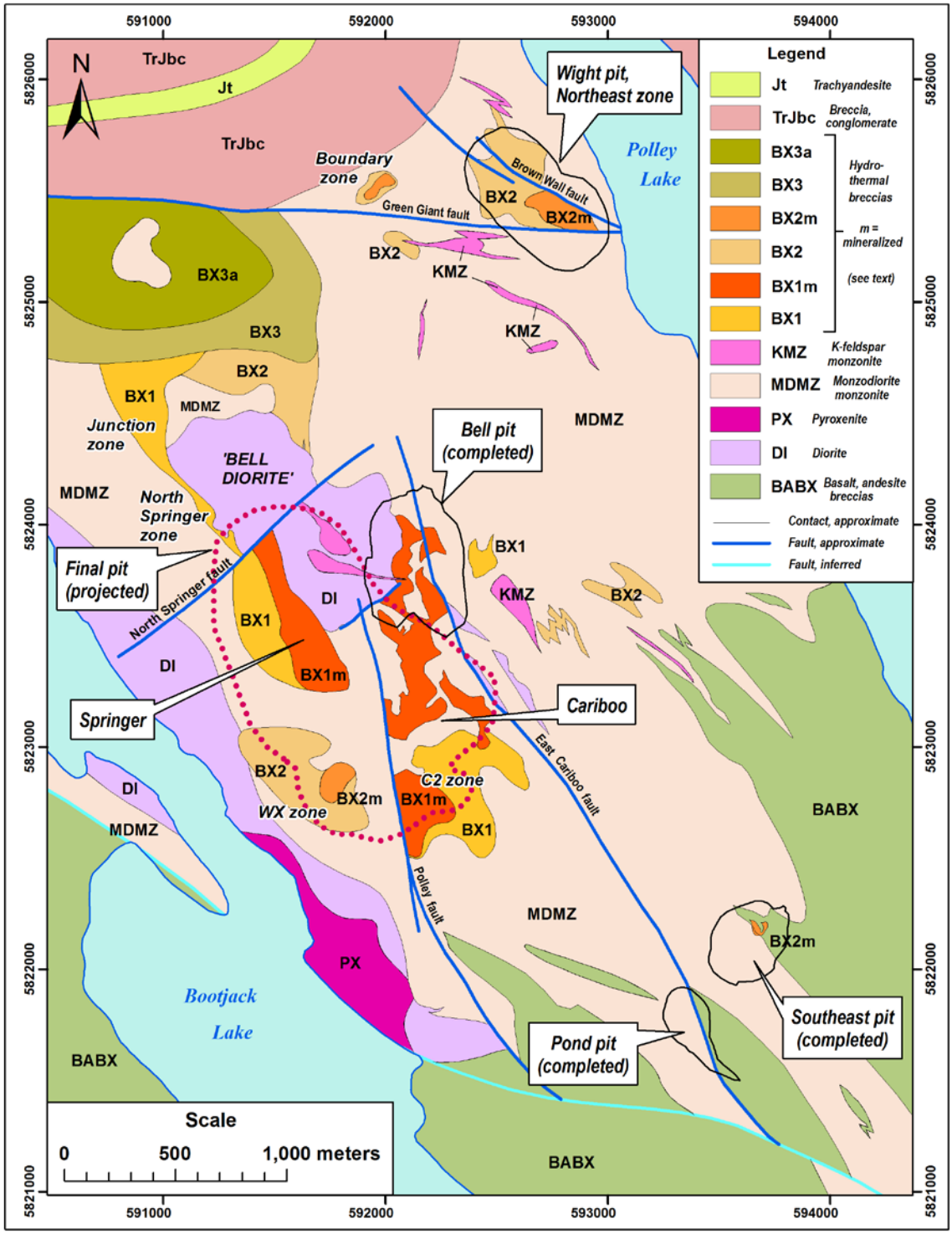
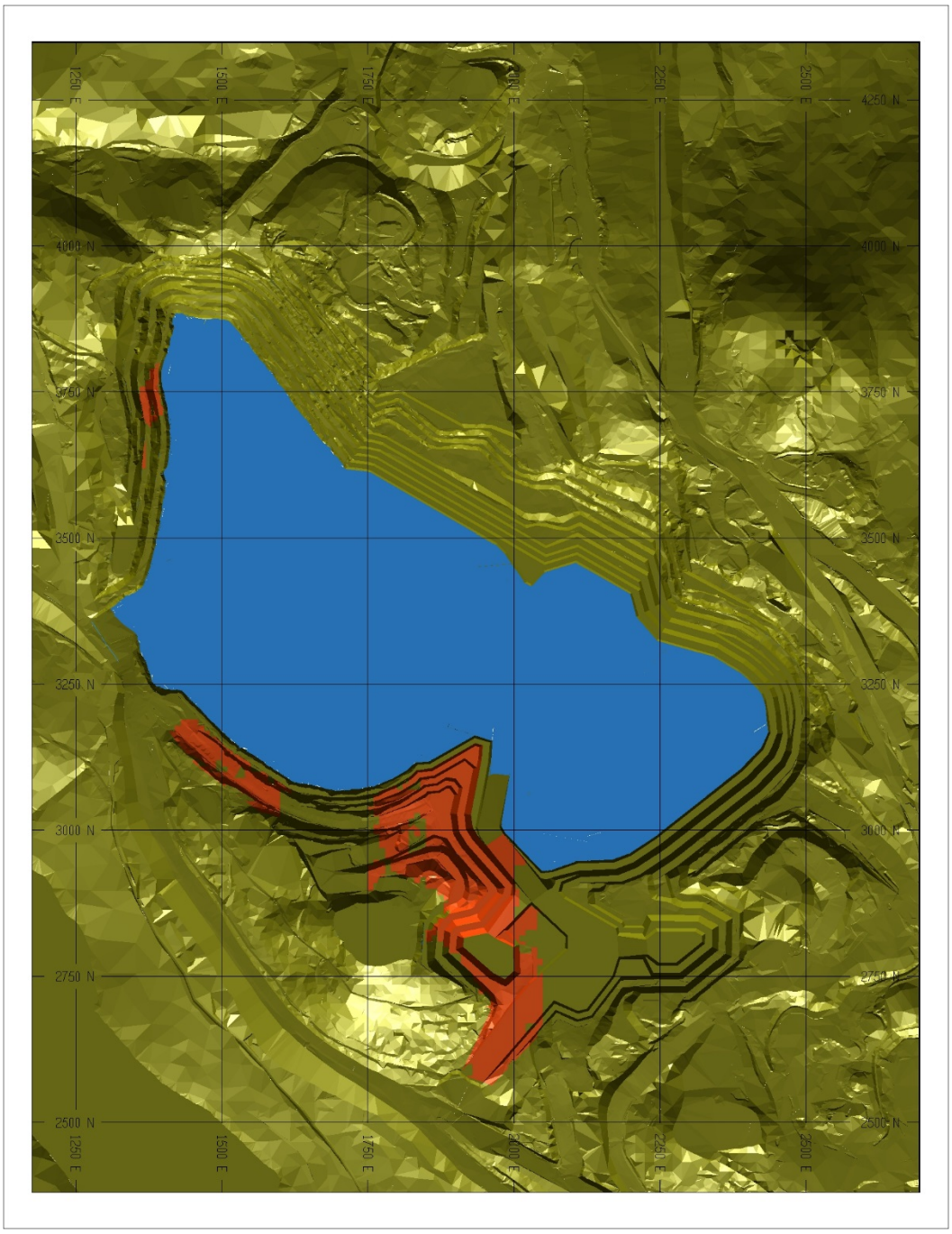


Figure 1. Geological Map of the Mount Polley Mine (Rees 2013)



Source: MPM

Figure 2. Pyritic Zones in the South and West Walls of the Springer Pit

1.1.3 Mining History and Closure

Full scale mining began in the Cariboo Pit by mining high oxide and high gold parts of the ore body then transitioning to the Bell Pit in 1999. Mining was suspended in 2001 due to unfavorable market conditions. The mine re-opened in 2005 after a 3½ year care-and-maintenance period. The following zones have been mined since 2005:

- Completed mining and backfilling of the Bell Pit.
- Completed mining and backfilling of the small Southeast Zone and Pond Zone Pits.
- Completed mining of the Wight Pit (Northeast Zone).

Active mining is focussed on the Cariboo and Springer Pits (which will merge to a single pit), Northeast Zone underground (access from the Wight Pit) and Boundary Pit.

Upon completion of mining, the Springer-Cariboo Pit will be backfilled by rock from the Temporary Northwest (NW) PAG Stockpile (the NAG/PAG Pad) and allowed to flood. The Wight Pit and underground workings will also flood. The Tailings Storage Facility (TSF) will be decommissioned with a minimal water cover.

1.1.4 Waste Rock Management

Mining at MPM is primarily by open pit. As of the end of 2015, about 95 million tonnes of ore had been processed.

Mines Act Permit M-200 issued on July 11, 1997 specified that waste rock is to be segregated according to ARD potential using a neutralization potential ratio (NPR) of 2. Rock with NPR greater than 2 is to be considered non-ARD generating (NAG). Rock with NPR less than 2 was to be considered potentially ARD generating (PAG). The definition of NPR is assumed to be neutralization potential (NP)/acid potential (AP) where NP is determined by a neutralization potential method and AP is acid potential determined from sulphide sulphur.

The procedure used by MPMC to identify and segregate PAG waste rock is attached in Appendix A.

To support the TAR, MPMC personnel developed a thorough inventory of the quantities of waste rock in each category and determined that about 167 million tonnes of waste rock were classified as NAG, and 19 million tonnes were classified as PAG. Development of the inventory showed the source of NAG and PAG materials and their disposal locations. Appendix B provides the inventory and Table 1 summarizes major disposal locations (Figure 3).

The primary NAG rock disposal locations are the North Bell Dump (which includes backfill in the Bell Pit), the South East Rock Dump Site (which also includes the backfilled Southeast Zone and Pond Zone Pits), and the Northeast Zone Dump[1]. NAG rock has been used for construction purposes (Waste Haul Road and the TSF). The inventory indicates that NAG rock from the open pits has been disposed at a variety of different locations resulting in waste rock dumps containing non-unique source materials. The exception is that the Northeast Zone and East Rock Dumps received waste primarily from the Wight Pit.

Prior to 2005 (i.e. before operations were re-started), limited PAG waste rock was mined and was dumped into the bottom of the Bell Pit (C. Hughes, MPMC, pers. comm.). A small amount was

[1] Also referred to as Wight Pit waste rock dumps.

dumped over the north end of the Cariboo Pit, but it was re-handled to the bottom of the Cariboo Pit. Acid-base accounting (ABA) analyses were performed by an external lab.

Since 2005, PAG waste rock has primarily been disposed in the Temporary NW PAG Stockpile (the NAG/PAG Pad; Ex-pit PAG in Figure 3) which is planned to be backhauled to the Springer Pit at closure for subaqueous disposal. PAG rock has also been disposed subaqueously in the Cariboo Pit backfill and Southeast Zone Pit. PAG rock mainly originates from the Cariboo Pit and Springer Pit. The PAG waste rock in the North Bell Dump originated from the Southeast Zone Pit which was dominated by PAG waste rock.

An amendment to *Mines Act* Permit M-200 in July 8, 2009 allowed the placement of low sulphur (less than 0.3%) waste (LSW) as 2 m layers with Springer Zone NAG waste rock to create a NAG waste rock blend. The quantity of PAG rock mined from the Pond Zone was 6,615 t, which was disposed in a portion of the Northeast Zone Dump referred to as the Sandwich Dump.

Table 1. Major Waste Rock Disposal Locations

Placement Location	NAG		PAG	
	Mass (tonnes)	Percent of NAG	Mass (tonnes)	Percent of PAG
Bell Pit Rock Dump	80,878,729	48.6%	187,573	1%
Cariboo PAG Dump	999,750	0%	1,573,456	8%
Dam	9,871,313	5.9%	0	0%
NAG/PAG Pad	3,991,967	2.4%	16,091,498	86%
South East NAG Dump	32,271,810	19.4%	3,105	0%
South East PAG Dump	5,971	0%	886,665	5%
Waste Haul Road	6,915,893	4.2%	1,290	0%
Northeast Zone Dump	14,770,426	8.9%	9,855	0%

Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV04.xlsx]

8 Mt of ore was stockpiled to the north of the ore processing plant and has served as a source of ore during limited operations following the tailings dam failure in August 2014. The current remaining quantity of rock in the stockpiles is 2 Mt. The waste rock inventory also indicated that about 110,000 tonnes of ore has been placed at twelve other locations around the site. The largest disposal location is the South East Rock Dump (34,000 tonnes). Stockpiled ore is not classified by ARD potential but the quantities are insignificant relative to waste rock.

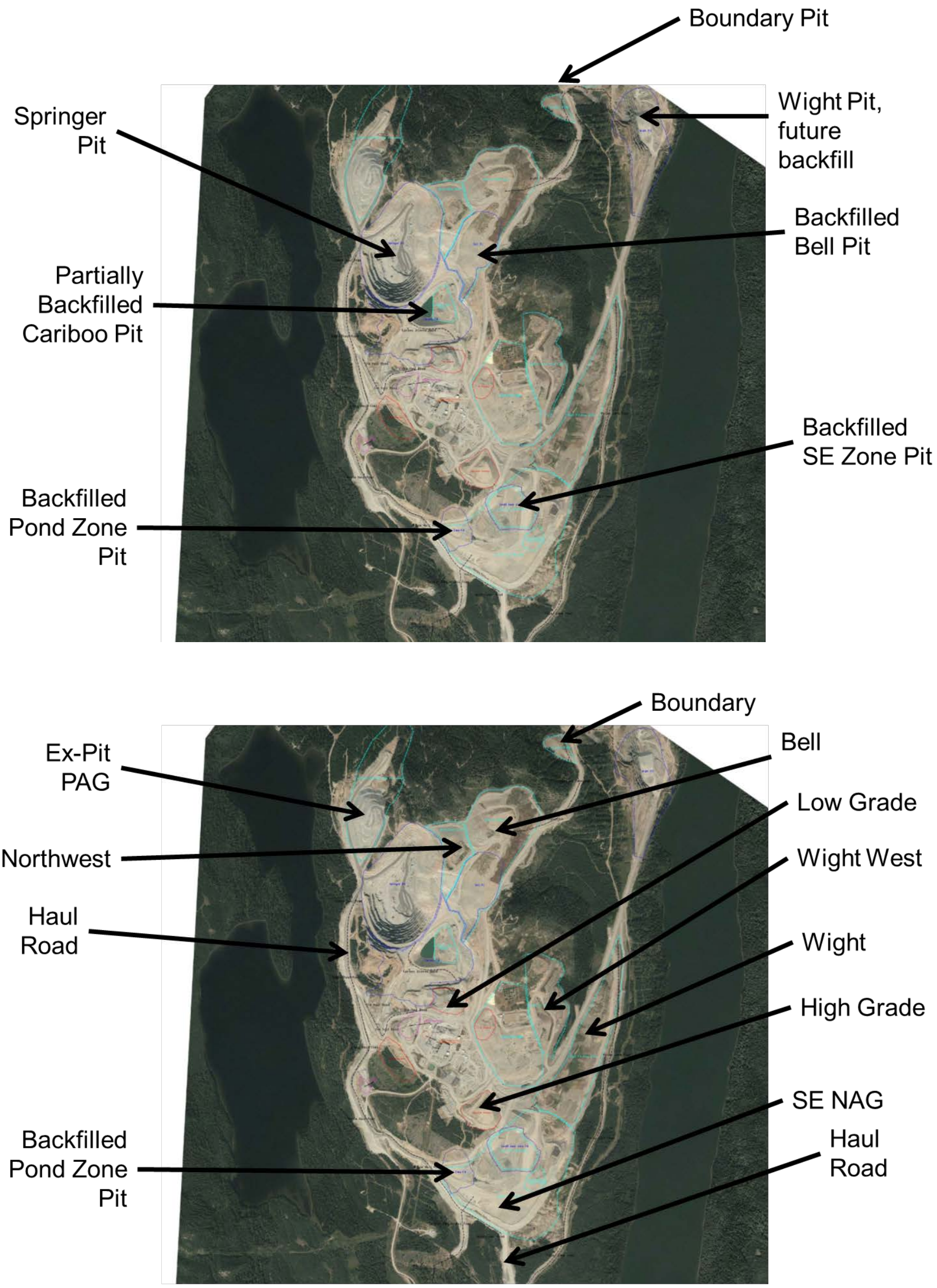


Figure 3. Pits and Waste Rock Dump Features

1.1.5 Rock Geochemical Characteristics

1.1.5.1 Introduction

Understanding of waste rock geochemical characteristics has been accumulated from a variety of sources including diamond drill core tested prior to mining, blast hole cuttings to inform waste rock management operations in the pit during operations and post-depositional monitoring (Table 2). The database is dominated by the data gathered to operationally characterize waste rock in the Springer Pit which is the main source of PAG rock at the MPM. However, the database is incomplete because some of the earlier data were lost and blast hole data are lacking for Cariboo Pit and Wight Pit. For Cariboo Pit and Wight Pit, confirmatory post-depositional data partly address this gap.

The inventory primarily contains static ARD potential data though trace element scans are also available for all zones except the Boundary Pit.

Table 2. Static Test Inventory

Source	Drill Core	Blast Hole	Confirmatory	Total
Bell Pit and North Bell Dump	0	78	52	130
Cariboo Pit	0	0	43	43
Pond and Sandwich Dump	27	174	5	206
SE Zone Pit and Dump	37	0	101	138
Springer Pit and PAG Dump	101	3789	20	3910
Wight Pit	102	0	0	102
Boundary Pit and Dump	16	123	5	144
Other PAG	0	0	29	29
Roads	0	0	37	37
Dam	0	0	31	31
Total	283	4164	323	4770

Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[Confirmatry_Grabs_1CI008007_SJD_REV01.xlsx]

Drill core analyses were primarily performed by off-site laboratories and included total sulphur, sulphate, sulphide by difference, total carbonate, neutralization potential, and paste pH. For some samples, a trace element scan was performed. On-site tests were total sulphur and total carbon (see Appendix A). The former is assumed to be a proxy for sulphide sulphur because other forms of sulphur (including sulphate) are not common at MPM. The latter is assumed to be a proxy for reactive carbonate minerals. The assumption is supported by the observed dominance of calcite, the lack of reported iron carbonate and the strong correlation and equivalence of total carbon and total carbonate (Figure 4). The dominant plutonic geological setting supports the lack of non-carbonate carbon.

The following sections compare ARD and trace element characteristics of the various mineralized zones at MPM.

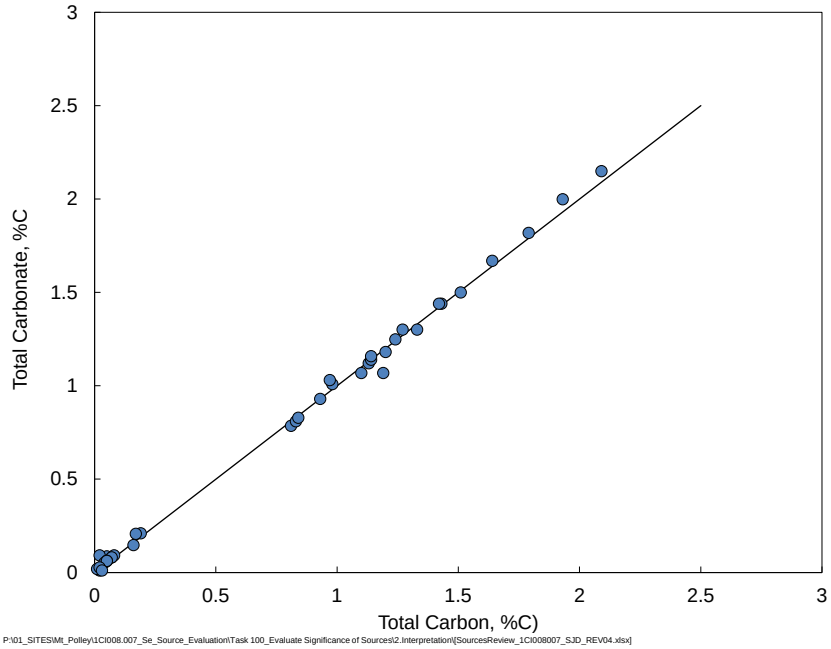


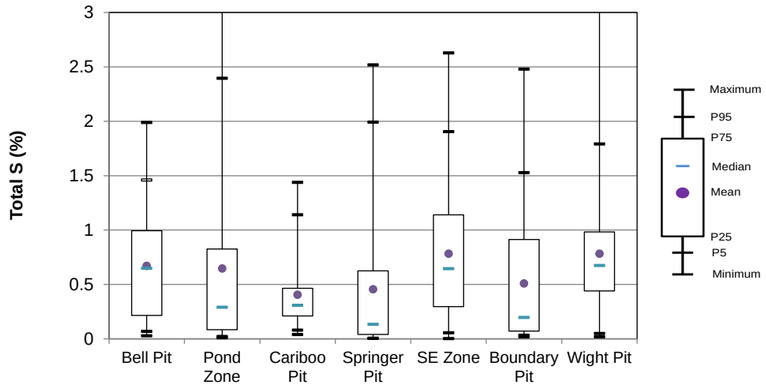
Figure 4. Comparison of Total Carbon and Total Carbonate. The Diagonal Line Shows Equivalence.

1.1.5.2 ARD Potential

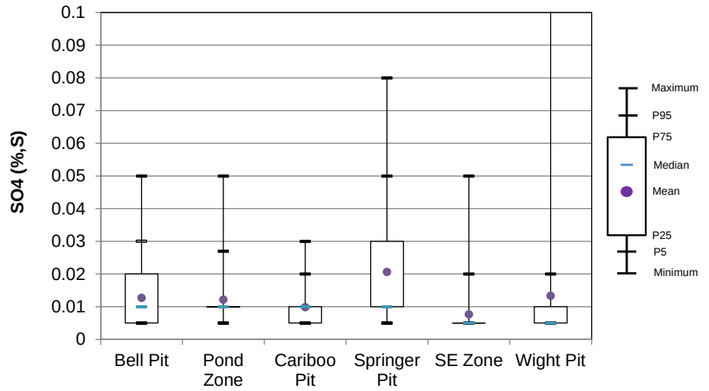
Figure 5 (top) shows the distribution of total sulphur and sulphate by zone. Sulphate concentrations are uniformly low (averages near the detection limit of 0.01%) with no apparent differences between zones. Total sulphur, which therefore provides an approximation of sulphide content, shows some differences by zone though there is also considerable overlap and higher end concentrations vary over a narrow range (95th percentiles 1.1% to 2.0%). The Southeast Zone and the Wight Pit have the highest mean sulphur concentrations at 0.78% whereas Cariboo Pit has the lowest at 0.47%.

Comparison of carbonate content with NP shows that, except for a few samples, NP exceeds carbonate. This reflects the digestion of silicates for the NP determination. The difference between NP and total inorganic carbon (TIC) varies by zone. The skarn mineralization of the Pond Zone shows the greatest NP relative to carbonate reflecting the presence of epidote that digests more readily in acid than feldspars which dominate in the other rock types. The Springer Pit, the Cariboo Pit and the Southeast Zone show the next greatest difference followed by the Wight Pit and the Bell Pit. The difference between NP and TIC at MPM led to the adoption of total carbon as a proxy for carbonate content rather than relying on NP. Comparison of AP and TIC shows that the Southeast Zone is dominantly PAG whereas the Wight Pit and the Cariboo Pit are dominantly NAG. Oher zones show characteristics overlapping the NAG and PAG.

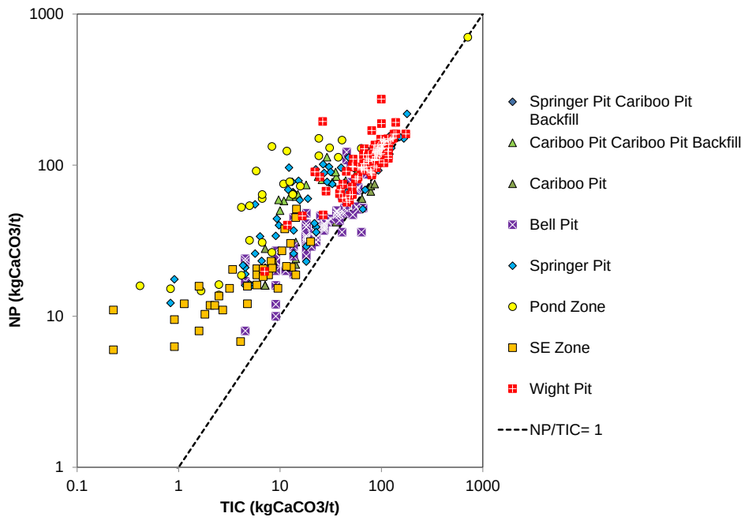
Figure 6 shows results of blast hole sampling for comparison. The complete dataset is provided in Appendix C. Bell Pit blast hole data are presented as part of the above descriptions because pre-mining ABA data were not available. The presence of PAG rock in all zones is apparent and resulted in segregation. This figure illustrates that for the most part PAG rock has higher sulphide content than NAG rock because NP is relatively consistent regardless of sulphide content.



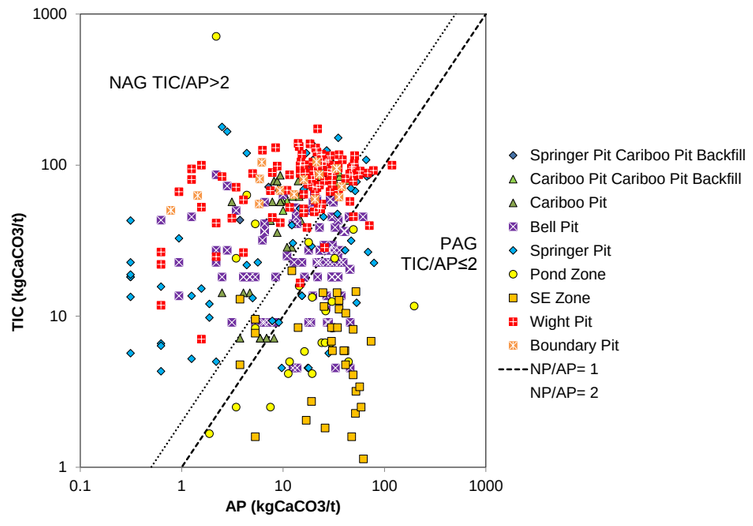
P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV05.xlsx]



P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV04.xlsx]

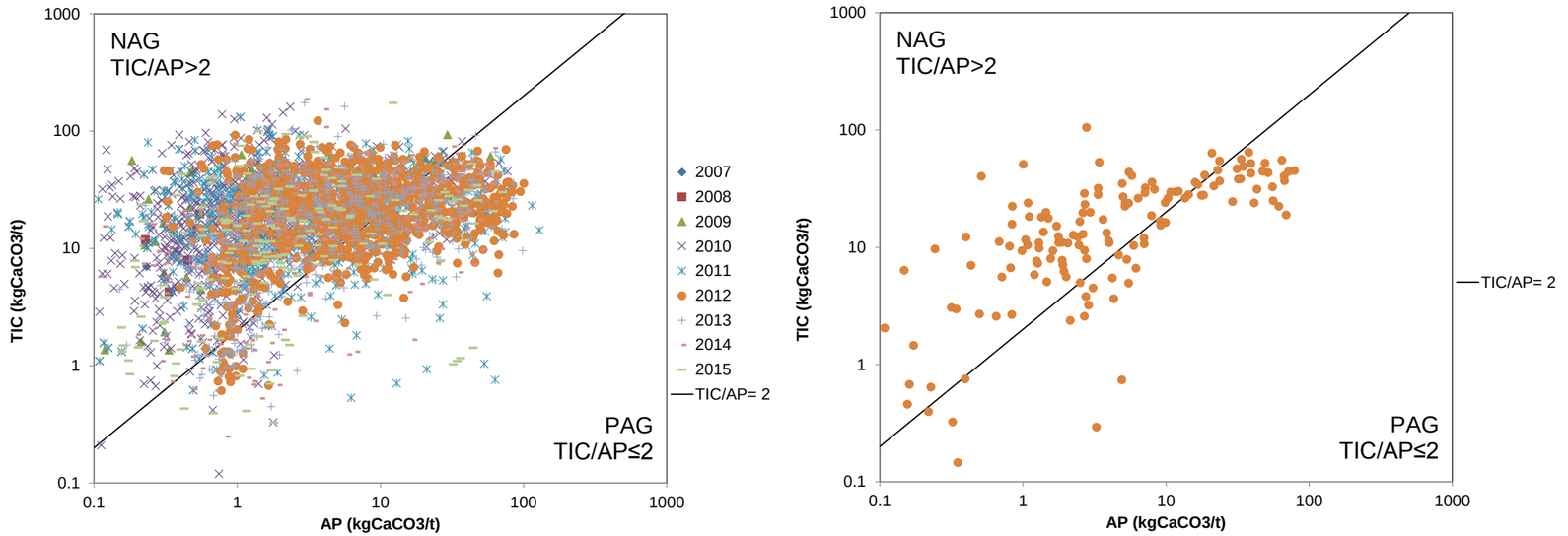


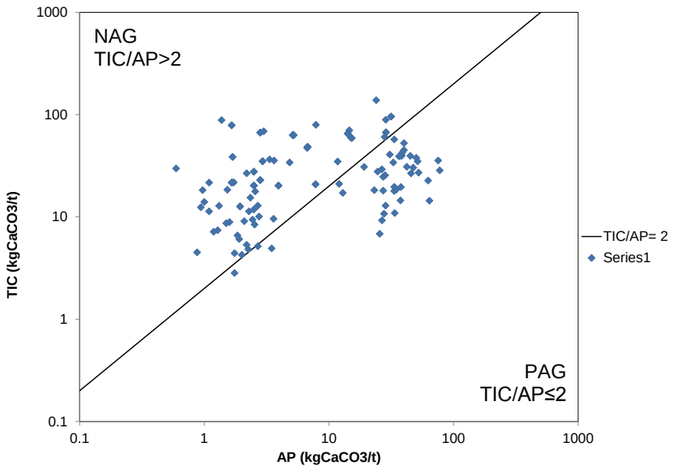
P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV04.xlsx]

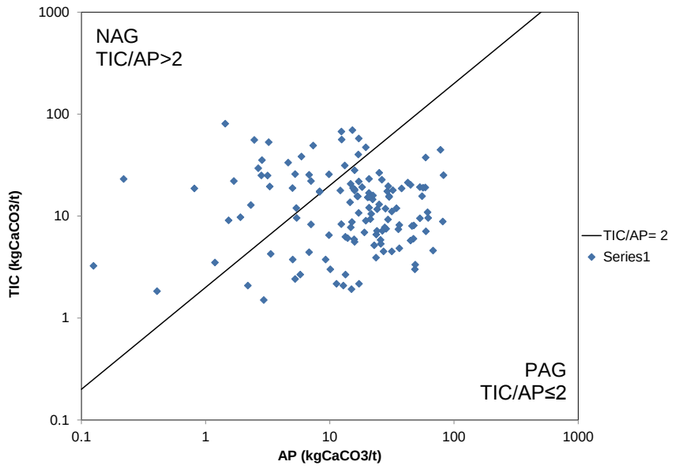


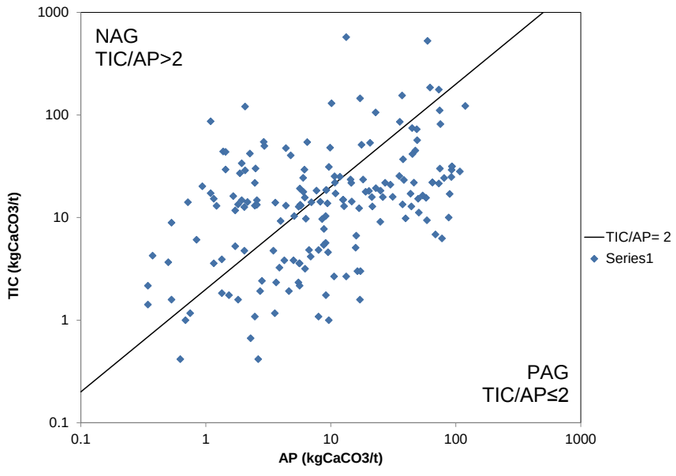
C:\Users\sday\Dropbox\Projects\Mount_Polley\SourceTermReport\[SourcesReview_1CI008007_SJD_REV05.xlsx]

Figure 5. Sulphur Forms (top), NP Compared to Carbonate (bottom left) and ARD Potential (bottom right) by Zone









Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV06.xlsx]

Figure 6. Blast Hole ABA Results for Springer (top left), Cariboo (top right), Boundary (bottom left), Southeast (bottom middle) and Pond Zones (bottom right)

1.1.5.3 Trace Element Content

When compared to global average for igneous rocks (Price 1997), some of the rocks at MPM have concentrations an order of magnitude higher for arsenic, copper, selenium, and mercury (Southeast Zone and Wight Pit) though median concentrations only slightly pass this threshold. Arsenic concentrations weakly correlate with sulphur, and copper correlates with selenium.

Within the site, selenium concentrations were elevated in the Cariboo Pit rocks and lowest at the Wight Pit (Figure 7). Selenium-to-sulphur ratios were examined because selenium is typically released by oxidation of sulphide and the ratios can be indicative of differences in selenium release. The ratio is notably higher for the Cariboo and Springer Pits, intermediate for the Bell Pit and lowest for the Southeast Zone and Wight Pits. The distributions imply spatial zoning of selenium relative to sulphide possibly with selenium enrichment associated with the more intensive alteration of BX1.

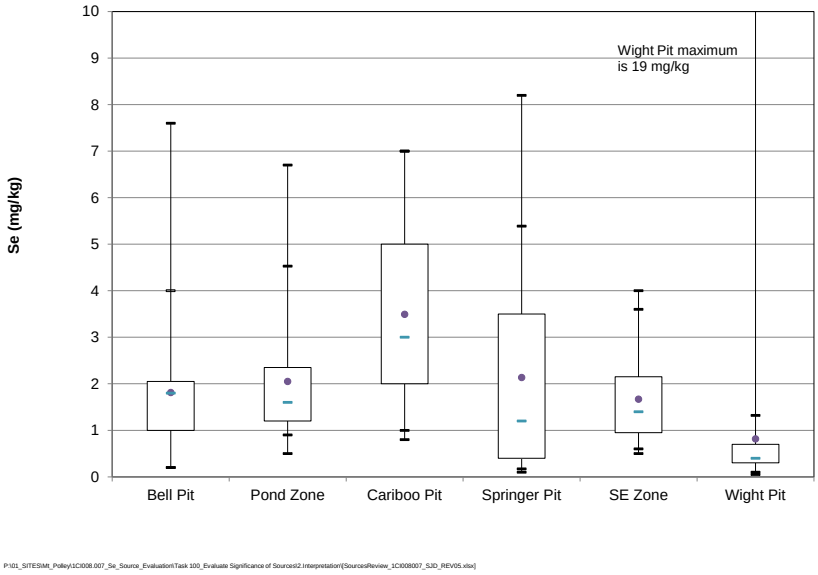


Figure 7. Box-and-Whisker Plots for Selenium and Selenium-to-Sulphur Ratios

1.1.5.4 Extraction Tests

Mines Act Permit M-200 required that “oxidized” samples be tested for solubility using the Shake Flask Extraction (SFE) method of Price (1998). The definition of oxidized was not provided in the verbiage of the permit. Nine samples of the -2 mm fraction of blasted rock were submitted for the procedure in 2001. Eight samples of ore stockpile rock were tested in 2015 as part of a *Mines Act* Permit M-200 requirement to evaluate closure requirements for the stockpiles (SRK 2015b).

Leachates from all extraction tests were non-acidic with leachate chemistry dominated by sulphate, alkalinity and calcium. The 2015 tests were more useful than the 2001 tests for understanding trace element leachability due to the use of lower detection limits and testing of stockpiled waste rock. A number of trace elements were not detected or yielded concentrations close to detection limits including cadmium (0.05 µg/L), chromium (0.5 µg/L), cobalt (0.1 µg/L), lead (0.1 µg/L), mercury (0.05 µg/L), nickel (0.5 µg/L) and zinc (10 µg/L). Average arsenic, copper, molybdenum and selenium concentrations were 4, 5, 29 and 15 µg/L, respectively.

1.1.5.5 Kinetic Testing

Laboratory kinetic (humidity cell) tests were performed on fifteen samples in support of geochemical characterization for permitting of mining of the Wight Pit (Northeast Zone), Southeast Zone, Boundary Zone, Pond Zone and expansion of the Springer Pit . Results have been reported annually as part of *Mines Act* Permit M-200 requirements. The samples were generally selected to evaluate oxidation rates for typical and elevated sulphide concentrations.

Samples from the Pond Zone were submitted for an acid-leaching procedure to remove carbonate and evaluate the reactivity of silicate minerals.

Table 3. Characteristics of Samples in Waste Rock Humidity Cells

HCT	Sample ID	Zone	Rock Type	Date Started	Date Stopped	Paste pH	TIC %C	Total S %	SO_4-S %S	AP kg $CaCO_3$/t	NP kg $CaCO_3$/t	NP/AP	TIC/AP	Ag ppm	As ppm	Ca %	Cd ppm	Co ppm	Cu ppm	Hg ppm	Mg %	Mn ppm	Mo ppm	Ni ppm	Pb ppm	Sb ppm	Se ppm	Zn ppm
HC2	31576	NE	PPp	7/21/2004	1/7/2013	8	0.79	1.4	<0.01	44	83	1.9	1.5	0.4	19	3	1.1	8.7	330	0.57	0.59	1400	13	1.2	38	0.3	0.7	170
HC3	32491	NE	Bx	7/21/2004	8/11/2008	8.3	1.1	0.45	<0.01	14	140	10	6.4	1.1	12	4.4	0.6	19	1700	0.39	1.3	1900	5.8	3.3	17	0.2	1	150
HC4	31943	NE	Bx	7/21/2004	8/11/2008	8.4	1.1	0.99	<0.01	31	130	4.1	2.9	1.2	10	4.2	0.9	20	1300	0.25	0.72	2000	7.6	4.2	21	0.3	1.4	170
HC5	32519	NE	PPp	7/21/2004	8/11/2008	8.6	0.62	0.54	<0.01	17	88	5.2	3.1	0.7	18	3.4	0.1	14	1700	0.19	1.2	1400	1.9	4.1	13	0.5	1.3	100
HC6	SE-05-17 Comp #1	SE	Monzonite	9/26/2005	1/7/2013	8.4	0.12	0.72	<0.01	23	21	0.91	0.43	0.3	17	0.87	<0.1	8.1	710	0.1	0.57	420	170	1.7	7.6	0.7	0.9	34
HC7	SE-05-30 Comp #1	SE	Monzonite	9/26/2005	1/7/2013	8.7	0.12	0.37	<0.01	12	40	3.5	0.85	<0.1	15	1.7	0.1	11	180	0.02	0.86	480	6.1	12	10	0.4	0.5	30
HC8	SE-07-66-72.5-75.13	SE		8/11/2008	1/7/2013	9.2	0.082	1	0.01	32	19	0.59	0.21	0.12	10	1.3	0.1	7.9	160	0.018	0.89	460	6	2.7	7.5	0.92	1.5	40
HC9	476111	Springer		8/11/2008	10/6/2009	7.9	0.011	0.04	0.01	0.94	18	19	0.97	0.34	11	1.7	0.42	21	710	0.077	1.3	1100	1.1	9.3	7.8	0.21	0.5	89
HC10	146677	Boundary		8/11/2008	10/6/2009	8.4	2	0.1	0.01	2.8	150	53	59	0.13	14	6.3	0.21	30	510	0.036	1.5	2800	1.4	12	7.8	0.64	0.7	110
HC11	146794	Boundary		8/11/2008	10/6/2009	8.4	1.4	0.15	0.01	4.4	160	35	27	0.17	17	4.7	0.37	23	250	0.12	1.2	2300	3	9.2	10	0.54	1.3	110
HC12	50033-1; Composite-4	Pond	MZ	4/20/2009	6/8/2009	6.6	<0.005	0.51	<0.01	16	8.4	0.53	<0.03	0.48	14	1.2	0.15	10	340	0.015	0.65	610	4.9	4.7	5.7	0.37	1.9	47
HC13	50033-1; Composite-5	Pond	DI	4/20/2009	ongoing	7.7	<0.005	0.19	<0.01	5.9	7.9	1.3	<0.08	0.25	12	0.89	0.11	8.8	250	0.01	0.59	520	3.5	4.1	6	0.4	1.2	49
HC14	465240; SD-07-23	Springer	BX	10/12/2009	1/7/2013	8.1	0.48	0.39	#N/A	12	96	7.9	3.3	0.62	34	2.6	0.98	14	720	0.4	0.95	1500	6	2.8	10	0.28	4.3	86
HC15	475695; SD-07-48	Springer	DI	10/12/2009	1/7/2013	8.1	0.27	2.5	#N/A	79	94	1.2	0.29	0.88	18	2.3	0.09	20	780	0.015	1	500	18	5	11	0.07	8.2	41
HC16	480684; SD-07-57	Springer	MZ	10/12/2009	1/7/2013	8.9	0.14	0.06	#N/A	1.9	69	37	6.4	0.52	13	2.2	0.43	14	360	0.14	0.67	730	3.5	2.4	10	0.16	0.5	92

Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\l080_Deliverables\2.SourceTermReport\Tables

One Pond Zone test is continuing. The other tests ran for 1 to 9 years. General findings were as follows:

- Except for the Pond Zone tests which were artificially depleted of carbonate, no other tests generated acid. Six samples were classified as PAG from ABA but carbonate content prevented acid generation for the duration of the test.
- Sulphate release was strongly correlated with sulphur content regardless of zone (Figure 8).
- There was a lack of correlation between trace element content and trace element release rates, and sulphide content and trace element content.
- Comparison of relative utilization of carbonate minerals to oxidation rates indicated that an NPR of 2 or lower is appropriate for classification of ARD potential.

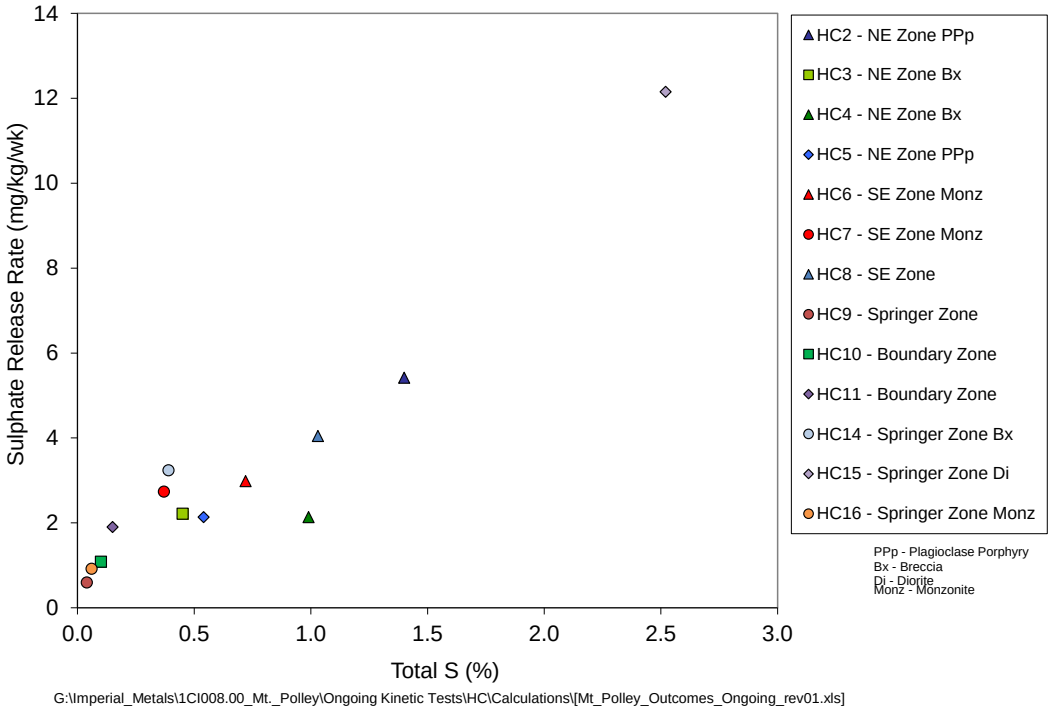


Figure 8. Correlation of Sulphur Content with Oxidation Rate

The strong relationship between sulphur content and oxidation rate yields the following predictive relationship for the onset of acidification (t_{onset}) in years at room temperature for waste rock with an initial (i.e., at time = 0) NP/AP of $\left(\frac{NP}{AP}\right)_0$:

$$t_{onset} = 70 \times \left(\frac{NP}{AP}\right)_0$$

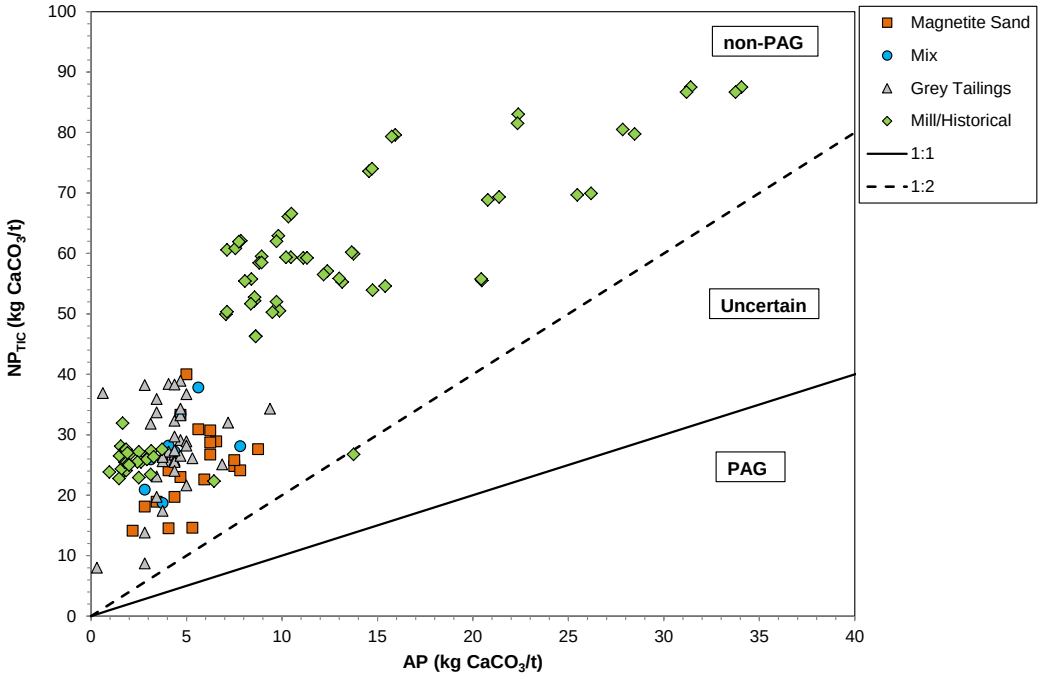
A previous assessment using earlier humidity cell data (Appendix D) yielded a coefficient for this equation of 60 years and a confidence range of 42 to 100 years.

The equation indicates that waste rock with an initial NP/AP of 1 would become acidic in 70 years at room temperature. The general finding from the kinetic testing is that acidification of PAG materials at MPM will take decades to develop. This is consistent with the widespread pH neutral weathering conditions at MPM in both natural and mined materials.

1.1.6 Tailings Geochemical Characteristics

1.1.6.1 Static Characteristics

SRK (2015) reviewed tailings geochemical characteristics as part of submissions following up on the tailings dam failure in August 2014 (Figure 9). The principal finding from this review was that the tailings are not PAG. Compared to crustal normal concentrations, copper and selenium were present in the tailings at order of magnitude higher concentrations. Copper is partially deported as silicate minerals. Selenium is associated with the sulphide component of the tailings and is also correlated with copper content. Kinetic testing on tailings samples has to-date confirmed they are non-acid generating. The tests are continuing.



Z:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\500_Reporting\Interpretations\Geochemistry\HzItn_Crk_2014\[MtPolley_HzItnCrk_2014_1CI008.003_REV01_CBK sjn.xlsx]

Figure 9. Static Geochemical Characteristics of Tailings (SRK 2015)

1.1.6.2 Kinetic Characteristics

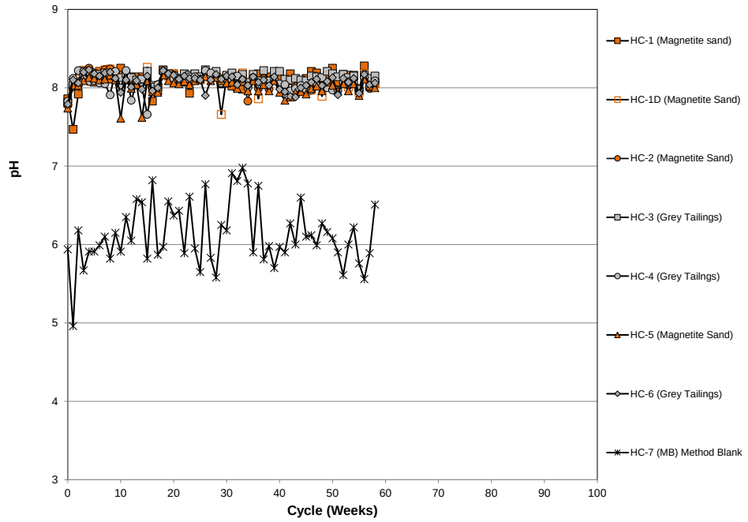
Six samples of tailings collected from Hazeltine Creek following the dam failure are being tested in humidity cells. Three of the samples are also being tested in columns using a trickle leach applied at less than 0.1 L/kg/week (compared to flood leach of 0.5 L/kg/week for humidity cells).

The samples were selected to represent visually distinctive tailings materials (magnetite sand and grey tailings). The samples are dominated by tailings solids but also contained native materials (mineral and organic soils, and glacial sediments entrained in the debris flow). The samples characterize weathering behaviour for a range of sulphur concentrations which align with typical characteristics of tailings in the impoundment.

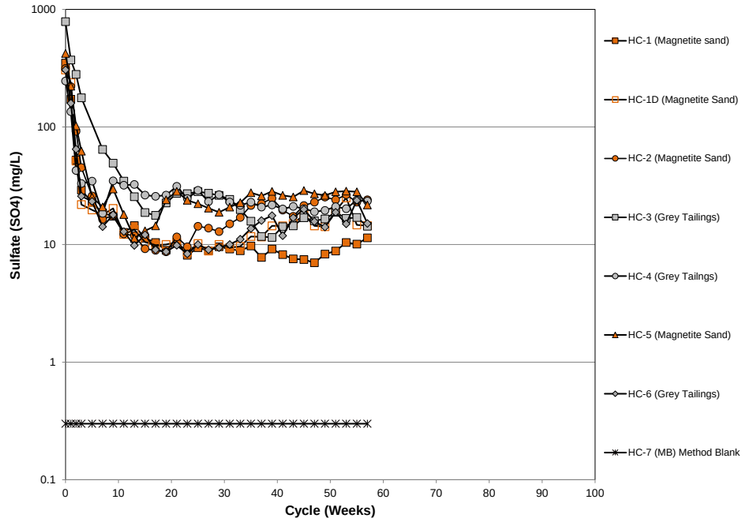
The humidity cell tests (HCTs) have been running for about one year while the columns have operated for about 35 weeks. All tests have yielded leachate pHs typically between 8.0 and 8.2. Sulphate concentrations were initially near 1000 mg/L for humidity cells and above 1000 mg/L for columns. Both types of tests showed decreasing sulphate concentrations which have stabilized at lower concentrations. Humidity cells have generally reached stable concentrations for humidity cells while column test leachates continue to stabilize for some parameters. For parameters considered enriched in the tailings solids (copper and selenium):

- Highest copper concentration in one HCT was 0.15 mg/L but typical maximum copper concentrations were 0.02 mg/L in HCT leachates and 0.05 mg/L in column test leachates.
- Highest selenium concentrations were 0.01 mg/L in HCT leachates and 0.06 mg/L in column test leachates.

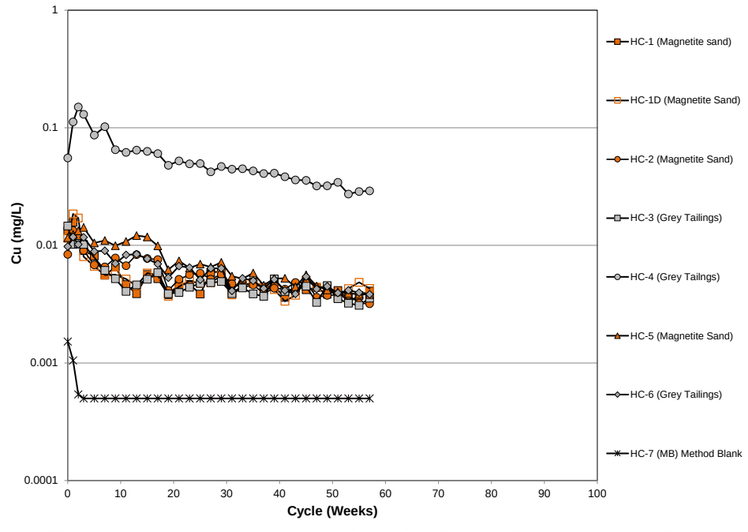
For other parameters, notable results were initial molybdenum concentrations between 2 and 3 mg/L in column leachates.



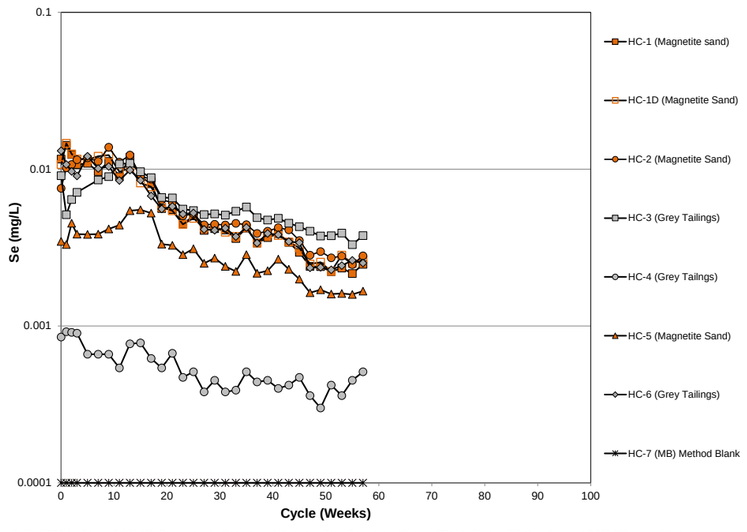
P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\HCTs\[Mt. Polley_HCT_Conc Charts _1CI008-003_rtc_rev00.xlsx]



P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\HCTs\[Mt. Polley_HCT_Conc Charts _1CI008-003_rtc_rev00.xlsx]

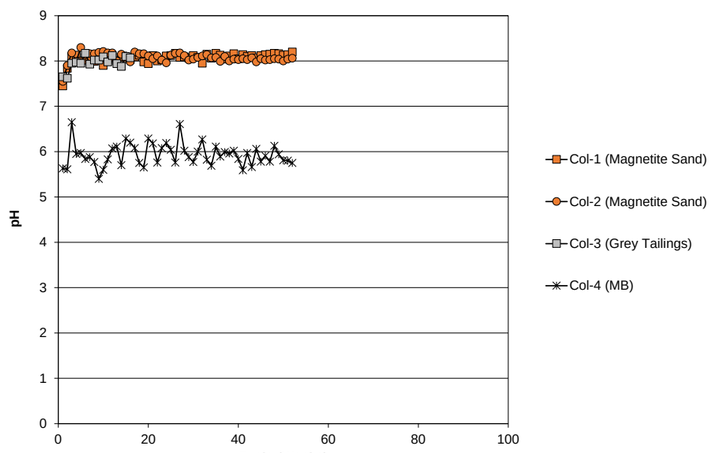


P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\HCTs\[Mt. Polley_HCT_Conc Charts _1CI008-003_rtc_rev00.xlsx]

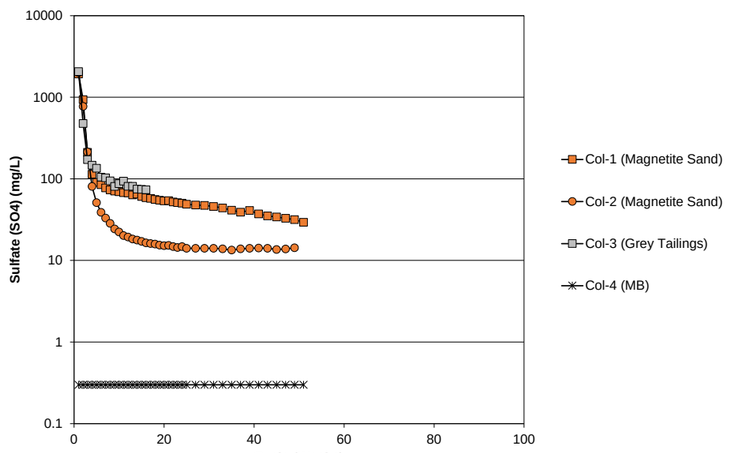


P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\HCTs\[Mt. Polley_HCT_Conc Charts _1CI008-003_rtc_rev00.xlsx]

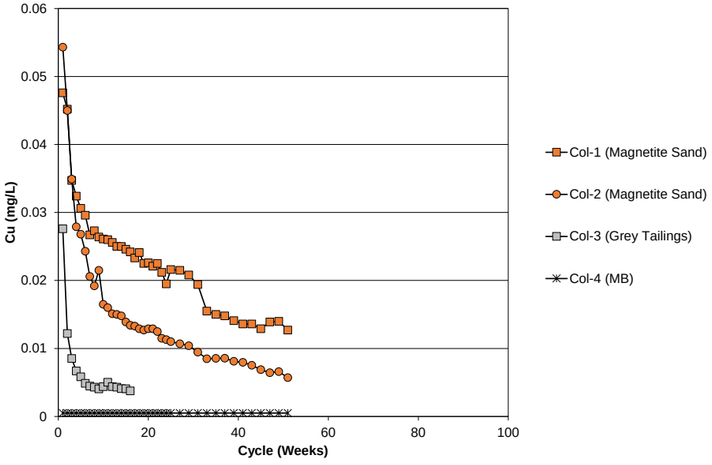
Figure 10. Selected Leachate Chemistry for Tailings Humidity Cells



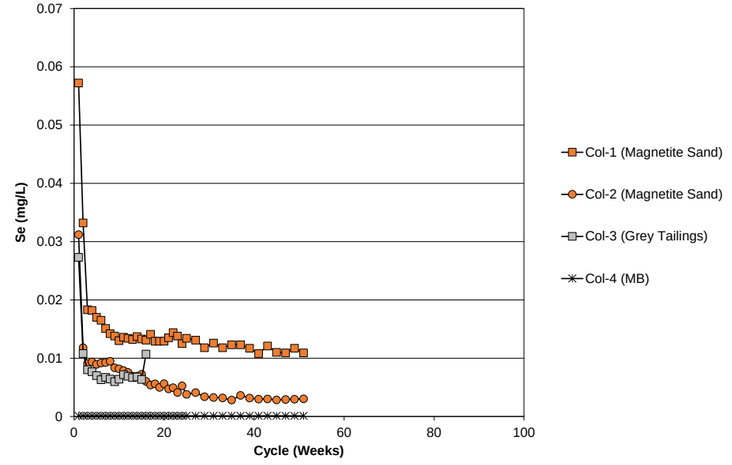
P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\COLs\[Mt. Polley_Col_Conc Charts_1CI008-003_rtc_rev01.xlsx]



P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\COLs\[Mt. Polley_Col_Conc Charts_1CI008-003_rtc_rev01.xlsx]



P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\COLs\[Mt. Polley_Col_Conc Charts_1CI008-003_rtc_rev01.xlsx]



P:\01_SITES\Mt_Polley\1CI008.003_Privileged_and_Confidential\410_Kinetic_Tests\Calculations+Charts\COLs\[Mt. Polley_Col_Conc Charts_1CI008-003_rtc_rev01.xlsx]

Figure 11. Selected Leachate Chemistry for Tailings Columns

1.1.7 Other Sources

Two other sources were identified as potentially requiring geochemical source terms.

Sulphur was imported in 2004 as part of evaluations of recovery of copper present as oxide. The stockpiles are located between the East Rock Dump and Ore Stockpile (Figure 3). Composition data for these stockpiles are not available but the stockpiles are expected to be composed of approaching 100% sulphur in elemental form. Neutralization potential is expected to be negligible and elemental sulphur generates acid through oxidation to sulphate.

Magnetite was recovered from MPM tailings to generate a concentrate for use as a dense medium in coal processing. The magnetite stockpiles are located adjacent to the ore processing plant. No geochemical data are available for the magnetite.

1.2 Scope

The scope of this work is to generate geochemical source terms that can be used as an input to operational and closure water quality models for MPM produced by Golder Associates Ltd. (Golder).

1.3 Acknowledgements

This work was performed by SRK using data collected and collated by MPM site personnel (primarily Katie McMahen, Colleen Hughes, Luke Moger, Ryan Brown and Art Frye).

2 Conceptual Geochemical Models

2.1 Purpose

The purpose of conceptual geochemical models (CGMs) is to describe the anticipated geochemical performance of each source at MPM which is then implemented as a numerical model to generate source terms. CGMs consider the current understanding of geochemical characteristics (as described in Sections 1.1.5 and 1.1.6).

2.2 Sources

The following sources were evaluated:

- NAG waste rock.
- Ex-Pit PAG waste rock.
- Ore stockpiles.
- Pit backfills.
- Pit walls.
- Ore processing.

- Tailings.

CGMs for each source are described below.

2.3 Ex-Pit NAG Waste Rock and Construction Fills

Ex-pit NAG waste rock is produced by operational segregation of waste rock into PAG and NAG components using an NP/AP of 2. NAG rock was primarily placed in ex-pit subaerial dumps but has and continues to be used for construction of fills at the TSF.

Nominally, NAG waste rock contains an excess of acid neutralizing minerals over acid generating sulphide minerals and will generate pH basic water for perpetuity. General weathering processes will include:

- Oxidation of sulphides (pyrite, chalcopyrite and bornite) to release iron, acidity, sulphate and trace elements contained in the sulphides. Copper is expected to be primarily released by oxidation of chalcopyrite and bornite.
- Weathering of silicates by dissolved carbon dioxide in infiltrating waters. This process results in release of alkali earth and alkali metals, silicon and bicarbonate. Copper (whether incorporated in the mineral structure at the ionic scale, or native, see Section 1.1.2) could conceivably be released from chlorite by this process but chlorite has relatively low susceptibility to weathering by meteoric waters compared to sulphides and carbonates.
- Neutralization of acidity by reaction with calcium carbonate minerals or mixing with alkaline waters resulting in basic pHs, and precipitation of metals as various secondary minerals, including gypsum, metal oxides and metal carbonates. From observation of natural weathering, copper may form malachite and chrysocolla and be sorbed with iron oxides.
- Dissolution of secondary minerals produced by weathering processes. The more soluble forms are expected to be copper oxides.
- Dissolution of rock components independent of acid generation and neutralization (for example, natural secondary minerals such as malachite and chrysocolla).
- Control of trace elements forming cations by lower mobility at high pH (e.g. copper).
- Higher mobility of trace elements forming anions at high pH (e.g. selenium, molybdenum, arsenic).

Due to the solubility control exerted by secondary minerals, contact water chemistry is expected to be constrained so that chemical loadings are directly proportional to infiltrating water volume. Therefore, loadings will tend to increase as footprint area increases rather than as total mass increases. The exceptions are parameters that do not readily form secondary minerals such as selenium which may therefore leach in proportion to the mass of waste rock.

Operationally, the NAG waste rock can be expected to contain PAG components due to inefficiencies in segregation. Potential for ARD or accelerated metal leaching due to the presence of PAG would be controlled partly by the mass balance of AP and NP, but also the extent of contiguous PAG rock placed in the waste rock dumps. If the PAG rock is well-distributed through

the dump, the potential for water quality effect is reduced. The absence of minerals hosting metals that remain somewhat mobile at carbonate-buffered pHs (such a cadmium and zinc) also limits the potential for water quality effects at MPM.

2.4 Ex-Pit PAG Waste Rock

Segregated and exposed ex-pit PAG waste rock is present in the Temporary NW PAG Stockpile located adjacent to the Springer Pit. The distinguishing feature of PAG rock at MPM is that it contains an excess of sulphide over carbonate minerals (in terms of ABA units) rather than being from a particular rock type. Sulphide content is higher than NAG waste rock.

Due to the higher sulphide content of PAG waste rock, the overall oxidation rate of PAG waste rock is expected to be greater than NAG waste rock. However, before acidification occurs, PAG and NAG weathering conditions are expected to be similar with secondary minerals exerting solubility controls. For example, the solubility of sulphate is expected to be controlled by gypsum which will be similar regardless of the sulphide oxidation rate. The source terms for NAG and PAG waste rock are not expected to be sufficiently different to warrant developing different terms.

Acidification is expected to take decades to progress with early contact waters remaining basic and having metal concentrations controlled by the solubility of secondary minerals.

As higher proportions of the rock acidify, the drainage can be expected to become acidic. Metal concentrations will increase as secondary minerals formed at higher pHs dissolve. In the longer term, metal concentrations will decrease due to depletion of acid soluble secondary minerals and reduction in the available sulphide.

The timeframe for acidification effects is expected to be of the order of decades (See Section 1.1.5.5) and therefore will be avoided by timely (i.e., at the end of the currently anticipated life of mine) re-handling back to the Springer-Cariboo Pit.

2.5 Ore Stockpiles

Ore stockpiles will perform the same as NAG and PAG waste rock depending on composition. The presence of more copper sulphides than waste rock will result in more leachable copper being generated but similar solubility controls are expected for the elements of interest.

2.6 Pit Backfill

Existing backfilled pits are the Bell Pit (completely full), the Southeast Zone Pit (completely full), the Pond Zone Pit (completely full), the Wight Pit (partially full), and Cariboo Pit (partially full). PAG rock from Temporary NW PAG Stockpile will be backfilled into the Springer-Cariboo Pit at completion of mining. Backfilling of currently filled pits occurred during operation so that run-of-mine waste rock was directed immediately to a backfill location. The water level has risen in most of these pits resulting in complete submergence of PAG rock and partial submergence of NAG rock. PAG rock in the Cariboo Pit and Wight Pit remains unsubmerged due to drawdown of the water table as operations continue in these pits.

Waste rock in backfilled pits will behave the same as waste rock in external waste rock dumps until it is submerged by rising pit waters after which oxidation will effectively occur very slowly due to low oxygen concentrations in the backfill. During submergence, flushing of weathering products formed while the rock is exposed will likely occur but concentrations will be constrained by the same secondary minerals formed under subaerial conditions. Pore water will equilibrate with the secondary minerals in the waste rock.

Leaching effects due to low oxygen conditions such as reductive dissolution of oxides is not likely to occur because reactive carbon needed to provide electrons for reducing processes does not occur in the rock.

2.7 Pit Walls

Exposed pit walls will remain in the Springer-Cariboo Pit, Wight Pit and Boundary Pit. All other pits have been backfilled resulting in pit wall reactive surfaces becoming part of the backfill.

Pit walls are composed of fractured walls and rubble resulting from over-blast and physical weathering. Localized wall failures will contribute additional talus. Reactive surface area for pit walls is contained primarily in the broken rock rather than fractured walls.

For source terms, pit walls are assumed to perform the same as waste rock dumps composed of PAG and NAG waste but flow paths are much shorter.

During flooding of pit walls, accumulated soluble weathering products will be flushed into pit walls. Following submergence, oxidation of walls will effectively be stopped due to reduction in availability of oxygen. Highwalls above final flood levels will continue to weather.

2.8 Ore Processing

Ore processing results in crushing and grinding of ore in contact water. Soluble components of the ore are dissolved and become part of the process water. Modification of process water chemistry may occur in the cleaner circuit where lime is added to increase pH. The change in pH may cause copper to precipitate.

The ore source term is expressed as mass leached per mass of ore. Except for the possible effects of pH adjustment described above, process water concentrations are expected to be too low to be controlled by secondary minerals.

The ore processing terms will depend on the degree of oxidation of the ore. Freshly blasted ore will contribute less load than ore re-handled from stockpiles, and deep fresh ore will contribute less load than near surface ore that has been naturally oxidized.

2.9 Tailings Solids

During operations, tailings are deposited by spigotting from the TSF embankments, resulting in tailings beaches and slimes migrating to the centre of TSF. Cycloned tailings were also used for dam construction.

Under normal operational conditions, slimes in the centre would be fully saturated and below the process pond. Due to the finger drains in the dam, the water table drops from surface at the edge of the pond in the centre of the facility to the finger drains. As a result, tailings near the embankments are partially saturated. Oxygen enters the unsaturated tailings in the beaches and embankments by diffusion resulting in near surface tailings oxidizing most rapidly and consuming oxygen. An oxygen concentration profile will be present in the tailings which decreases most rapidly near surface and eventually results in negligible oxygen concentrations at depth. It is probable that active oxidation at this stage extends no more than a few metres into the tailings.

Due to the acid-consuming characteristics of the tailings, the weathering environment is pH-basic and overall processes are comparable to NAG waste rock (Section 2.3). Pore water chemistry during operations is dominated by process water with less effect from weathering processes because tailings are continually deposited, resulting in re-setting of the oxidation profile.

Process water contains low levels of dissolved organic carbon from flotation process reagents (e.g., methyl isobutyl carbinol). These compounds may act as a source of reduced carbon to facilitate reductive dissolution processes in the saturated components of the tailings such as dissolution of iron oxides and release of contained trace elements. SRK (2015a) assessed this susceptibility and concluded the tailings were stable under chemically-reducing conditions.

Following the tailings dam failure in August 2014, the water table dropped, allowing more of the tailings to become unsaturated than under operational conditions. Draindown of pore waters will have occurred allowing oxidation processes to influence pore water chemistry.

Reactivation of the tailings pond will result in the water table rising again into the tailings. As the water table rises, oxidation products formed following partial draindown will be dissolved by process waters. Pore waters can therefore be expected to reflect a mixture of process water effects and flushing of oxidation products, though, due to the limited penetration of oxygen into the tailings, process water will dominate.

After operations cease, the process pond will decrease and the water table will again drop resulting in more tailings becoming unsaturated. Draindown of the tailings will result in a transition from process water dominated chemistry to oxidation effects becoming dominant. Eventual pore water chemistry will be controlled by equilibration of water chemistry with tailings weathering products which will include oxides and sulphates.

2.10 Sulphur Stockpile

Elemental sulphur (S^0) oxidizes to yield sulphuric acid through the following reaction:

$$S^0 + H_2O + 3/2O_2 \rightarrow H_2SO_4$$

Since the sulphur stockpile contains no neutralizing minerals, infiltration from the stockpile is expected to be acidic. Metal content of the pile is expected to be low relative to rock at the site resulting in acidic drainage carrying lower metal concentrations than would be expected for ARD. The foundation of the stockpile is NAG waste rock. It is expected that neutralization potential in the waste rock is neutralizing acid generated by the stockpile leading to non-acidic drainage with

chemistry comparable to weathering of waste rock. It is possible that depletion of neutralizing minerals in the NAG rock will result in the NAG rock becoming acid generating leading to a localized acidic plume in this area of the pile.

2.11 Magnetite Stockpiles

The magnetite stockpiles consist of sand-sized magnetite recovered magnetically from tailings. The separation process will have resulted in entrainment of non-magnetic components of the tailings.

Magnetite is resistant to oxidation under atmospheric conditions and therefore will not contribute significantly to the chemistry of drainage from the stockpiles. Drainage chemistry will be determined by the entrained minerals and will therefore be pH neutral having similar characteristics to NAG waste rock and tailings.

2.12 Nitrogen Leaching

Nitrogen leaching is covered separately from the foregoing conceptual models because it originates from explosives residuals rather than mineral weathering. Since the rock does not generate leachable nitrogen, the leaching of residuals provides a flush of nitrogen which occurs with water contact. It is expected that the load of nitrogen flushed is greatest initially then decaying in proportion to the remaining soluble nitrogen. The commonly used model of Ferguson and Leask (1988) assumes that all residual nitrogen is flushed in the year following placement of waste. This means that nitrogen leaching exactly tracks with waste rock placed and stops two years after placement stops. In fact, it can be expected that nitrogen leaching continues after the rock is first placed. In terms of cumulative leaching, a newly constructed waste rock dump would be expected to show increasing loads for several years then stable loads as the volume of rock added each year becomes small relative to the total volume. “Tailing off” at closure will occur. Delays and lag effects may be expected due to hydrological factors.

For a mature site such as MPM, active and long closed waste rock dumps indicate nitrogen release under operational and closed conditions. Sump waters from open pits indicate leaching from pit walls.

Leaching of explosive residual from ore will occur due to flushing in the milling process. Tailings solids themselves will not leach nitrogen because flushing during processing is very efficient. Nitrogen leaching from the TSF will reflect the influence of process water.

3 Source Terms

3.1 General Approach

MPM operations started in 1997, resulting in generation of waste rock and tailings. These full-scale waste facilities provide a more appropriate basis for predicting current and future water chemistry than scaling laboratory tests to full-scale conditions, provided that near source monitoring locations are available and appropriate allowance for local dilution effects at

monitoring locations are included. The general approach for MPM has been to use interpreted full scale monitoring data to develop source terms supplemented by laboratory data where needed. This approach removes most of the uncertainty related to predicting source term chemistry.

3.2 Incorporating Uncertainty

The CGMs described in Section 2 indicate that geochemical processes reflected in source terms consist of weathering of primary minerals, which is determined by rates of mineral conversions, and dissolution processes which combine rates and solubility constraints. The latter consists of the rate at which minerals dissolve and the eventual concentrations achieved when equilibrium with the contact water is reached. For example, chalcopyrite oxidizes at some rate to produce copper sulphate. The copper sulphate then dissolves at a rate adding copper and sulphate to the water until copper and sulphate concentrations in the water are in equilibrium with the solid copper sulphate.

As described in Section 3.1, the general methodology used to develop the source terms relies mainly on site monitoring data which reflects the end product of weathering and dissolution of weathering products. The assumption is that the monitoring data contain indications of the end-point solubility of the weathering products with the proviso that dilution needs to be considered. Higher end concentrations in the dataset are used as the starting point to develop source terms because these are most likely to be closest to a solubility limit. To represent uncertainty in the underlying solubility limits, the statistics from water chemistry databases used are the 95th and 99th percentile concentrations. Maximum concentrations are not used to eliminate the bias caused by spurious concentrations resulting from sampling and analytical errors. The two (2) high end percentiles are used because concentrations constrained by the solubility of minerals are not fixed but dependent on total solution chemistry including, particularly, pH.

Other approaches to incorporating uncertainty are described in the following sections.

3.3 NAG Waste Rock

3.3.1 Method

The method for the NAG waste rock source terms is as follows:

- Evaluate partitioning of reactive minerals during blasting.
- Evaluate potential for acidification due to included PAG rock.
- Evaluate seepage chemistry for geochemical controls.
- Prepare statistical summaries for seeps from major rock dumps.
- Scale-up maximum concentrations to account for dilution effects to yield source terms.

The basis for the latter step is that seepage chemistry may be diluted from true contact water and therefore needs to be scaled to remove dilution effects. Scaling was approached by assuming that gypsum is likely to exert a strong solubility control on major ion chemistry due to the interaction between oxidizing sulphides (yielding sulphate) and dissolving carbonates (yielding

calcium). It also has well-defined behaviour in which chemistry matches thermodynamic models, and is expected to be one of the most soluble secondary minerals in this setting. The high solubility indicates that it will likely be the last to reach equilibrium with contact water compared to other major primary minerals

Scaling is therefore achieved using the following equation:

$$[M]_{corrected} = \left(\frac{[SO_{4,Theoretical}]}{[SO_{4,Observed}]} \right) \cdot [M]_{observed}$$

$[SO_{4,theoretical}]$ is the maximum sulphate concentration indicated by the solubility of gypsum.

$[SO_{4,observed}]$ and $[M]_{observed}$ are the observed sulphate and element concentrations. $[M]_{corrected}$ is the scaled element concentration. $[SO_{4,observed}]$ values are the 95th and 99th percentile seep concentrations selected to be at the upper end of the distribution so that the need for correction is minimized.

$[SO_{4,theoretical}]$ depends on bulk chemistry being lowest for waters containing only calcium as the balancing cation. As other major ions (K, Mg and Na) increase in significance, $[SO_{4,theoretical}]$ increases. The ratio (Mg+K+Na)/Ca shows significant variation within MPM (Figure 12). The ratio is lowest for the Boundary Zone and highest for seeps from the two haul roads. For the purpose of determining a range of $[SO_{4,theoretical}]$s, the 50th and 95th percentiles for each dump group were used. The 50th percentile indicates median predicted sulphate whereas the 95th percentile is a conservative limit. The actual range of the ratio is fairly narrow. For the Boundary Zone, the resulting range is 1510 to 1540 mg/L whereas for the South East Dump the range is 1610 to 1670 mg/L.

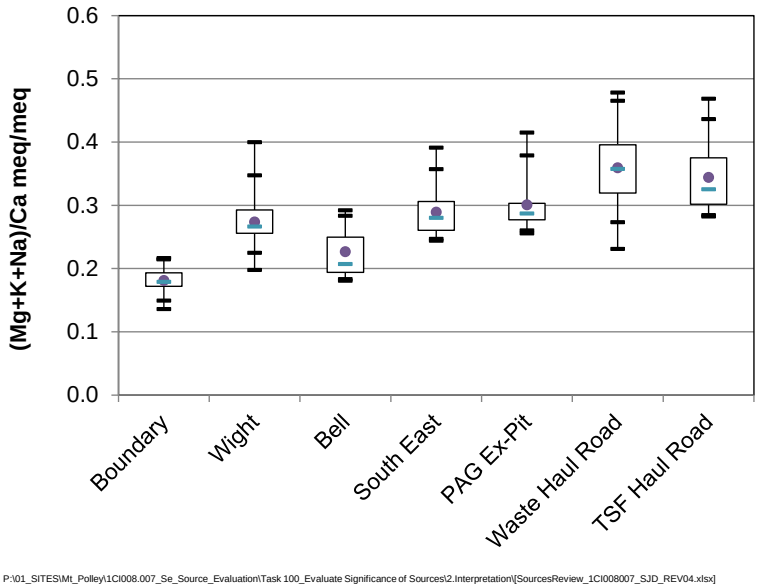


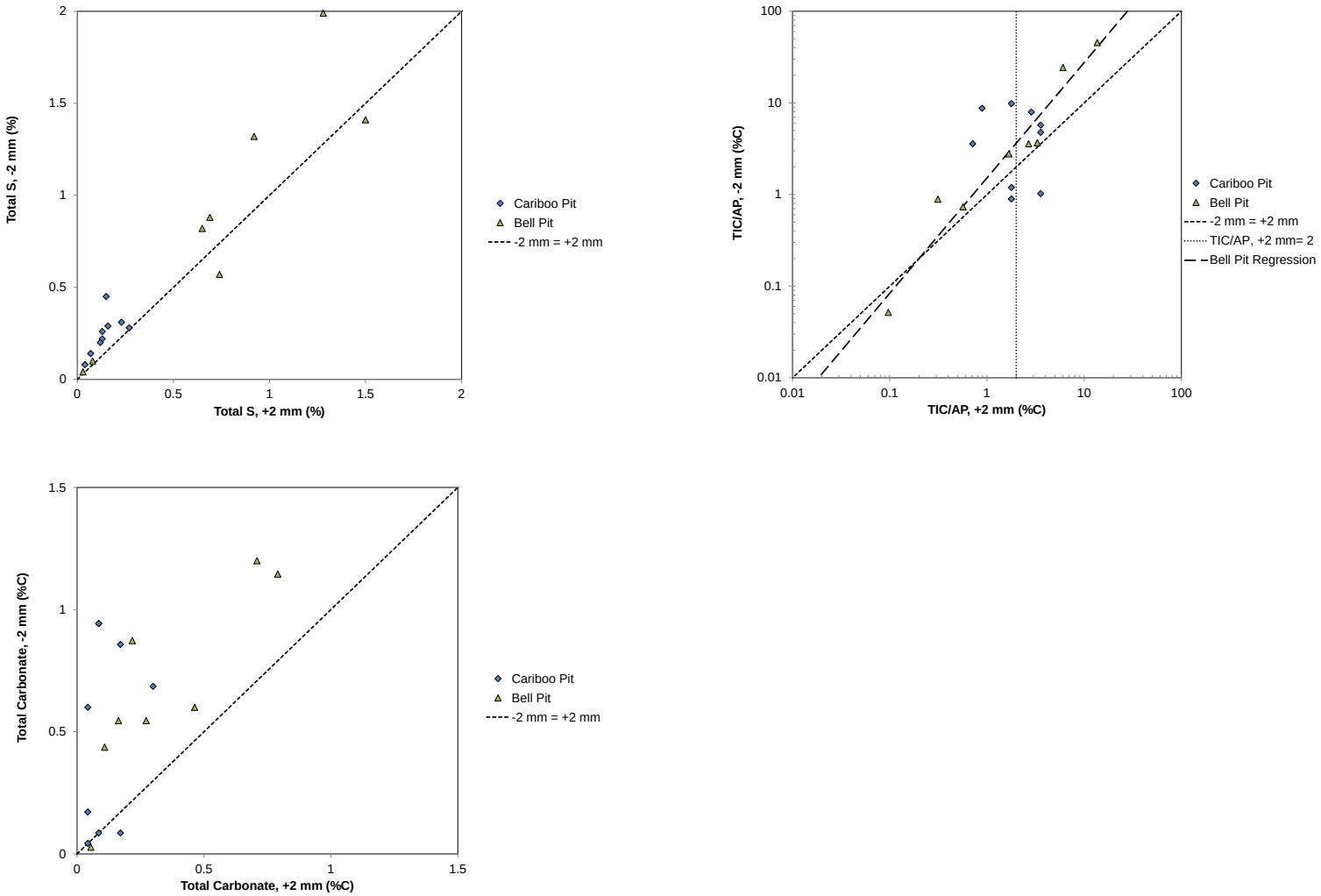
Figure 12. Box and Whisker Distributions for the Cation Ratio

3.3.2 Inputs

3.3.2.1 Mineral Partitioning During Blasting

Mineral partitioning during blasting was evaluated using blast hole cuttings because this can have an effect on the classification of waste for ARD potential (Day et al. 2015). If carbonate minerals preferentially partition into the blast fines, the use of a bulk NP/AP classification factor can lead to misclassification of rock that will probably not generate acid as PAG. The reverse can also occur if sulphide minerals preferentially classify to the fines.

In 2001, blast muck samples from the Bell and Cariboo Pits were collected and the +2 mm and -2 mm fractions were tested separately for acid-base accounts. The +2 mm provides an indication of “bulk” characteristics because it contains larger rock fragments.



Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[ABASizeFractionPartions.1CI008007_SJD_REV00.xlsx]

Figure 13. Results of Testing of Blast Rock Size Fractions

Both sulphur and carbonate preferentially partitioned into the -2 mm fraction but the effect was much stronger for carbonate (Figure 13). While there was good correlation between sulphur in the two size fractions, the correlation was absent for Cariboo Pit samples and weak for Bell Pit samples. The result of the difference in partitioning was that TIC/AP in the fine fractions was greater than in the +2 mm fractions for all but four samples. Again, for the Cariboo Pit there was no correlation between the fractions so the observed partitioning is qualitative only. For the Bell Pit, a regression equation could be derived:

$$\text{Log (TIC/AP, -2 mm)} = 1.3 \times \text{Log(TIC/AP, +2 mm)} + 0.18, r=0.97$$

The regression equation indicates that TIC/AP of 2.0 in the +2 mm fraction (i.e., approximately equivalent to bulk analysis determined in blast hole cuttings) is equivalent to 3.6 in the fines.

The equivalent regression equation:

$$\text{Log (TIC/AP, +2 mm)} = 0.75 \times \text{Log(TIC/AP, -2 mm)} - 0.10, r=0.97$$

shows that if it is assumed that the TIC/AP segregation criterion of 2 should be applied to the blast fines, the respective bulk criterion is 1.3. Based on the characteristics of NAG rock throughout MPM, about 22% of samples have TIC/AP between 1.3 and 2.

The findings of this assessment is that the classification of PAG using TIC/AP of 2 in blast hole cuttings has probably led to misclassification of some NAG rock as PAG. This finding was not used directly but primarily to confirm that under-classification of PAG rock (i.e., increased likelihood of PAG rock in NAG rock) is not a concern for MPM.

3.3.2.2 Potential for Acidification

The potential for acidification of NAG rock considers:

- the likelihood that misclassified PAG waste rock occurs as large segregated volumes (resulting in hotspots); and
- the mass balance ABA resulting from misclassified PAG rock.

From operating experience, MPM geological staff have determined that PAG rock is correlated with well-defined pyritic zones (see Section 1.1.2) but also occasionally as isolated pockets. The current main pyritic zone being exposed by mining is on the southeast wall of the Springer-Cariboo Pit. A similar zone was encountered in the Bell Pit and was managed appropriately by segregation and disposal in the Cariboo Pit. The Southeast Zone was classified entirely as PAG. The Wight Pit and Boundary Zone do not appear to have distinctive pyritic zones.

Sampling effort during operations focusses the defining dig limits around the pyritic zone in Cariboo-Springer Pit and a confirmatory-type approach outside the areas of known PAG occurrence. Due to the well-defined nature of the pyritic zones, the potential for PAG rock being included with NAG rock is largely expected to be due to isolated PAG occurrences outside the known pyritic zones. MPM target for sampling is one blast hole sample per 30,000 tonnes

meaning that a PAG quantity up to this amount could be missed if surrounded by NAG blast holes. An average PAG amount in this scenario would be 15,000 tonnes which on a 15 m bench would be a 20 m x 20 m area. At the scale of mining, a PAG area this size would become mixed with surrounding NAG rock as a result of digging and placement in a rock storage area.

The acid base balance for mixing of PAG and NAG rock is shown in Figure 14. The mixing lines were calculated using average characteristics for the whole site and are based on PAG defined as TIC/AP>2 in the bulk rock. The “Best” and “Worst” envelopes were derived by combining the 95% confidence limits on the means. The “Worst Case” is the upper confidence limits for AP combined with the lowest confidence limits on NP. The “Best Case” combines the reversed limits. The overall percent PAG accounted for at MPM is 11% of the total rock mass of which 9% is in the Temporary NW PAG Stockpile located next to Springer Pit for re-handle to Springer-Cariboo Pit at closure. The remaining 2% is stored elsewhere at the site in pit backfills. As there is a good understanding of the occurrence of PAG rock based on geological controls, it is expected that unaccounted for PAG rock is probably not more than a few percent, resulting in mass balance TIC/AP exceeding 3 and probably exceeding 4.

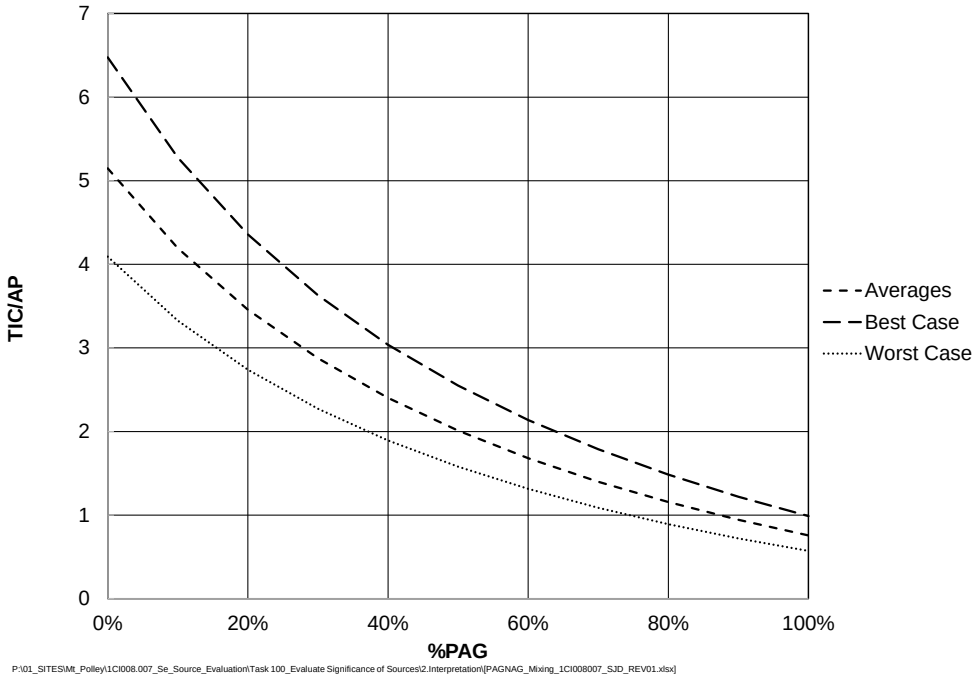


Figure 14. Acid-Base Account for PAG-NAG Mixing

Acidification of NAG waste rock at more than a very local scale is not expected because the percentage of PAG rock that could have been inadvertently included in the NAG waste risk is likely no more than a few percent. It was therefore concluded that NAG rock can be expected to remain permanently non-acidic and that long term changes in the NAG rock source term do not need to be considered.

3.3.2.3 Waste Rock Seepage Database

The seepage database (Appendix E) was interpreted to understand what mineralogical controls may be constraining water chemistry, determine if seasonal variations are apparent, and derive statistics for input into source term derivation.

As a general interpretation effort, relationships between rock composition and seepage chemistry were evaluated. However, except for the Wight Pit (East Rock Dump and Northeast Zone Dump) and Boundary Pit waste rock dumps, waste rock from all pits has been placed in several different locations limiting the opportunity to link rock composition to seepage chemistry.

Description of the Database

The current database contains 314 water analyses for seeps located as shown in Figure 15. Seeps have been sampled biannually since 2013. Filtering of samples occurs at the analytical laboratory unless hold times cannot be met. Samples are analysed for a full range of major and trace ions.

General Description of Water Chemistry

Water chemistry statistics grouped according to the areas indicated are provided in Table 4.

All seeps are non-acidic with medians above 7 and more typically nearer 8. The major anion is sulphate followed by bicarbonate (indicated by alkalinity) which is balanced mainly by calcium and magnesium. As discussed with reference to Figure 12, some differences in major ion chemistry were reflected in the cation ratio but differences in seepage chemistry were generally absent reflecting consistencies with the geological setting and placement of waste rock from the pits at multiple locations.

Selenium to sulphate ratios were examined for comparison with ratios in the rocks (Figure 7). Rock chemistry showed some distinctive variations in the ratio with typical ratios between 0.0001 and 0.001 mgSe/mgS. Likewise, the ratio was in the same range for seeps (Figure 16). Wight Pit extended to lower ratios in both the rock and seeps. It was concluded that selenium leaching is due to oxidation of sulphides and that leaching effects are similar throughout the site.

Nitrate concentrations varied significantly by source area (Figure 17). Distinctively higher concentrations were found for the Southeast Dump, the Temporary NW PAG Stockpile and TSF Haul Road. Lower concentrations were indicated for the North Bell Dump, Wight Pit Dumps (East Rock Dump and Northeast Zone Dump) and the small Boundary Dump. The differences are linked to placement activity with lowest concentrations for dumps less recently active.

Interpretation of Water Chemistry

Water chemistry was interpreted by using PHREEQC to calculate mineral saturation indices thereby providing an indication possible constraining minerals.

Saturations indices for sulphate were consistent with gypsum as a strong solubility control. At higher sulphate concentrations, gypsum saturation indices approached 0. Most seeps had

sulphate concentrations well below those required to be at gypsum indicating possible dilution effects, lack of gypsum, or incomplete equilibration. Regardless, the general observation is gypsum likely controls major ion (calcium and sulphate) chemistry with pH control by carbonate. Saturation indices greater than 0 for calcite were consistent with its dissolution and partial pressures for CO_2 were above -3.4.

Figure 15. Seep Sampling Locations

Table 4. Waste Rock Seepage Statistics

Statistic	Zone	pH -	Alkalinity mg/L	Cl mg/L	F mg/L	NO_3 mgN/L	NO_2 mg/L	SO_4 mg/L	Al-D mg/L	As-D mg/L	Cd-D mg/L	Ca-D mg/L	Co-D mg/L	Cu-D mg/L	Fe-D mg/L	Mg-D mg/L	Mn-D mg/L	Mo-D mg/L	Ni-D mg/L	Se-D mg/L	Zn-D mg/L
P95	Boundary	8.3	210	2.5	0.29	0.96	0.014	640	0.0093	0.002	0.000067	260	0.0011	0.0089	0.038	40	0.41	0.047	0.00025	0.0048	0.0037
	Wight	8.3	200	9.3	0.71	7.2	0.01	1200	0.056	0.00061	0.00031	370	0.0033	0.19	0.015	82	0.43	0.31	0.0048	0.19	0.034
	All Non-PAG	8.3	210	15	0.49	74	0.45	1200	0.029	0.0024	0.00016	420	0.0056	0.026	0.015	85	2.4	0.3	0.0021	0.29	0.007
	All PAG - Pre-Acid	8.2	330	14	0.29	50	2.1	1100	0.067	0.0018	0.00035	420	0.017	0.021	0.034	71	7.8	0.29	0.0017	0.24	0.008
P99	Boundary	8.3	220	2.5	0.3	0.99	0.021	650	0.024	0.0027	0.000073	260	0.0014	0.0094	0.038	40	0.48	0.054	0.00057	0.0064	0.004
	Wight	8.3	240	13	0.78	14	0.01	1300	0.061	0.00074	0.0006	400	0.008	0.3	0.015	90	1.1	0.42	0.0081	0.21	0.083
	All Non-PAG	8.4	240	21	0.68	130	5.5	1400	0.039	0.0032	0.00027	510	0.01	0.055	0.015	95	5.1	0.56	0.0032	0.41	0.0091
	All PAG - Pre-Acid	8.3	370	18	0.45	54	3.7	1100	0.28	0.0027	0.00044	430	0.024	0.024	0.034	76	8.9	0.48	0.0028	0.26	0.02

Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\080_Deliverables\2.SourceTermReport\Tables\[Tables_1CI008007_SJD_REV00.xlsx]

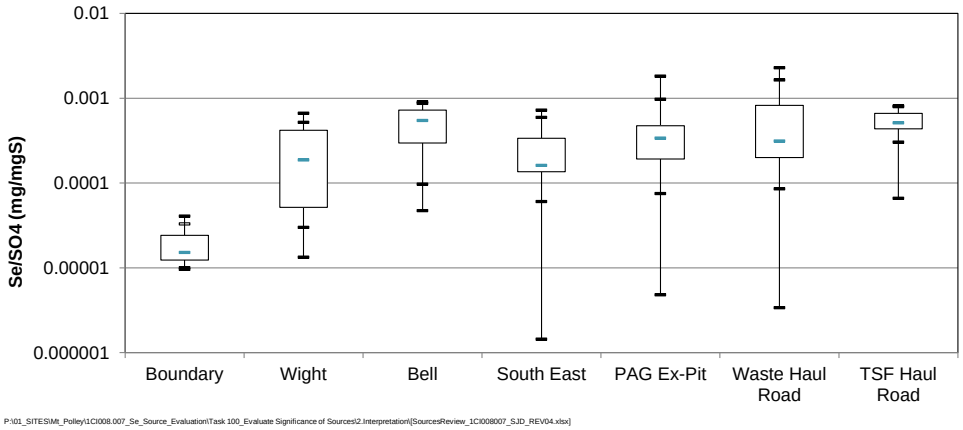


Figure 16. Se/SO_4 Ratios in Seepage

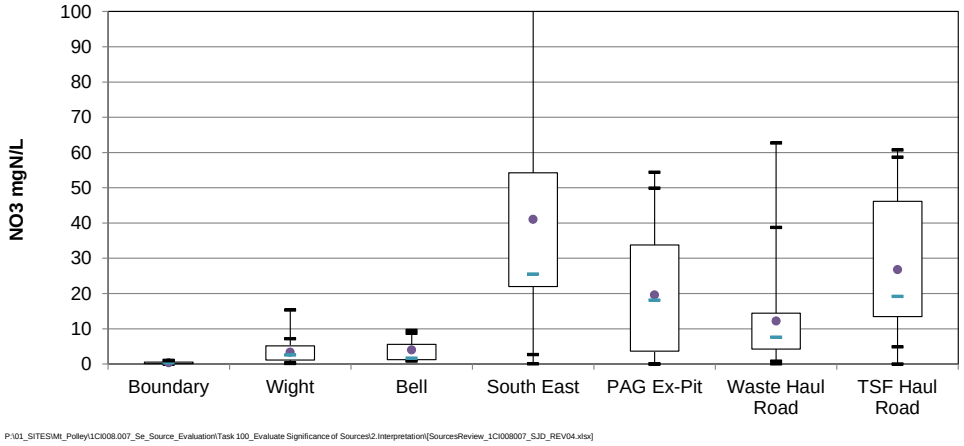
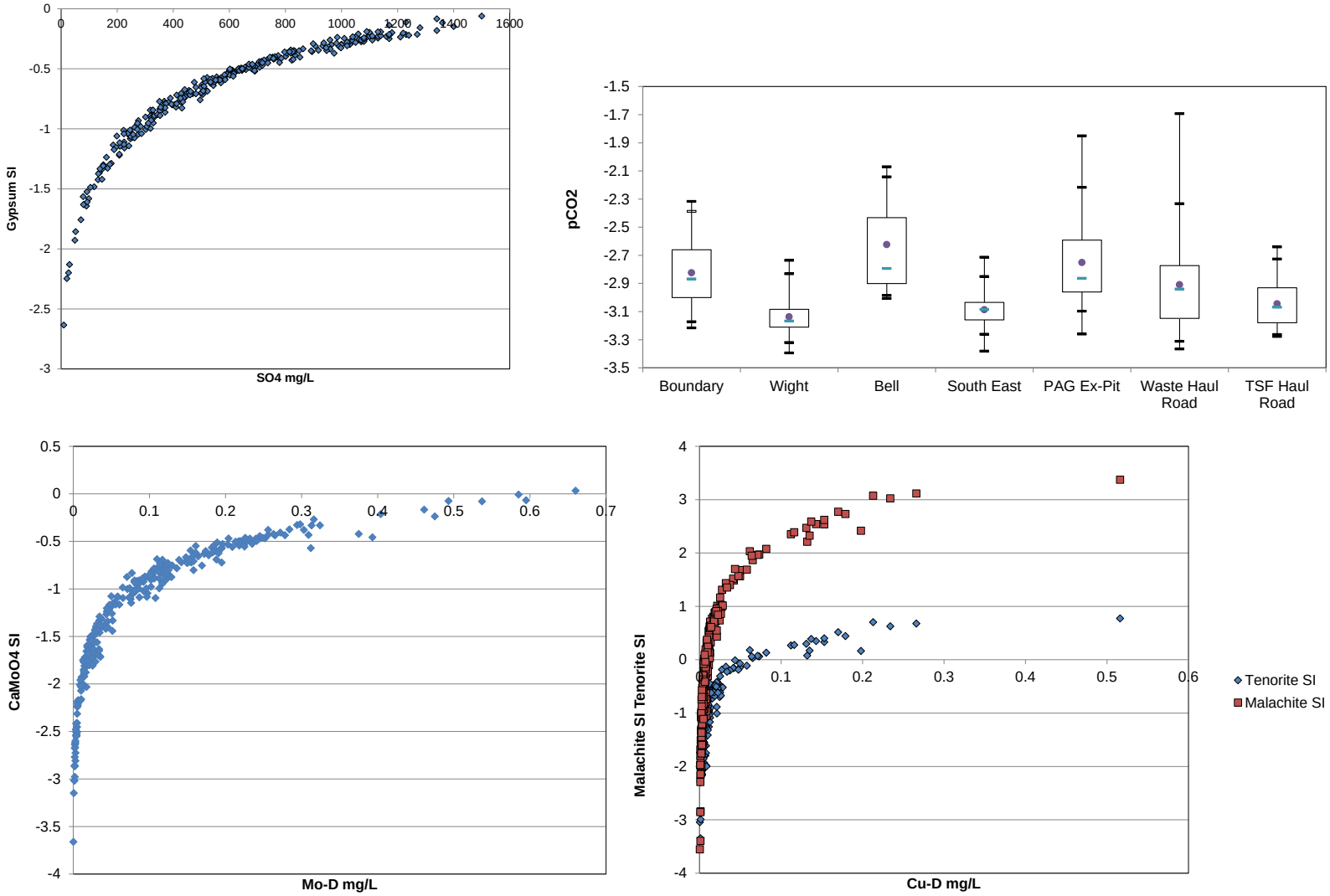


Figure 17. NO_3 in Seepage



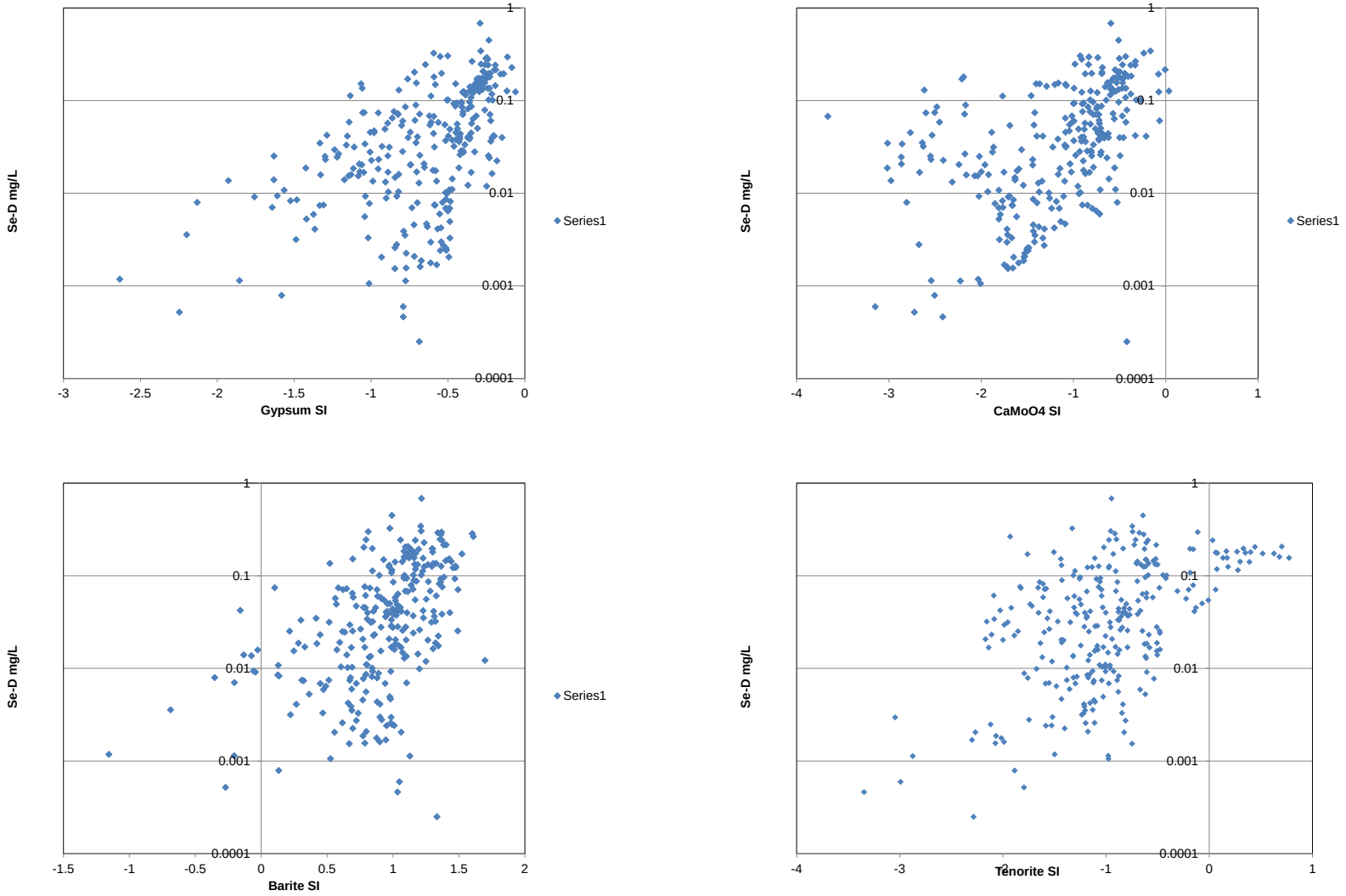
Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV06.xlsx]

Figure 18. Selected Saturation Indices

Saturation indices for malachite were well above 0 showing that copper concentrations were higher than would be predicted if malachite is controlling copper. Tenorite saturations indices were between 0 and 1 at higher copper concentrations indicating that it is more likely that a copper oxide is controlling copper concentrations. The finding that malachite does not appear to be controlling copper concentration is not consistent with the observed presence of malachite which formed by natural oxidation of the orebody. The likely controls on copper concentrations are secondary minerals resulting from oxidation of the waste rock following mining.

Other indications that higher end concentrations indicate mineral saturation included molybdenum which may be controlled by calcium molybdate (Figure 18) and barium by barite. Trace elements occurring at concentrations well below saturation in indices of 0 for their discrete minerals are probably adsorbed or co-precipitated with major secondary minerals (for example, iron oxyhydroxides).

Like the majority of trace elements, saturation indices for selenium minerals were well below 0, reflecting that discrete selenium minerals are not likely to be forming. Relationships between selenium concentrations and saturation indices for major ions that do appear to be controlling solution chemistry were examined (Figure 19). Upper limits to selenium concentrations were correlated with increasing saturation indices for gypsum and barite which may indicate co-precipitation with these minerals. The relationship with tenorite saturation indices showed that selenium concentrations appear to be constrained as copper concentrations were constrained. This may indicate that selenium is co-precipitating or adsorbing with an oxide or that the conditions resulting in copper oxide precipitation also result in selenium removal from solution. These interpretations do not provide a conclusive mechanism for constraining selenium concentrations but jointly show that higher selenium concentrations in the dataset are probably constrained. On this basis, seepage concentrations were used as the basis to calculate source terms.



Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV06.xlsx]

Figure 19. Relationships between Selenium Concentrations and Saturation Indices for Gypsum, $CaMoO_4$, Barite and Tenorite

Seasonal Variations

The seepage database was inspected for seasonal variations but none were identified. This may indicate that seepage chemistry does not respond to climatic variation or that the current size of the database does not allow seasonal effects to be resolved.

3.3.3 Results

Source terns for NAG waste rock are provided in Appendix F.

3.4 Ex-Pit PAG Waste Rock

Since ex-pit PAG waste rock will be re-handled to the Springer-Cariboo Pit at closure before acidification is predicted to occur, and the same solubility controls are expected as NAG, no separate PAG waste rock term was generated. The PAG waste rock term is that shown as “All-PAG Pre-acid shown in Table 4.

Acidification of PAG walls is discussed subsequently in Section 3.7.

3.5 Ore Stockpiles

Ore stockpiles are composed of rock with similar composition to waste rock with the exception of higher copper concentrations. Overall controls on water chemistry are expected to be similar to NAG waste rock and no separate term was developed. The effects of processing oxidized ore are considered separately in Section 3.8.

3.6 Pit Backfill

Exposed components of pit backfill are assigned the same source term as NAG waste rock. Following submergence, the same source term is assigned to the pore water chemistry assuming that pore waters equilibrate with the same previously formed secondary minerals. Over time, leaching of these minerals will result in decreasing concentrations; however, this process has not been quantified and it is conservatively assumed that constant pore water chemistry will be maintained in perpetuity.

3.7 Pit Walls

3.7.1 Method

Pit wall source terms prior to flooding consider the loading from weathering of rubble in exposed walls. Walls covered by waste rock backfill are not assigned a loading because the reactive surface area in waste rock far exceeds that in the rubble on pit walls.

The process of flushing walls by rising water levels was not considered because the relative volume water involved and flushing of pit walls weathering under non-acidic conditions will be small relative to ongoing flushing of exposed walls and flushing of backfilled waste rock.

Pit walls covered by water are also assumed to yield negligible loading because oxidation processes are effectively altered by a water cover. Ongoing leaching may occur (as described for waste rock backfill) but the volume involved is relatively small.

The load of parameter i released by weathering of rubble on pit benches (W_i) is calculated from:

$$W_i = M \cdot R_i \cdot k_O \cdot k_T \cdot k_p$$

R_i is the rate of release indicated by HCTs scaled to allow for oxygen availability (k_O), differences in temperature (k_T), and differences in reactive surface area (k_p) and applied to a mass M. Mass is calculated on a per m^2 planar wall basis, using rock density (ρ) and an assumed reacting thickness (h):

$$M = 1 \cdot h \cdot \rho$$

The load leached (L_i) is calculated from:

$$L_i = W_i \cdot k_c$$

k_c is a factor to account for incomplete leaching of weathering products.

The resulting concentration [M_i] in runoff from the wall area is obtained:

$$[M_i] = \frac{L_i}{I}$$

I is the infiltration over the area. Concentrations obtained for non-acidic walls are compared to those developed for NAG waste rock and constrained to the NAG waste rock if concentrations greater than for NAG waste rock are obtained. For PAG walls, concentrations were not constrained assuming that low pHs will result in high solubility of secondary minerals.

3.7.2 Inputs

R_is for non-acidic conditions were estimated from three humidity cells (HC14, HC15 and HC16) performed on Springer Pit rock (Table 3). The average of the three tests was used to estimate R. Scaling factors used for k_O, k_T, k_p and k_c respectively were 1, 0.3, 0.1, and 1, and assume that oxygen is not limited, temperatures are lower under site conditions, rock is coarser than humidity cells and weathering products are completely leached.

No naturally progressing humidity cells have yielded acidic leachate for MPM but rates obtained from HCTs on Pond Zone rock forced to generate acid by stripping of carbonate (HC12 and HC13, Table 3) were used to estimate an acidic source term. Since these samples were selected to evaluate oxidation rates following carbonate depletion for samples containing lower sulphide in the Pond Zone, the HCT weathering rates $R_{i,HCT}$ were scaled to sulphide concentrations in the acidic Springer Pit walls ($S_{i,Wall}$) using:

$$R_{i,acid} = R_{i,HCT}\left(\frac{S_{acid,wall}}{S_{HCT}}\right)$$

$S_{acid,wall}$ was estimated from the blast hole cuttings database from the Springer Pit. For each PAG sample in the database, the sulphur remaining following depletion of all NP was calculated from the measured sulphide content (S_0) and carbonate content ($NP_{TIC,0}$) and the rate ratio for depletion of carbonate (R_{ratio}):

$$S_{acid,wall} = S_0 - \left(\frac{NP_{TIC,0}}{R_{ratio} \cdot 31.25}\right)$$

R_{ratio} is equivalent to the PAG/NAG segregation criterion of 2. The 95th percentile of the resulting distribution of $S_{acid,wall}$ was calculated to be 1.7% compared to the 95th percentile of measured values of 2.1%. The resulting rates are shown in Table 5.

Table 5. Humidity Cell Rates (mg/kg/week) Used for Pit Wall Terms

HCT	Zone	Alkalinity	SO_4	Al	As	Cd	Ca	Co	Cu	Fe	Pb	Mg	Mn	Mo	Ni	Se	U	Zn
HC-12	Pond	0	27	0.062	0.0016	0.000073	2.5	0.0034	0.065	0.036	0.0001	0.48	0.17	0.00046	0.0013	0.0028	0.00005	0.053
HC-13	Pond	0	4.7	0.025	0.000044	0.000037	1.2	0.0057	0.099	0.0047	0.000014	0.22	0.13	0.000029	0.0012	0.0001	0.0000022	0.012
HC-14	Springer	18	3.2	0.022	0.00068	0.000029	7.2	0.000031	0.0024	0.018	0.000037	1	0.002	0.0067	0.000052	0.0064	0.000068	0.0014
HC-15	Springer	6.3	12	0.17	0.00013	0.0000048	7.2	0.00013	0.0061	0.063	0.00014	0.12	0.0028	0.0042	0.000054	0.00017	0.000035	0.0013
HC-16	Springer	13	0.92	0.068	0.00063	0.0000051	4	0.000013	0.00089	0.0039	0.000028	0.38	0.00034	0.0022	0.000046	0.00019	0.000032	0.001

Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV06.xlsx]

The weathering thickness (h) was set to 2 m to be equivalent to typical over-blast thickness. ρ was used as 2.65 t/m^3.

Total annual precipitation of 670 mm/year was used to estimate infiltration of 603 mm/year assuming that 90% of precipitation contacts wall rocks.

3.7.3 Results

Pit wall source terms of non-acidic and acidic walls are shown in Appendix G.

3.8 Ore Processing

3.8.1 Method

The mass leached from ore as it is processed was calculated from shake flask extraction test data. Concentrations in the shake flask tests (in mg/L) were converted to mass leached as (mg/t) by multiplying by factors of 3 L/kg which is the leach ratio in the test, and 1000 kg/t. The mass leached is used to determine the load added to the process water from each t of rock processed.

3.8.2 Inputs

Shake flask data from characterization of eight samples from four ore stockpiles were used (SRK 2015b). The data were used to calculate 5th, 50th and 95th percentile of the loads leached. Since the rock in the stockpiles varied in age from one to nine years, they were not representative of freshly blasted ore. To account for this, the 5th percentile was used to indicate leaching of freshly blasted ore and the 95th percentile was used for processing of the stockpiles.

3.8.3 Results

The resulting source terms are provided in Appendix I.

3.9 Tailings

3.9.1 Method

Tailings source terms were developed for operating conditions (i.e., when tailings are being discharged) and closure conditions when contact waters are assumed to represent oxidation of tailings following draindown of process waters. Re-flooding resulting from reactivation of the impoundment would result in seepage chemistry intermediate between these conditions.

For operational conditions, observed seepage chemistry from tailings dam drains (see Appendix H) was assumed to be representative of future tailings contact water. Seepage chemistry is assumed to reflect mainly the influence of entrained process water with less influence from oxidation of tailings. Since localized influence from groundwater and non-contact surface can be expected, the range of concentrations assumed was the 95th and 99th percentiles.

For closure conditions, the preferred approach was to obtain direct chemistry from contact waters in the current unsaturated zone because these would likely represent the conditions when the

tailings are fully drained down. Site personnel identified two groundwater monitoring locations (Breach-1 and Upstream-1) which were felt to possibly represent the influence of tailings; however, sulphate concentrations were not different from the tailings dam drains, and higher end dissolved element concentrations were strongly influenced by suspended matter (for example, aluminum concentrations on filtered samples ranged up to 33 mg/L). It was therefore not known with confidence whether the data indicated contact water chemistry.

Interpretation of leach column data (see below) indicated that early chemistry provide a good indication of contact water chemistry reflecting the influence of oxidation processes. The following method was used to estimate contact water chemistry for drained down tailings:

- The 95th and 99th percentile concentrations of column data were calculated.
- For the majority of parameters, drain down chemistry was characterized by the column data percentiles.
- For selenium, interpretation of the column data resulted in the conclusion that attenuation of selenium may be occurring in the early stages of testing as a result of reductive process converting selenate to selenite. To address this possible effect, selenium concentrations were calculated using the sulphate statistics and the range of Se/SO_4 ratios indicated by later data:

$$[Se] = \left(\frac{Se}{SO_4} \right)_{ratio} \times [SO_4] .$$

- The equivalent dam drain percentile was used for ammonia because it was not measured in column leachates.
- Manganese concentrations were markedly lower in column leachates compared to seepage. This difference may reflect that conditions in desaturated tailings favour lower mobility of manganese, but the seepage data were selected.

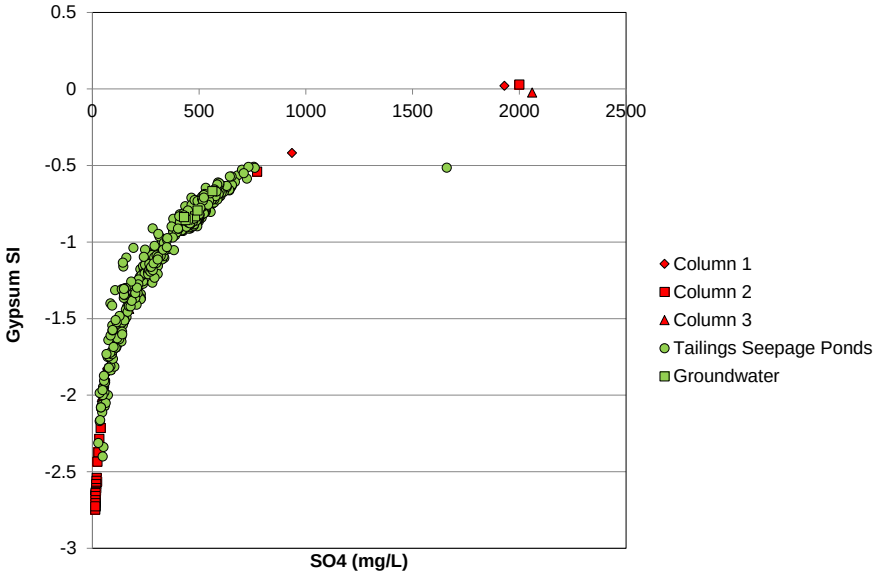
3.9.2 Inputs

Seepage data statistics were calculated for all seepage collection points collected between 1998 and 2015.

Seepage and column data were evaluated for solubility controls using the same approach as waste rock (see Section 3.3.2.3). Sulphate concentrations in all column data were close to 2000 mg/L and found to yield gypsum saturation indices near 0, and therefore consistent with solubility control by gypsum. Seepage saturation indices tended to be well below 0. Other parameters showing possible secondary mineral controls were copper (tenorite), molybdenum (calcium molybdate), and barium (barium sulphate). Based on similar reasoning as waste rock, the early column data appear to indicate secondary mineral solubility controls for these elements and provide a good indication of the solubility of other elements.

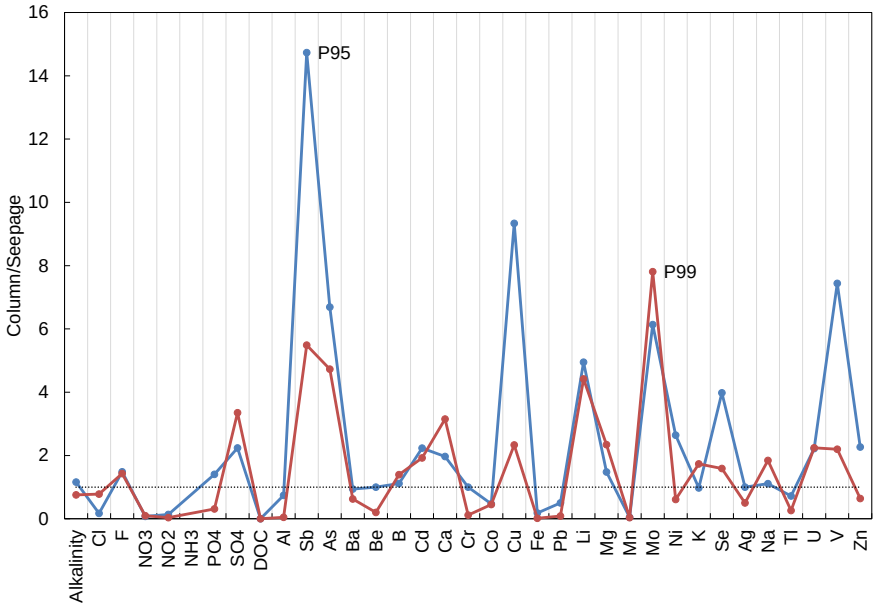
Figure 21 shows the ratio of Column to Seepage for the two statistics. The columns showed higher concentrations than seepage for most parameters including those linked to acid generation and neutralization processes (SO_4, Ca, Mg) and related heavy elements (Cu, As, Mo, Sb, Se).

Those lower in column data include nitrogen forms (which would be introduced by leaching in the process plant), and Al, Mn and Fe. Manganese and iron may be higher in seepage due to reducing conditions in drains but also may be influenced by colloidal matter. The latter may also explain why aluminum concentrations were higher in seepage compared to the column tests, and exceeded theoretical solubility of aluminum hydroxides (Figure 22).



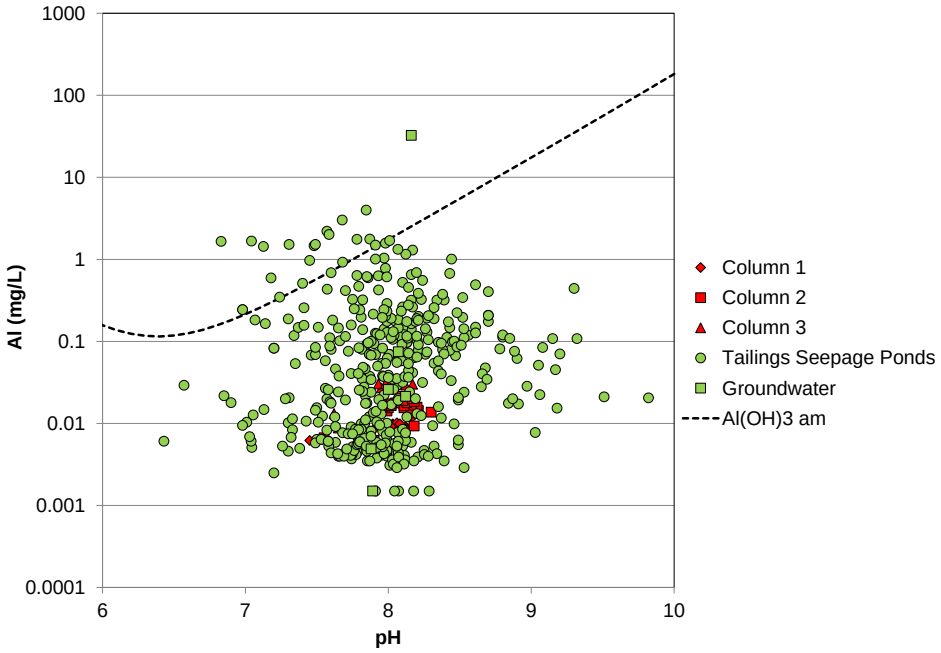
Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[TailingsReview_1CI008007_SJD_REV07.xlsx]

Figure 20. Gypsum Saturation Indices for Tailings Seepage and Column Data



Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[TailingsReview_1CI008007_SJD_REV07.xlsx]

Figure 21. Comparison of P95 and P99 Statistics for Ratio of Column/Seepage



Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[TailingsReview_1CI008007_SJD_REV07.xlsx]

Figure 22. Tailings Aluminum Concentrations on Log Scale Compared to pH. Ideal Solubility of Amorphous Aluminum Hydroxide is Shown

3.9.3 Results

Tailings source terms are provided in Appendix I.

3.10 Sulphur Stockpile

No separate source term was developed for the spatially limited sulphur stockpile. As indicated in the conceptual model, it is likely that the stockpile is leaching sulphuric acid. It is assumed that the leaching effect of the stockpile is reflected in other site seeps and is therefore reflected in the NAG waste rock source terms.

3.11 Magnetite Stockpiles

No separate source term was developed for the magnetite stockpiles. Relative to other sources, these stockpiles are not expected to be significant sources.

3.12 Nitrogen Leaching

Nitrogen leaching was included for each source term as follows:

- Waste Rock. Nitrogen sources terms were developed from existing seepage by grouping waste rock dumps into active (PAG Ex-Pit and Southeast Dump), and inactive (Bell Pit and Wight Pit). For each group, mean concentrations and 95% confidence limits on the means were calculated to consider uncertainty (Table 6).

- Pit Walls. Pit walls were assumed to have zero contribution due to the small mass involved and expected results of meteoric leaching which is expected to result in any leaching effects having short duration and being insignificant relative to waste rock reporting to pit water sumps. B. Mattson, Lorax (pers. comm.), indicated that a non-zero source term should be applied but supporting data were not available.
- Backfill. Backfill source terms are the same as those for waste rock (Table 6).
- Ore Processing. Leaching of nitrogen forms by processing were based on the shake flask extraction data (Appendix I).
- Tailings. Tailings source terms are based on the observed seepage for operational conditions and column data for draindown conditions (Appendix I).

Table 6. Waste Rock Nitrogen Source Terms

Phase	Statistic	Ammonia mgN/L	Nitrate mgN/L	Nitrite mgN/L
Inactive	Lower 95% Confidence Limit	0	1.7	0
	Mean	0.053	3.4	0.51
	Upper 95% Confidence Limit	0.18	5.2	1.9
Active	Lower 95% Confidence Limit	0.034	11	0
	Mean	0.15	28	0.29
	Upper 95% Confidence Limit	0.27	45	0.61

Source: P:\01_SITES\Mt_Polley\1CI008.007_Se_Source_Evaluation\Task 100_Evaluate Significance of Sources\2.Interpretation\[SourcesReview_1CI008007_SJD_REV06.xlsx]

4 Conclusions

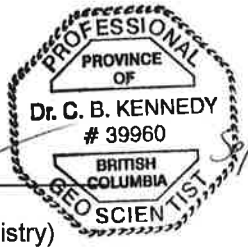
This report presents source term geochemical predictions that are inputs into the site wide water quality model. The main conclusions that provided input into the source terms are:

- While several ore zones at MPM have been mined since 1997, all except the relatively small Pond Zone are alkalic porphyry mineralization centred on magmatic-hydrothermal breccia bodies with similar geological characteristics. The host rock for the mineralization is the MPIC which is mainly monzonite. The similarities of the mineralized zones, including their host rocks, indicate that source terms can appropriately be developed on a site-wide basis rather than considering significant differences between the zones.
- As a result of geochemical segregation of waste rock based on ARD potential through the mine life, PAG waste rock has been or will be placed in open pits where it will be permanently flooded thereby preventing ARD from developing.
- It is expected that operational inefficiencies will have resulted in PAG waste being incorporated into the NAG waste rock but the segregation approach was conservative and mass balance excess of acid neutralizing minerals over acid generating minerals means that future development of ARD is very unlikely. Weathering conditions are predicted to be pH-basic in perpetuity.
- Tailings are non-PAG.
- As a result of the pH-basic weathering conditions, chemistry of seepage from the existing full scale facilities reflects solubility limits for weathering minerals. Chemistry is affected by dilution which was corrected using the solubility limit of gypsum.

This report, Derivation of Geochemical Source Terms, Mount Polley Mine, was prepared by

Stephen Day, MSc, PGeo
Corporate Consultant (Geochemistry)

and reviewed by



September 28, 2016

Chris Kennedy, PhD, PGeo
Principal Consultant (Geochemistry)

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Disclaimer—SRK Consulting (Canada) Inc. has prepared this document for Mount Polley Mining Corporation. Any use or decisions by which a third party makes of this document are the responsibility of such third parties. In no circumstance does SRK accept any consequential liability arising from commercial decisions or actions resulting from the use of this report by a third party.

The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

5 References

Day, S., Forsyth, B. and Desjardins, M. 2015. Influence of Size-Fraction Partitioning of Sulphide and Carbonate Minerals in Blasted Rock on ARD Potential Classification, Copper Mountain Mine. Proceedings of 22nd Annual British Columbia-MEND ML/ARD Workshop, December 2 and 3, 2015, Vancouver, BC.

Ferguson, K.D. and Leask, S.M. 1988. The Export of Nutrients from Surface Coal Mines. Regional Program Report 87-11. Environment Canada.

Henry, C. 2009. Semi-Industrial Scale Testing of Biologically-Induced Copper Heap Leaching at Imperial Metals Corporation – Mount Polley Mine. MSc Thesis in Natural Resources and Environmental Studies (Environmental Science), University of Northern British Columbia, December 2009.

Price, W. 1997. Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia. Reclamation Section, British Columbia Ministry of Energy and Mines. April 1997.

Rees, C. 2013. The Mount Polley Cu-Au Porphyry Deposit, south-central British Columbia, Canada; in Porphyry Systems of Central and Southern BC: Tour of Central BC Porphyry Deposits from Prince George to Princeton; edited by Logan, J., and Schroeter, T.; Guidebook Series of the Society of Economic Geologists, Inc., Guidebook 44, pages 67-98.

SRK Consulting. 2015a. Mount Polley Mine Tailings Dam Failure: Geochemical Characterization of Spilled Tailings. Report prepared for Mount Polley Mining Corporation. SRK Project 1CI008.003. June 2015.

SRK Consulting. 2015b. Mount Polley Mine Geochemical Characterization of Ore Stockpiles. Report prepared for Mount Polley Mining Corporation. SRK Project 1CI008.005. October 2015.

Suárez, S., Nieto, F., and Velasco, F.. 2009. Copper Inclusions in Chlorite from the Aguablanca Ni-Cu-PGE Sulfide Deposit (SW Spain). Macla 11, p. 173-174

Appendix A – ML/ARD Management Procedure Manual

MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS CORPORATION

ML/ARD MANAGEMENT PROCEDURE MANUAL

OBJECTIVE

The objective of this Metal Leaching/Acid Rock Drainage (ML/ARD) Management Procedure Manual is to provide detail on how ML/ARD potential is considered in material management at the Mount Polley Mine (MPM). This document summarizes all the various procedures and considerations related to ML/ARD potential through mine life processes.

DOCUMENT REVISION HISTORY

This document replaces earlier versions of similar documents that directed ML/ARD Management at MPM in response to *Mines Act* Permit M-200 issued on August 3, 1995. The procedures as described have been in the place since that date.

Document Update Summary

Revision Date	Author	Comment
June 30, 2016	Chad Cameron Ben Harding Katie McMahen Luke Moger Ryan Brown Stephen Day (SRK)	Original Document

BACKGROUND

Metal leaching and acid generation are naturally occurring chemical processes which may have negative impacts on the receiving environment. The potential environmental impact of ML/ARD will depend on their magnitude, the sensitivity of the receiving environment, dilution and/or attenuation, as well as any mitigation measures that are in place.

Metal leaching occurs as a result of: weathering of metal-containing minerals (i.e., exposure to water and oxygen), drainage conditions that increase solubility, and flow of water through source materials. Acid generation occurs when minerals containing reduced sulphur (e.g. sulphide and elemental sulphur) are exposed to the weathering effects of oxygen and water. In iron sulphide minerals (e.g. pyrite) acidity is also generated when ferric iron precipitates. Other minerals in the source rock, primarily calcium and magnesium carbonates can neutralize the acid. ARD occurs when the amount of acid-generation exceeds the ability of the source rock to neutralize this acid. Any surplus acid is entrained in water and can create acidic and metal-containing run-off.

Pre-mining and operational geochemical characterization has shown that ARD potential at MPM is restricted due to the abundance of acid-consuming carbonate minerals compared to acid generating sulphide minerals. In addition, the presence of natural carbonate and oxide copper minerals in the pre-mining weathering zone reinforce the expectation that weathering conditions are dominantly basic. However, due to the potential consequences of acid generation for long term management of the site, Mount Polley Mining Corporation (MPMC) actively manages waste rock based on its ARD potential as described in the following sections.

MPMC has focused on managing potential for ARD due to the link between acid generation and enhanced solubility of copper which is expected to be the primary concern for ML. Selenium leaching has also been identified as occurring at MPM. Selenium is released by oxidation of sulphide minerals but leaching is not necessarily associated with pH depression. Selenium leaching occurs regardless of whether waste rock is classified as potentially ARD generating (PAG) or non-PAG (referred to as NAG at MPM).

UNDERSTANDING OF THE DISTRIBUTION OF ARD POTENTIAL

Like other alkalic porphyry deposits (e.g. Copper Mountain, Brenda), MPM lacks the strong hydrothermal alteration zoning that is commonly observed in calc-alkalic porphyry deposits (e.g. Highland Valley Copper, Island Copper, Gibraltar). In particular, phyllic alteration is absent at MPM. A common feature of calc-alkalic porphyry deposits is often a pronounced pyritic halo that surrounds the copper mineralization and is associated with phyllic and propylitic alteration. At MPM, discontinuous pyritic zones are present but do not appear to be mineralization halos. MPMC geological staff identified a pyritic zone in the south wall of the Springer Pit which extends into the adjacent Cariboo Pit.

This ML/ARD Management Procedure Manual applies to waste rock and ore stockpiles. Tailings are consistently NAG due to removal of copper sulphides by ore processing.

MANAGEMENT OF PAG ROCK

Best practice for management of PAG rock is subaqueous disposal in a configuration that provides permanent and low maintenance containment. At MPM, this has been implemented by disposing of waste rock in completed open pits that will subsequently fill with water. Mine planning is carried out at MPM such that the open pits have sufficient capacity that PAG material can be re-handled into the open pits and stored subaqueously at closure. The following pits are available for subaqueous disposal (in sequence):

- Cariboo Pit
- Bell Pit
- Pond Zone Pit
- Southeast Zone Pit
- Wight Pit
- Cariboo-Springer Pit.

For the Springer Pit, backfill locations are not currently available. The PAG rock is therefore stockpiled adjacent to the open pit in the Temporary Northwest PAG Stockpile for backhauling to the Cariboo-Springer Pit upon completion of mining.

For the small Pond Zone Pit, low sulfur PAG waste rock is layered with NAG waste rock.

Onset of acidic conditions in waste rock at MPM takes at least decades as shown by humidity cells, and the lack of acidification in the natural exposure of the deposit indicates that flooding of PAG waste rock does not need to be immediate. The current approaches of backfilling into dry pits and stockpiling following by backfilling allows PAG rock to be submerged before it acidifies.

DETERMINATION OF ML/ARD POTENTIAL

Waste rock on site is separated into two categories, NAG and PAG, using Neutralizing Potential Ratio (NPR) defined as:

$$NPR = NP/AP.$$

Acid Potential (AP) (in kg $CaCO_3$/t) is measured from:

- Total sulphur (%) x 31.25

Neutralizing Potential (NP) (in kg $CaCO_3$/t) is measured from total carbonate NP determined from:

- Total carbon (%C) x 83.33.

Due to the dominantly intrusive rock host at MPM, total carbon is an appropriate proxy for carbonate.

As required by *Mines Act* Permit M-200, PAG is defined as:

- NPR≤2 and total S>0.1%.

This *Mines Act* Permit M-200 requirement was specified in terms of NP determined by a whole-rock acid extraction and titration method; however, MPMC chose to use total carbonate which yields lower NP than the titration methods.

MATERIAL CHARACTERIZATION OVERVIEW

This section provides an overview of characterization procedures.

The MPM program characterizes all material types that will be handled during the mine life. Analysis is completed on site by Mount Polley's LECO™ instrument , allowing MPMC to best manage mine waste by directing it to suitable storage sites, or to construction usage when required (and if deemed suitable).

On each bench, a sample of cuttings is collected from each blast hole and analyzed for total copper, non-sulphide copper, iron, and gold. Areas of ore and waste are identified by interpolation of these assay results and the economic analysis of the resulting metal grades. Ore/waste boundaries are then established based on the calculated mill head values.

In areas which have proven to be consistently NAG on previous adjacent benches in blasthole samples, the waste tonnage in each blast is divided by 40,000 in order to determine the number of ABA samples to be submitted (i.e., one per 40,000 tonnes (t) of waste). However, in areas where PAG has been modelled through either exploration sampling, or results of previous blasthole sampling on other benches, (or where NAG and PAG may coincide), the sample density is doubled to one per 20,000 t. This approach results in greater sampling density in areas of suspected NAG/PAG boundaries, and increases the certainty of defining PAG. Typically structures at MPM are vertically oriented, and relatively continuous. This provides some assurance that blasthole samples from previously mined benches have relevance for determining where additional samples should be taken on new benches.

Any ore that will be stockpiled rather than processed immediately is sampled at a frequency of one (1) per 20,000 t to determine if it is classified as PAG or NAG. Millfeed ore areas are excluded from ABA analysis, as this material is processed through the Mill.

Composite tailings samples are collected and analyzed every month when processing of ore occurs to represent the tonnage of tailings deposited.

As a QA/QC measure required by *Mines Act* Permit M-200, the Environmental Department takes random weekly grab samples from the NAG waste dump when PAG is being mined to verify that waste is being appropriately characterized and handled.

Water chemistry monitoring of seepage from rock dumps and of contact water from the site water collection systems is also conducted by the Environmental Department to inform development of geochemical source terms and long-term water quality predictions. Similarly, tailings composites and monthly random drill pulp samples are sent to a third party laboratory for metals analysis as an additional source of data for site geochemical models.

IN-PIT SEGREGATION

Blasthole Samples:

1. After the production drill has completed and moved away from the hole, the sample may be taken.
2. Using a tube sampler, the Driller will take a representative sample of the cuttings pile.
3. Samples are to be collected in a clean plastic sample bag.
4. The Driller is to complete a Blasthole Sample Tag, tearing off the tag once completed and inserting it into sample bag.
5. The sample bag is to be tied off using ribbon.
6. In the case where multiple composite samples are to be taken from a single hole, the remaining cuttings after the sample are to be removed by the Driller so a clean new pile of cuttings can be formed.
7. Completed samples are to be left on the drill by the Driller. At the end of shift, the Mine Operations Pit Supervisor (or designate) will collect all samples and deliver them to the Bucking Room.

Bucking Room:

1. Each sample is to be transferred from the sample bag to a clean metal tray. The Blasthole Sample Tag is to be kept with the sample.
2. The sample is to be dried at 105°C.
3. The sample is then to be crushed in the Primary Crusher.
4. The sample is then to be crushed in the Fine Crusher.
5. The sample is to be split until the sample size is approximately 200 g.
    a. Reject from the sample is to be wasted.
6. The sample is then to be pulverized for 75 seconds.
7. The sample is to be placed in a pouch with the Blasthole Sample Tag stapled to the pouch.
8. If the pouch is a pit sample, it is to be sent to Assay Lab 1. If the sample is an ABA sample, it is to be sent to Assay Lab 2.

Assay Lab 1:

1. The Assay Lab is to run the sample through the atomic absorption analyzer which automatically transfers the copper (CU), non-sulphide copper (CUNS) and iron (FE) values into the LIMS database.
2. The samples for gold analysis are to be fire assayed and analyzed by atomic absorption which automatically transfers the gold (AU) value into the LIMS database.
3. The sample is then to be placed into storage. Pit samples are to be stored for 21 days.

Ore Control Technician 1:

1. Once assays have been entered into the LIMS database, the Ore Control Technician will review the data and roughly determine where in the blast any Mill Feed Ore will be located.

2. Once the Ore Control Technician drafts the Mill Feed Ore locations, the Ore Control Technician will evenly select holes in the non-Mill Feed Ore areas (including materials designated for ore stockpiles) at a ratio of one (1) sample per 20,000 t of rock. This equates to about one for every nine blast holes. Additional samples can be requested whenever additional data is desired for improving understanding of the geological conditions. An example of a sample layout is included as Figure 1.

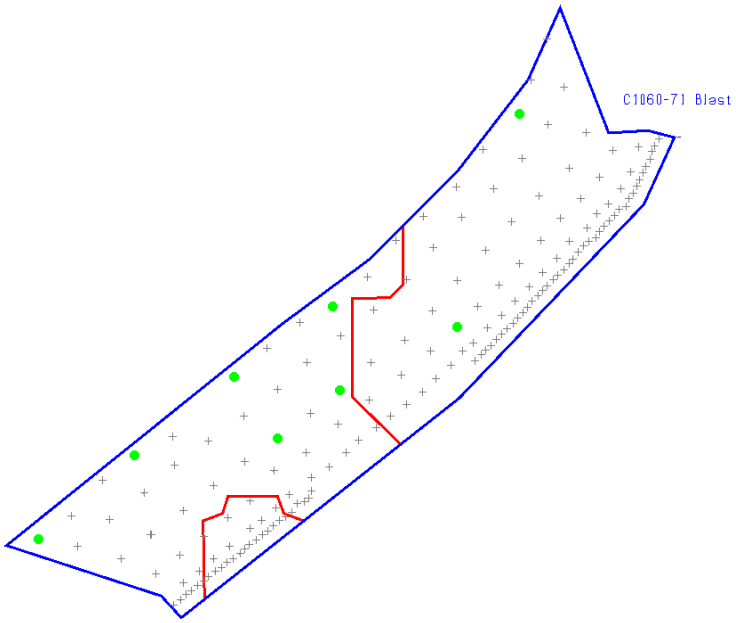


Figure 1: Location of ABA samples (green dots) within a blast. Red polygons denote mill feed ore, remainder is waste. The Ore Control Technician focuses sampling on areas which are designated waste and/or stockpile ore by the blasthole model. Reference blast = 149,173 t.

3. The Ore Control Technician is to then make an Analysis Request with the holes selected to the Assay Lab.

Assay Lab 2:

1. If the Assay Lab receives an Analysis Request, they will retrieve the sample pouch from storage, otherwise the sample will be delivered to the Bucking Room.
2. The Assay Lab will run the sample through the LECO CS230 Carbon Sulphur Analyzer.
3. Once analyzed, the machine transfers the carbon percentage (C%) and the sulphur percentage (S%) to a spreadsheet where NPR, NP and AP are calculated.
4. The NPR, NP, AP, C% and S% are transferred automatically to the LIMS database.
5. The sample is then to be placed into storage. ABA samples are to be stored for 14 days.

Ore Control Technician 2:

1. Once all the assays and ABAs have been entered into the LIMS database, the Ore Control Technician is to review the data and model the blast.
2. Modeling the blast

a. The software used is MineSight.
b. The model is based on a 5 metre (m) x 5 m x 12 m block system.
c. The block closest to the ABA sample will closely match the sample.
d. The blocks between the samples receive a weighted average of the sample carbon and sulfur grades.
e. Once each block gets the weighted C% and S%, then the AP, NP and NPR is calculated for each block.
f. Using the calculated NPR value, the model is to be coded as Ore/NAG/PAG by the Ore Control Technician and the resulting markup design is to be provided to the Surveyor.

3. The Ore Control Technician is responsible for the release of the final ore markup to the Surveyor. An example of a sample layout is included as Figure 2.

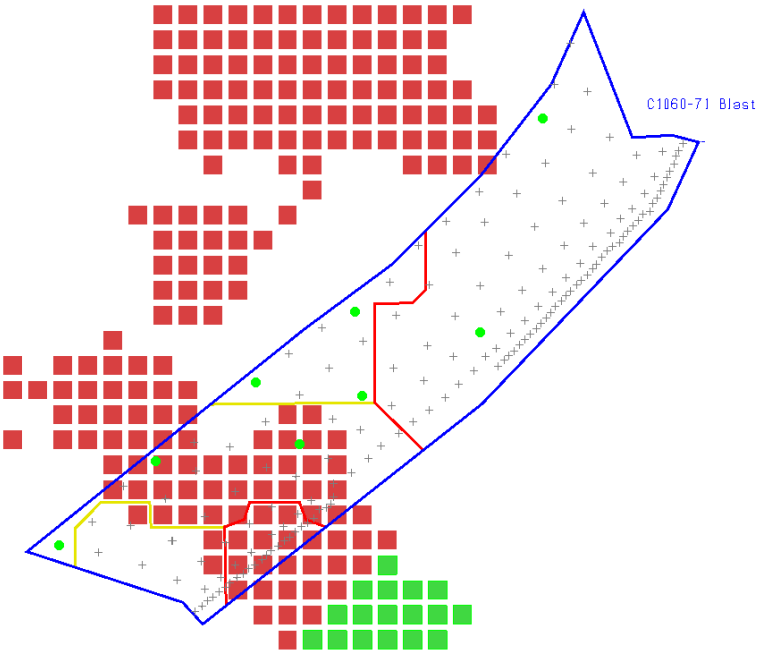


Figure 2. ABA results from samples shown in Figure 1 are used to update the blasthole PAG model item which identifies blocks which meet PAG criteria (red). The Ore Control Technician then marks up the PAG waste (yellow polygon) and the complete ore/waste markup is released to the Surveyor.

Surveyor:

1. The Surveyor will be responsible for the layout all Ore/NAG/PAG, as determined by the Ore Control Technician, in the field.

2. Using four (4) foot stakes spaced approximately 5 m apart, the Surveyor will mark out the contacts using marked placards.
   a. Red Placard = Mill Feed Ore
   b. Green Placard = Hi-Ox Ore
   c. Yellow Placard = PAG
   d. Blue Placard = NAG
   e. Pink Ribbon = High Grade Mill Feed Ore

f. Green Ribbon = Cariboo Stockpile Ore

3. Once complete, the Surveyor will print out maps of the area delineating material types for the shovel operator(s), and, if required, provide field verification of material types.

MATERIAL HANDLING

Shovel/Haul Truck Operators:

1. The Shovel Operator will mine the rock, following the contacts laid out by the Surveyor.
2. The Shovel Operator will ensure that all material contained within the contact stakes is routed as described by the markup and that any uncertainty in material classification is resolved by seeking the assistance of either the Pit Supervisor or the Engineering Department.
3. Upon loading a haul truck, the Shovel Operator shall direct the Haul Truck Driver as to the material type being hauled, and destination, using a horn sequence. The Haul Truck Driver will then take the material to the designated area.

IN-PIT MONITORING

Shovel Operator:

The Shovel Operator follows the staking of the Surveyor. Any material marked out as PAG is only to be hauled to approved locations. If a discrepancy is found, the Surveyor is to be called out to verify the material markup.

Pit Supervisor:

Throughout the shift, the Pit Supervisor will check in with the Shovel Operator and confirm the material type being loaded and that the destination is correct.

Haul Truck Driver:

If the Haul Truck Driver is uncertain of the material loaded, the Haul Truck Driver will confirm with the Shovel Operator or the Pit Supervisor.

Ore Control Technician:

The Ore Control Technician is to check Shovel Operator dig faces and confirm that the markup is appropriate and material is being routed appropriately.

Surveyor:

The Surveyor is to verify that material staking is visible and correct.

Environmental Department:

Once a month, the Environmental Department is to send a randomly selected drill hole pulp sample that MPMC ABA'ed to a third party laboratory (typically ALS Environmental in

Burnaby, BC) for metals analysis as an additional source of data to support site geochemical models.

Additionally, the Environmental Department takes water samples from all pit sumps to inform long-term geochemical predictions. Samples are collected as per MPMC-SOP-002: Surface Water Quality Monitoring. Monitoring locations and frequencies are regularly updated to reflect site developments and are included in the Operation, Maintenance, and Surveillance Manual.

TAILINGS MONITORING

Mill Metallurgy

1. The Mill Metallurgy Department is to take a monthly composite sample of the tailings generated through the month.
    - Slurry is to be sampled every two (2) hours and made into a composite for the shift.
    - The shift composite is then to be added to a monthly composite.
    - At the end of the month, the monthly composite is to be given to the Bucking Room and prepared for an ABA sample.
2. The Environmental Department is to send the monthly tailings composite sample to a third party laboratory (typically ALS Environmental in Burnaby, BC) for metals analysis to provide data for site geochemical modelling.

WASTE DUMP MONITORING

Environment Department

1. The Environmental Department is to take ABA grab samples on a weekly basis as per MPMC-SOP-016: ABA and Soil Sampling.
2. Seeps and contact water collected on site are sampled to provide data for site geochemical modelling. Samples are collected as per MPMC-SOP-002: Surface Water Quality Monitoring. The frequency and locations of these monitoring sites are updated regularly to reflect changes to the mine site and can be found in the Operation, Maintenance and Surveillance Manual.

REVIEW OF RESULTS AND PROGRAM EFFICACY

Data collected and corresponding interpretation regarding the ML/ARD program are included in the Annual Environmental and Reclamation Report (AERR), due annually to the British Columbia Ministry of Environment and Ministry of Energy and Mines on March 31 of each year, reflective of the previous calendar year. The AERR includes sections on: waste rock characterization and disposal; drainage water quality monitoring; and, updates to long-term predictions (kinetic testing).

MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS CORPORATION

MPMC – SOP – 002:

Surface Water Quality Monitoring

Purpose

To monitor surface water quality in accordance with Permit11678, the Mount Polley QA/QC Binder, and the *BC Field Sampling Manual* and 2016 Comprehensive Environmental Monitoring Plan.

Scope

This procedure outlines the surface water quality monitoring requirements that are the responsibility of MPMC Environmental Department staff.

Introduction

All surface water sampling must be carried out in accordance with the *BC Field Sampling Manual*. This SOP outlines the procedure required to maintain compliance with the Manual and Permit 11678, including who is responsible for the sampling, and when monitoring needs to occur. A comprehensive list of all required sampling is available under Permit 11678 and 2016 Comprehensive Environmental Monitoring Plan. The specific work methods are found in *MPMC-WORK-002: Surface Water Quality Monitoring*.

Samples must be taken on or before Thursday, as they must be shipped to the laboratory in Burnaby by Thursday afternoon at the latest. Monthly and quarterly water quality samples are collected the first week of the month when possible.

At least one duplicate surface sample is taken per month along with either a field or a trip blank. The second mandatory duplicate may be taken at a far-field or groundwater site depending on sampling schedule.

Responsibilities

Environmental Superintendent/Coordinator:

- Ensure that the results of samples required under Permit11678 are reported in quarterly reports to MOE, in the Annual Environmental and Reclamation Report, which is submitted to MOE and MEM.
- Review sample results regularly to identify any QA/QC issues or water quality concerns.
- If a Permit 11678 or MMER discharge water quality guideline is exceeded, follow the reporting and follow-up monitoring requirements in MMER, Permit 11678, and the First Nations Communication Plan.

Environmental Technologist/Technician:

- Coordinate the sampling schedule in accordance with the Annual Monitoring Plan (the Annual Monitoring Plan 2016 is provided in Appendix X).
- Ensure that samples are collected and handled in accordance with the *BC Field Sampling Manual*, the *MPMC-WORK-002: Surface Water Sampling*, and this document.
- Ensure samples are preserved, packed, and shipped according to *MPMC-WORK-004: Sample Preservation and Shipping*.
- Enter field data into the MP-5 database and/or spreadsheets on the Environmental network drive.

Preparation

Two Weeks Before Sampling:

- Make sure there is a sufficient sampling supplies and ice (for shipping) on site (refer to Appendix X – Sample Supplies Inventory Checklist).

One Week Before Sampling:

- Arrange for second person to assist with sampling, as required.
- Plan for shipping of samples to ensure there is not a conflict with statutory holidays.

On the Day of Sampling:

- Label all bottles and place in clear sample bags.
- Place sample bags in cooler(s) and label coolers accordingly.
- Place ice in the coolers along with the field blank set (if planned).
- Check all equipment required for sampling is functioning correctly and has sufficient battery life.
- Carry out any necessary equipment maintenance and calibrations as required by *MPMC-WORK-00:5 Data Collection Equipment*.
- Review the associated sampling Job Hazard Assessment, and complete and FLRA if necessary.
- Review safety concerns at individual sites if needed.
- Follow *MPMC-SOP-011: Check In and Check Out Procedure.*

Procedure

Collection:

- Collect all bottles and equipment necessary for sampling.
- Locate sampling locations using the Sample Locations Map (Appendix I), the Sample Site UTMs (Appendix II), and the Site Matrix (Appendix IV). Documents are also available in the Environmental Management System folder on the Environmental network drive.
- Carry out the in situ tests (as per *MPMC-WORK-005-1: WTW pH and Conductivity Meter* and *MPMC-WORK-005-7: NTU Meter*), preserve the samples and record keeping at each sample location in accordance with *MPMC-SOP-17: Record Keeping*.
- For each sample follow the guidelines as presented in the *BC Field Sampling Manual*.
- Place the samples in a cooler with ice.
- Upon returning to the lab, create a COC, and pack the coolers for shipping as per *MPMC-WORK-004: Water Sample Preservation and Shipping*.
- Ensure samples are collected on or before Thursday so that they may be shipped out to the lab in a timely manner.
- Enter field data into the MP-5 database and/or necessary spreadsheets on the Environmental network drive.
- Results from surface water samples required by Permit 11678 are to be submitted to MOE quarterly and annually (as part of the Annual Environmental and Reclamation Report).

For more specific surface water sample collection procedures, refer to *MPMC-WORK-002: Surface Water Sampling*.

Documents and Records

- Surface water sample results are stored in the MP-5 database and on the Environmental network drive.
- Surface water sample results are to be submitted to MOE on a quarterly and annual basis.

References

- Permit 11678
- *BC Field Sampling Manual*
- 2016 Comprehensive Environmental Monitoring Plan

Related Documents

- *MPMC-SOP-005: Data Collection Equipment*
- *MPMC-SOP-011: Check In and Check Out Procedure*
- *MPMC-SOP-017: Record Keeping*
- *MPMC-WORK-002: Surface Water Quality Monitoring*
- *MPMC-WORK-004: Water Sample Preservation and Shipping*
- *MPMC-WORK-005-1: WTW pH and Conductivity Meter*
- *MPMC-WORK-005-7: NTU Meter*
- Sampling Locations Map (Appendix I)
- Sample Site UTMs (Appendix II)
- Site Matrix (Appendix IV)
- Sample Supplies Inventory Checklist (Appendix X)

MOUNT POLLEY MINING CORPORATION
IMPERIAL METALS CORPORATION

MPMC – SOP – 016:
ABA and Soil Sampling

Purpose

To monitor the operational MPMC ARD/ML sampling and segregation program by collecting weekly waste rock samples (when PAG material is being mined), as per Permit M-200, and to assess the variability and suitability of reclamation materials on site, as per Permit M-200 and the *MPMC Soil Management Plan*.

Scope

This procedure outlines the ABA and soil sampling requirements that are the responsibility of MPMC Environmental Department staff.

Introduction

ABA grab samples are taken from active rock dumping sites; typical sample sites include, but are not limited to, active rock disposal sites, new road construction and road surfaces, and TSF construction. These samples are a randomized audit of detailed geological mapping done by MPMC geologists to ensure proper segregation and management of acid generating, PAG, and NAG materials. While Permit M-200 requires weekly samples only when PAG material is being mined, MPMC takes ABA grab sample weekly, regardless of the material being mined.

Soil samples are taken from stockpiles to monitor soil degradation and for characterization purposes prior application of soil to reclamation sites. All new soil stockpiles are to be sampled upon creation, and a site wide soil stockpile sampling program is to be carried out every 5 years. Additional soil sampling may be completed on progressive reclamation sites to monitor soil development.

Site specific soil surveys must be completed by a qualified professional for areas schedule to be disturbed by mine expansion. This is discussed in the *MPMC Soil Management Plan* and is beyond the scope of this document.

Responsibilities

Environmental Superintendent/Coordinator:

- Ensure that sampling is completed on a regular schedule, as required.
- Ensure that results are reported in the Annual Environmental and Reclamation Report, which is to be submitted to MOE and MEM.

Environmental Technologist/Technician:

- Coordinate sampling schedule.
- Ensure that samples are collected and handled in accordance with *MPMC-WORK-016: Acid-Base Accounting and Soil Sampling*, and this document.

Preparation

On the Day of Sampling:

- Pre-select area(s) for soil samples to be taken (refer to *MPMC-WORK-016: Acid-Base Accounting and Soil Sampling* for details).
- Call Pit-Shifter and ask if any rock waste is being hauled, its location and if it is safe to enter the area (refer to *MPMC-WORK-016: Acid-Base Accounting and Soil Sampling* for details).
- Review the associated Job Hazard Assessment, and completed a FLRA if necessary.
- Ensure all workers have appropriate PPE and are fit for the task.
- Follow *MPMC-SOP-011: Check In and Check Out Procedure*.

Procedure

ABA Grab Sampling:

- Take a composite sample of a minimum of 1 kg of randomly selected material, as described in *MPMC-WORK-016: Acid-Base Accounting and Soil Sampling*, and place in clean sample bag.
- Record the GPS Coordinates, elevation and sample information in the field notebook as per *MPMC-SOP-17: Record Keeping.*
- Enter sample information into the spreadsheet on the Environmental Network Drive and submit an analysis request in LIMS.
- Tag and date sample bag.
- Deliver sample(s) to the Bucking Room.

Soil Stockpile Sampling:

- Take a photo of the stockpile to document characteristics, including size and vegetative cover.
- Collect a composite sample from a minimum of three sub-sample locations in a clean, labelled, plastic sample bag, taking soil from the surface and at depth at each subsample location.
- Record the sample location GPS coordinates and record sample information in the field notebook as per *MPMC-SOP-17: Record Keeping.*
- Store samples in the refrigerator until they can be shipped to the analytical laboratory.

The detailed procedure is outlined in *MPMC-WORK-016: Acid-Base Accounting and Soil Sampling*.

Soil Sampling of Reclamation Sites:

- Pre-select soil sample locations and record GPS coordinates.
- Collect a composite sample from minimum three locations at each site in a clean, labelled plastic sample bag, taking a representative sample from the entire soil profile at each location.
- Record sample information in the field notebook as per *MPMC-SOP-17: Record Keeping.*
- Store samples in the refrigerator until they can be shipped to the analytical laboratory.

A detailed procedure is outlined in *MPMC-WORK-016: Acid-Base Accounting and Soil Sampling;* however, it may need to be adapted for specific sampling objectives.

Documents and Records

- ABA analysis results are recorded in the MPMC LIMS and into the spreadsheet on the Environmental Network Drive.
- All soil sample results are recorded on the Environmental network drive.
- ABA and Soil results are reported to MOE and MEM in the Annual Environmental and Reclamation Report.

References

- *MPMC Soil Management Plan*
- Permit M-200

Related Documents

- *MPMC-SOP-011: Check In and Check Out Procedure*
- *MPMC-WORK-016: Acid Base Accounting and Soil Sampling*

Appendix B – Waste Rock Inventory

1.000%	Bell Pit Rock Dump	Boundary Dump	Boundary Zone Haul Road	Cariboo Access Road	Cariboo Nag Dump	Cariboo Pag Dump	Cariboo Pit Dump	Central Collection Sump	Dyke around Tailings Breach	East Cariboo Extension	East Rock Dump	Heli Pad	Low Sulphur Waste Dump	NAG/PAG Pad	Not sure. From old DB	NutriFor Dump	Ore Haul Road	Plug Access Road	Polley Lake Road Upgrade	South Abutment	South East Nag Dump	South East PAG Dump	Springer Tailings Line	Sump Access Dyke in Tailings	Surface Crew Yard	Waste Haul Road	Water Treatment Plant	Wight Pit Connector	Wight Pit Rock Dump	Wight Pit West Rock Dump	Dam	Tailings Dam quarry material	Polley Lake Weir	Main Embankment East	Tailings Dam - upstream	Main Embankment Central	Ditch Armouring 1 (SERD SUMP)	Tailings Dam - Barge	Ditch Armouring 3	Armouring 2 (North of Orica)	Gavin's Ditch	Grand Total
#1: Below 0.6% CU	12,193			2,666										135	525						4,455								1,032		1,350											22,356
#2: Above 0.6% CU	1,720			539																									86													2,345
#3: Non-Mill Feed	258																																								258
#4: 0.3 - 0.5% CU																													2,064												2,064
#5: Springer Mill Feed	344			172																									602												1,118
Bell Pit	824,969	405	8,581			965,799	172			253,022	1,329,220				153,975				2,700										2,480,226	99,813	24,380										6,143,262
Bell Pit Rock Dump	103,898										1,215										2,430										1,350											108,893
Bootjack Access Road														320																											320
Borrow Pit																													1,142		11,373										12,515
Boundary Dump			10,750																																						10,750
Boundary Pit	481	132,754	1,720																		2,150																					137,105
Boundary Zone Haul Road		17,778	237,742																																							255,520
Breach Zone									114												1,691			5,870		2,025					424											10,124
Cariboo Access Road	430		385	2,931																	270				121						121											4,258
Cariboo Access Stockpile			236	2,050																	405										11,339											14,030
Cariboo Pit	25,143,252			171,076	6,427	3,105			1,217,616		61,555	135		1,742,822	164,175		68,409	371,857			16,089,509			287,799		124,992	540	416	51,810		1,819,010	135	258	92,475								47,397,373
Contaminated Soil Stockpile	29,756																																									29,756
Crushed Stockpiles	205			605																	151					135	109				6,846			242								8,293
Crusher waste stockpile	20,533	883	13,333	41,158				71	154		330	54,657		1,555			4,672	502			13,032		748	71	358	21,306		484	19,893		217,729											411,469
Crusher Waste Stockpile Node				270		443					207	135		1,215							20,520					1,620			9,614	803	6,705											41,532
Cut-Off Wall Aggregate Stockpile								627																134																		761
Dam								984	3,535									2,417			38,229			-							272,563				2,580							320,308
Dirt East											7,125																															7,125
Dyke around Tailings Breach									7,419												540																					7,959
East Rock Dump	3,450														7,050														2,075													12,575
Filter Blanket Stockpile								48																130																		178
Haul Roads (maintenance)	24,799			27,025		1,221	1,200							12,764							189,755					1,204			4,984		405											263,357
Hazeltine Creek																		1,399						11,026							118,830											131,255
Hazeltine Gravel Sorter Stockpile																		656																								656
High Grade stockpile	17,073										1,271																		13,485													31,829
Leach Pad	774																														1,118											1,892
Leach Pad High Grade Stockpile																													258													258
Low Grade stockpile	1,634					688					1,874																		4,742													8,938
Magnetite Stockpile	263	414																																								677
Nag Stockpile Node																					1,452																					1,452
NAG/PAG Pad														1,681																												1,681
No specific location	3,010					-			-				4,128	121							2,409								124		10,360											20,152
North Abutment																															584											584
PAR Rock Stockpile								492										82						2,829							8,918											12,321
Peterson Stockpile 2																					3,915																					3,915
Peterson's Sorter																															9,413											9,413
Plug Access Road																		56,797			347			-			164				5,173											62,481
Polley Lake Road Upgrade																			3,440																							3,440
Pond Zone Pit	25,967												402,227			172													204,588		503,053											1,136,007
Primary Crusher						1,056																		77							10,256											11,389
Sand Dump WP Rd	791																												308	462	1,023											2,584
South Abutment																				8,954				675																		9,629
South East Nag Dump	1,890							1,646	1,379,782									29,912			53,834			306,352		6,815					146,959											1,927,190
South East Pit	87,599		561										3,526																		62,147											166,466
Springer Pit	54,456,811	32,718	541,227	1,132,908	63,284	15,552	605,354		-	4,248	9,458	6,492	269,655	2,222,984		19,710	1,052,422			-	15,821,548	5,971			254,824	6,741,277		2,566,315	792,184	13,169	4,882,929											91,511,040
Springer Pit Wall Relief	60,009																																								60,009
Sulphur Storage	344																																								344
Surface Crew Yard														4,185																												4,185
Tailings Dam - Buttress																		1,776			1,090					16,519	49,897				7,995						2,870					80,147
Tailings Dam Access Road								3,239	3,799					135				943			684			892			1,725				111,093						1,476		369			124,355
Till Stockpile																													3,612												3,612
Upstream Rockfill Berm																				2,870	13,646			2,275							1,048				1,558							21,397
Water Treatment Plant																											1,476															1,476
Wight Pit	49,292	654,985	62,730	1,376		3,455	810		1,485	3,240	233,915							753	10,568		10,102								10,746,717	1,946,628	1,466,049											15,192,105
Wight Pit Haul Road	2,535			2,390		172					19,871																		362,351	79,096	430										1,845	468,690
Wight Pit Rock Dump																					2,025								4,028		128,177											132,205
Wight Pit Underground																																										2,025
Yard	4,449			495		8,259								4,050			3,100				17,621								2,354		11,105											51,433
1.5" Stockpile																															5,214											5,214
Main Embankment Central																																				123						123
Main Embankment East																																		2,706								2,706
None																															-											-
Rock Quarry																															55,256							2,240				57,496
Temporary Rock Stockpile																																					9,594			9,922		19,516
Transition Rock Stockpile																															102											102
TSF Rock Stockpile																																					7,831					7,831
Grand Total	80,878,729	839,937	877,265	1,385,661	69,711	999,750	607,536	7,107	2,613,904	260,510	1,666,041	61,419	679,536	3,991,967	325,725	19,882	1,128,603	467,094	16,708	11,824	32,271,810	5,971	748	618,130	255,303	6,915,893	53,911	2,567,215	14,770,426	2,139,971	9,871,313	135	258	95,423	4,138	123	21,771	2,240	369	9,922	1,845	166,515,224

1.000%	Bell Pit Rock Dump	Cariboo Pag Dump	NAG/PAG Pad	NutriFor Dump	South East Nag Dump	South East PAG Dump	Waste Haul Road	Wight Pit Connector	Wight Pit Rock Dump	Grand Total
Bell Pit		615,177								**615,177**
Cariboo Pit			8,454,652			1,350				**8,456,002**
Haul Roads (maintenance)			800							**800**
NAG/PAG Pad			258							**258**
No specific location			270							**270**
Pond Zone Pit	1,485								5,130	**6,615**
South East Pit	184,112	37,332							945	**222,389**
Springer Pit	1,976		7,620,803	832	3,105	885,315	1,290	5,891	3,780	**9,442,743**
Surface Crew Yard			11,070							**11,070**
Yard		1,196	3,645							**4,841**
Grand Total	**187,573**	**1,573,456**	**16,091,498**	**832**	**3,105**	**886,665**	**1,290**	**5,891**	**9,855**	**18,760,165**

Appendix C – Operational Waste Rock Monitoring Database

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C	NP	Ag	Al
											%C	%C		ppm	%
1	SD 1 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	7.4	7.6	#N/A	-0.05	15.00	0.7	8.41
2	SD 1 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	7.4	7.7	#N/A	-0.05	16.00	0.7	7.89
3	SD 2 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	6.8	7.2	#N/A	-0.05	12.00	0.8	8.34
4	SD 2 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	6.9	7.3	#N/A	-0.05	14.00	0.7	7.73
5	SD 3 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.25	0.02	7.9	8.1	#N/A	0.86	100.00	1	8.33
6	SD 3 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.13	0.01	7.9	7.9	#N/A	0.52	65.00	1	9.02
7	SD 3 - 3	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.23	0.01	8.3	8.1	#N/A	0.50	67.00	0.9	8.8
8	SD 3 - 4	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.53	0.02	8	8	#N/A	1.01	114.00	1	8.42
9	SD 3 - 5	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.58	0.01	7.9	8	#N/A	1.12	114.00	1.6	8.82
10	CPD 1	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.32	-0.01	8.1	8.2	#N/A	0.48	50.00	1	8.93
11	CPD 2	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.44	0.02	8	8	#N/A	0.71	79.00	1.2	9.06
12	CPD 3	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.17	0.02	8	8	#N/A	0.85	84.00	1.3	9.37
13	CPD 4	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.41	0.01	8.2	8.2	#N/A	0.54	62.00	0.9	9.47
14	CPD 5	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.78	0.02	8	8.2	#N/A	0.72	84.00	1.1	9.23
15	CPD 6	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.84	0.01	8.1	8	#N/A	0.75	80.00	1.2	9.23
16	CPD 7	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.36	0.01	8.2	8.2	#N/A	0.52	58.00	0.9	9.05
17	CPD 8	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.47	0.01	8.1	8.2	#N/A	0.55	62.00	1.1	9.32
18	CPD 9	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.49	0.01	8.2	8.2	#N/A	0.52	64.00	0.6	8.26
19	CPD 10	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.32	0.01	8.1	8.1	#N/A	0.50	59.00	0.9	8.15
20	CPD 11	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.07	0.02	8	8	#N/A	0.67	77.00	0.8	8.23
21	CPD 12	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.15	0.02	7.8	7.9	#N/A	0.85	90.00	0.8	8.29
22	CPD 13	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.6	0.02	8	8.1	#N/A	0.64	74.00	0.9	8.54
23	CPD 14	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.96	0.03	7.9	8	#N/A	1.02	113.00	0.7	8.35
24	HWD 1	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.44	0.02	7.7	7.8	#N/A	0.46	61.00	0.5	7.84
25	HWD 2	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.08	0.02	8.1	8.2	#N/A	0.82	104.00	-0.5	8.43
26	HWD 3	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.28	0.03	7.9	7.8	#N/A	0.41	57.00	0.5	7.88
27	HWD 4	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.19	0.02	7.8	8	#N/A	0.38	52.00	0.6	8.48
28	HWD 5	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.13	-0.01	8	8.1	#N/A	0.55	67.00	0.6	8.65
29	HWD 6	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.25	0.01	8	8	#N/A	0.78	92.00	-0.5	8.36
30	HWD 7	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.17	0.02	7.9	8	#N/A	1.21	122.00	0.7	7.64
31	63 DP6 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.2	0.01	8.3	0	#N/A	1.31	139.00	#N/A	#N/A
32	64 DP7 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.01	-0.01	8.5	0	#N/A	0.22	31.00	#N/A	#N/A
33	65 DP8 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.05	0.01	8.6	0	#N/A	0.71	101.00	#N/A	#N/A
34	66 DP9 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.23	0.02	8.1	0	#N/A	1.75	171.00	#N/A	#N/A
35	67 DP10 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.12	0.01	8.2	0	#N/A	1.09	102.00	#N/A	#N/A
36	Jan 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jan 2001 Sample - 1-2 mm	LG Breccia	0.26	-0.01	8	#N/A	0.94	#N/A	67.00	0.2	7.82
37	Jan 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jan 2001 Sample - 2-2 mm	0	0.39	-0.01	not/ss	#N/A	0.34	#N/A	not/ss	0.2	7.65
38	Feb 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Feb 2001 Sample - 1-2 mm	LG Breccia	0.35	-0.01	not/ss not/ss	#N/A	0.34	#N/A	not/ss 64	0.6	7.3
39	Feb 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Feb 2001 Sample - 2-2 mm	0	0.29	-0.01	0	#N/A	0.86	#N/A	0.00	-0.2	7.39
40	Mar 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Mar 2001 Sample - 2-2 mm	LG Breccia	0.14	-0.01	7.8	#N/A	-0.09	#N/A	16.00	0.2	7.96
41	May 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	May 2001 Sample - 1-2 mm	0	0.33	-0.01	7.9	#N/A	0.77	#N/A	60.00	0.2	8.05
42	Mar 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Mar 2001 Sample - 1-2 mm	0	0.1	-0.01	7.9	#N/A	0.69	#N/A	53.00	0.2	7.44
43	Apr 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Apr 2001 Sample - 1-2 mm	0	0.28	-0.01	8	#N/A	0.43	#N/A	42.00	0.4	6.75
44	Apr 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Apr 2001 Sample - 2-2 mm	Monzonite	0.08	-0.01	7.9	#N/A	0.17	#N/A	31.00	0.2	6.54
45	May 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	May 2001 Sample - 2-2 mm	0	0.24	-0.01	not/ss	#N/A	0.51	#N/A	not/ss	0.2	8.17
46	Jun 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jun 2001 Sample - 1-2 mm	Monzonite	0.45	-0.01	not/ss not/ss	#N/A	0.60	#N/A	not/ss 47	0.4	7.93
47	Jun 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jun 2001 Sample - 2-2 mm	0	0.48	-0.01	0	#N/A	0.51	#N/A	0.00	0.6	7.49
48	July 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	July 2001 Sample - 1-2 mm	0	0.28	-0.01	7.9	#N/A	0.94	#N/A	73.00	0.4	7.88
49	July 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	July 2001 Sample - 2-2 mm	0	0.3	-0.01	not/ss 8.8	#N/A	1.03	#N/A	75.00	0.6	7.42
50	Aug 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Aug 2001 Sample - 1-2 mm	Monzonite	0.22	-0.01	8.6	#N/A	0.09	#N/A	16.00	-0.5	6.34
51	Aug 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Aug 2001 Sample - 2+2 mm	0	0.28	0.03	0	#N/A	0.69	#N/A	96.00	0.5	6.52
52	Sep 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 1+2 mm	0	0.2	0.01	8.6	#N/A	0.09	#N/A	16.00	-0.5	6.5
53	Sep 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 2+2 mm	0	0.31	0.01	8.7	#N/A	0.69	#N/A	90.00	0.5	6.83
54	Oct 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Oct 2001 Sample - 1+2 mm	Monzonite	0.22	-0.01	8.5	#N/A	0.09	#N/A	19.00	0.5	6.38
55	Oct 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Oct 2001 Sample - 2+2 mm	0	0.46	0.01	8.4	#N/A	0.94	#N/A	94.00	-0.5	6.53
56	Jan 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Jan 2001 Sample - 2+2 mm	LG Breccia	0.13	0.01	9.1	#N/A	0.09	#N/A	21.00	-0.2	8.67
57	Feb 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Feb 2001 Sample - 2+2 mm	0	0.16	0.01	9	#N/A	0.17	#N/A	22.00	0.2	8.49
58	Mar 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Mar 2001 Sample - 2+2 mm	LG Breccia	0.07	-0.01	8.8	#N/A	-0.09	#N/A	14.00	-0.2	8.21
59	Apr 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Apr 2001 Sample - 2+2 mm	Monzonite	0.04	-0.01	8.9	#N/A	-0.09	#N/A	13.00	0.4	7.97
60	May 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	May 2001 Sample - 2+2 mm	0	0.15	-0.01	8.9	#N/A	-0.09	#N/A	20.00	0.4	8.34
61	Jun 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Jun 2001 Sample - 2+2 mm	Monzonite	0.27	0.01	9	#N/A	0.09	#N/A	28.00	-0.2	7.99
62	July 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	July 2001 Sample - 2+2 mm	Monzonite	0.13	-0.01	8.9	#N/A	0.17	#N/A	24.00	0.2	8.91
63	Sep 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 1+2 mm	0	0.2	0.01	8.6	#N/A	0.09	#N/A	16.00	-0.5	6.5
64	Sep 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 2+2 mm	0	0.31	0.01	8.7	#N/A	0.69	#N/A	90.00	0.5	6.83
65	BD 1 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 1	0	0.23	#N/A	7.4	7.7	#N/A	#N/A	106.00	1.2	9.38
66	BD 1 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 2	0	0.18	#N/A	7.6	7.7	#N/A	#N/A	95.00	1	9.36
67	BD 1 - 3	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 3	0	0.14	#N/A	7.5	7.6	#N/A	#N/A	103.00	0.9	8.91
68	BD 1 - 4	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 4	0	0.39	#N/A	7.7	7.6	#N/A	#N/A	100.00	0.8	9.06
69	BD 1 - 5	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 5	0	0.46	#N/A	8.1	8.1	#N/A	#N/A	119.00	1.1	8.58
70	BD 1 - 6	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 6	0	0.4	#N/A	8.1	8.2	#N/A	#N/A	110.00	1	8.68
71	BD 1 - 7	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 7	0	0.32	#N/A	8.2	8.3	#N/A	#N/A	72.00	1	9.59
72	BD 1 - 8	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 8	0	0.45	#N/A	8.1	8.2	#N/A	#N/A	72.00	1.1	9.33
73	BD 1 - 9	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 9	0	0.47	#N/A	8	8.1	#N/A	#N/A	60.00	1.2	9.51
74	BD 1 - 10	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 10	0	0.44	#N/A	7.9	7.9	#N/A	#N/A	66.00	1.1	9.39
75	BD 2 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 2 - 1	0	0.51	#N/A	8.1	8.1	#N/A	#N/A	107.00	1.2	8.93
76	BD 2 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 2 - 2	0	0.41	#N/A	7.8	7.9	#N/A	#N/A	135.00	0.8	8.72
77	BD 3 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 3 - 1	0	0.06	#N/A	7.9	8	#N/A	#N/A	31.00	0.8	9.93
78	BD 3 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 3 - 2	0	0.05	#N/A	7.8	8.1	#N/A	#N/A	28.00	1	9.62
79	BD 4 -1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 -1	0	0.07	#N/A	7.8	8	#N/A	#N/A	46.00	0.9	8.58
80	BD 4 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 - 2	0	0.08	#N/A	7.6	7.8	#N/A	#N/A	35.00	0.8	9.29
81	BD 4 - 3	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 - 3	0	0.03	#N/A	7.8	8	#N/A	#N/A	73.00	0.7	9.58
160	Feb 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite	0.11	-0.01	8.1	8	#N/A	0.60	70.00	0.2	5.63
161	Mar 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic	0.1	0.01	8.2	8	#N/A	0.87	87.00	-0.2	5.24
162	Apr 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite	0.05	-0.01	7.7	7.1	#N/A	-0.05	15.00	-0.2	9.08
163	May 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite	0.04	-0.01	8.1	8.1	#N/A	0.55	70.00	-0.2	5.11
164	Jun 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	East Breccia waste	1.32	0.02	7.6	not/ss	#N/A	0.44	49.00	1	7.23
165	Jun 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	East Breccia waste	1.41	0.05	6.7	not/ss	#N/A	-0.05	10.00	1	8.71
166	Jul 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic West Wall Diorite	0.93	-0.01	7.8	7.9	#N/A	0.71	71.00	0.6	8.1
167	Jul 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	0.07	-0.01	8	8	#N/A	1.04	112.00	-0.2	7.96
168	Aug 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic West Wall Diorite East Breccia waste	0.86	0.02	8	0	#N/A	1.15	113.00	0.5	6.54
169	Aug 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	0.44	0.01	8.2	0	#N/A	0.55	122.00	-0.5	6.25
170	Aug 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	1.45	0.02	8	0	#N/A	0.55	73.00	2	6.71
171	Sep 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic	0.82	0.02	8	0	#N/A	1.15	130.00	#N/A	#N/A
172	Sep 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite East Breccia waste	0.57	0.02	8.1	0	#N/A	0.60	103.00	#N/A	#N/A
173	Sep 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	1.99	0.03	8.6	0	#N/A	0.55	108.00	#N/A	#N/A
174	Oct 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic	0.88	0.03	8.1	0	#N/A	1.20	134.00	#N/A	#N/A
175	Oct 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite East Breccia waste	0.45	0.01	8.1	0	#N/A	0.60	77.00	#N/A	#N/A
176	Oct 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	1.64	0.02	8.1	0	#N/A	1.15	117.00	#N/A	#N/A
177	Mar 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	Volcanic	0.08	-0.01	8.7	8	#N/A	0.22	48.00	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
						ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
1	SD 1 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	10	2130	1	-2	3.76	-0.5	28	77	1745	0.061	5.74	6	3.34	2.19	1420	-1	2.14	33	1820	4	-5	-1	374	0.31	174	10	84
2	SD 1 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	7	2130	1.1	-2	4.46	-0.5	33	126	1560	0.063	6.42	6	3.4	2.92	1530	1	1.75	51	1850	8	-5	-1	398	0.27	190	10	99
3	SD 2 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	16	2340	1.1	-2	3.54	-0.5	35	102	2570	0.093	7.13	9	3.9	2.62	1225	-1	1.49	39	1710	5	-5	-1	402	0.31	239	10	88
4	SD 2 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	15	1850	1	-2	4.46	-0.5	36	146	1415	0.052	6.77	9	3.06	3.22	1410	1	1.83	59	1450	7	-5	-1	427	0.32	214	10	89
5	SD 3 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	32	1420	1.1	-2	5.59	-0.5	25	46	1965	0.06	5.53	20	2.71	1.86	916	16	2.26	23	1330	4	-5	3	452	0.34	198	10	67
6	SD 3 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	34	1710	1.1	-2	4.88	-0.5	26	28	1885	0.07	6.23	13	2.76	1.52	1070	8	2.55	9	1460	6	-5	2	539	0.38	208	10	73
7	SD 3 - 3	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	38	1570	1.1	-2	4.61	-0.5	30	43	2090	0.079	6.18	13	2.97	1.81	958	16	2.51	22	1520	-2	-5	3	506	0.35	219	10	66
8	SD 3 - 4	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	29	1410	1.2	-2	6.24	-0.5	29	61	1675	0.035	6.29	13	2.67	1.98	1270	19	2.04	32	1530	3	-5	3	468	0.34	207	10	84
9	SD 3 - 5	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	48	1160	1.2	-2	5.7	-0.5	27	19	4760	0.063	6.81	22	3.53	1.36	1000	14	2.07	6	1350	5	-5	5	424	0.3	224	10	75
10	CPD 1	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	21	1520	1.1	2	3.82	-0.5	24	31	2470	0.08	5.9	13	3.56	1.53	705	15	2.65	14	1350	3	-5	5	501	0.36	202	10	64
11	CPD 2	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	46	260	1.2	2	4.59	-0.5	36	30	2820	0.057	7	20	3.77	1.42	645	55	2.52	9	1380	-2	-5	6	468	0.33	205	10	61
12	CPD 3	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	38	330	1.3	2	4.55	-0.5	33	22	3200	0.046	7.28	22	4.39	1.23	584	41	2.46	6	1370	5	-5	7	499	0.32	196	10	59
13	CPD 4	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	21	1630	1.1	2	4.92	-0.5	27	36	1885	0.042	6.41	10	3.64	1.69	897	23	2.77	14	1540	3	-5	3	546	0.36	225	10	78
14	CPD 5	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	36	1130	1.2	2	6.07	-0.5	31	23	1975	0.037	7.02	14	3.23	1.67	1045	27	2.39	7	1550	2	-5	4	544	0.39	217	10	85
15	CPD 6	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	32	730	1.1	2	5.21	-0.5	31	30	1985	0.043	6.89	15	3.31	1.58	972	30	2.63	11	1480	5	-5	4	528	0.37	217	10	91
16	CPD 7	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	31	1640	1	2	4.28	-0.5	24	37	1875	0.046	6.07	11	3.7	1.53	826	16	2.64	16	1460	2	-5	2	525	0.37	214	10	73
17	CPD 8	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	43	1690	1.1	2	4.24	-0.5	25	54	2470	0.055	6.26	15	4.24	1.7	803	32	2.71	23	1390	5	6	4	523	0.37	231	10	75
18	CPD 9	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	30	1400	1.4	2	3.85	-0.5	21	38	1945	0.057	5.64	14	3.85	1.54	825	38	2.64	21	1280	11	-5	3	465	0.33	207	-10	83
19	CPD 10	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	23	1470	1.4	2	3.9	-0.5	22	30	1800	0.067	5.92	15	3.55	1.46	964	16	2.48	14	1260	11	-5	3	514	0.33	196	-10	79
20	CPD 11	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	32	1100	1.5	2	4.26	-0.5	26	19	2200	0.049	6.27	19	3.64	1.3	741	35	2.53	6	1190	9	-5	5	470	0.32	185	-10	69
21	CPD 12	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	45	830	1.6	2	4.55	-0.5	28	18	2250	0.046	6.43	24	3.59	1.35	757	43	2.51	6	1240	13	-5	7	440	0.32	192	-10	64
22	CPD 13	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	23	1380	1.6	2	4.35	1.1	26	19	2160	0.071	6.33	15	3.57	1.5	998	31	2.47	7	1390	11	-5	3	508	0.35	202	-10	105
23	CPD 14	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	36	800	1.6	2	5.18	-0.5	23	14	1880	0.033	5.89	19	2.88	1.29	770	32	2.73	6	1190	11	-5	5	398	0.31	194	-10	62
24	HWD 1	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	28	1700	1.5	-2	4.03	-0.5	28	31	2390	0.086	6.28	12	3.86	1.56	1095	25	1.84	13	1540	7	-5	4	439	0.31	212	-10	72
25	HWD 2	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	13	1920	1.5	-2	7.86	-0.5	20	12	617	0.014	5.75	10	2.01	2.05	1415	3	1.83	4	1560	13	5	-1	567	0.39	216	-10	96
26	HWD 3	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	23	1730	1.5	-2	4.24	-0.5	25	28	1980	0.084	5.84	14	3.12	1.58	1170	13	2.08	13	1610	11	-5	2	434	0.31	190	-10	76
27	HWD 4	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	34	1460	1.8	-2	3.2	0.6	28	40	2490	0.138	5.73	13	3.98	1.65	821	27	2.42	22	1360	12	-5	3	400	0.32	218	-10	60
28	HWD 5	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	14	1470	1.5	-2	4.7	-0.5	16	44	2040	0.064	4.61	7	3.06	1.57	825	4	2.87	25	1190	11	-5	4	580	0.37	177	-10	65
29	HWD 6	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	11	1440	1.6	-2	5.25	0.7	21	61	1975	0.057	5.27	18	3.41	1.99	937	11	2.49	42	1290	10	-5	3	470	0.33	213	-10	73
30	HWD 7	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	28	1300	1.4	-2	5.45	-0.5	13	31	2610	0.039	3.75	10	3.84	1.58	728	3	2.24	18	1040	8	-5	3	373	0.31	246	-10	48
31	63 DP6 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	64 DP7 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	65 DP8 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	66 DP9 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	67 DP10 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Jan 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jan 2001 Sample - 1-2 mm	16	1360	0.5	-2	6.16	0.5	26	134	3580	0.07	6.07	70	2.73	3.02	845	67	2.17	53	1220	8	1	2.8	492	0.37	355	-10	74
37	Jan 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jan 2001 Sample - 2-2 mm	9	1900	1	-2	4.1	1	21	220	3630	#N/A	6.79	160	2.96	2.08	890	6	2.31	128	1240	24	#N/A	#N/A	831	0.42	314	20	120
38	Feb 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Feb 2001 Sample - 1-2 mm	11	1360	0.5	-2	3.83	-0.5	19	123	3510	0.023	6.36	90	2.58	1.81	780	5	2.29	63	1290	22	0	0	698	0.38	276	10	96
39	Feb 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Feb 2001 Sample - 2-2 mm	16	1210	0.5	-2	4.68	-0.5	16	102	2870	0	4.79	50	1.44	1.77	605	48	2.58	43	990	8	0	0	574	0.37	247	10	42
40	Mar 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Mar 2001 Sample - 2-2 mm	12	1290	1	-2	2.81	-0.5	19	20	5300	0.212	7.57	160	1.9	1.75	665	5	2.96	7	1810	6	0.2	1.6	463	0.35	378	20	40
41	May 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	May 2001 Sample - 1-2 mm	16	1350	1	2	5.13	-0.5	22	86	3480	0.03	5.2	60	2.77	2.53	735	150	2.37	33	1150	10	0.6	3	475	0.36	276	-10	58
42	Mar 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Mar 2001 Sample - 1-2 mm	11	1480	0.5	-2	4.51	-0.5	16	20	1475	0.018	4.83	30	2.37	1.67	715	-1	2.04	10	1200	14	0.2	0.8	494	0.33	246	10	58
43	Apr 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Apr 2001 Sample - 1-2 mm	10	1060	1	-2	2.84	-0.5	12	30	2240	0.014	4	150	4.01	1.14	550	5	1.87	11	640	14	1.8	2.2	366	0.23	227	10	100
44	Apr 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Apr 2001 Sample - 2-2 mm	9	1090	0.5	-2	2.72	-0.5	22	53	4780	0.251	6.67	130	1.52	2.09	1685	-1	1.5	22	1720	8	0.8	1.6	400	0.39	261	10	64
45	May 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	May 2001 Sample - 2-2 mm	11	980	0.5	-2	4.76	-0.5	20	190	2990	not/ss	6.88	140	2.66	1.94	635	54	2.4	99	1260	10	#N/A	#N/A	556	0.36	319	-10	62
46	Jun 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jun 2001 Sample - 1-2 mm	13	1200	0.5	-2	4.44	-0.5	23	219	4690	not/ss 0.041	6.72	150	3.69	2.17	715	12	2.24	76	1370	10	#N/A	#N/A	553	0.39	299	-10	66
47	Jun 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jun 2001 Sample - 2-2 mm	27	960	0.5	12	3.82	-0.5	20	121	4610	0	6.76	130	3.4	2	625	6	2.12	61	1340	8	0	0	470	0.36	322	-10	60
48	July 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	July 2001 Sample - 1-2 mm	24	1170	1	-2	5.78	-0.5	20	103	2890	0.018	5.29	150	2.36	2.49	740	3	1.69	58	1600	8	0.8	3	557	0.38	245	-10	60
49	July 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	July 2001 Sample - 2-2 mm	27	1260	0.5	-2	5.52	-0.5	21	88	2510	0.018	5.43	140	2.36	2.46	745	4	1.61	47	1640	8	0.2	2.2	499	0.38	247	-10	58
50	Aug 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Aug 2001 Sample - 1-2 mm	5	1140	2	-2	2.9	-0.5	17	54	6830	0.298	7.96	100	4.21	1.48	700	3	2.41	6	980	10	5	7	419	0.33	340	-10	80
51	Aug 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Aug 2001 Sample - 2+2 mm	5	2730	2	-2	4.6	-0.5	19	65	3010	0.026	5.75	100	2.84	1.95	785	7	3.04	34	1490	16	15	3	746	0.39	208	-10	76
52	Sep 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 1+2 mm	5	1110	2	-2	2.8	-0.5	17	47	6470	0.299	7.78	70	4.29	1.48	690	8	2.43	6	990	8	5	7	401	0.34	336	-10	72
53	Sep 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 2+2 mm	5	2730	2	-2	4.8	-0.5	19	59	3350	0.028	5.94	100	3	1.97	800	9	3.18	33	1510	12	5	3	746	0.4	214	-10	78
54	Oct 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Oct 2001 Sample - 1+2 mm	5	1150	2	-2	3	-0.5	16	26	6580	0.285	7	90	4.26	1.42	680	6	2.53	2	990	10	10	7	422	0.32	307	-10	68
55	Oct 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Oct 2001 Sample - 2+2 mm	15	2120	2	-2	5	-0.5	18	41	5300	0.045	6.26	200	3.11	1.59	755	11	3.14	11	1090	14	5	4	547	0.35	232	-10	82
56	Jan 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Jan 2001 Sample - 2+2 mm	6	1640	0.5	-2	2.86	-0.5	14	47	1160	0.005	4.29	40	3.62	1.44	775	3	3.3	15	1490	4	-0.2	1	632	0.36	175	-10	58
57	Feb 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Feb 2001 Sample - 2+2 mm	9	1220	0.5	-2	2.62	-0.5	14	34	1440	0.009	4.35	30	3.1	1.31	440	9	3.54	4	1130	4	-0.2	2	574	0.32	233	-10	30
58	Mar 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Mar 2001 Sample - 2+2 mm	9	1250	1	-2	2.16	-0.5	15	20	2040	0.076	5.17	70	2.98	1.25	415	5	3.42	3	1490	2	-0.2	2	486	0.29	261	-10	26
59	Apr 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Apr 2001 Sample - 2+2 mm	6	1080	0.5	-2	2.02	-0.5	15	32	2340	0.162	6.04	50	4.41	1.23	395	2	2.63	7	1080	4	0.2	1	391	0.3	239	-10	40
60	May 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	May 2001 Sample - 2+2 mm	7	860	0.5	-2	2.83	-0.5	19	18	1745	0.026	7.28	70	2.67	1.88	495	2	3.03	5	1250	2	-0.2	1	561	0.38	272	-10	48
61	Jun 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Jun 2001 Sample - 2+2 mm	13	890	0.5	-2	3.08	-0.5	18	21	2300	0.01	6.12	90	3.02	1.63	535	2	3.08	7	1300	2	-0.2	2	582	0.35	253	-10	44
62	July 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	July 2001 Sample - 2+2 mm	13	1190	0.5	-2	3.86	-0.5	16	20	1255	0.006	5.66	50	2.76	1.8	570	1	2.98	7	1280	2	-0.2	1	665	0.38	243	-10	44
63	Sep 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 1+2 mm	5	1110	2	-2	2.8	-0.5	17	47	6470	0.299	7.78	70	4.29	1.48	690	8	2.43	6	990	8	5	7	401	0.34	336	-10	72
64	Sep 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 2+2 mm	5	2730	2	-2	4.8	-0.5	19	59	3350	0.028	5.94	100	3	1.97	800	9	3.18	33	1510	12	5	3	746	0.4	214	-10	78
65	BD 1 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 1	25	1940	1	-2	6.98	-0.5	24	23	1995	0.047	6.1	10	2.59	1.55	1375	2	2.43	4	1540	6	-5	2	642	0.36	197	10	93
66	BD 1 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 2	28	2000	1	-2	7.24	-0.5	23	23	876	0.019	6.18	8	2.24	1.82	1405	6	2.53	6	1700	4	-5	1	647	0.41	216	10	89
67	BD 1 - 3	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 3	18	1770	0.9	-2	7.62	-0.5	26	18	602	0.009	6.48	7	2.12	1.96	1510	3	2.23	5	1650	8	-5	1	594	0.38	230	10	96
68	BD 1 - 4	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 4	22	1580	1.1	-2	5.21	-0.5	23	28	2480	0.033	6.12	12	3.66	1.37	738	26	2.69	9	1350	4	-5	4	524	0.34	206	10	58
69	BD 1 - 5	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 5	28	1570	1.1	-2	6.07	-0.5	24	27	2190	0.034	6.12	17	3.41	1.73	773	32	2.31	11	1460	-2	-5	2	544	0.35	233	10	52
70	BD 1 - 6	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 6	26	1560	1.1	-2	6.26	-0.5	26	31	2300	0.046	6.05	14	3.56	1.78	823	23	2.27	10	1440	9	-5	4	532	0.32	234	10	58
71	BD 1 - 7	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 7	26	1580	1.1	-2	4.76	-0.5	24	26	2500	0.068	6.05	10	3.59	1.44	753	17	2.94	8	1380	4	6	2	560	0.37	206	10	63
72	BD 1 - 8	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 8	21	1570	1.1	-2	4.39	-0.5	26	35	2770	0.054	6.26	11	3.8	1.44	679	30	2.78	9	1470	6	-5	3	527	0.37	215	10	59
73	BD 1 - 9	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 9	23	1570	1.2	-2	3.7	-0.5	30	26	3140	0.087	6.57	14	3.97	1.32	684	28	2.81	9	1380	3	-5	5	529	0.33	215	10	56
74	BD 1 - 10	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 10	21	1390	1.3	-2	3.73	-0.5	33	24	2740	0.099	6.68	14	3.73	1.37	776	39	2.74	7	1380	6	-5	5	458	0.32	217	10	54
75	BD 2 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 2 - 1	24	1330	1.2	-2	5.37	-0.5	27	19	2900	0.075	5.89	12	3.16	1.37	631	25	2.47	7	1330	7	-5	5	477	0.32	198	10	50
76	BD 2 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 2 - 2	12	1540	1.1	-2	6.1	-0.5	24	19	2580	0.036	5.74	9	3	1.19	596	19	2.17	4	1290	-2	-5	3	406	0.31	191	10	45
77	BD 3 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 3 - 1	33	2190	1	-2	6.84	-0.5	27	18	428	0.014	6.47	10	1.95	1.79	1605	1	2.47	7	1870	5	-5	-1	579	0.37	222	10	118
78	BD 3 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 3 - 2	31	2490	1	-2	6.59	-0.5	26	23	488	0.019	6.37	13	2.01	1.74	1595	-1	2.34	5	1850	7	-5	-1	599	0.38	211	10	115
79	BD 4 -1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 -1	19	2040	1	-2	5.9	-0.5	26	58	776	0.025	5.9	13	2.14	2.25	1210	1	2.14	46	1610	7	-5	1	667	0.39	211	10	78
80	BD 4 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 - 2	15	2130	0.9	-2	5.73	-0.5	28	43	827	0.018	6.33	11	2.39	1.99	1305	1	2.39	24	1710	4	-5	-1	632	0.4	224	10	87
81	BD 4 - 3	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 - 3	14	2620	1	-2	6.9	-0.5	27	21	458	0.013	6.28	7	2.2	1.79	1445	1	2.55	10	1750	4	-5	-1	616	0.41	229	10	82
160	Feb 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	10	690	1	-2	4.88	-0.5	39	388	453	#N/A	4.85	160	1.4	7.19	965	1	1.55	335	1320	8	0.2	-0.2	374	0.34	168	-10	58
161	Mar 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	13	1070	1	-2	5.14	-0.5	40	354	878	#N/A	5.24	160	1.2	7.03	960	3	1.26	381	1190	8	-0.2	0.2	381	0.32	159	-10	58
162	Apr 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	78	1820	0.5	-2	5.44	-0.5	31	58	1095	#N/A	5.78	90	1.43	1.75	1355	8	2.72	12	1490	14	1.4	0.2	626	0.38	220	-10	80
163	May 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	4	440	1	-2	5.05	-0.5	39	422	103	#N/A	4.48	60	1.25	7.39	940	-1	1.43	363	1360	4	0.6	-0.2	262	0.35	144	-10	56
164	Jun 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	47	200	1	-2	2.6	-0.5	51	42	3720	#N/A	6.36	240	4.19	1.28	895	102	1.63	11	1330	10	1	7.6	275	0.28	288	-10	48
165	Jun 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	62	1400	0.5	-2	1.82	-0.5	51	48	2770	#N/A	8.65	350	3.73	1.27	700	133	2.25	8	1190	14	2.8	4.8	457	0.36	208	-10	58
166	Jul 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	29	1460	0.5	-2	6.07	-0.5	29	118	1180	#N/A	5.27	90	4.09	2.33	980	90	2.09	45	990	10	0.6	2.2	499	0.29	222	-10	64
167	Jul 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	12	2300	0.5	-2	7.05	-0.5	23	57	398	#N/A	5.34	60	1.86	2.13	1720	5	1.96	21	1410	6	0.8	0.2	649	0.38	221	-10	86
168	Aug 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	140	1530	2	-2	4	-0.5	26	91	4440	#N/A	7.24	470	4.78	1.08	585	46	2.18	7	1100	10	20	4	475	0.31	229	-10	62
169	Aug 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	25	1580	1.5	-2	5.2	-0.5	20	36	4940	#N/A	6.15	160	4.31	1.32	990	17	2.29	12	1140	12	15	3	553	0.34	218	-10	74
170	Aug 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	35	550	2	-2	3	-0.5	31	24	3580	#N/A	7.04	220	4.82	0.99	650	59	2.27	3	920	8	15	4	455	0.3	180	-10	60
171	Sep 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
172	Sep 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
173	Sep 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
174	Oct 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
175	Oct 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
176	Oct 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
177	Mar 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C	NP	Ag	Al
											%C	%C		ppm	%
178	May 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	West Wall Diorite	0.03	-0.01	8.6	8.1	#N/A	0.16	45.00	#N/A	#N/A
179	Jun 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	East Breccia waste	0.92	0.02	8.7	not/ss	#N/A	0.11	23.00	#N/A	#N/A
180	Jun 2001 Sample 2+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	East Breccia waste	1.5	0.03	8.2	8.1	#N/A	0.05	17.00	#N/A	#N/A
181	Sep 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	Volcanic	0.65	-0.01	8.3	0	#N/A	0.79	52.00	#N/A	#N/A
182	Sep 2001 Sample 2+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	West Wall Diorite East Breccia waste	0.74	0.01	8.7	0	#N/A	0.46	47.00	#N/A	#N/A
183	Sep 2001 Sample 3+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	0	1.28	0.03	8.7	0	#N/A	0.27	31.00	#N/A	#N/A
184	Oct 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	Volcanic	0.69	-0.01	8.4	0	#N/A	0.71	51.00	#N/A	#N/A
185	102 - 10 - 100	Springer Pit	Springer Pit	DD Core	102 - 10 - 100	#N/A	0.04	0.04	8.8	#N/A	#N/A	#N/A	10.10	#N/A	#N/A
186	102 - 100 - 200	Springer Pit	Springer Pit	DD Core	102 - 100 - 200	#N/A	0.05	0.03	8.8	#N/A	#N/A	#N/A	16.80	#N/A	#N/A
187	102 - 200 - 300	Springer Pit	Springer Pit	DD Core	102 - 200 - 300	#N/A	0.05	0.04	8.8	#N/A	#N/A	#N/A	25.10	#N/A	#N/A
188	102 - 300 - 400	Springer Pit	Springer Pit	DD Core	102 - 300 - 400	#N/A	0.13	0.03	8.8	#N/A	#N/A	#N/A	27.80	#N/A	#N/A
189	102 - 400 - 500	Springer Pit	Springer Pit	DD Core	102 - 400 - 500	#N/A	0.21	0.05	9	#N/A	#N/A	#N/A	25.20	#N/A	#N/A
190	102 - 500 - 600	Springer Pit	Springer Pit	DD Core	102 - 500 - 600	#N/A	0.16	0.04	8.9	#N/A	#N/A	#N/A	45.60	#N/A	#N/A
191	103 - 10 - 100	Springer Pit	Springer Pit	DD Core	103 - 10 - 100	#N/A	0.01	0.01	8.9	#N/A	#N/A	#N/A	17.20	#N/A	#N/A
192	103 - 100 - 200	Springer Pit	Springer Pit	DD Core	103 - 100 - 200	#N/A	0	0	8.9	#N/A	#N/A	#N/A	22.50	#N/A	#N/A
193	103 - 200 - 300	Springer Pit	Springer Pit	DD Core	103 - 200 - 300	#N/A	0	0	8.9	#N/A	#N/A	#N/A	24.80	#N/A	#N/A
194	103 - 300 - 400	Springer Pit	Springer Pit	DD Core	103 - 300 - 400	#N/A	0.05	0.03	8.8	#N/A	#N/A	#N/A	25.30	#N/A	#N/A
195	103 - 400 - 500	Springer Pit	Springer Pit	DD Core	103 - 400 - 500	#N/A	0.04	0.04	9	#N/A	#N/A	#N/A	15.00	#N/A	#N/A
196	103 - 500 - 600	Springer Pit	Springer Pit	DD Core	103 - 500 - 600	#N/A	0.34	0.04	8.7	#N/A	#N/A	#N/A	23.10	#N/A	#N/A
197	105 - 10 - 100	Springer Pit	Springer Pit	DD Core	105 - 10 - 100	#N/A	0.08	0.03	9.2	#N/A	#N/A	#N/A	19.40	#N/A	#N/A
198	105 - 100 - 200	Springer Pit	Springer Pit	DD Core	105 - 100 - 200	#N/A	0.03	0.03	9	#N/A	#N/A	#N/A	29.40	#N/A	#N/A
199	105 - 200 - 300	Springer Pit	Springer Pit	DD Core	105 - 200 - 300	#N/A	0.06	0.06	9.1	#N/A	#N/A	#N/A	22.30	#N/A	#N/A
200	105 - 300 - 400	Springer Pit	Springer Pit	DD Core	105 - 300 - 400	#N/A	0.03	0.03	9.1	#N/A	#N/A	#N/A	20.00	#N/A	#N/A
201	105 - 400 - 500	Springer Pit	Springer Pit	DD Core	105 - 400 - 500	#N/A	0.08	0.03	9.2	#N/A	#N/A	#N/A	29.20	#N/A	#N/A
202	105 - 500 - 600	Springer Pit	Springer Pit	DD Core	105 - 500 - 600	#N/A	0.09	0.05	9.3	#N/A	#N/A	#N/A	42.70	#N/A	#N/A
203	106 - 10 - 100	Springer Pit	Springer Pit	DD Core	106 - 10 - 100	#N/A	0.06	0.02	8.9	#N/A	#N/A	#N/A	24.30	#N/A	#N/A
204	106 - 100 - 200	Springer Pit	Springer Pit	DD Core	106 - 100 - 200	#N/A	0.02	0.02	8.8	#N/A	#N/A	#N/A	16.40	#N/A	#N/A
205	106 - 200 - 300	Springer Pit	Springer Pit	DD Core	106 - 200 - 300	#N/A	0.04	0.02	8.9	#N/A	#N/A	#N/A	23.60	#N/A	#N/A
206	106 - 300 - 400	Springer Pit	Springer Pit	DD Core	106 - 300 - 400	#N/A	0.07	0.01	8.9	#N/A	#N/A	#N/A	24.20	#N/A	#N/A
207	106 - 400 - 500	Springer Pit	Springer Pit	DD Core	106 - 400 - 500	#N/A	0.03	0.01	9.3	#N/A	#N/A	#N/A	44.20	#N/A	#N/A
208	106 - 500 - 600	Springer Pit	Springer Pit	DD Core	106 - 500 - 600	#N/A	0.05	0.03	9.3	#N/A	#N/A	#N/A	8.80	#N/A	#N/A
209	108 - 10 - 100	Springer Pit	Springer Pit	DD Core	108 - 10 - 100	#N/A	0.01	0.01	8.2	#N/A	#N/A	#N/A	11.00	#N/A	#N/A
210	108 - 100 - 200	Springer Pit	Springer Pit	DD Core	108 - 100 - 200	#N/A	0.04	0.03	8.7	#N/A	#N/A	#N/A	16.50	#N/A	#N/A
211	108 - 200 - 300	Springer Pit	Springer Pit	DD Core	108 - 200 - 300	#N/A	0.02	0.01	8.7	#N/A	#N/A	#N/A	33.20	#N/A	#N/A
212	108 - 300 - 400	Springer Pit	Springer Pit	DD Core	108 - 300 - 400	#N/A	0.04	0.02	8.7	#N/A	#N/A	#N/A	23.50	#N/A	#N/A
213	108 - 400 - 500	Springer Pit	Springer Pit	DD Core	108 - 400 - 500	#N/A	0.04	0.04	9	#N/A	#N/A	#N/A	21.50	#N/A	#N/A
214	108 - 500 - 600	Springer Pit	Springer Pit	DD Core	108 - 500 - 600	#N/A	0.13	0.08	9.1	#N/A	#N/A	#N/A	37.50	#N/A	#N/A
215	150 - 10 - 100	Springer Pit	Springer Pit	DD Core	150 - 10 - 100	#N/A	0.06	0.04	8.8	#N/A	#N/A	#N/A	19.60	#N/A	#N/A
216	150 - 100 - 200	Springer Pit	Springer Pit	DD Core	150 - 100 - 200	#N/A	0.06	0.02	8.7	#N/A	#N/A	#N/A	29.40	#N/A	#N/A
217	150 - 200 - 300	Springer Pit	Springer Pit	DD Core	150 - 200 - 300	#N/A	0.84	0.02	8.8	#N/A	#N/A	#N/A	84.20	#N/A	#N/A
218	150 - 300 - 400	Springer Pit	Springer Pit	DD Core	150 - 300 - 400	#N/A	0.67	0.03	8.8	#N/A	#N/A	#N/A	29.10	#N/A	#N/A
219	150 - 400 - 500	Springer Pit	Springer Pit	DD Core	150 - 400 - 500	#N/A	0.34	0.01	8.9	#N/A	#N/A	#N/A	26.30	#N/A	#N/A
220	150 - 500 - 600	Springer Pit	Springer Pit	DD Core	150 - 500 - 600	#N/A	0.47	0.01	8.8	#N/A	#N/A	#N/A	25.90	#N/A	#N/A
221	73093	Springer Pit	Springer Pit	DD Core	73093	#N/A	-0.01	-0.01	9	0	0.22	#N/A	23.00	#N/A	#N/A
222	73113	Springer Pit	Springer Pit	DD Core	73113	#N/A	-0.01	-0.01	8.4	0	0.22	#N/A	29.00	#N/A	#N/A
223	73233	Springer Pit	Springer Pit	DD Core	73233	#N/A	0.01	-0.01	8.4	0	0.27	#N/A	39.00	#N/A	#N/A
224	73253	Springer Pit	Springer Pit	DD Core	73253	#N/A	0.49	-0.01	8	0	0.16	#N/A	37.00	#N/A	#N/A
225	73273	Springer Pit	Springer Pit	DD Core	73273	#N/A	0.8	-0.01	8.1	0	0.55	#N/A	66.00	#N/A	#N/A
226	73293	Springer Pit	Springer Pit	DD Core	73293	#N/A	0.29	-0.01	8	0	0.11	#N/A	34.00	#N/A	#N/A
227	73488	Springer Pit	Springer Pit	DD Core	73488	#N/A	0.31	-0.01	8.3	0	0.05	#N/A	19.00	#N/A	#N/A
228	74333	Springer Pit	Springer Pit	DD Core	74333	#N/A	0.56	-0.01	8.3	0	0.05	#N/A	21.00	#N/A	#N/A
229	74478	Springer Pit	Springer Pit	DD Core	74478	#N/A	0.57	-0.01	8.5	0	0.05	#N/A	16.00	#N/A	#N/A
230	74498	Springer Pit	Springer Pit	DD Core	74498	#N/A	0.18	-0.01	8.7	0	0.27	#N/A	36.00	#N/A	#N/A
231	MP-66	Springer Pit	Springer Pit	DD Core	MP-66	#N/A	0.25	-0.05	9.3	0	0.11	#N/A	44.20	#N/A	#N/A
232	MP-67	Springer Pit	Springer Pit	DD Core	MP-67	#N/A	0.51	0.02	8.2	8.6	0.16	#N/A	26.00	#N/A	#N/A
233	476111	Springer Pit	Springer Pit	DD Core	476111	#N/A	0.04	0.01	7.92	#N/A	0.01	0.03	17.58	#N/A	#N/A
234	146670	Springer Pit	Springer Pit	DD Core	146670	#N/A	1.74	0.04	8.07	#N/A	0.93	0.93	102.24	#N/A	#N/A
235	146671	Springer Pit	Springer Pit	DD Core	146671	#N/A	2.15	0.01	7.93	#N/A	1.01	0.98	116.58	#N/A	#N/A
236	146672	Springer Pit	Springer Pit	DD Core	146672	#N/A	0.84	0.01	8.21	#N/A	1.12	1.13	92.27	#N/A	#N/A
237	146673	Springer Pit	Springer Pit	DD Core	146673	#N/A	0.96	0.01	8.22	#N/A	0.79	0.81	51.12	#N/A	#N/A
238	146674	Springer Pit	Springer Pit	DD Core	146674	#N/A	2.13	0.02	8.01	#N/A	1.30	1.33	145.89	#N/A	#N/A
239	146675	Springer Pit	Springer Pit	DD Core	146675	#N/A	0.66	0.01	8.34	#N/A	1.18	1.20	114.71	#N/A	#N/A
240	146676	Springer Pit	Springer Pit	DD Core	146676	#N/A	0.09	0.01	8.43	#N/A	2.15	2.09	218.20	#N/A	#N/A
241	146677	Springer Pit	Springer Pit	DD Core	146677	#N/A	0.1	0.01	8.39	#N/A	2.00	1.93	150.25	#N/A	#N/A
242	146678	Springer Pit	Springer Pit	DD Core	146678	#N/A	0.62	0.01	8.27	#N/A	1.67	1.64	155.86	#N/A	#N/A
243	146679	Springer Pit	Springer Pit	DD Core	146679	#N/A	1.58	0.02	8.14	#N/A	1.14	1.14	139.65	#N/A	#N/A
244	146680	Springer Pit	Springer Pit	DD Core	146680	#N/A	0.86	0.01	8.45	#N/A	1.07	1.10	128.43	#N/A	#N/A
245	146790	Springer Pit	Springer Pit	DD Core	146790	#N/A	2.49	0.08	7.91	#N/A	1.07	1.19	127.18	#N/A	#N/A
246	146791	Springer Pit	Springer Pit	DD Core	146791	#N/A	2.29	0.05	7.98	#N/A	1.03	0.97	112.84	#N/A	#N/A
247	146794	Springer Pit	Springer Pit	DD Core	146794	#N/A	0.15	0.01	8.42	#N/A	1.44	1.43	155.24	#N/A	#N/A
248	146795	Springer Pit	Springer Pit	DD Core	146795	#N/A	1.66	0.02	8.05	#N/A	0.81	0.83	92.27	#N/A	#N/A
249	146796	Springer Pit	Springer Pit	DD Core	146796	#N/A	0.69	0.01	8.39	#N/A	1.25	1.24	132.17	#N/A	#N/A
250	146797	Springer Pit	Springer Pit	DD Core	146797	#N/A	0.88	0.02	8	#N/A	1.50	1.51	129.68	#N/A	#N/A
251	146798	Springer Pit	Springer Pit	DD Core	146798	#N/A	1.1	0.02	8.39	#N/A	1.16	1.14	127.81	#N/A	#N/A
252	146799	Springer Pit	Springer Pit	DD Core	146799	#N/A	0.55	0.01	8.36	#N/A	1.44	1.42	118.45	#N/A	#N/A
253	146922	Springer Pit	Springer Pit	DD Core	146922	#N/A	1.13	0.01	8.18	#N/A	1.82	1.79	153.37	#N/A	#N/A
254	146923	Springer Pit	Springer Pit	DD Core	146923	#N/A	0.64	0.01	8.45	#N/A	1.30	1.27	123.44	#N/A	#N/A
255	146926	Springer Pit	Springer Pit	DD Core	146926	#N/A	0.52	0.01	8.51	#N/A	0.83	0.84	68.58	#N/A	#N/A
256	465229	Springer Pit	Springer Pit	DD Core	465229	#N/A	0.01	#N/A	8.62	#N/A	0.23	0.22	60.00	0.393	1.84
257	470445	Springer Pit	Springer Pit	DD Core	470445	#N/A	0.05	#N/A	8.84	#N/A	0.18	0.18	78.75	0.186	2.85
258	465244	Springer Pit	Springer Pit	DD Core	465244	#N/A	0.47	#N/A	8.37	#N/A	0.62	0.59	105.00	0.345	1.41
259	465240	Springer Pit	Springer Pit	DD Core	465240	#N/A	0.39	#N/A	8.1	#N/A	0.48	0.45	96.25	0.619	1.83
260	470436	Springer Pit	Springer Pit	DD Core	470436	#N/A	1.1	#N/A	8.06	#N/A	0.57	0.56	112.50	0.367	2.33
261	470423	Springer Pit	Springer Pit	DD Core	470423	#N/A	1.31	#N/A	8.38	#N/A	0.33	0.31	88.75	0.284	2.87
262	480754	Springer Pit	Springer Pit	DD Core	480754	#N/A	0.9	#N/A	8.62	#N/A	0.07	0.07	55.00	0.25	2.7
263	480757	Springer Pit	Springer Pit	DD Core	480757	#N/A	0.4	#N/A	8.75	#N/A	0.37	0.37	97.50	0.189	2.38
264	475695	Springer Pit	Springer Pit	DD Core	475695	#N/A	2.52	#N/A	8.1	#N/A	0.27	0.27	93.75	0.88	3.09
265	475682	Springer Pit	Springer Pit	DD Core	475682	#N/A	1.7	#N/A	8.43	#N/A	0.15	0.16	96.25	0.452	3.4
266	475668	Springer Pit	Springer Pit	DD Core	475668	#N/A	2.2	#N/A	8.12	#N/A	0.32	0.33	101.25	0.796	3.34
267	480746	Springer Pit	Springer Pit	DD Core	480746	#N/A	1.49	#N/A	8.26	#N/A	0.84	0.83	128.75	0.348	2.23
268	475493	Springer Pit	Springer Pit	DD Core	475493	#N/A	0.14	#N/A	9.13	#N/A	0.26	0.27	41.25	0.151	0.33
269	475466	Springer Pit	Springer Pit	DD Core	475466	#N/A	0.06	#N/A	8.94	#N/A	0.12	0.12	40.00	0.211	0.43
270	475479	Springer Pit	Springer Pit	DD Core	475479	#N/A	0.04	#N/A	9.34	#N/A	0.06	0.10	16.00	0.135	0.52
271	481100	Springer Pit	Springer Pit	DD Core	481100	#N/A	0.01	#N/A	8.78	#N/A	0.16	0.17	66.25	0.563	2.37
272	474152	Springer Pit	Springer Pit	DD Core	474152	#N/A	0.07	#N/A	9.15	#N/A	0.06	0.09	16.25	0.117	0.39
273	470040	Springer Pit	Springer Pit	DD Core	470040	#N/A	0.02	#N/A	8.71	#N/A	0.19	0.19	58.75	0.27	2.17
274	470063	Springer Pit	Springer Pit	DD Core	470063	#N/A	0.01	#N/A	8.57	#N/A	0.52	0.51	76.25	0.122	1.13
275	480677	Springer Pit	Springer Pit	DD Core	480677	#N/A	0.04	#N/A	8.89	#N/A	0.16	0.14	65.00	0.312	2.31
276	470050	Springer Pit	Springer Pit	DD Core	470050	#N/A	0.03	#N/A	8.6	#N/A	0.39	0.40	75.00	0.291	1.62
277	480664	Springer Pit	Springer Pit	DD Core	480664	#N/A	0.16	#N/A	8.48	#N/A	0.16	0.15	77.50	0.834	1.74
278	471271	Springer Pit	Springer Pit	DD Core	471271	#N/A	0.02	#N/A	9.23	#N/A	0.08	0.09	23.25	0.095	2.14
279	480684	Springer Pit	Springer Pit	DD Core	480684	#N/A	0.06	#N/A	8.9	#N/A	0.14	0.15	68.75	0.521	2.8
280	474261	Springer Pit	Springer Pit	DD Core	474261	#N/A	0.01	#N/A	8.71	#N/A	-0.01	-0.02	12.25	0.236	1.43
281	480178	Springer Pit	Springer Pit	DD Core	480178	#N/A	0.02	#N/A	8.39	#N/A	0.08	0.08	33.75	0.335	3.22
282	471262	Springer Pit	Springer Pit	DD Core	471262	#N/A	0.01	#N/A	9.07	#N/A	0.07	0.07	26.00	0.118	2.42
283	471269	Springer Pit	Springer Pit	DD Core	471269	#N/A	0.02	#N/A	9.29	#N/A	0.05	0.05	21.75	0.064	2.37
284	470298	Springer Pit	Springer Pit	DD Core	470298	#N/A	1.5	#N/A	8.32	#N/A	0.38	0.37	90.00	0.448	2.56
285	470279	Springer Pit	Springer Pit	DD Core	470279	#N/A	0.61	#N/A	8.61	#N/A	0.35	0.34	77.50	0.403	2.46
286	262761	Pond Zone	East Wall	DD Core	262761	Volcanic	6.33	0.05	7.66	#N/A	0.14	0.17	124.06	0.763	2.02
287	262775	Pond Zone	East Wall	DD Core	262775	Volcanic	1.06	0.03	8.2	#N/A	0.29	0.29	150.38	0.158	2.77
288	275422	Pond Zone	East Wall	DD Core	275422	Volcanic	0.98	0.01	8.29	#N/A	0.10	0.12	132.83	0.221	2.38
289	482023	Pond Zone	East wall South Ramp	DD Core	482023	Skarn/Vol	0.63	0.01	7.88	#N/A	0.16	0.17	63.91	0.898	1.06
290	482021	Pond Zone	East wall South Ramp	DD Core	482021	Skarn/Vol	0.38	0.01	8.47	#N/A	0.06	0.07	53.88	0.84	1.07
291	482034	Pond Zone	South Ramp	DD Core	482034	Skarn/Vol	0.63	0.01	8.7	#N/A	0.05	0.09	52.63	1.062	0.91
292	482042	Pond Zone	South Ramp	DD Core	482042	Skarn/Vol	0.47	0.01	8.51	#N/A	0.19	0.20	72.68	0.728	1.15
293	482032	Pond Zone	South Ramp	DD Core	482032	Skarn/Vol	0.85	0.01	8.42	#N/A	0.13	0.13	75.19	1.01	1.01
294	482041	Pond Zone	South Ramp	DD Core	482041	Skarn/Vol	0.78	0.01	8.58	#N/A	0.08	0.08	30.81	0.616	0.91

Index	Sample ID	Source	Location	Sample Type	Sample ID	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
						ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
178	May 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
179	Jun 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
180	Jun 2001 Sample 2+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
181	Sep 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
182	Sep 2001 Sample 2+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
183	Sep 2001 Sample 3+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
184	Oct 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
185	102 - 10 - 100	Springer Pit	Springer Pit	DD Core	102 - 10 - 100	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
186	102 - 100 - 200	Springer Pit	Springer Pit	DD Core	102 - 100 - 200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
187	102 - 200 - 300	Springer Pit	Springer Pit	DD Core	102 - 200 - 300	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
188	102 - 300 - 400	Springer Pit	Springer Pit	DD Core	102 - 300 - 400	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
189	102 - 400 - 500	Springer Pit	Springer Pit	DD Core	102 - 400 - 500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
190	102 - 500 - 600	Springer Pit	Springer Pit	DD Core	102 - 500 - 600	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
191	103 - 10 - 100	Springer Pit	Springer Pit	DD Core	103 - 10 - 100	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
192	103 - 100 - 200	Springer Pit	Springer Pit	DD Core	103 - 100 - 200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
193	103 - 200 - 300	Springer Pit	Springer Pit	DD Core	103 - 200 - 300	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
194	103 - 300 - 400	Springer Pit	Springer Pit	DD Core	103 - 300 - 400	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
195	103 - 400 - 500	Springer Pit	Springer Pit	DD Core	103 - 400 - 500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
196	103 - 500 - 600	Springer Pit	Springer Pit	DD Core	103 - 500 - 600	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
197	105 - 10 - 100	Springer Pit	Springer Pit	DD Core	105 - 10 - 100	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
198	105 - 100 - 200	Springer Pit	Springer Pit	DD Core	105 - 100 - 200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
199	105 - 200 - 300	Springer Pit	Springer Pit	DD Core	105 - 200 - 300	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
200	105 - 300 - 400	Springer Pit	Springer Pit	DD Core	105 - 300 - 400	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
201	105 - 400 - 500	Springer Pit	Springer Pit	DD Core	105 - 400 - 500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
202	105 - 500 - 600	Springer Pit	Springer Pit	DD Core	105 - 500 - 600	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
203	106 - 10 - 100	Springer Pit	Springer Pit	DD Core	106 - 10 - 100	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
204	106 - 100 - 200	Springer Pit	Springer Pit	DD Core	106 - 100 - 200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
205	106 - 200 - 300	Springer Pit	Springer Pit	DD Core	106 - 200 - 300	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
206	106 - 300 - 400	Springer Pit	Springer Pit	DD Core	106 - 300 - 400	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
207	106 - 400 - 500	Springer Pit	Springer Pit	DD Core	106 - 400 - 500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
208	106 - 500 - 600	Springer Pit	Springer Pit	DD Core	106 - 500 - 600	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
209	108 - 10 - 100	Springer Pit	Springer Pit	DD Core	108 - 10 - 100	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
210	108 - 100 - 200	Springer Pit	Springer Pit	DD Core	108 - 100 - 200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
211	108 - 200 - 300	Springer Pit	Springer Pit	DD Core	108 - 200 - 300	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
212	108 - 300 - 400	Springer Pit	Springer Pit	DD Core	108 - 300 - 400	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
213	108 - 400 - 500	Springer Pit	Springer Pit	DD Core	108 - 400 - 500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
214	108 - 500 - 600	Springer Pit	Springer Pit	DD Core	108 - 500 - 600	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
215	150 - 10 - 100	Springer Pit	Springer Pit	DD Core	150 - 10 - 100	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
216	150 - 100 - 200	Springer Pit	Springer Pit	DD Core	150 - 100 - 200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
217	150 - 200 - 300	Springer Pit	Springer Pit	DD Core	150 - 200 - 300	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
218	150 - 300 - 400	Springer Pit	Springer Pit	DD Core	150 - 300 - 400	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
219	150 - 400 - 500	Springer Pit	Springer Pit	DD Core	150 - 400 - 500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
220	150 - 500 - 600	Springer Pit	Springer Pit	DD Core	150 - 500 - 600	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
221	73093	Springer Pit	Springer Pit	DD Core	73093	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
222	73113	Springer Pit	Springer Pit	DD Core	73113	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
223	73233	Springer Pit	Springer Pit	DD Core	73233	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
224	73253	Springer Pit	Springer Pit	DD Core	73253	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
225	73273	Springer Pit	Springer Pit	DD Core	73273	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
226	73293	Springer Pit	Springer Pit	DD Core	73293	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
227	73488	Springer Pit	Springer Pit	DD Core	73488	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
228	74333	Springer Pit	Springer Pit	DD Core	74333	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
229	74478	Springer Pit	Springer Pit	DD Core	74478	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
230	74498	Springer Pit	Springer Pit	DD Core	74498	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
231	MP-66	Springer Pit	Springer Pit	DD Core	MP-66	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
232	MP-67	Springer Pit	Springer Pit	DD Core	MP-67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
233	476111	Springer Pit	Springer Pit	DD Core	476111	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
234	146670	Springer Pit	Springer Pit	DD Core	146670	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
235	146671	Springer Pit	Springer Pit	DD Core	146671	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
236	146672	Springer Pit	Springer Pit	DD Core	146672	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
237	146673	Springer Pit	Springer Pit	DD Core	146673	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
238	146674	Springer Pit	Springer Pit	DD Core	146674	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
239	146675	Springer Pit	Springer Pit	DD Core	146675	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
240	146676	Springer Pit	Springer Pit	DD Core	146676	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
241	146677	Springer Pit	Springer Pit	DD Core	146677	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
242	146678	Springer Pit	Springer Pit	DD Core	146678	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
243	146679	Springer Pit	Springer Pit	DD Core	146679	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
244	146680	Springer Pit	Springer Pit	DD Core	146680	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
245	146790	Springer Pit	Springer Pit	DD Core	146790	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
246	146791	Springer Pit	Springer Pit	DD Core	146791	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
247	146794	Springer Pit	Springer Pit	DD Core	146794	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
248	146795	Springer Pit	Springer Pit	DD Core	146795	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
249	146796	Springer Pit	Springer Pit	DD Core	146796	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
250	146797	Springer Pit	Springer Pit	DD Core	146797	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
251	146798	Springer Pit	Springer Pit	DD Core	146798	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
252	146799	Springer Pit	Springer Pit	DD Core	146799	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
253	146922	Springer Pit	Springer Pit	DD Core	146922	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
254	146923	Springer Pit	Springer Pit	DD Core	146923	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
255	146926	Springer Pit	Springer Pit	DD Core	146926	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
256	465229	Springer Pit	Springer Pit	DD Core	465229	20	64.3	#N/A	0.05	2.12	0.57	14.7	11.4	960.62	#N/A	3.64	147	0.11	0.89	1479	2.5	0.071	3.7	0.18	7.83	0.17	0.4	439.1	0.06	117	0.7	146.1
257	470445	Springer Pit	Springer Pit	DD Core	470445	11	143.8	#N/A	0.03	2.41	0.6	17.7	9.4	522.51	#N/A	4.36	379	0.25	1.03	791	3.18	0.439	5.6	0.226	17.35	0.1	0.6	990.9	0.097	194	0.2	177.4
258	465244	Springer Pit	Springer Pit	DD Core	465244	33.3	62	#N/A	0.08	3.1	0.22	11.5	12.2	517.73	#N/A	4.44	120	0.06	0.91	1663	11.29	0.012	2.3	0.115	4.8	0.38	1.2	153.8	0.058	113	0.8	70.8
259	465240	Springer Pit	Springer Pit	DD Core	465240	33.5	82.1	#N/A	0.14	2.58	0.98	13.6	11.5	715.44	#N/A	3.57	401	0.07	0.95	1546	5.97	0.016	2.8	0.147	10.04	0.28	4.3	89.6	0.021	125	0.3	85.8
260	470436	Springer Pit	Springer Pit	DD Core	470436	14.9	31.5	#N/A	0.12	3.18	0.19	18.9	13.5	1108.5	#N/A	4.84	105	0.19	1.35	662	18.19	0.119	5.1	0.176	9.13	0.24	3.5	646.3	0.131	169	0.4	61.4
261	470423	Springer Pit	Springer Pit	DD Core	470423	16.8	34.6	#N/A	0.07	2.48	0.09	13.7	9.1	979.52	#N/A	3.87	139	0.15	1.16	611	8.07	0.534	4.5	0.182	7.71	0.22	3.7	962.6	0.089	133	0.4	43.3
262	480754	Springer Pit	Springer Pit	DD Core	480754	10.2	56.1	#N/A	0.03	1.63	0.28	19.7	6.9	509.8	#N/A	4.6	91	0.25	0.82	576	18.17	0.856	4.2	0.155	10.48	0.12	3.5	274.6	0.124	139	0.5	95.8
263	480757	Springer Pit	Springer Pit	DD Core	480757	12.1	60.1	#N/A	0.02	2.38	0.24	13.8	6.9	287.3	#N/A	5.39	79	0.2	0.86	868	16.65	0.68	3.8	0.146	9.57	0.15	2.5	254	0.107	178	0.7	111.9
264	475695	Springer Pit	Springer Pit	DD Core	475695	18	66.6	#N/A	0.2	2.31	0.09	20.2	11.7	778.79	#N/A	5.14	15	0.22	1	495	18.35	1.008	5	0.166	10.7	0.07	8.2	338.9	0.13	150	0.6	40.5
265	475682	Springer Pit	Springer Pit	DD Core	475682	19.4	64.8	#N/A	0.08	1.78	0.62	17.6	11.3	384.19	#N/A	5.03	5	0.32	1.02	513	10.28	1.445	4.2	0.159	7.17	0.09	3.6	212.8	0.163	155	0.3	95.9
266	475668	Springer Pit	Springer Pit	DD Core	475668	19.6	50.1	#N/A	0.13	2.52	0.48	17.7	8.7	253.97	#N/A	4.8	16	0.17	1.13	760	18.42	1.056	3.9	0.171	10.58	0.07	4.5	395.6	0.147	125	0.9	98.2
267	480746	Springer Pit	Springer Pit	DD Core	480746	14.6	56.9	#N/A	0.05	3.75	0.32	18.6	7	436.47	#N/A	5.16	139	0.19	1.47	1065	22.13	0.254	4.8	0.171	10.81	0.21	6.3	76.8	0.127	169	0.5	112.5
268	475493	Springer Pit	Springer Pit	DD Core	475493	3	850.3	#N/A	0.05	1.07	0.04	6.6	13.9	649.9	#N/A	2.68	10	0.03	0.29	219	2.74	0.042	2.8	0.071	5.19	0.07	0.8	55.5	0.083	88	0.5	19.5
269	475466	Springer Pit	Springer Pit	DD Core	475466	4.2	806.1	#N/A	0.03	0.77	0.22	8.9	55.3	506.83	#N/A	2.75	24	0.1	0.54	229	2.78	0.069	16	0.087	7.19	0.16	0.7	102.1	0.08	102	0.3	51.2
270	475479	Springer Pit	Springer Pit	DD Core	475479	5.4	333.2	#N/A	0.05	0.65	0.06	6.7	54.6	503.11	#N/A	1.9	5	0.04	0.57	247	2.06	0.037	10.8	0.073	4.51	0.09	0.4	30.2	0.069	71	0.3	29.1
271	481100	Springer Pit	Springer Pit	DD Core	481100	17.4	240.6	#N/A	0.03	2.37	0.74	20.4	6	148.46	#N/A	3.55	173	0.1	0.8	1185	1.53	0.261	2.3	0.174	24.35	0.17	0.4	369.5	0.055	116	0.5	179.5
272	474152	Springer Pit	Springer Pit	DD Core	474152	6.8	243.5	#N/A	0.13	0.7	0.09	4.9	20.5	244.69	#N/A	1.83	12	0.14	0.31	153	4.85	0.03	4.7	0.065	5.23	0.16	1.1	16.2	0.068	64	1.2	21.1
273	470040	Springer Pit	Springer Pit	DD Core	470040	9.5	127.4	#N/A	0.03	2.05	0.65	9.1	11	218.05	#N/A	2.75	183	0.16	0.49	1025	4.71	0.639	2	0.149	13.25	0.09	0.3	246.1	0.045	110	0.5	148.8
274	470063	Springer Pit	Springer Pit	DD Core	470063	12.4	44.4	#N/A	0.06	2.21	0.34	11.5	12.5	492.87	#N/A	2.64	124	0.09	0.6	1176	1.79	0.009	2.6	0.107	5.11	0.37	0.2	242.5	0.026	95	0.2	138.8
275	480677	Springer Pit	Springer Pit	DD Core	480677	6.8	114.1	#N/A	0.03	1.68	0.43	12.1	8.7	156.76	#N/A	3.87	73	0.15	0.57	509	2.08	1.129	2.6	0.188	10.8	0.11	0.3	210.7	0.08	148	0.2	101.4
276	470050	Springer Pit	Springer Pit	DD Core	470050	9	38.3	#N/A	0.05	2.76	0.6	10	10.6	408.78	#N/A	2.77	117	0.11	0.63	1860	5.95	0.101	2.1	0.12	15.13	0.16	0.5	394.3	0.058	85	0.7	187.7
277	480664	Springer Pit	Springer Pit	DD Core	480664	14.1	147.9	#N/A	0.05	1.98	1.14	19.8	6.5	740.33	#N/A	4.2	504	0.08	1.31	1295	6.77	0.016	3.4	0.188	14.1	0.49	1.8	226.8	0.091	128	0.8	409.4
278	471271	Springer Pit	Springer Pit	DD Core	471271	9.6	617.3	#N/A	-0.02	2.27	0.11	20.2	11.2	218.24	#N/A	4.88	7	0.13	1.21	622	4.87	0.026	4.8	0.114	2.93	0.06	0.3	66.1	0.155	187	0.2	38.7
279	480684	Springer Pit	Springer Pit	DD Core	480684	12.5	283.8	#N/A	0.04	2.18	0.43	13.7	8.3	361.74	#N/A	3.85	144	0.14	0.67	731	3.45	0.921	2.4	0.182	9.95	0.16	0.5	338.3	0.078	125	0.4	92.3
280	474261	Springer Pit	Springer Pit	DD Core	474261	18.7	106.4	#N/A	0.09	1.14	0.21	11.5	11.5	717.72	#N/A	3.57	73	0.14	0.84	414	4.32	0.148	2.4	0.16	4.93	0.18	0.6	35	0.102	115	0.6	39.8
281	480178	Springer Pit	Springer Pit	DD Core	480178	6	101.8	#N/A	0.04	1.89	0.32	13.8	14.8	747.83	#N/A	4.64	97	0.31	0.82	951	2.39	0.866	3.4	0.149	7.27	0.05	0.2	879.3	0.074	162	0.3	98.6
282	471262	Springer Pit	Springer Pit	DD Core	471262	8.6	286.5	#N/A	-0.02	2.63	0.08	21.4	10.6	102.4	#N/A	4.99	6	0.12	1.26	587	2.57	0.028	4.3	0.119	4.11	0.07	0.1	52	0.181	201	0.2	44.5
283	471269	Springer Pit	Springer Pit	DD Core	471269	16.6	752	#N/A	-0.02	2.47	0.11	22.1	9.2	146.86	#N/A	4.92	6	0.14	1.22	638	2.63	0.041	4.3	0.121	3.27	0.09	0.1	80.8	0.18	194	0.2	36.8
284	470298	Springer Pit	Springer Pit	DD Core	470298	19	78	#N/A	0.05	2.63	0.36	18	12.8	564.26	#N/A	4.46	85	0.28	0.9	608	33.74	0.428	4	0.163	16.35	0.2	5	659.9	0.101	147	0.5	86.7
285	470279	Springer Pit	Springer Pit	DD Core	470279	16.8	71.2	#N/A	0.03	2.67	0.81	17.7	6.4	229.47	#N/A	4.74	126	0.2	1.04	755	19.41	0.537	3.6	0.209	24.49	0.15	3.1	181.7	0.125	175	0.6	176.7
286	262761	Pond Zone	East Wall	DD Core	262761	30.1	18.5	#N/A	0.88	1.5	0.12	44.2	23.6	752.17	#N/A	8.46	271	0.05	2.53	1184	12.73	0.013	16.6	0.2	5.14	0.3	6.7	104.3	0.228	170	1.3	79.9
287	262775	Pond Zone	East Wall	DD Core	262775	15.9	17.1	#N/A	0.14	1.74	0.02	23.1	38.7	95.99	#N/A	5.25	47	0.06	3.17	1287	2.36	0.024	19.4	0.191	2.59	0.14	1.3	92.2	0.213	131	0.7	92.2
288	275422	Pond Zone	East Wall	DD Core	275422	11.3	19.4	#N/A	0.31	1.64	0.03	21.9	101.9	236.61	#N/A	4.86	26	0.07	2.49	1204	4.15	0.026	66.2	0.173	4.55	0.1	1.4	57.8	0.201	139	0.6	81.2
289	482023	Pond Zone	East wall South Ramp	DD Core	482023	13.4	13.3	#N/A	0.05	1.29	3.24	17.6	21.4	798.79	#N/A	2.62	519	0.06	1.02	849	4.39	0.022	6.2	0.121	4.91	0.3	1.3	87.8	0.094	68	0.4	685.4
290	482021	Pond Zone	East wall South Ramp	DD Core	482021	11.3	21.7	#N/A	0.05	1.24	2.33	13.4	21.6	803.74	#N/A	2.65	272	0.06	0.79	864	3.8	0.034	4.8	0.137	5.75	0.27	1	81.1	0.084	77	0.5	434.5
291	482034	Pond Zone	South Ramp	DD Core	482034	10.5	22.4	#N/A	0.07	1.38	1.86	14.2	27.4	942.11	#N/A	1.98	302	0.07	0.65	792	5.85	0.024	5.6	0.11	8.69	0.34	1.3	65.7	0.083	63	0.6	508.9
292	482042	Pond Zone	South Ramp	DD Core	482042	9.1	19.2	#N/A	0.06	1.92	0.48	13.2	27.2	356.72	#N/A	1.56	81	0.12	0.9	837	4.84	0.024	6.5	0.114	2.81	0.33	1.1	58.5	0.084	46	0.5	199.2
293	482032	Pond Zone	South Ramp	DD Core	482032	14.1	21.6	#N/A	0.08	1.38	2.05	16.1	34.3	922.07	#N/A	2.66	315	0.06	0.98	1124	6.69	0.019	6.2	0.116	8.95	0.37	1.9	74.2	0.084	76	0.7	472.6
294	482041	Pond Zone	South Ramp	DD Core	482041	10.5	11.8	#N/A	0.1	1.31	0.25	16	31.3	485.48	#N/A	1.81	70	0.12	0.99	800	5.64	0.029	6.8	0.113	3.13	0.39	1.6	52.6	0.088	48	0.5	123

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C	NP	Ag	Al
											%C	%C		ppm	%
295	499413	Pond Zone	North Wall (Skarn)	DD Core	499413	Skarn	0.58	0.01	8.37	#N/A	0.37	0.39	130.33	0.893	1.63
296	499431	Pond Zone	North Wall (Skarn)	DD Core	499431	Skarn	0.08	0.01	8.42	#N/A	8.54	8.59	701.75	0.77	0.56
297	499502	Pond Zone	Lower North Wall (Skarn)	DD Core	499502	Skarn	0.15	0.01	8.29	#N/A	0.76	0.76	129.07	0.118	1.7
298	499521	Pond Zone	Lower North Wall (Skarn)	DD Core	499521	Skarn	1.59	0.01	8.34	#N/A	0.45	0.46	112.78	1.333	1.05
299	483866	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	483866	Diorite	1.42	0.01	8.48	#N/A	0.06	0.07	31.82	0.337	1.11
300	273110	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	273110	Diorite	0.99	0.02	8.32	#N/A	0.15	0.16	77.69	0.822	0.92
301	273120	Pond Zone	West wall(North 1/2),same rock as above	DD Core	273120	Diorite	0.84	0.01	8.1	#N/A	0.08	0.08	60.15	0.681	0.84
302	483849	Pond Zone	West wall(North 1/2),same rock as below	DD Core	483849	Diorite	0.37	0.01	8.5	#N/A	0.05	0.06	18.69	0.397	0.84
303	464304	Pond Zone	West Wall of South Ramp	DD Core	464304	Diorite	0.11	-0.01	7.99	#N/A	0.00	0.03	16.21	0.152	1.21
304	499406	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	499406	Diorite	0.02	0.01	8.27	#N/A	-0.01	0.01	15.91	0.205	0.91
305	464317	Pond Zone	Upper North Wall (monz above Skarn)	DD Core	464317	Monzonite	0.31	-0.01	8.87	#N/A	0.01	0.04	15.21	0.512	1.02
306	464308	Pond Zone	West wall(south 1/2), same rock as above	DD Core	464308	Monzonite	0.25	0.01	8	#N/A	0.03	0.03	13.84	0.201	1.03
307	464315	Pond Zone	West wall(south 1/2),same rock as below	DD Core	464315	Monzonite	0.17	-0.01	8.83	#N/A	0.10	0.11	26.43	0.411	0.98
308	464314	Pond Zone	West Wall of South Ramp	DD Core	464314	Monzonite	0.06	-0.01	8.45	#N/A	0.02	0.05	14.71	0.503	1.08
309	464306	Pond Zone	Ore Zone	DD Core	464306	Fault zone	0.13	0.02	8.62	#N/A	0.29	0.30	115.29	1.186	1.33
310	468311	Pond Zone	Ore Zone	DD Core	468311	Fault zone	0.53	0.01	8.46	#N/A	0.07	0.10	91.48	3.229	1.81
311	468316	Pond Zone	Ore Zone	DD Core	468316	Fault zone	0.18	0.01	8.37	#N/A	0.49	0.49	146.62	2.166	1.28
312	468323	Pond Zone	Ore Zone	DD Core	468323	Monz Dyke	0.96	0.01	8.24	#N/A	0.08	0.09	63.91	0.71	1.23
313	241931	SE Zone	SE Zone	DD Core	241931	KP	1.67	-0.01	8.4	#N/A	0.17	#N/A	51.20	0.2	1.22
314	241932	SE Zone	SE Zone	DD Core	241932	KP	0.17	-0.01	9	#N/A	0.09	#N/A	18.80	0.1	1.3
315	241933	SE Zone	SE Zone	DD Core	241933	KP	0.45	-0.01	9	#N/A	0.10	#N/A	21.40	0.1	1.31
316	241941	SE Zone	SE Zone	DD Core	241941	KP	0.61	-0.01	9.4	#N/A	0.03	#N/A	11.00	0.2	1.14
317	241943	SE Zone	SE Zone	DD Core	241943	KP	0.83	-0.01	9.2	#N/A	0.02	#N/A	10.30	0.2	0.94
318	255935	SE Zone	SE Zone	DD Core	255935	KP	0.04	-0.01	8.7	#N/A	0.00	#N/A	6.00	-0.1	1
319	255936	SE Zone	SE Zone	DD Core	255936	KP	0.17	-0.01	9	#N/A	0.02	#N/A	8.00	0.1	1.11
320	256192	SE Zone	SE Zone	DD Core	256192	KP	1.99	0.01	7.9	#N/A	0.01	#N/A	12.10	0.1	1.81
321	256194	SE Zone	SE Zone	DD Core	256194	KP	1.58	0.01	8	#N/A	0.05	#N/A	6.80	0.1	1.3
322	241232	SE Zone	SE Zone	DD Core	241232	Mz	0.98	-0.01	9.2	#N/A	0.07	#N/A	20.60	0.1	1.58
323	241234	SE Zone	SE Zone	DD Core	241234	Mz	1.09	-0.01	8.6	#N/A	0.17	#N/A	45.00	0.2	1.47
324	241392	SE Zone	SE Zone	DD Core	241392	Mz	0.54	-0.01	8.8	#N/A	0.02	#N/A	11.80	0.2	1.77
325	241394	SE Zone	SE Zone	DD Core	241394	Mz	1.31	0.01	8.6	#N/A	0.07	#N/A	18.80	0.1	1.86
326	241416	SE Zone	SE Zone	DD Core	241416	Mz	0.96	-0.01	8.7	#N/A	0.10	#N/A	22.60	0.1	1.55
327	241419	SE Zone	SE Zone	DD Core	241419	Mz	1.32	-0.01	8.8	#N/A	0.06	#N/A	15.80	0.1	1.46
328	256208	SE Zone	SE Zone	DD Core	256208	Mz	1.67	-0.01	8.5	#N/A	0.04	#N/A	15.30	0.1	1.24
329	256210	SE Zone	SE Zone	DD Core	256210	Mz	0.96	0.01	8.9	#N/A	0.08	#N/A	18.30	0.1	1.52
330	256319	SE Zone	SE Zone	DD Core	256319	Mz	0.49	0.05	6.7	#N/A	0.01	#N/A	6.30	0.1	1.2
331	256321	SE Zone	SE Zone	DD Core	256321	Mz	1.91	0.02	7.05	#N/A	0.00	#N/A	11.00	0.2	1.23
332	256331	SE Zone	SE Zone	DD Core	256331	Mz	1.65	-0.01	8.7	#N/A	0.03	#N/A	11.80	0.4	1.75
333	256332	SE Zone	SE Zone	DD Core	256332	Mz	1.57	-0.01	8.6	#N/A	0.10	#N/A	23.10	0.2	1.31
334	258583	SE Zone	SE Zone	DD Core	258583	Mz	2.36	-0.01	8.6	#N/A	0.08	#N/A	20.60	0.1	1.12
335	258585	SE Zone	SE Zone	DD Core	258585	Mz	1.1	-0.01	9	#N/A	0.10	#N/A	20.80	0.1	1.24
336	259062	SE Zone	SE Zone	DD Core	259062	Mz	1.27	-0.01	8.8	#N/A	0.07	#N/A	16.10	0.1	1.52
337	259065	SE Zone	SE Zone	DD Core	259065	Mz	1.82	-0.01	8.5	#N/A	0.04	#N/A	20.40	0.1	1.4
338	259250	SE Zone	SE Zone	DD Core	259250	Mz	1.15	0.01	8.2	#N/A	0.13	#N/A	37.90	0.1	2.77
339	259253	SE Zone	SE Zone	DD Core	259253	Mz	1.15	0.01	8.3	#N/A	0.15	#N/A	30.40	0.1	2.28
340	259502	SE Zone	SE Zone	DD Core	259502	Mz	1.62	0.02	7.5	#N/A	0.01	#N/A	9.50	0.2	1.33
341	259505	SE Zone	SE Zone	DD Core	259505	Mz	1.88	-0.01	8.5	#N/A	0.03	#N/A	13.60	0.1	1.46
342	259795	SE Zone	SE Zone	DD Core	259795	Mz	0.17	-0.01	9.5	#N/A	0.11	#N/A	15.30	0.2	0.57
343	259796	SE Zone	SE Zone	DD Core	259796	Mz	0.12	-0.01	9.5	#N/A	0.16	#N/A	21.10	0.2	0.49
344	260569	SE Zone	SE Zone	DD Core	260569	Mz	0.12	-0.01	9.4	#N/A	0.06	#N/A	12.10	-0.1	1.31
345	260573	SE Zone	SE Zone	DD Core	260573	Mz	1.52	0.01	9	#N/A	0.02	#N/A	15.80	0.1	1.37
346	261763	SE Zone	SE Zone	DD Core	261763	Mz	0.39	-0.01	9	#N/A	0.24	#N/A	31.20	0.1	1.57
347	261765	SE Zone	SE Zone	DD Core	261765	Mz	0.81	-0.01	9.2	#N/A	0.14	#N/A	21.40	-0.1	0.87
348	261775	SE Zone	SE Zone	DD Core	261775	Mz	1.33	-0.01	8.8	#N/A	0.13	#N/A	27.10	0.2	1.43
349	261776	SE Zone	SE Zone	DD Core	261776	Mz	0.79	-0.01	9	#N/A	0.17	#N/A	18.80	0.1	1.35
350	31929	Wight Pit	WB-03-06	DD Core	31929	AP	0.04	0.01	8.15	#N/A	1.13	#N/A	136.00	1.2	1.2
351	32550	Wight Pit	WB-03-11	DD Core	32550	AP	0.05	-0.01	8.57	#N/A	0.63	#N/A	97.00	-0.3	2.43
352	31636	Wight Pit	WB-03-03	DD Core	31636	BX	0.67	-0.01	8.53	#N/A	1.56	#N/A	151.10	1.1	1.58
353	31598	Wight Pit	WB-03-03	DD Core	31598	BX	3.79	-0.01	8	#N/A	1.20	#N/A	119.60	0.9	1.1
354	31943	Wight Pit	WB-03-06	DD Core	31943	BX	0.88	-0.01	8.3	#N/A	1.08	#N/A	113.40	1.1	0.82
355	31998	Wight Pit	WB-03-06	DD Core	31998	BX	0.3	0.02	8.27	#N/A	1.18	#N/A	148.60	1.4	2.01
356	32491	Wight Pit	WB-03-11	DD Core	32491	BX	0.47	-0.01	8.4	#N/A	1.19	#N/A	127.20	1.2	1.88
357	32539	Wight Pit	WB-03-11	DD Core	32539	BX	0.49	0.02	8.39	#N/A	1.06	#N/A	113.40	0.7	1.49
358	32727	Wight Pit	WB-03-14	DD Core	32727	BX	0.86	0.17	7.86	#N/A	1.46	#N/A	146.10	0.5	1.86
359	32635	Wight Pit	WB-03-14	DD Core	32635	BXm	0.76	-0.01	8.16	#N/A	1.40	#N/A	115.90	0.8	1.52
360	31557	Wight Pit	WB-03-03	DD Core	31557	PP	1.51	-0.01	7.63	#N/A	1.14	#N/A	108.30	0.6	1.14
361	31945	Wight Pit	WB-03-06	DD Core	31945	PPg	0.05	-0.01	8.21	#N/A	0.08	#N/A	19.80	-0.3	1.44
362	32561	Wight Pit	WB-03-11	DD Core	32561	PPg	0.07	-0.01	8.51	#N/A	0.50	#N/A	60.50	0.3	2.53
363	32640	Wight Pit	WB-03-14	DD Core	32640	PPg	2.18	-0.01	8.09	#N/A	1.06	#N/A	122.20	1.5	1.47
364	32729	Wight Pit	WB-03-14	DD Core	32729	PPg	0.81	0.28	7.97	#N/A	1.06	#N/A	120.90	0.8	1.61
365	31603	Wight Pit	WB-03-03	DD Core	31603	PPp	0.83	0.01	8.24	#N/A	0.95	#N/A	93.20	1	1.21
366	31576	Wight Pit	WB-03-03	DD Core	31576	PPp	1.57	-0.01	8.07	#N/A	0.94	#N/A	90.70	-0.3	0.88
367	31973	Wight Pit	WB-03-06	DD Core	31973	PPp	0.66	-0.01	8.54	#N/A	0.78	#N/A	93.20	0.4	1.49
368	32519	Wight Pit	WB-03-11	DD Core	32519	PPp	0.51	-0.01	8.42	#N/A	0.62	#N/A	71.80	0.7	1.86
369	32702	Wight Pit	WB-03-14	DD Core	32702	PPp	1.57	0.02	8.32	#N/A	1.17	#N/A	117.10	0.9	1.26
370	1	Wight Pit	WB-03-01	DD Core	1	#N/A	1.85	0.01	8.4	#N/A	1.10	#N/A	121.20	#N/A	#N/A
371	2	Wight Pit	WB-03-01	DD Core	2	#N/A	0.47	0.01	8.3	#N/A	1.60	#N/A	160.40	#N/A	#N/A
372	3	Wight Pit	WB-03-02	DD Core	3	#N/A	-0.02	<0.01	8.1	#N/A	0.14	#N/A	40.10	#N/A	#N/A
373	4	Wight Pit	WB-03-02	DD Core	4	#N/A	1.79	0.01	8.3	#N/A	1.04	#N/A	118.70	#N/A	#N/A
374	5	Wight Pit	WB-03-03	DD Core	5	#N/A	1.55	0.01	8.4	#N/A	1.03	#N/A	107.30	#N/A	#N/A
375	6	Wight Pit	WB-03-03	DD Core	6	#N/A	1.33	0.01	8.1	#N/A	0.98	#N/A	108.60	#N/A	#N/A
376	7	Wight Pit	WB-03-04	DD Core	7	#N/A	0.51	<0.01	8.6	#N/A	0.97	#N/A	88.40	#N/A	#N/A
377	8	Wight Pit	WB-03-04	DD Core	8	#N/A	-0.02	<0.01	8.1	#N/A	0.32	#N/A	46.90	#N/A	#N/A
378	9	Wight Pit	WB-03-05	DD Core	9	#N/A	1.62	0.01	8.5	#N/A	1.23	#N/A	130.10	#N/A	#N/A
379	10	Wight Pit	WB-03-05	DD Core	10	#N/A	0.65	0.02	8.7	#N/A	1.26	#N/A	137.60	#N/A	#N/A
380	11	Wight Pit	WB-03-06	DD Core	11	#N/A	0.2	<0.01	8.2	#N/A	1.51	#N/A	149.00	#N/A	#N/A
381	12	Wight Pit	WB-03-06	DD Core	12	#N/A	2.37	0.1	6.2	#N/A	0.48	#N/A	68.90	#N/A	#N/A
382	13	Wight Pit	WB-03-07	DD Core	13	#N/A	0.98	0.01	8.6	#N/A	0.95	#N/A	89.60	#N/A	#N/A
383	14	Wight Pit	WB-03-08	DD Core	14	#N/A	0.69	<0.01	8.8	#N/A	0.85	#N/A	97.70	#N/A	#N/A
384	15	Wight Pit	WB-03-08	DD Core	15	#N/A	1.59	0.01	9	#N/A	0.55	#N/A	56.80	#N/A	#N/A
385	16	Wight Pit	WB-03-09	DD Core	16	#N/A	0.7	<0.01	8.9	#N/A	1.18	#N/A	130.10	#N/A	#N/A
386	17	Wight Pit	WB-03-09	DD Core	17	#N/A	0.9	0.01	8.4	#N/A	1.30	#N/A	142.70	#N/A	#N/A
387	18	Wight Pit	WB-03-10	DD Core	18	#N/A	1.04	0.01	9	#N/A	1.11	#N/A	121.20	#N/A	#N/A
388	19	Wight Pit	WB-03-11	DD Core	19	#N/A	0.99	0.01	8.7	#N/A	1.03	#N/A	109.80	#N/A	#N/A
389	20	Wight Pit	WB-03-12	DD Core	20	#N/A	1.13	0.01	9.2	#N/A	0.81	#N/A	93.40	#N/A	#N/A
390	21	Wight Pit	WB-03-12	DD Core	21	#N/A	1.47	0.01	8.4	#N/A	0.69	#N/A	80.80	#N/A	#N/A
391	22	Wight Pit	WB-03-13	DD Core	22	#N/A	0.08	<0.01	8.7	#N/A	1.01	#N/A	127.50	#N/A	#N/A
392	23	Wight Pit	WB-03-13	DD Core	23	#N/A	1.46	0.01	8.4	#N/A	1.05	#N/A	121.20	#N/A	#N/A
393	24	Wight Pit	WB-03-14	DD Core	24	#N/A	0.49	<0.01	8.3	#N/A	1.42	#N/A	130.10	#N/A	#N/A
394	25	Wight Pit	WB-03-15	DD Core	25	#N/A	0.94	0.01	8.5	#N/A	0.80	#N/A	102.30	#N/A	#N/A
395	26	Wight Pit	WB-03-16	DD Core	26	#N/A	0.16	<0.01	8.7	#N/A	1.06	#N/A	123.40	#N/A	#N/A
396	27	Wight Pit	WB-03-16	DD Core	27	#N/A	0.65	0.01	8.7	#N/A	1.10	#N/A	132.20	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
						ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
295	499413	Pond Zone	North Wall (Skarn)	DD Core	499413	22.9	26.3	#N/A	1.29	4	0.12	26.7	35.3	646.85	#N/A	3.14	69	0.03	1.63	2540	5.09	0.012	13.7	0.129	5.47	0.44	3.4	70.1	0.153	90	0.8	60.6
296	499431	Pond Zone	North Wall (Skarn)	DD Core	499431	17.2	12.6	#N/A	1.23	27.67	20.9	7.3	5.5	144.09	#N/A	1.28	1835	0.02	0.25	1182	6.78	0.003	2.4	0.045	265.69	0.58	3.9	347.7	0.022	30	0.9	1970.7
297	499502	Pond Zone	Lower North Wall (Skarn)	DD Core	499502	16.7	7.1	#N/A	0.27	6.73	1.14	7.3	19.5	53.54	#N/A	2.35	205	0.06	0.99	3039	12.3	0.007	6.5	0.125	2.85	0.67	0.5	56	0.091	62	1.4	194.4
298	499521	Pond Zone	Lower North Wall (Skarn)	DD Core	499521	16	18.8	#N/A	0.34	2.83	0.19	23.3	39.6	595.05	#N/A	2.56	32	0.15	1.1	1502	7	0.004	15.8	0.12	13.98	0.42	4.8	55.3	0.132	62	0.6	66.8
299	483866	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	483866	20.7	27	#N/A	0.18	1.12	0.09	26.8	21.9	214.77	#N/A	2.82	38	0.23	1.14	637	3.66	0.027	6.9	0.094	2.71	0.38	2.4	105.6	0.132	55	0.4	53.7
300	273110	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	273110	11	42.3	#N/A	0.18	1.48	0.1	17.5	26.8	624.86	#N/A	3.01	23	0.06	0.75	633	4.48	0.034	6.6	0.127	6.9	0.7	2.9	87.9	0.094	71	0.5	55.6
301	273120	Pond Zone	West wall(North 1/2),same rock as above	DD Core	273120	9.3	16.8	#N/A	0.24	1.46	0.19	10.9	20.7	760.22	#N/A	1.72	12	0.06	0.59	724	5.89	0.022	4.7	0.106	13.9	0.22	2.3	50.6	0.074	40	0.4	40
302	483849	Pond Zone	West wall(North 1/2),same rock as below	DD Core	483849	17.5	47.4	#N/A	0.08	0.85	0.44	9.4	14.8	363.92	#N/A	1.9	46	0.03	0.89	487	2.92	0.018	3.9	0.097	3.32	0.35	0.9	70.1	0.068	55	0.3	97.8
303	464304	Pond Zone	West Wall of South Ramp	DD Core	464304	17.6	106.1	#N/A	0.14	1.05	0.2	14.3	24.1	271.04	#N/A	2.85	19	0.06	0.6	736	2.55	0.06	5.2	0.145	5.5	0.64	2.2	186.3	0.132	75	0.6	70
304	499406	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	499406	13.4	16.3	#N/A	0.33	0.98	0.06	11.7	24	18	#N/A	1.85	17	0.02	0.58	712	2.82	0.049	3.3	0.127	4.05	0.45	1.8	147.2	0.13	49	0.6	33.2
305	464317	Pond Zone	Upper North Wall (monz above Skarn)	DD Core	464317	10.7	40.9	#N/A	0.1	1	0.12	11.4	43.6	393.49	#N/A	2.65	11	0.1	0.78	644	2.02	0.06	6.1	0.128	6.22	0.58	1.4	147.4	0.138	80	0.6	45
306	464308	Pond Zone	West wall(south 1/2), same rock as above	DD Core	464308	18.8	67.8	#N/A	0.19	0.97	0.12	11	30.9	160.65	#N/A	2.5	19	0.07	0.47	552	2.5	0.075	3.6	0.126	9.32	0.68	2.2	176.6	0.15	76	0.5	33.8
307	464315	Pond Zone	West wall(south 1/2),same rock as below	DD Core	464315	11.8	70.1	#N/A	0.1	1.48	0.14	10.9	43.3	330.67	#N/A	2.03	18	0.08	0.69	692	2.27	0.063	5.4	0.129	4.29	0.69	0.9	211.7	0.139	65	0.5	46.4
308	464314	Pond Zone	West Wall of South Ramp	DD Core	464314	13.2	53	#N/A	0.17	1.44	0.09	14.3	34.9	397.99	#N/A	2.5	12	0.08	0.74	831	2.54	0.055	5.4	0.129	5.53	0.59	1.8	161.7	0.131	73	0.5	60.3
309	464306	Pond Zone	Ore Zone	DD Core	464306	43.3	15.3	#N/A	0.61	4.67	1	8	43.4	955.42	#N/A	1.23	52	0.15	0.59	1178	5.56	0.009	3.4	0.198	3.45	0.38	0.9	17.9	0.102	47	0.5	168.8
310	468311	Pond Zone	Ore Zone	DD Core	468311	30.1	8.2	#N/A	0.14	4.32	0.95	19	26.4	2646.24	#N/A	2.72	147	0.22	1.39	2218	12.43	0.005	5	0.223	9.88	0.4	1.2	24.5	0.122	91	1.2	160.6
311	468316	Pond Zone	Ore Zone	DD Core	468316	37.8	5.5	#N/A	0.27	5.9	0.65	6.7	32.3	1479.66	#N/A	1.75	82	0.03	0.48	1394	4.81	0.005	3.2	0.159	6.2	0.32	1.2	36.9	0.088	51	0.9	103.6
312	468323	Pond Zone	Ore Zone	DD Core	468323	10.9	17.7	#N/A	0.14	1.67	0.29	19.8	17.7	695.19	#N/A	2.48	58	0.08	0.7	617	4.84	0.114	3.9	0.123	7.32	0.13	3.1	45.5	0.032	43	0.4	75.1
313	241931	SE Zone	SE Zone	DD Core	241931	15.8	21	#N/A	0.8	1.5	0.1	34.3	17.8	307.6	#N/A	2.95	310	0.08	0.95	645	6.6	0.015	2.7	0.104	4.9	0.6	1.4	159	0.119	72	0.6	46
314	241932	SE Zone	SE Zone	DD Core	241932	12.2	24	#N/A	0.2	1.51	0.1	5.6	28.8	37.8	#N/A	1.89	80	0.07	0.76	534	2.4	0.032	2.7	0.081	4	0.6	-0.5	232	0.123	78	0.5	38
315	241933	SE Zone	SE Zone	DD Core	241933	18.1	12	#N/A	0.2	1.56	0.1	8.7	18.8	57.9	#N/A	2.2	50	0.06	1.06	768	2.2	0.015	3.3	0.107	5.2	0.5	0.5	144	0.117	70	0.7	47
316	241941	SE Zone	SE Zone	DD Core	241941	11.7	21	#N/A	0.3	1.31	0.1	9.2	29.1	130.5	#N/A	1.85	220	0.06	0.55	507	2.6	0.036	1.8	0.061	7.1	0.7	0.7	221	0.119	69	0.4	39
317	241943	SE Zone	SE Zone	DD Core	241943	11.8	15	#N/A	0.7	1.04	0.1	13.9	21.2	79.9	#N/A	1.66	340	0.05	0.58	513	4.2	0.023	2	0.057	9.9	0.6	0.7	163	0.094	57	0.4	41
318	255935	SE Zone	SE Zone	DD Core	255935	7.3	16	#N/A	0.1	0.84	0.1	4.3	25.6	336.4	#N/A	1.57	50	0.05	0.58	531	1.8	0.029	2.6	0.053	5.4	0.6	-0.5	234	0.103	61	0.4	38
319	255936	SE Zone	SE Zone	DD Core	255936	9.1	18	#N/A	0.2	0.99	0.1	7.2	26.3	258.5	#N/A	1.78	70	0.05	0.63	516	2	0.03	2.5	0.068	5	0.6	-0.5	235	0.122	68	0.4	41
320	256192	SE Zone	SE Zone	DD Core	256192	13.7	88	#N/A	0.4	1.34	0.1	9.8	18	121.9	#N/A	2.53	130	0.08	0.66	347	5.2	0.287	2.2	0.074	11.3	0.4	3	96	0.098	80	0.6	34
321	256194	SE Zone	SE Zone	DD Core	256194	13.5	33	#N/A	0.4	1.2	-0.1	11.6	20.9	148.9	#N/A	2.5	220	0.08	0.65	362	11	0.03	2.3	0.078	8.6	0.7	2.4	142	0.119	87	0.8	33
322	241232	SE Zone	SE Zone	DD Core	241232	13.6	27	#N/A	0.3	1.86	0.1	11.2	31.8	345.3	#N/A	3.07	120	0.1	0.82	511	9.5	0.045	2.4	0.106	7.1	0.4	1.7	210	0.162	121	1	31
323	241234	SE Zone	SE Zone	DD Core	241234	10.2	36	#N/A	0.3	1.96	0.1	11.9	17	392.1	#N/A	3.18	70	0.09	0.77	518	2.7	0.076	2.7	0.104	7	0.3	1.4	112	0.146	119	0.7	31
324	241392	SE Zone	SE Zone	DD Core	241392	11.4	110	#N/A	0.3	1.78	0.1	10.3	30	56.4	#N/A	3.03	30	0.09	0.9	743	3.5	0.031	2.8	0.107	5.1	0.5	0.6	201	0.142	118	1	41
325	241394	SE Zone	SE Zone	DD Core	241394	14	47	#N/A	0.5	2.07	0.1	9.8	29.2	122.3	#N/A	3.47	40	0.1	1.04	676	3.3	0.044	2.8	0.127	4.2	0.5	1.3	183	0.174	121	1.4	41
326	241416	SE Zone	SE Zone	DD Core	241416	10.7	142	#N/A	0.2	1.7	0.1	13.2	14.8	229.8	#N/A	3.54	60	0.13	0.97	580	2.3	0.038	3.2	0.13	3.4	0.3	1.3	120	0.169	140	0.7	36
327	241419	SE Zone	SE Zone	DD Core	241419	12.8	100	#N/A	0.2	1.57	0.1	15	17	145.7	#N/A	3.5	90	0.11	0.95	490	1.9	0.035	3.3	0.126	3.1	0.4	1.7	152	0.164	120	0.6	34
328	256208	SE Zone	SE Zone	DD Core	256208	14.7	17	#N/A	0.2	1.28	0.1	19.6	21.3	310.1	#N/A	2.69	160	0.06	0.89	451	6.1	0.024	1.9	0.102	2.9	0.9	2.4	236	0.136	94	0.7	35
329	256210	SE Zone	SE Zone	DD Core	256210	18.6	23	#N/A	0.2	1.77	0.1	10.5	22.7	229.5	#N/A	2.96	40	0.07	0.95	543	27.1	0.025	2.5	0.109	3.3	0.8	1.6	188	0.134	108	0.9	37
330	256319	SE Zone	SE Zone	DD Core	256319	10.5	26	#N/A	0.3	0.85	0.1	5.6	28.2	89.5	#N/A	3.21	220	0.06	0.68	240	7.8	0.032	2.6	0.098	3.1	0.5	2.7	190	0.195	95	0.7	31
331	256321	SE Zone	SE Zone	DD Core	256321	17.7	12	#N/A	0.3	0.98	0.1	13	22.2	228.6	#N/A	3.57	250	0.03	0.95	310	11.6	0.025	4.4	0.123	4.2	0.7	3.9	302	0.18	80	0.9	37
332	256331	SE Zone	SE Zone	DD Core	256331	12.2	11	#N/A	0.2	2.03	-0.1	13.8	26	276.1	#N/A	3	100	0.03	0.85	427	135.8	0.036	2.7	0.103	9.7	0.5	4	218	0.153	93	0.9	35
333	256332	SE Zone	SE Zone	DD Core	256332	13.2	13	#N/A	0.2	1.72	-0.1	13.9	18.7	232.1	#N/A	3.13	100	0.03	0.76	361	65.6	0.026	3	0.115	5.7	0.3	3.3	108	0.118	90	0.6	31
334	258583	SE Zone	SE Zone	DD Core	258583	13.3	20	#N/A	0.5	1.05	0.1	11.3	23.7	124.4	#N/A	3.14	100	0.06	1.04	409	2.7	0.027	3.5	0.114	2.5	0.7	1.5	191	0.134	68	0.9	39
335	258585	SE Zone	SE Zone	DD Core	258585	9.4	23	#N/A	0.2	1.18	-0.1	9.6	24.8	121.6	#N/A	3.01	60	0.06	1.08	518	1.9	0.026	3	0.112	2	0.8	0.9	234	0.141	85	0.6	43
336	259062	SE Zone	SE Zone	DD Core	259062	11.9	24	#N/A	0.2	1.86	-0.1	15.3	21.2	219.7	#N/A	3	40	0.06	0.8	401	4.5	0.02	2.3	0.124	3.3	0.2	1.9	124	0.128	85	0.6	29
337	259065	SE Zone	SE Zone	DD Core	259065	10.7	21	#N/A	0.2	1.28	-0.1	12.4	19.1	248.1	#N/A	3.73	40	0.06	1.26	428	2.1	0.022	5.7	0.124	2	0.2	2.1	176	0.141	108	0.7	38
338	259250	SE Zone	SE Zone	DD Core	259250	13.2	55	#N/A	0.3	1.94	0.2	18.4	18.1	142.3	#N/A	3.39	140	0.3	1.88	915	2.3	0.39	4	0.156	9.7	0.4	1.4	304	0.147	141	0.5	70
339	259253	SE Zone	SE Zone	DD Core	259253	11.1	73	#N/A	0.4	1.95	0.2	12.2	16.6	87.2	#N/A	3.42	90	0.16	1.29	834	1.9	0.396	3.7	0.144	7.1	0.3	1	317	0.145	126	1.2	65
340	259502	SE Zone	SE Zone	DD Core	259502	13.2	30	#N/A	0.7	1.11	0.1	14	18.2	299.7	#N/A	2.82	330	0.08	0.96	502	4.2	0.027	3.2	0.111	6.4	0.4	2.2	216	0.162	89	1.1	41
341	259505	SE Zone	SE Zone	DD Core	259505	14.7	18	#N/A	0.7	1.64	0.2	13.5	20.9	191.5	#N/A	2.71	330	0.07	0.94	699	2.9	0.025	2.6	0.105	6.4	0.5	1.3	171	0.139	89	1	57
342	259795	SE Zone	SE Zone	DD Core	259795	6.2	21	#N/A	0.1	1.09	0.2	3.3	27.2	317.6	#N/A	1.7	70	0.08	0.21	257	4.1	0.029	1.5	0.068	6.9	0.3	0.6	27	0.11	100	0.4	29
343	259796	SE Zone	SE Zone	DD Core	259796	7.6	38	#N/A	0.1	1.2	0.2	4.4	45.4	625.4	#N/A	4.84	130	0.1	0.26	291	6.3	0.046	4	0.141	5.6	0.3	-0.5	65	0.119	228	0.4	34
344	260569	SE Zone	SE Zone	DD Core	260569	9	22	#N/A	0.5	1.4	0.1	7.7	22.9	30	#N/A	2.62	190	0.06	0.95	701	3.2	0.029	2.6	0.099	6.1	0.6	-0.5	256	0.157	100	0.6	47
345	260573	SE Zone	SE Zone	DD Core	260573	12.5	19	#N/A	0.9	1.52	0.1	14.6	48.2	70.5	#N/A	2.56	300	0.07	0.97	692	6.9	0.033	3.6	0.103	3.6	0.4	0.7	199	0.158	84	1	46
346	261763	SE Zone	SE Zone	DD Core	261763	20.7	22	#N/A	0.1	2.41	0.1	11.2	34	203.9	#N/A	3.29	60	0.06	0.78	485	6.7	0.026	4.1	0.114	4.7	0.7	-0.5	186	0.17	121	1.4	34
347	261765	SE Zone	SE Zone	DD Core	261765	11.5	10	#N/A	0.1	1.2	-0.1	11.4	27	124.2	#N/A	2.79	20	0.04	0.58	311	2.9	0.026	2.3	0.101	3	0.4	0.7	103	0.134	88	1	27
348	261775	SE Zone	SE Zone	DD Core	261775	15	25	#N/A	0.3	1.77	0.1	15.5	26.4	304.5	#N/A	3.68	160	0.08	0.86	550	5.5	0.026	2.4	0.117	3	0.5	1.6	166	0.148	123	1	38
349	261776	SE Zone	SE Zone	DD Core	261776	14.6	35	#N/A	0.2	1.88	0.1	13.1	27.4	252	#N/A	3.58	40	0.07	0.63	578	8.9	0.042	2.9	0.097	3.9	0.5	1.2	122	0.147	110	0.8	37
350	31929	Wight Pit	WB-03-06	DD Core	31929	5	64	#N/A	-3	3.77	1	13	3	0.05	#N/A	4.22	#N/A	0.22	0.82	1965	2	0.03	3	0.145	7	-3	#N/A	96	0.09	156	-2	152
351	32550	Wight Pit	WB-03-11	DD Core	32550	24	102	#N/A	-3	2.97	-0.5	29	125	0.03	#N/A	7.11	#N/A	0.18	2.39	2821	-1	0.03	52	0.155	-3	4	#N/A	205	0.27	250	-2	123
352	31636	Wight Pit	WB-03-03	DD Core	31636	9	61	#N/A	-3	5.58	0.5	21	10	0.108	#N/A	6.04	#N/A	0.18	1.41	3027	4	0.04	4	0.155	7	-3	#N/A	172	0.13	270	-2	199
353	31598	Wight Pit	WB-03-03	DD Core	31598	20	62	#N/A	-3	4.25	0.9	13	4	0.068	#N/A	4.16	#N/A	0.21	0.85	1545	10	0.04	3	0.126	15	-3	#N/A	125	0.14	128	-2	115
354	31943	Wight Pit	WB-03-06	DD Core	31943	7	51	#N/A	-3	4.33	0.7	19	11	0.118	#N/A	4.93	#N/A	0.13	0.71	2070	5	0.03	5	0.122	5	-3	#N/A	106	0.14	229	-2	164
355	31998	Wight Pit	WB-03-06	DD Core	31998	17	45	#N/A	-3	5.9	0.7	16	4	0.154	#N/A	4.76	#N/A	0.13	1.05	2371	5	0.46	1	0.543	7	-3	#N/A	368	0.11	184	-2	157
356	32491	Wight Pit	WB-03-11	DD Core	32491	9	70	#N/A	-3	4.65	0.5	18	5	0.15	#N/A	5.37	#N/A	0.17	1.41	1799	5	0.03	4	0.181	10	3	#N/A	140	0.13	270	-2	145
357	32539	Wight Pit	WB-03-11	DD Core	32539	7	184	#N/A	-3	4.32	-0.5	13	9	0.069	#N/A	4.14	#N/A	0.21	0.97	1435	4	0.04	5	0.139	7	-3	#N/A	874	0.1	216	-2	113
358	32727	Wight Pit	WB-03-14	DD Core	32727	7	61	#N/A	-3	6.29	-0.5	15	8	0.062	#N/A	4.31	#N/A	0.11	0.96	1477	77	0.06	3	0.145	9	-3	#N/A	144	0.15	209	-2	123
359	32635	Wight Pit	WB-03-14	DD Core	32635	10	56	#N/A	-3	4.7	-0.5	17	6	0.016	#N/A	4.34	#N/A	0.15	1.14	1959	3	0.03	3	0.178	18	3	#N/A	137	0.07	165	-2	121
360	31557	Wight Pit	WB-03-03	DD Core	31557	12	79	#N/A	-3	4.12	0.6	12	5	0.097	#N/A	3.47	#N/A	0.16	0.87	1393	5	0.03	3	0.128	10	-3	#N/A	130	0.02	115	-2	111
361	31945	Wight Pit	WB-03-06	DD Core	31945	13	124	#N/A	-3	3.62	-0.5	15	8	0.023	#N/A	4.52	#N/A	0.23	1.22	1642	4	0.06	4	0.159	-3	-3	#N/A	108	0.11	167	-2	80
362	32561	Wight Pit	WB-03-11	DD Core	32561	30	140	#N/A	-3	4.06	-0.5	12	7	0.033	#N/A	3.96	#N/A	0.27	0.86	1442	1	0.04	4	0.113	4	-3	#N/A	294	0.16	199	-2	98
363	32640	Wight Pit	WB-03-14	DD Core	32640	21	37	#N/A	-3	3.99	-0.5	16	5	0.133	#N/A	3.97	#N/A	0.22	1.16	2274	11	0.03	4	0.124	19	-3	#N/A	114	0.1	129	2	123
364	32729	Wight Pit	WB-03-14	DD Core	32729	7	103	#N/A	-3	4.46	-0.5	13	2	0.012	#N/A	4.41	#N/A	0.19	1.14	1421	2	0.06	1	0.164	8	-3	#N/A	178	0.17	167	-2	71
365	31603	Wight Pit	WB-03-03	DD Core	31603	12	67	#N/A	4	3.56	0.6	11	5	0.14	#N/A	3.8	#N/A	0.24	0.92	1707	5	0.04	2	0.125	11	-3	#N/A	155	0.11	183	-2	139
366	31576	Wight Pit	WB-03-03	DD Core	31576	15	111	#N/A	3	3.28	0.8	7	3	0.01	#N/A	2.5	#N/A	0.2	0.46	1412	13	0.05	1	0.078	29	-3	#N/A	115	-0.01	71	-2	133
367	31973	Wight Pit	WB-03-06	DD Core	31973	10	104	#N/A	-3	3.62	-0.5	14	6	0.02	#N/A	4.26	#N/A	0.14	1.12	1730	6	0.11	1	0.141	6	-3	#N/A	149	0.17	172	-2	75
368	32519	Wight Pit	WB-03-11	DD Core	32519	20	60	#N/A	-3	3.25	-0.5	13	8	0.152	#N/A	4.2	#N/A	0.15	1.09	1264	1	0.04	4	0.126	8	3	#N/A	125	0.17	193	2	93
369	32702	Wight Pit	WB-03-14	DD Core	32702	21	71	#N/A	-3	4.68	-0.5	14	6	0.021	#N/A	4.6	#N/A	0.11	1.08	1356	13	0.03	3	0.166	11	-3	#N/A	420	0.17	174	-2	80
370	1	Wight Pit	WB-03-01	DD Core	1	#N/A	901	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	419	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
371	2	Wight Pit	WB-03-01	DD Core	2	#N/A	1817	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	170	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
372	3	Wight Pit	WB-03-02	DD Core	3	#N/A	1517	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
373	4	Wight Pit	WB-03-02	DD Core	4	#N/A	1758	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	421	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
374	5	Wight Pit	WB-03-03	DD Core	5	#N/A	1545	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	544	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
375	6	Wight Pit	WB-03-03	DD Core	6	#N/A	1548	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	334	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
376	7	Wight Pit	WB-03-04	DD Core	7	#N/A	1847	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	156	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
377	8	Wight Pit	WB-03-04	DD Core	8	#N/A	1480	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
378	9	Wight Pit	WB-03-05	DD Core	9	#N/A	1467	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	593	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
379	10	Wight Pit	WB-03-05	DD Core	10	#N/A	1754	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	285	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.1	#N/A	#N/A	#N/A	#N/A	#N/A
380	11	Wight Pit	WB-03-06	DD Core	11	#N/A	1457	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	146	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
381	12	Wight Pit	WB-03-06	DD Core	12	#N/A	1465	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2394	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	18.6	#N/A	#N/A	#N/A	#N/A	#N/A
382	13	Wight Pit	WB-03-07	DD Core	13	#N/A	1391	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	523	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	#N/A
383	14	Wight Pit	WB-03-08	DD Core	14	#N/A	1437	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	247	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
384	15	Wight Pit	WB-03-08	DD Core	15	#N/A	1301	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	146	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
385	16	Wight Pit	WB-03-09	DD Core	16	#N/A	1322	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	457	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
386	17	Wight Pit	WB-03-09	DD Core	17	#N/A	1279	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	430	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
387	18	Wight Pit	WB-03-10	DD Core	18	#N/A	1321	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
388	19	Wight Pit	WB-03-11	DD Core	19	#N/A	1556	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	605	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
389	20	Wight Pit	WB-03-12	DD Core	20	#N/A	1592	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	272	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
390	21	Wight Pit	WB-03-12	DD Core	21	#N/A	1001	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	259	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
391	22	Wight Pit	WB-03-13	DD Core	22	#N/A	1402	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	68	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
392	23	Wight Pit	WB-03-13	DD Core	23	#N/A	1289	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	382	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
393	24	Wight Pit	WB-03-14	DD Core	24	#N/A	1721	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	244	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
394	25	Wight Pit	WB-03-15	DD Core	25	#N/A	1417	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	678	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
395	26	Wight Pit	WB-03-16	DD Core	26	#N/A	1033	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	157	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
396	27	Wight Pit	WB-03-16	DD Core	27	#N/A	1643	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	424	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C	NP	Ag	Al
											%C	%C		ppm	%
397	28	Wight Pit	WB-03-17	DD Core	28	#N/A	0.86	0.01	8.6	#N/A	1.26	#N/A	144.60	#N/A	#N/A
398	29	Wight Pit	WB-03-17	DD Core	29	#N/A	0.73	<0.01	8.6	#N/A	0.69	#N/A	108.50	#N/A	#N/A
399	30	Wight Pit	WB-03-18	DD Core	30	#N/A	1.03	0.01	8.6	#N/A	1.20	#N/A	273.50	#N/A	#N/A
400	31	Wight Pit	WB-03-18	DD Core	31	#N/A	0.47	<0.01	9.2	#N/A	0.20	#N/A	46.10	#N/A	#N/A
401	32	Wight Pit	WB-03-18	DD Core	32	#N/A	0.67	0.01	8.8	#N/A	0.70	#N/A	97.30	#N/A	#N/A
402	33	Wight Pit	WB-03-19	DD Core	33	#N/A	0.26	0.01	8.6	#N/A	0.54	#N/A	91.00	#N/A	#N/A
403	34	Wight Pit	WB-03-19	DD Core	34	#N/A	0.1	<0.01	8.7	#N/A	0.53	#N/A	61.10	#N/A	#N/A
404	37	Wight Pit	WB-03-20	DD Core	37	#N/A	0.26	0.02	7.8	#N/A	0.81	#N/A	128.40	#N/A	#N/A
405	38	Wight Pit	WB-03-20	DD Core	38	#N/A	0.3	<0.01	9.1	#N/A	0.50	#N/A	74.80	#N/A	#N/A
406	39	Wight Pit	WB-03-21	DD Core	39	#N/A	0.13	<0.01	8.7	#N/A	0.71	#N/A	83.50	#N/A	#N/A
407	40	Wight Pit	WB-03-22	DD Core	40	#N/A	0.51	<0.01	8.8	#N/A	0.77	#N/A	96.00	#N/A	#N/A
408	41	Wight Pit	WB-03-22	DD Core	41	#N/A	0.05	0.01	8	#N/A	0.96	#N/A	169.60	#N/A	#N/A
409	42	Wight Pit	WB-03-22	DD Core	42	#N/A	1	-0.01	8.5	#N/A	1.12	#N/A	125.90	#N/A	#N/A
410	44	Wight Pit	WB-03-23	DD Core	44	#N/A	0.59	-0.01	8.3	#N/A	1.66	#N/A	192.00	#N/A	#N/A
411	46	Wight Pit	WB-03-24	DD Core	46	#N/A	1.24	0.01	8.8	#N/A	1.30	#N/A	142.10	#N/A	#N/A
412	47	Wight Pit	WB-03-25	DD Core	47	#N/A	0.35	-0.01	8.8	#N/A	0.82	#N/A	102.20	#N/A	#N/A
413	48	Wight Pit	WB-03-25	DD Core	48	#N/A	0.05	-0.01	8	#N/A	1.20	#N/A	188.30	#N/A	#N/A
414	49	Wight Pit	WB-03-25	DD Core	49	#N/A	0.04	0.01	9.2	#N/A	0.60	#N/A	117.20	#N/A	#N/A
415	50	Wight Pit	WB-03-26	DD Core	50	#N/A	0.25	0.01	8.9	#N/A	1.07	#N/A	124.70	#N/A	#N/A
416	51	Wight Pit	WB-03-26	DD Core	51	#N/A	0.11	-0.01	9.3	#N/A	0.86	#N/A	111.00	#N/A	#N/A
417	53	Wight Pit	WB-03-27	DD Core	53	#N/A	0.65	-0.01	9.4	#N/A	0.59	#N/A	63.60	#N/A	#N/A
418	54	Wight Pit	WB-03-27	DD Core	54	#N/A	0.38	0.01	8.7	#N/A	0.63	#N/A	109.70	#N/A	#N/A
419	55	Wight Pit	WB-03-27	DD Core	55	#N/A	0.78	0.01	8.6	#N/A	0.66	#N/A	81.00	#N/A	#N/A
420	56	Wight Pit	WB-03-28	DD Core	56	#N/A	0.75	-0.01	8.3	#N/A	0.62	#N/A	98.50	#N/A	#N/A
421	57	Wight Pit	WB-03-28	DD Core	57	#N/A	0.98	0.01	8.4	#N/A	0.89	#N/A	117.20	#N/A	#N/A
422	58	Wight Pit	WB-03-28	DD Core	58	#N/A	0.71	-0.01	8.8	#N/A	0.62	#N/A	63.90	#N/A	#N/A
423	59	Wight Pit	WB-03-29	DD Core	59	#N/A	0.94	0.01	7.9	#N/A	1.39	#N/A	149.60	#N/A	#N/A
424	62	Wight Pit	WB-03-31	DD Core	62	#N/A	0.62	0.01	8.2	#N/A	0.96	#N/A	86.00	#N/A	#N/A
425	63	Wight Pit	WB-03-31	DD Core	63	#N/A	1.13	0.01	8.1	#N/A	1.15	#N/A	124.70	#N/A	#N/A
426	64	Wight Pit	WB-03-32	DD Core	64	#N/A	2.49	0.01	8	#N/A	1.10	#N/A	125.90	#N/A	#N/A
427	65	Wight Pit	WB-03-32	DD Core	65	#N/A	1.14	0.01	8.3	#N/A	0.76	#N/A	94.80	#N/A	#N/A
428	67	Wight Pit	WB-03-33	DD Core	67	#N/A	0.28	0.01	7.9	#N/A	1.57	#N/A	150.90	#N/A	#N/A
429	69	Wight Pit	WB-03-35	DD Core	69	#N/A	0.78	-0.01	8.7	#N/A	1.27	#N/A	103.50	#N/A	#N/A
430	70	Wight Pit	WB-03-35	DD Core	70	#N/A	0.66	-0.01	8.5	#N/A	1.25	#N/A	137.20	#N/A	#N/A
431	71	Wight Pit	WB-03-35	DD Core	71	#N/A	0.97	0.01	8.6	#N/A	1.07	#N/A	96.00	#N/A	#N/A
432	74	Wight Pit	WB-03-37	DD Core	74	#N/A	0.56	0.01	8.1	#N/A	0.46	#N/A	64.80	#N/A	#N/A
433	75	Wight Pit	WB-03-37	DD Core	75	#N/A	1.64	0.02	8.4	#N/A	1.39	#N/A	123.40	#N/A	#N/A
434	76	Wight Pit	WB-03-38	DD Core	76	#N/A	0.63	-0.01	8.7	#N/A	0.87	#N/A	92.30	#N/A	#N/A
435	77	Wight Pit	WB-03-38	DD Core	77	#N/A	0.07	-0.01	8.4	#N/A	0.30	#N/A	83.50	#N/A	#N/A
436	79	Wight Pit	WB-03-39	DD Core	79	#N/A	0.52	-0.01	8.3	#N/A	1.21	#N/A	135.90	#N/A	#N/A
437	81	Wight Pit	WB-03-40	DD Core	81	#N/A	0.79	0.01	8.7	#N/A	1.19	#N/A	148.40	#N/A	#N/A
438	82	Wight Pit	WB-03-41	DD Core	82	#N/A	0.7	-0.01	8.5	#N/A	2.09	#N/A	160.80	#N/A	#N/A
439	83	Wight Pit	WB-03-41	DD Core	83	#N/A	0.65	-0.01	8.8	#N/A	1.02	#N/A	98.50	#N/A	#N/A
440	84	Wight Pit	WB-03-42	DD Core	84	#N/A	0.02	-0.01	8.7	#N/A	0.26	#N/A	90.20	#N/A	#N/A
441	85	Wight Pit	WB-03-42	DD Core	85	#N/A	1.15	0.01	8.5	#N/A	1.41	#N/A	111.00	#N/A	#N/A
442	87	Wight Pit	WB-03-43	DD Core	87	#N/A	0.68	-0.01	8.4	#N/A	1.21	#N/A	128.40	#N/A	#N/A
443	88	Wight Pit	WB-03-44	DD Core	88	#N/A	0.78	0.01	8.2	#N/A	1.42	#N/A	137.20	#N/A	#N/A
444	89	Wight Pit	WB-03-44	DD Core	89	#N/A	0.56	-0.01	8.1	#N/A	0.90	#N/A	106.00	#N/A	#N/A
445	91	Wight Pit	WB-03-46	DD Core	91	#N/A	0.51	-0.01	8.7	#N/A	0.58	#N/A	58.60	#N/A	#N/A
446	92	Wight Pit	WB-03-47	DD Core	92	#N/A	0.13	-0.01	7.8	#N/A	0.32	#N/A	194.50	#N/A	#N/A
447	93	Wight Pit	WB-03-47	DD Core	93	#N/A	0.83	0.01	8.2	#N/A	0.34	#N/A	67.30	#N/A	#N/A
448	94	Wight Pit	WB-03-48	DD Core	94	#N/A	0.37	-0.01	8.4	#N/A	1.04	#N/A	135.90	#N/A	#N/A
449	95	Wight Pit	WB-03-48	DD Core	95	#N/A	0.48	-0.01	8.8	#N/A	1.26	#N/A	145.90	#N/A	#N/A
450	96	Wight Pit	WB-03-49	DD Core	96	#N/A	0.46	0.01	8.6	#N/A	1.67	#N/A	160.80	#N/A	#N/A
451	97	Wight Pit	WB-03-49	DD Core	97	#N/A	0.97	-0.01	8.5	#N/A	1.13	#N/A	124.70	#N/A	#N/A
575	320198	Boundary Pit	ND-06-05 6.1-7.5	DD Core	320198	#N/A	1.14	#N/A	#N/A	#N/A	#N/A	0.74	61.50	#N/A	#N/A
576	320302	Boundary Pit	ND-06-06 17.5-20	DD Core	320302	#N/A	0.197	#N/A	#N/A	#N/A	#N/A	1.25	104.17	#N/A	#N/A
577	320380	Boundary Pit	ND-06-07 30-32.5	DD Core	320380	#N/A	0.685	#N/A	#N/A	#N/A	#N/A	1.26	105.00	#N/A	#N/A
578	320447	Boundary Pit	ND-06-08 22.5-25	DD Core	320447	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.86	72.00	#N/A	#N/A
579	320534	Boundary Pit	ND-06-09 4.57-5	DD Core	320534	#N/A	0.41	#N/A	#N/A	#N/A	#N/A	0.77	63.83	#N/A	#N/A
580	320735	Boundary Pit	ND-06-10 5-7.5	DD Core	320735	#N/A	0.511	#N/A	#N/A	#N/A	#N/A	0.97	80.42	#N/A	#N/A
581	320855	Boundary Pit	ND-06-11 18.75-20	DD Core	320855	#N/A	0.025	#N/A	#N/A	#N/A	#N/A	0.60	50.17	#N/A	#N/A
582	320880	Boundary Pit	ND-06-11 67.5-70	DD Core	320880	#N/A	1.08	#N/A	#N/A	#N/A	#N/A	1.14	95.00	#N/A	#N/A
583	215305	Boundary Pit	ND-06-14 45-47.5	DD Core	215305	#N/A	0.298	#N/A	#N/A	#N/A	#N/A	0.82	67.92	#N/A	#N/A
584	215401	Boundary Pit	ND-06-15 15-15.24	DD Core	215401	#N/A	0.659	#N/A	#N/A	#N/A	#N/A	0.71	59.50	#N/A	#N/A
585	265862	Boundary Pit	ND-06-16 45-47.5	DD Core	265862	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.75	62.83	#N/A	#N/A
586	265988	Boundary Pit	ND-06-17 12.5-15	DD Core	265988	#N/A	0.729	#N/A	#N/A	#N/A	#N/A	1.04	86.67	#N/A	#N/A
587	400129	Boundary Pit	ND-06-18 15-17.5	DD Core	400129	#N/A	0.188	#N/A	#N/A	#N/A	#N/A	0.97	80.92	#N/A	#N/A
588	400251	Boundary Pit	ND-06-19 7.5-10	DD Core	400251	#N/A	0.186	#N/A	#N/A	#N/A	#N/A	0.66	55.33	#N/A	#N/A
589	320856	Boundary Pit	ND-06-11 20-22.5	DD Core	320856	#N/A	1.08	#N/A	#N/A	#N/A	#N/A	1.14	95.00	#N/A	#N/A
590	320881	Boundary Pit	ND-06-11 70-72.5	DD Core	320881	#N/A	0.025	#N/A	#N/A	#N/A	#N/A	0.60	50.17	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
						ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
397	28	Wight Pit	WB-03-17	DD Core	28	#N/A	2080	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	555	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
398	29	Wight Pit	WB-03-17	DD Core	29	#N/A	1689	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	373	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
399	30	Wight Pit	WB-03-18	DD Core	30	#N/A	1341	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.7	#N/A	#N/A	#N/A	#N/A	#N/A
400	31	Wight Pit	WB-03-18	DD Core	31	#N/A	820	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	115	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
401	32	Wight Pit	WB-03-18	DD Core	32	#N/A	713	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	470	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.4	#N/A	#N/A	#N/A	#N/A	#N/A
402	33	Wight Pit	WB-03-19	DD Core	33	#N/A	2351	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	199	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	#N/A
403	34	Wight Pit	WB-03-19	DD Core	34	#N/A	1514	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	264	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
404	37	Wight Pit	WB-03-20	DD Core	37	#N/A	1397	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	388	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
405	38	Wight Pit	WB-03-20	DD Core	38	#N/A	758	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	70	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
406	39	Wight Pit	WB-03-21	DD Core	39	#N/A	1665	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	217	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
407	40	Wight Pit	WB-03-22	DD Core	40	#N/A	1487	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	199	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
408	41	Wight Pit	WB-03-22	DD Core	41	#N/A	665	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
409	42	Wight Pit	WB-03-22	DD Core	42	#N/A	1286	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	566	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
410	44	Wight Pit	WB-03-23	DD Core	44	#N/A	1384	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	437	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	#N/A
411	46	Wight Pit	WB-03-24	DD Core	46	#N/A	1613	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	448	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
412	47	Wight Pit	WB-03-25	DD Core	47	#N/A	1798	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	564	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
413	48	Wight Pit	WB-03-25	DD Core	48	#N/A	56	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	33	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
414	49	Wight Pit	WB-03-25	DD Core	49	#N/A	841	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
415	50	Wight Pit	WB-03-26	DD Core	50	#N/A	1537	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	284	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
416	51	Wight Pit	WB-03-26	DD Core	51	#N/A	1726	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	221	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
417	53	Wight Pit	WB-03-27	DD Core	53	#N/A	1241	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	424	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.9	#N/A	#N/A	#N/A	#N/A	#N/A
418	54	Wight Pit	WB-03-27	DD Core	54	#N/A	1907	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	305	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.3	#N/A	#N/A	#N/A	#N/A	#N/A
419	55	Wight Pit	WB-03-27	DD Core	55	#N/A	2121	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	425	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
420	56	Wight Pit	WB-03-28	DD Core	56	#N/A	865	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	382	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
421	57	Wight Pit	WB-03-28	DD Core	57	#N/A	1356	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	792	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.1	#N/A	#N/A	#N/A	#N/A	#N/A
422	58	Wight Pit	WB-03-28	DD Core	58	#N/A	1124	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	251	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
423	59	Wight Pit	WB-03-29	DD Core	59	#N/A	1811	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	123	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
424	62	Wight Pit	WB-03-31	DD Core	62	#N/A	1935	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	113	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
425	63	Wight Pit	WB-03-31	DD Core	63	#N/A	1758	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	250	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
426	64	Wight Pit	WB-03-32	DD Core	64	#N/A	1213	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	948	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
427	65	Wight Pit	WB-03-32	DD Core	65	#N/A	1996	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	523	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	#N/A
428	67	Wight Pit	WB-03-33	DD Core	67	#N/A	1623	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
429	69	Wight Pit	WB-03-35	DD Core	69	#N/A	1056	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	163	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
430	70	Wight Pit	WB-03-35	DD Core	70	#N/A	1592	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	207	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
431	71	Wight Pit	WB-03-35	DD Core	71	#N/A	1559	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	193	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
432	74	Wight Pit	WB-03-37	DD Core	74	#N/A	2159	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	92	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.9	#N/A	#N/A	#N/A	#N/A	#N/A
433	75	Wight Pit	WB-03-37	DD Core	75	#N/A	1644	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	325	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
434	76	Wight Pit	WB-03-38	DD Core	76	#N/A	1716	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	128	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
435	77	Wight Pit	WB-03-38	DD Core	77	#N/A	1745	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	69	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
436	79	Wight Pit	WB-03-39	DD Core	79	#N/A	1524	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	143	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
437	81	Wight Pit	WB-03-40	DD Core	81	#N/A	1307	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	329	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
438	82	Wight Pit	WB-03-41	DD Core	82	#N/A	1069	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	163	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
439	83	Wight Pit	WB-03-41	DD Core	83	#N/A	1633	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	82	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
440	84	Wight Pit	WB-03-42	DD Core	84	#N/A	1515	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.1	#N/A	#N/A	#N/A	#N/A	#N/A
441	85	Wight Pit	WB-03-42	DD Core	85	#N/A	1738	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	92	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
442	87	Wight Pit	WB-03-43	DD Core	87	#N/A	1324	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	230	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
443	88	Wight Pit	WB-03-44	DD Core	88	#N/A	1514	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	419	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
444	89	Wight Pit	WB-03-44	DD Core	89	#N/A	1304	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	162	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
445	91	Wight Pit	WB-03-46	DD Core	91	#N/A	1459	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	123	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
446	92	Wight Pit	WB-03-47	DD Core	92	#N/A	260	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	304	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
447	93	Wight Pit	WB-03-47	DD Core	93	#N/A	1190	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	302	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.3	#N/A	#N/A	#N/A	#N/A	#N/A
448	94	Wight Pit	WB-03-48	DD Core	94	#N/A	1423	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.9	#N/A	#N/A	#N/A	#N/A	#N/A
449	95	Wight Pit	WB-03-48	DD Core	95	#N/A	1421	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	422	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
450	96	Wight Pit	WB-03-49	DD Core	96	#N/A	1469	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	144	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
451	97	Wight Pit	WB-03-49	DD Core	97	#N/A	1371	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	293	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
575	320198	Boundary Pit	ND-06-05 6.1-7.5	DD Core	320198	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
576	320302	Boundary Pit	ND-06-06 17.5-20	DD Core	320302	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
577	320380	Boundary Pit	ND-06-07 30-32.5	DD Core	320380	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
578	320447	Boundary Pit	ND-06-08 22.5-25	DD Core	320447	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
579	320534	Boundary Pit	ND-06-09 4.57-5	DD Core	320534	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
580	320735	Boundary Pit	ND-06-10 5-7.5	DD Core	320735	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
581	320855	Boundary Pit	ND-06-11 18.75-20	DD Core	320855	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
582	320880	Boundary Pit	ND-06-11 67.5-70	DD Core	320880	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
583	215305	Boundary Pit	ND-06-14 45-47.5	DD Core	215305	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
584	215401	Boundary Pit	ND-06-15 15-15.24	DD Core	215401	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
585	265862	Boundary Pit	ND-06-16 45-47.5	DD Core	265862	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
586	265988	Boundary Pit	ND-06-17 12.5-15	DD Core	265988	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
587	400129	Boundary Pit	ND-06-18 15-17.5	DD Core	400129	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
588	400251	Boundary Pit	ND-06-19 7.5-10	DD Core	400251	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
589	320856	Boundary Pit	ND-06-11 20-22.5	DD Core	320856	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
590	320881	Boundary Pit	ND-06-11 70-72.5	DD Core	320881	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Pit	HoleID	Bench	Year	AP	NP	C	S	STARTDATE	NP/AP
Springer	S1180-52228	1180	2007	0.233	7.01			10/27/2007	30.09
Springer	S1180-54145	1180	2007	2.038	9.5			11/1/2007	4.66
Springer	S1180-54244	1180	2007	5.125	13.75			11/1/2007	2.68
Springer	S1180-55153	1180	2007	1.866	21.83			11/1/2007	11.70
Springer	S1144-41503	1144	2008	0.453	7.93			4/14/2008	17.51
Springer	S1156-41024	1156	2008	0.334	4.28			7/7/2008	12.81
Springer	S1156-41030	1156	2008	0.228	11.92			7/7/2008	52.28
Springer	S1132-57121	1132	2008	0.547	19.75			12/19/2008	36.11
Springer	S1072-22004	1072	2009	9.125	20			12/19/2009	2.19
Springer	S1072-22012	1072	2009	58.75	61.08			12/19/2009	1.04
Springer	S1072-22016	1072	2009	5.406	26.83			12/19/2009	4.96
Springer	S1072-22020	1072	2009	3.531	34.33			12/19/2009	9.72
Springer	S1072-22024	1072	2009	2.375	36.83			12/19/2009	15.51
Springer	S1072-22028	1072	2009	1.709	26.67			12/19/2009	15.61
Springer	S1072-22032	1072	2009	4.25	12.5			12/19/2009	2.94
Springer	S1072-22036	1072	2009	1.928	21.17			12/19/2009	10.98
Springer	S1072-22040	1072	2009	0.466	22.58			12/19/2009	48.45
Springer	S1072-22044	1072	2009	0.304	16.42			12/19/2009	54.01
Springer	S1072-22048	1072	2009	0.553	19.58			12/19/2009	35.41
Springer	S1072-22052	1072	2009	1.259	28			12/19/2009	22.24
Springer	S1072-22056	1072	2009	1.375	20.25			12/19/2009	14.73
Springer	S1072-22060	1072	2009	3.75	20.67			12/19/2009	5.51
Springer	S1072-22062	1072	2009	3.906	40.25			12/19/2009	10.30
Springer	S1072-22065	1072	2009	2.156	41.25			12/19/2009	19.13
Springer	S1072-22068	1072	2009	1.409	53.5			12/19/2009	37.97
Springer	S1072-22072	1072	2009	1.269	46.92			12/19/2009	36.97
Springer	S1072-22075	1072	2009	0.487	46.58			12/19/2009	95.65
Springer	S1072-22077	1072	2009	0.469	44.17			12/19/2009	94.18
Springer	S1072-22080	1072	2009	0.24	26.25			12/19/2009	109.38
Springer	S1072-22084	1072	2009	4.562	61.17			12/19/2009	13.41
Springer	S1072-22088	1072	2009	29.406	93.33			12/19/2009	3.17
Springer	S1072-22092	1072	2009	15.844	59.5			12/19/2009	3.76
Springer	S1072-22095	1072	2009	24.187	54.58			12/19/2009	2.26
Springer	S1072-22098	1072	2009	31.562	53.33			12/19/2009	1.69
Springer	S1072-22202	1072	2009	0.267	11.42			12/19/2009	42.77
Springer	S1072-22205	1072	2009	0.184	56.17			12/19/2009	305.27
Springer	S1072-22209	1072	2009	1.069	63			12/19/2009	58.93
Springer	S1072-22217	1072	2009	1.856	54.42			12/19/2009	29.32
Springer	S1072-22220	1072	2009	22.969	52.92			12/19/2009	2.30
Springer	S1072-22223	1072	2009	20.5	59.67			12/19/2009	2.91
Springer	S1156-32005	1156	2009	0.334	1.36			12/29/2009	4.07
Springer	S1156-32007	1156	2009	0.311	1.94			12/29/2009	6.24
Springer	S1156-32010	1156	2009	0.227	10.67			12/29/2009	47.00
Springer	S1156-32013	1156	2009	0.444	5.68			12/29/2009	12.79
Springer	S1156-32016	1156	2009	0.308	6.22			12/29/2009	20.19
Springer	S1156-32039	1156	2009	0.119	1.37			12/29/2009	11.51
Springer	S1156-32042	1156	2009	0.214	1.6			12/29/2009	7.48
Springer	S1156-32045	1156	2009	0.559	4.46			12/29/2009	7.98
Springer	S1156-32049	1156	2009	1.297	8.17			12/29/2009	6.30
Springer	S1060-11024	1060	2009	24.719	44.08			12/31/2009	1.78
Springer	S1060-11044	1060	2009	8.938	43.58			12/31/2009	4.88
Springer	S1060-11048	1060	2009	9.031	29.08			12/31/2009	3.22
Springer	S1060-11058	1060	2009	17.562	37.67			12/31/2009	2.14
Springer	S1060-11060	1060	2009	24.844	53.75			12/31/2009	2.16
Springer	S1156-33157	1156	2010	3.312	37.75			1/3/2010	11.40
Springer	S1156-33161	1156	2010	3.312	18.67			1/3/2010	5.64
Springer	S1156-33167	1156	2010	3.375	17.83			1/3/2010	5.28
Springer	S1156-33172	1156	2010	3.594	23.83			1/3/2010	6.63
Springer	S1144-48012	1144	2010	0.117	1.57			1/7/2010	13.42
Springer	S1144-48015	1144	2010	0.4	11.92			1/7/2010	29.80
Springer	S1144-48018	1144	2010	0.109	1.1			1/7/2010	10.09
Springer	S1144-48026	1144	2010	0.126	1.42			1/7/2010	11.27
Springer	S1144-48050	1144	2010	2.109	8.83			1/7/2010	4.19
Springer	S1144-48059	1144	2010	0.534	27.92			1/7/2010	52.28
Springer	S1144-48063	1144	2010	0.236	10.08			1/7/2010	42.71
Springer	S1144-48066	1144	2010	0.156	1.32			1/7/2010	8.46
Springer	S1060-11519	1060	2010	11.063	42.33			1/10/2010	3.83
Springer	S1060-11522	1060	2010	35.625	60.67			1/10/2010	1.70
Springer	S1060-11525	1060	2010	53.438	33.25			1/10/2010	0.62
Springer	S1060-11528	1060	2010	11	21.42			1/10/2010	1.95
Springer	S1060-11531	1060	2010	4.688	20.58			1/10/2010	4.39
Springer	S1060-11545	1060	2010	32.187	13.67			1/10/2010	0.42
Springer	S1060-11548	1060	2010	24.906	15.92			1/10/2010	0.64
Springer	S1060-11551	1060	2010	54.063	37.42			1/10/2010	0.69
Springer	S1060-11572	1060	2010	12	34.75			1/10/2010	2.90
Springer	S1060-11575	1060	2010	2.559	17.83			1/10/2010	6.97
Springer	S1156-34005	1156	2010	0.791	9			1/10/2010	11.38
Springer	S1156-34014	1156	2010	0.284	3.05			1/10/2010	10.74
Springer	S1156-34023	1156	2010	0.344	1.41			1/10/2010	4.10
Springer	S1156-34035	1156	2010	0.249	1.3			1/10/2010	5.22
Springer	S1156-34079	1156	2010	0.288	2.65			1/10/2010	9.20
Springer	S1156-34085	1156	2010	0.331	31.08			1/10/2010	93.90
Springer	S1156-34091	1156	2010	0.338	2.6			1/10/2010	7.69
Springer	S1156-34097	1156	2010	0.438	10.5			1/10/2010	23.97
Springer	S1156-34103	1156	2010	0.728	26.92			1/10/2010	36.98
Springer	S1156-34111	1156	2010	0.375	4.45			1/10/2010	11.87
Springer	S1156-35115	1156	2010	0.394	9.33			1/13/2010	23.68
Springer	S1156-35124	1156	2010	0.109	2.89			1/13/2010	26.51
Springer	S1156-35136	1156	2010	0.088	14.58			1/13/2010	165.68
Springer	S1156-35148	1156	2010	0.257	1.99			1/13/2010	7.74
Springer	S1156-35308	1156	2010	0.138	4.6			1/13/2010	33.33
Springer	S1156-35316	1156	2010	0.094	8.07			1/13/2010	85.85
Springer	S1156-35326	1156	2010	0.287	4.14			1/13/2010	14.43
Springer	S1060-13003	1060	2010	0.199	45.08			1/15/2010	226.53
Springer	S1060-13007	1060	2010	0.869	24.5			1/15/2010	28.19
Springer	S1060-13011	1060	2010	5.375	25			1/15/2010	4.65
Springer	S1060-13015	1060	2010	2.944	54.33			1/15/2010	18.45
Springer	S1060-13019	1060	2010	1.881	27.08			1/15/2010	14.40
Springer	S1060-13023	1060	2010	2.606	31.33			1/15/2010	12.02
Springer	S1060-13027	1060	2010	2.1	50.58			1/15/2010	24.09
Springer	S1060-13030	1060	2010	0.969	23.75			1/15/2010	24.51
Springer	S1060-13034	1060	2010	4.812	18.17			1/15/2010	3.78
Springer	S1060-13053	1060	2010	0.937	38.67			1/15/2010	41.27
Springer	S1060-13056	1060	2010	1.372	16.58			1/15/2010	12.08
Springer	S1060-13058	1060	2010	2.263	25.42			1/15/2010	11.23
Springer	S1144-49008	1144	2010	0.894	20.83			1/18/2010	23.30
Springer	S1144-49011	1144	2010	0.331	23.25			1/18/2010	70.24
Springer	S1144-49014	1144	2010	3.187	36.5			1/18/2010	11.45
Springer	S1144-49017	1144	2010	0.316	14.75			1/18/2010	46.68
Springer	S1144-49031	1144	2010	0.509	68.25			1/18/2010	134.09
Springer	S1144-49034	1144	2010	0.256	46.92			1/18/2010	183.28
Springer	S1144-49037	1144	2010	0.175	15.33			1/18/2010	87.60
Springer	S1144-49042	1144	2010	0.691	29.17			1/18/2010	42.21
Springer	S1144-49069	1144	2010	0.083	49.42			1/18/2010	595.42
Springer	S1144-49073	1144	2010	0.147	19.67			1/18/2010	133.81
Springer	S1144-49076	1144	2010	0.178	17			1/18/2010	95.51
Springer	S1144-49099	1144	2010	0.628	44.75			1/18/2010	71.26
Springer	S1144-49113	1144	2010	0.096	16.58			1/18/2010	172.71
Springer	S1156-36010	1156	2010	3.969	9			1/18/2010	2.27
Springer	S1156-36025	1156	2010	2.456	8.5			1/18/2010	3.46
Springer	S1156-36034	1156	2010	2.309	12.83			1/18/2010	5.56
Springer	S1156-36046	1156	2010	0.304	6.19			1/18/2010	20.36
Springer	S1156-36099	1156	2010	0.519	47.25			1/18/2010	91.04
Springer	S1156-36109	1156	2010	0.289	6.88			1/18/2010	23.81
Springer	S1156-36117	1156	2010	0.516	12.83			1/18/2010	24.86
Springer	S1156-36131	1156	2010	0.575	8.75			1/18/2010	15.22
Springer	S1156-36132	1156	2010	0.188	27.67			1/18/2010	147.18
Springer	S1156-37002	1156	2010	0.397	12.5			1/19/2010	31.49
Springer	S1156-37043	1156	2010	0.124	6.08			1/19/2010	49.03
Springer	S1156-37061	1156	2010	0.141	9.08			1/19/2010	64.40
Springer	S1156-37067	1156	2010	0.153	7.39			1/19/2010	48.30
Springer	S1060-12062	1060	2010	3.156	28.42			1/25/2010	9.01
Springer	S1060-12070	1060	2010	6.25	24.58			1/25/2010	3.93
Springer	S1060-12076	1060	2010	23.563	39.33			1/25/2010	1.67
Springer	S1060-12080	1060	2010	13.562	73.58			1/25/2010	5.43
Springer	S1060-12084	1060	2010	0.972	17.75			1/25/2010	18.26
Springer	S1060-12089	1060	2010	49.375	21.17			1/25/2010	0.43
Springer	S1060-12094	1060	2010	36.875	61.08			1/25/2010	1.66
Springer	S1156-30133	1156	2010	0.24	16.08			1/27/2010	67.00
Springer	S1156-30136	1156	2010	0.27	31.42			1/27/2010	116.37
Springer	S1156-30143	1156	2010	0.49	4.78			1/27/2010	9.76
Springer	S1156-30251	1156	2010	0.33	9.33			1/27/2010	28.27
Springer	S1156-30254	1156	2010	0.09	25.25			1/27/2010	280.56
Springer	S1156-30321	1156	2010	0.13	12.33			1/27/2010	94.85
Springer	S1156-30324	1156	2010	0.18	41.25			1/27/2010	229.17
Springer	S1156-42006	1156	2010	0.297	25.67			1/29/2010	86.43
Springer	S1156-42010	1156	2010	0.491	30.42			1/29/2010	61.96
Springer	S1156-42015	1156	2010	0.277	24.25			1/29/2010	87.55
Springer	S1156-42018	1156	2010	0.719	32.5			1/29/2010	45.20
Springer	S1144-51007	1144	2010	0.981	16.08			2/2/2010	16.39
Springer	S1144-51025	1144	2010	0.509	12.33			2/2/2010	24.22
Springer	S1144-51028	1144	2010	0.644	4.83			2/2/2010	7.50
Springer	S1144-51031	1144	2010	0.447	1.44			2/2/2010	3.22
Springer	S1144-51067	1144	2010	0.353	4.28			2/2/2010	12.12
Springer	S1144-51070	1144	2010	0.306	30.83			2/2/2010	100.75
Springer	S1144-51082	1144	2010	0.866	14.42			2/2/2010	16.65
Springer	S1144-51085	1144	2010	0.656	2.24			2/2/2010	3.41
Springer	S1144-50032	1144	2010	0.459	18.42			2/3/2010	40.13
Springer	S1144-50042	1144	2010	1.219	29.92			2/3/2010	24.54
Springer	S1144-50045	1144	2010	0.362	37.08			2/3/2010	102.43
Springer	S1144-50048	1144	2010	0.312	5.51			2/3/2010	17.66
Springer	S1144-50078	1144	2010	0.322	30.67			2/3/2010	95.25
Springer	S1144-50081	1144	2010	0.362	14.67			2/3/2010	40.52
Springer	S1144-50084	1144	2010	0.223	42.67			2/3/2010	191.35
Springer	S1144-50117	1144	2010	0.384	8.42			2/3/2010	21.93
Springer	S1144-50120	1144	2010	0.416	32.5			2/3/2010	78.13
Springer	S1144-50123	1144	2010	0.494	0.62			2/3/2010	1.26
Springer	S1144-50126	1144	2010	0.264	30.75			2/3/2010	116.48
Springer	S1144-50156	1144	2010	0.487	29.92			2/3/2010	61.44
Springer	S1144-50159	1144	2010	0.403	46.17			2/3/2010	114.57
Springer	S1144-50162	1144	2010	0.544	38.92			2/3/2010	71.54
Springer	S1144-50165	1144	2010	0.544	1.15			2/3/2010	2.11
Springer	S1144-52117	1144	2010	0.356	13.83			2/3/2010	38.85
Springer	S1144-52123	1144	2010	0.307	18.08			2/3/2010	58.89
Springer	S1144-52133	1144	2010	0.328	17.67			2/3/2010	53.87
Springer	S1144-52137	1144	2010	0.394	93.33			2/3/2010	236.88
Springer	S1060-14005	1060	2010	8	50.83			2/4/2010	6.35
Springer	S1060-14008	1060	2010	3.122	56.42			2/4/2010	18.07
Springer	S1060-14026	1060	2010	0.816	50.5			2/4/2010	61.89

Springer	S1060-14048	1060	2010	24.344	55.58			2/4/2010	2.28
Springer	S1060-14092	1060	2010	11.781	32.42			2/4/2010	2.75
Springer	S1060-14104	1060	2010	4.031	56.42			2/4/2010	14.00
Springer	S1060-14106	1060	2010	67.188	53.42			2/4/2010	0.80
Springer	S1144-51073	1144	2010	0.706	4.28			2/5/2010	6.06
Springer	S1144-54145	1144	2010	0.249	14.25			2/8/2010	57.23
Springer	S1144-54160	1144	2010	1.131	4.61			2/8/2010	4.08
Springer	S1156-41119	1156	2010	0.562	1.71			2/8/2010	3.04
Springer	S1156-41201	1156	2010	0.231	4.26			2/8/2010	18.44
Springer	S1156-41207	1156	2010	0.112	0.21			2/8/2010	1.88
Springer	S1156-41244	1156	2010	0.275	1			2/8/2010	3.64
Springer	S1156-41503	1156	2010	0.453	7.93			2/8/2010	17.51
Springer	S1156-41523	1156	2010	0.114	6.09			2/8/2010	53.42
Springer	S1144-56101	1144	2010	1.125	19.33			2/11/2010	17.18
Springer	S1144-56110	1144	2010	0.966	17.33			2/11/2010	17.94
Springer	S1144-56119	1144	2010	0.334	4.27			2/11/2010	12.78
Springer	S1144-56128	1144	2010	0.134	34.75			2/11/2010	259.33
Springer	S1144-56137	1144	2010	0.163	4.99			2/11/2010	30.61
Springer	S1144-56226	1144	2010	0.328	5.83			2/11/2010	17.77
Springer	S1144-56301	1144	2010	0.666	24.08			2/11/2010	36.16
Springer	S1144-56309	1144	2010	0.625	10.08			2/11/2010	16.13
Springer	S1144-56315	1144	2010	1.187	9.58			2/11/2010	8.07
Springer	S1144-56321	1144	2010	0.403	23.17			2/11/2010	57.49
Springer	S1144-53111	1144	2010	0.559	8.28			2/13/2010	14.81
Springer	S1144-53131	1144	2010	0.375	8.16			2/13/2010	21.76
Springer	S1144-53138	1144	2010	0.647	7.65			2/13/2010	11.82
Springer	S1144-53143	1144	2010	0.425	12.17			2/13/2010	28.64
Springer	S1144-53170	1144	2010	0.258	15.25			2/13/2010	59.11
Springer	S1144-53301	1144	2010	0.494	15.17			2/13/2010	30.71
Springer	S1144-53310	1144	2010	0.416	19.83			2/13/2010	47.67
Springer	S1144-53337	1144	2010	0.466	2.31			2/13/2010	4.96
Springer	S1144-53356	1144	2010	0.791	13.75			2/13/2010	17.38
Springer	S1060-16021	1060	2010	25.156	33.17			2/15/2010	1.32
Springer	S1060-16024	1060	2010	14.969	31.08			2/15/2010	2.08
Springer	S1060-16027	1060	2010	4.594	74.08			2/15/2010	16.13
Springer	S1060-16030	1060	2010	3.25	50.5			2/15/2010	15.54
Springer	S1060-16033	1060	2010	0.516	45.17			2/15/2010	87.54
Springer	S1060-16036	1060	2010	0.997	32.5			2/15/2010	32.60
Springer	S1060-16039	1060	2010	0.788	35.5			2/15/2010	45.05
Springer	S1060-16042	1060	2010	3.813	40.17			2/15/2010	10.54
Springer	S1060-16069	1060	2010	16	25.08			2/15/2010	1.57
Springer	S1060-16078	1060	2010	19.344	36.5			2/15/2010	1.89
Springer	S1060-16084	1060	2010	11.781	59.08			2/15/2010	5.01
Springer	S1060-16086	1060	2010	2.591	50.08			2/15/2010	19.33
Springer	S1060-16088	1060	2010	1.428	76.75			2/15/2010	53.75
Springer	S1060-16090	1060	2010	1.222	34.67			2/15/2010	28.37
Springer	S1060-16092	1060	2010	2.247	34.58			2/15/2010	15.39
Springer	S1060-16094	1060	2010	0.631	59.5			2/15/2010	94.29
Springer	S1132-42009	1132	2010	1.778	12.83			2/22/2010	7.22
Springer	S1132-42019	1132	2010	1.688	87.5			2/22/2010	51.84
Springer	S1132-42035	1132	2010	1.056	20.08			2/22/2010	19.02
Springer	S1132-42049	1132	2010	0.562	3.11			2/22/2010	5.53
Springer	S1132-42053	1132	2010	0.237	1.47			2/22/2010	6.20
Springer	S1132-42063	1132	2010	1.231	15.67			2/22/2010	12.73
Springer	S1132-42088	1132	2010	1.881	41.92			2/22/2010	22.29
Springer	S1132-42091	1132	2010	1.812	1.23			2/22/2010	0.68
Springer	S1132-42101	1132	2010	0.878	32.92			2/22/2010	37.49
Springer	S1132-42111	1132	2010	0.981	2.69			2/22/2010	2.74
Springer	S1144-57000	1144	2010	0.192	8.28			2/22/2010	43.13
Springer	S1144-57008	1144	2010	0.322	10.75			2/22/2010	33.39
Springer	S1144-57017	1144	2010	0.331	7.71			2/22/2010	23.29
Springer	S1144-57026	1144	2010	0.669	6.83			2/22/2010	10.21
Springer	S1144-57035	1144	2010	0.497	12			2/22/2010	24.14
Springer	S1144-57044	1144	2010	0.734	24.83			2/22/2010	33.83
Springer	S1144-57053	1144	2010	0.298	64.83			2/22/2010	217.55
Springer	S1144-57200	1144	2010	1.091	7.87			2/22/2010	7.21
Springer	S1144-57205	1144	2010	0.522	14.92			2/22/2010	28.58
Springer	S1144-57211	1144	2010	0.316	10			2/22/2010	31.65
Springer	S1144-57217	1144	2010	0.556	23.58			2/22/2010	42.41
Springer	S1144-57223	1144	2010	0.397	17			2/22/2010	42.82
Springer	S1144-57229	1144	2010	0.659	71.5			2/22/2010	108.50
Springer	S1144-58003	1144	2010	0.631	2.54			2/22/2010	4.03
Springer	S1144-58012	1144	2010	1.037	32.33			2/22/2010	31.18
Springer	S1144-58021	1144	2010	0.822	26.5			2/22/2010	32.24
Springer	S1144-58030	1144	2010	0.406	15.75			2/22/2010	38.79
Springer	S1144-58039	1144	2010	0.4	11.42			2/22/2010	28.55
Springer	S1144-58049	1144	2010	0.791	64.58			2/22/2010	81.64
Springer	S1144-58202	1144	2010	0.381	2.92			2/22/2010	7.66
Springer	S1144-58210	1144	2010	1.016	22.67			2/22/2010	22.31
Springer	S1144-58216	1144	2010	0.366	4.92			2/22/2010	13.44
Springer	S1144-58222	1144	2010	0.541	9.17			2/22/2010	16.95
Springer	S1144-58228	1144	2010	0.4	7.68			2/22/2010	19.20
Springer	S1060-15007	1060	2010	1.753	15.17			2/24/2010	8.65
Springer	S1060-15050	1060	2010	3.187	14.83			2/24/2010	4.65
Springer	S1060-15080	1060	2010	1.387	101.67			2/24/2010	73.30
Springer	S1060-15118	1060	2010	8.375	25.83			2/24/2010	3.08
Springer	S1060-15128	1060	2010	10.688	28.58			2/24/2010	2.67
Springer	S1060-15135	1060	2010	3.531	49.67			2/24/2010	14.07
Springer	S1060-15146	1060	2010	5.719	105			2/24/2010	18.36
Springer	S1060-15153	1060	2010	4.656	39.42			2/24/2010	8.47
Springer	S1060-15156	1060	2010	14	26.83			2/24/2010	1.92
Springer	S1060-15159	1060	2010	15.781	25.33			2/24/2010	1.61
Springer	S1060-15175	1060	2010	25.781	41.67			2/24/2010	1.62
Springer	S1060-15178	1060	2010	10.031	20.83			2/24/2010	2.08
Springer	S1060-15181	1060	2010	1.544	83.33			2/24/2010	53.97
Springer	S1060-15184	1060	2010	3.844	18.67			2/24/2010	4.86
Springer	S1132-43119	1132	2010	0.675	0.42			2/24/2010	0.62
Springer	S1132-43123	1132	2010	0.312	12.5			2/24/2010	40.06
Springer	S1132-43169	1132	2010	0.928	7.89			2/24/2010	8.50
Springer	S1132-43312	1132	2010	1.041	33.58			2/24/2010	32.26
Springer	S1132-43335	1132	2010	0.666	55.5			2/24/2010	83.33
Springer	S1132-43338	1132	2010	0.513	20.17			2/24/2010	39.32
Springer	S1132-43365	1132	2010	0.394	33.42			2/24/2010	84.82
Springer	S1132-43368	1132	2010	1.509	24.33			2/24/2010	16.12
Springer	S1132-43371	1132	2010	0.806	34.58			2/24/2010	42.90
Springer	S1132-43374	1132	2010	1.175	28.58			2/24/2010	24.32
Springer	S1144-58056	1144	2010	0.25	4.85			2/26/2010	19.40
Springer	S1144-58065	1144	2010	0.195	27.42			2/26/2010	140.62
Springer	S1048-3510	1048	2010	1.853	14.67			2/27/2010	7.92
Springer	S1048-3519	1048	2010	1.256	10.75			2/27/2010	8.56
Springer	S1048-3545	1048	2010	6	16.5			2/27/2010	2.75
Springer	S1048-3569	1048	2010	2.384	20.33			2/27/2010	8.53
Springer	S1048-3578	1048	2010	5.125	23.75			2/27/2010	4.63
Springer	S1048-3585	1048	2010	1.478	12.67			2/27/2010	8.57
Springer	S1048-3588	1048	2010	21.063	10.25			2/27/2010	0.49
Springer	S1048-3597	1048	2010	6.031	21.33			2/27/2010	3.54
Springer	S1048-3600	1048	2010	9.031	36.92			2/27/2010	4.09
Springer	S1132-43189	1132	2010	0.484	44			3/7/2010	90.91
Springer	S1132-43197	1132	2010	0.238	4.62			3/7/2010	19.41
Springer	S1132-43375	1132	2010	1.441	26.42			3/7/2010	18.33
Springer	S1132-44017	1132	2010	0.759	28.17			3/7/2010	37.11
Springer	S1132-44019	1132	2010	0.731	12.5			3/7/2010	17.10
Springer	S1132-44022	1132	2010	0.922	23.25			3/7/2010	25.22
Springer	S1132-44025	1132	2010	1.275	36.5			3/7/2010	28.63
Springer	S1132-44028	1132	2010	0.775	29.75			3/7/2010	38.39
Springer	S1132-44033	1132	2010	0.597	2.26			3/7/2010	3.79
Springer	S1132-44043	1132	2010	0.784	17.25			3/7/2010	22.00
Springer	S1132-44083	1132	2010	0.7	14.92			3/7/2010	21.31
Springer	S1132-44086	1132	2010	1.278	28.92			3/7/2010	22.63
Springer	S1132-44089	1132	2010	0.603	8.19			3/7/2010	13.58
Springer	S1132-44092	1132	2010	0.497	22.08			3/7/2010	44.43
Springer	S1132-44095	1132	2010	0.641	21.83			3/7/2010	34.06
Springer	S1132-44098	1132	2010	1.444	31.5			3/7/2010	21.81
Springer	S1132-44141	1132	2010	0.606	4.86			3/7/2010	8.02
Springer	S1132-44144	1132	2010	25.781	13.5			3/7/2010	0.52
Springer	S1132-44147	1132	2010	0.716	15.75			3/7/2010	22.00
Springer	S1132-44150	1132	2010	0.675	17.08			3/7/2010	25.30
Springer	S1132-44153	1132	2010	0.981	30			3/7/2010	30.58
Springer	S1132-44163	1132	2010	0.641	13.83			3/7/2010	21.58
Springer	S1132-44202	1132	2010	0.731	6.98			3/7/2010	9.55
Springer	S1132-44205	1132	2010	8.594	23.67			3/7/2010	2.75
Springer	S1132-44208	1132	2010	0.703	16.25			3/7/2010	23.12
Springer	S1132-44211	1132	2010	0.794	2.69			3/7/2010	3.39
Springer	S1132-44214	1132	2010	0.778	75.83			3/7/2010	97.47
Springer	S1060-17104	1060	2010	1.391	55			3/9/2010	39.54
Springer	S1060-17113	1060	2010	0.759	27.58			3/9/2010	36.34
Springer	S1060-17122	1060	2010	0.784	33.42			3/9/2010	42.63
Springer	S1060-17134	1060	2010	1.009	10.25			3/9/2010	10.16
Springer	S1060-17143	1060	2010	4.125	39.67			3/9/2010	9.62
Springer	S1060-17152	1060	2010	15.125	29.67			3/9/2010	1.96
Springer	S1060-17182	1060	2010	0.797	50.67			3/9/2010	63.58
Springer	S1060-17188	1060	2010	2.541	30.42			3/9/2010	11.97
Springer	S1060-17194	1060	2010	1.294	26.33			3/9/2010	20.35
Springer	S1060-17200	1060	2010	0.669	28.17			3/9/2010	42.11
Springer	S1060-17206	1060	2010	19.5	40.33			3/9/2010	2.07
Springer	S1048-4057	1048	2010	2.58	18.33			3/11/2010	7.10
Springer	S1048-4500	1048	2010	2.55	21.17			3/11/2010	8.30
Springer	S1048-4512	1048	2010	2.37	29.25			3/11/2010	12.34
Springer	S1048-4529	1048	2010	5.09	18.42			3/11/2010	3.62
Springer	S1048-4532	1048	2010	7.75	15.67			3/11/2010	2.02
Springer	S1048-4541	1048	2010	1.67	8.15			3/11/2010	4.88
Springer	S1144-59105	1144	2010	0.487	1.4			3/13/2010	2.87
Springer	S1144-59108	1144	2010	0.719	0.93			3/13/2010	1.29
Springer	S1144-59111	1144	2010	0.675	1.3			3/13/2010	1.93
Springer	S1144-59122	1144	2010	0.394	70.25			3/13/2010	178.30
Springer	S1144-59124	1144	2010	1.603	67.08			3/13/2010	41.85
Springer	S1144-59173	1144	2010	0.219	2.07			3/13/2010	9.45
Springer	S1144-59179	1144	2010	1.019	10.42			3/13/2010	10.23
Springer	S1144-59182	1144	2010	1.05	131.67			3/13/2010	125.40
Springer	S1144-59199	1144	2010	0.928	2.78			3/13/2010	3.00
Springer	S1144-59223	1144	2010	0.606	7.98			3/13/2010	13.17
Springer	S1144-59261	1144	2010	0.691	44.42			3/13/2010	64.28
Springer	S1144-59301	1144	2010	1.672	93.33			3/13/2010	55.82
Springer	S1144-59350	1144	2010	0.6	13.92			3/13/2010	23.20
Springer	S1144-60007	1144	2010	0.672	22.5			3/19/2010	33.48
Springer	S1144-60009	1144	2010	0.619	20.67			3/19/2010	33.39
Springer	S1144-60033	1144	2010	0.478	1.89			3/19/2010	3.95
Springer	S1144-60062	1144	2010	0.378	7.91			3/19/2010	20.93
Springer	S1144-60066	1144	2010	0.444	5.05			3/19/2010	11.37
Springer	S1144-60070	1144	2010	0.594	1.31			3/19/2010	2.21

Springer	S1144-60088	1144	2010	0.634	24.33			3/19/2010	38.38
Springer	S1144-60119	1144	2010	0.438	25.92			3/19/2010	59.18
Springer	S1144-60128	1144	2010	0.784	139.17			3/19/2010	177.51
Springer	S1144-60134	1144	2010	0.325	8.83			3/19/2010	27.17
Springer	S1144-60170	1144	2010	0.222	4.67			3/19/2010	21.04
Springer	S1144-60185	1144	2010	0.391	5.2			3/19/2010	13.30
Springer	S1144-60194	1144	2010	0.481	1.85			3/19/2010	3.85
Springer	S1132-45158	1132	2010	2.641	4.72			3/22/2010	1.79
Springer	S1132-45161	1132	2010	2.263	18.5			3/22/2010	8.17
Springer	S1132-45603	1132	2010	1.494	12.17			3/22/2010	8.15
Springer	S1132-45659	1132	2010	1.753	34.92			3/22/2010	19.92
Springer	S1132-45673	1132	2010	1.134	15.92			3/22/2010	14.04
Springer	S1132-45676	1132	2010	0.257	4.32			3/22/2010	16.81
Springer	S1132-45728	1132	2010	0.193	3.58			3/22/2010	18.55
Springer	S1132-45731	1132	2010	0.158	8.75			3/22/2010	55.38
Springer	S1132-45761	1132	2010	0.319	1.8			3/22/2010	5.64
Springer	S1132-45767	1132	2010	0.117	12.33			3/22/2010	105.38
Springer	S1132-45787	1132	2010	0.284	7.52			3/22/2010	26.48
Springer	S1060-18010	1060	2010	5.719	33.67			3/24/2010	5.89
Springer	S1060-18019	1060	2010	31.25	37.83			3/24/2010	1.21
Springer	S1060-18028	1060	2010	20.25	26.42			3/24/2010	1.30
Springer	S1060-18037	1060	2010	32.5	17.17			3/24/2010	0.53
Springer	S1060-18046	1060	2010	2.3	12.42			3/24/2010	5.40
Springer	S1060-18093	1060	2010	3.047	35.67			3/24/2010	11.71
Springer	S1060-18099	1060	2010	21.531	53.67			3/24/2010	2.49
Springer	S1060-18105	1060	2010	6.156	14.67			3/24/2010	2.38
Springer	S1060-18111	1060	2010	9.531	30.58			3/24/2010	3.21
Springer	S1132-46016	1132	2010	0.803	21			3/28/2010	26.15
Springer	S1132-46023	1132	2010	0.566	6.43			3/28/2010	11.36
Springer	S1132-46026	1132	2010	1.056	16.42			3/28/2010	15.55
Springer	S1132-46029	1132	2010	0.794	7.57			3/28/2010	9.53
Springer	S1132-46032	1132	2010	0.516	15.67			3/28/2010	30.37
Springer	S1132-46063	1132	2010	0.569	29.92			3/28/2010	52.58
Springer	S1132-46066	1132	2010	0.962	16.33			3/28/2010	16.98
Springer	S1132-46081	1132	2010	0.809	33.75			3/28/2010	41.72
Springer	S1132-47067	1132	2010	0.628	14.42			3/29/2010	22.96
Springer	S1132-47073	1132	2010	0.641	2.93			3/29/2010	4.57
Springer	S1132-47079	1132	2010	1.194	17.25			3/29/2010	14.45
Springer	S1132-47085	1132	2010	0.666	55.33			3/29/2010	83.08
Springer	S1132-47091	1132	2010	0.622	27.33			3/29/2010	43.94
Springer	S1132-47097	1132	2010	0.928	23.42			3/29/2010	25.24
Springer	S1132-47103	1132	2010	0.316	5.16			3/29/2010	16.33
Springer	S1132-50102	1132	2010	0.894	6.58			4/1/2010	7.36
Springer	S1132-50105	1132	2010	1.016	26.92			4/1/2010	26.50
Springer	S1132-50108	1132	2010	1.209	17.33			4/1/2010	14.33
Springer	S1132-50111	1132	2010	2.184	4.9			4/1/2010	2.24
Springer	S1132-50114	1132	2010	1.244	1.73			4/1/2010	1.39
Springer	S1132-50117	1132	2010	0.669	3.95			4/1/2010	5.90
Springer	S1132-50120	1132	2010	0.394	9			4/1/2010	22.84
Springer	S1132-50123	1132	2010	0.853	4.36			4/1/2010	5.11
Springer	S1132-50126	1132	2010	0.544	6.06			4/1/2010	11.14
Springer	S1132-50129	1132	2010	0.534	4.9			4/1/2010	9.18
Springer	S1132-50132	1132	2010	0.706	13.33			4/1/2010	18.88
Springer	S1132-50301	1132	2010	0.719	32.83			4/1/2010	45.66
Springer	S1132-50304	1132	2010	0.469	0.89			4/1/2010	1.90
Springer	S1132-50310	1132	2010	0.322	5.51			4/1/2010	17.11
Springer	S1132-50314	1132	2010	1.156	14.67			4/1/2010	12.69
Springer	S1132-49001	1132	2010	0.878	14.67			4/2/2010	16.71
Springer	S1132-49007	1132	2010	0.8	5.68			4/2/2010	7.10
Springer	S1132-49013	1132	2010	0.274	2.36			4/2/2010	8.61
Springer	S1132-49026	1132	2010	0.406	3.11			4/2/2010	7.66
Springer	S1132-49027	1132	2010	0.841	3.93			4/2/2010	4.67
Springer	S1132-49039	1132	2010	0.494	13.92			4/2/2010	28.18
Springer	S1132-49044	1132	2010	0.295	5.54			4/2/2010	18.78
Springer	S1132-49058	1132	2010	0.631	3.3			4/2/2010	5.23
Springer	S1132-49065	1132	2010	0.19	2.93			4/2/2010	15.42
Springer	S1132-49071	1132	2010	0.628	2.8			4/2/2010	4.46
Springer	S1132-49087	1132	2010	1.5	19.17			4/2/2010	12.78
Springer	S1132-49119	1132	2010	1.338	28.67			4/2/2010	21.43
Springer	S1132-49122	1132	2010	0.55	7.81			4/2/2010	14.20
Springer	S1132-49128	1132	2010	0.238	4.7			4/2/2010	19.75
Springer	S1132-49138	1132	2010	0.269	3.74			4/2/2010	13.90
Springer	S1132-51104	1132	2010	0.775	4.12			4/4/2010	5.32
Springer	S1132-51108	1132	2010	0.359	42			4/4/2010	116.99
Springer	S1132-51111	1132	2010	0.816	46.83			4/4/2010	57.39
Springer	S1132-51125	1132	2010	1.563	21.08			4/4/2010	13.49
Springer	S1132-51127	1132	2010	2.934	92.5			4/4/2010	31.53
Springer	S1132-51132	1132	2010	1.766	90			4/4/2010	50.96
Springer	S1132-51142	1132	2010	0.791	76.58			4/4/2010	96.81
Springer	S1132-51150	1132	2010	0.444	62.58			4/4/2010	140.95
Springer	S1048-5520	1048	2010	7.594	22.5			4/9/2010	2.96
Springer	S1048-5525	1048	2010	3.781	21			4/9/2010	5.55
Springer	S1048-5528	1048	2010	5.219	22.83			4/9/2010	4.37
Springer	S1048-5534	1048	2010	6.031	22.75			4/9/2010	3.77
Springer	S1048-5538	1048	2010	4.656	14			4/9/2010	3.01
Springer	S1048-5546	1048	2010	2.919	24.17			4/9/2010	8.28
Springer	S1048-5564	1048	2010	2.744	19.25			4/9/2010	7.02
Springer	S1048-5574	1048	2010	8.469	33.25			4/9/2010	3.93
Springer	S1132-52078	1132	2010	0.984	25.42			4/12/2010	25.83
Springer	S1132-52081	1132	2010	0.716	36			4/12/2010	50.28
Springer	S1132-52091	1132	2010	1.028	9.92			4/12/2010	9.65
Springer	S1132-52096	1132	2010	2.087	144.17			4/12/2010	69.08
Springer	S1132-52113	1132	2010	1.081	2.28			4/12/2010	2.11
Springer	S1132-52116	1132	2010	1.1	1.13			4/12/2010	1.03
Springer	S1132-52119	1132	2010	0.806	59.92			4/12/2010	74.34
Springer	S1132-52509	1132	2010	0.422	14.83			4/12/2010	35.14
Springer	S1132-52517	1132	2010	1.053	1.54			4/12/2010	1.46
Springer	S1132-52520	1132	2010	0.453	40.5			4/12/2010	89.40
Springer	S1132-52541	1132	2010	1.119	12.58			4/12/2010	11.24
Springer	S1132-52544	1132	2010	1.684	15.08			4/12/2010	8.95
Springer	S1132-52564	1132	2010	1.069	36.92			4/12/2010	34.54
Springer	S1132-52567	1132	2010	0.734	23.92			4/12/2010	32.59
Springer	S1132-53748	1132	2010	0.578	68.92			4/20/2010	119.24
Springer	S1132-53754	1132	2010	1.213	81.58			4/20/2010	67.25
Springer	S1132-53760	1132	2010	0.684	11.5			4/20/2010	16.81
Springer	S1132-53767	1132	2010	0.788	20.83			4/20/2010	26.43
Springer	S1132-53773	1132	2010	1.338	31.17			4/20/2010	23.30
Springer	S1132-48601	1132	2010	3.219	8.92			4/24/2010	2.77
Springer	S1132-48608	1132	2010	4.281	16.08			4/24/2010	3.76
Springer	S1132-48637	1132	2010	0.249	0.75			4/24/2010	3.01
Springer	S1132-48647	1132	2010	0.269	0.67			4/24/2010	2.49
Springer	S1132-48673	1132	2010	1.516	7.86			4/24/2010	5.18
Springer	S1132-48690	1132	2010	3.875	13.33			4/24/2010	3.44
Springer	S1132-48700	1132	2010	3.406	9.33			4/24/2010	2.74
Springer	S1132-48702	1132	2010	0.503	10			4/24/2010	19.88
Springer	S1132-48720	1132	2010	2.925	20.5			4/24/2010	7.01
Springer	S1132-48816	1132	2010	0.135	27.67			4/24/2010	204.96
Springer	S1132-48831	1132	2010	0.093	1.79			4/24/2010	19.25
Springer	S1132-48832	1132	2010	0.223	0.7			4/24/2010	3.14
Springer	S1048-8011	1048	2010	9.281	22.58			4/28/2010	2.43
Springer	S1048-8047	1048	2010	9.75	35.25			4/28/2010	3.62
Springer	S1048-8095	1048	2010	10.781	18.75			4/28/2010	1.74
Springer	S1048-8099	1048	2010	5.094	49.17			4/28/2010	9.65
Springer	S1048-8107	1048	2010	16.094	32.25			4/28/2010	2.00
Springer	S1048-8115	1048	2010	13.312	16.83			4/28/2010	1.26
Springer	S1132-54421	1132	2010	0.311	10.33			5/6/2010	33.22
Springer	S1132-54427	1132	2010	0.223	11.25			5/6/2010	50.45
Springer	S1132-54445	1132	2010	0.297	9.75			5/6/2010	32.83
Springer	S1120-51026	1120	2010	0.759	12.17			5/7/2010	16.03
Springer	S1120-51029	1120	2010	0.687	6.81			5/7/2010	9.91
Springer	S1120-51060	1120	2010	1.328	8.92			5/7/2010	6.72
Springer	S1120-51079	1120	2010	0.447	34.5			5/7/2010	77.18
Springer	S1120-51106	1120	2010	0.541	17.92			5/7/2010	33.12
Springer	S1120-51110	1120	2010	0.391	16.92			5/7/2010	43.27
Springer	S1120-51133	1120	2010	0.525	24.5			5/7/2010	46.67
Springer	S1120-51140	1120	2010	0.516	14.83			5/7/2010	28.74
Springer	S1120-51145	1120	2010	0.678	17.25			5/7/2010	25.44
Springer	S1120-51200	1120	2010	0.277	21.67			5/7/2010	78.23
Springer	S1120-51203	1120	2010	1.347	16.83			5/7/2010	12.49
Springer	S1120-51224	1120	2010	1.159	32.67			5/7/2010	28.19
Springer	S1120-51228	1120	2010	1.194	23.42			5/7/2010	19.61
Springer	S1120-51232	1120	2010	0.375	9.42			5/7/2010	25.12
Springer	S1048-9011	1048	2010	30.906	41.5			5/10/2010	1.34
Springer	S1048-9043	1048	2010	1.262	36			5/10/2010	28.53
Springer	S1048-9108	1048	2010	0.132	7.88			5/10/2010	59.70
Springer	S1048-9116	1048	2010	0.114	32			5/10/2010	280.70
Springer	S1132-54351	1132	2010	0.362	11.92			5/10/2010	32.93
Springer	S1132-54372	1132	2010	0.003	30.92			5/10/2010	10306.67
Springer	S1132-54461	1132	2010	0.003	13.67			5/10/2010	4556.67
Springer	S1132-54473	1132	2010	0.125	18.75			5/10/2010	150.00
Springer	S1132-54483	1132	2010	0.003	8.22			5/10/2010	2740.00
Springer	S1132-55271	1132	2010	0.003	3.62			5/10/2010	1206.67
Springer	S1048-10034	1048	2010	9	22.42			5/18/2010	2.49
Springer	S1048-10095	1048	2010	9.156	15.08			5/18/2010	1.65
Springer	S1048-10138	1048	2010	6.313	13.92			5/18/2010	2.20
Springer	S1048-10142	1048	2010	5.75	19.83			5/18/2010	3.45
Springer	S1120-52120	1120	2010	0.806	18.33			5/19/2010	22.74
Springer	S1120-52124	1120	2010	1.006	11.58			5/19/2010	11.51
Springer	S1120-52160	1120	2010	0.647	18.83			5/19/2010	29.10
Springer	S1120-52178	1120	2010	0.625	9.42			5/19/2010	15.07
Springer	S1120-52218	1120	2010	0.062	4.32			5/19/2010	69.68
Springer	S1120-52222	1120	2010	0.459	6.31			5/19/2010	13.75
Springer	S1120-52225	1120	2010	0.694	5.57			5/19/2010	8.03
Springer	S1132-57104	1132	2010	1.103	2.38			5/20/2010	2.16
Springer	S1132-57307	1132	2010	0.288	2.2			5/20/2010	7.64
Springer	S1132-57315	1132	2010	3.344	38.25			5/20/2010	11.44
Springer	S1048-11100	1048	2010	5.375	35			5/21/2010	6.51
Springer	S1048-11104	1048	2010	27.406	54.25			5/21/2010	1.98
Springer	S1048-11108	1048	2010	10.844	18.75			5/21/2010	1.73
Springer	S1048-11220	1048	2010	6.406	28.5			5/21/2010	4.45
Springer	S1048-11224	1048	2010	25.313	40.83			5/21/2010	1.61
Springer	S1120-55017	1120	2010	0.675	36.17			5/23/2010	53.59
Springer	S1120-55023	1120	2010	0.029	52.08			5/23/2010	1795.86
Springer	S1120-55029	1120	2010	1.019	23.75			5/23/2010	23.31
Springer	S1120-55042	1120	2010	0.129	33.25			5/23/2010	257.75
Springer	S1120-55096	1120	2010	0.074	40.25			5/23/2010	543.92
Springer	S1120-55102	1120	2010	1.409	0.7			5/23/2010	0.50
Springer	S1120-55109	1120	2010	0.497	36.33			5/23/2010	73.10
Springer	S1120-55116	1120	2010	0.097	45.17			5/23/2010	465.67
Springer	S1048-10064	1048	2010	1.659	21			5/24/2010	12.66

Springer	S1048-10154	1048	2010	2.647	32.33			5/24/2010	12.21
Springer	S1048-12024	1048	2010	16	45			5/24/2010	2.81
Springer	S1048-12055	1048	2010	10.125	18.08			5/24/2010	1.79
Springer	S1048-12059	1048	2010	49.375	40.08			5/24/2010	0.81
Springer	S1048-13001	1048	2010	10.531	29.25			5/24/2010	2.78
Springer	S1048-13019	1048	2010	1.603	47.58			5/24/2010	29.68
Springer	S1048-13034	1048	2010	1.197	48.75			5/24/2010	40.73
Springer	S1048-13069	1048	2010	1.753	114.17			5/24/2010	65.13
Springer	S1048-13077	1048	2010	0.544	50.67			5/24/2010	93.14
Springer	S1048-13085	1048	2010	79.687	30.25			5/24/2010	0.38
Springer	S1120-55071	1120	2010	0.037	11.75			5/28/2010	317.57
Springer	S1120-55077	1120	2010	0.037	61.08			5/28/2010	1650.81
Springer	S1120-56034	1120	2010	0.037	7.71			5/28/2010	208.38
Springer	S1120-56052	1120	2010	0.074	32			5/28/2010	432.43
Springer	S1120-56080	1120	2010	0.037	10.08			5/28/2010	272.43
Springer	S1120-56099	1120	2010	1.659	12.33			5/28/2010	7.43
Springer	S1120-56120	1120	2010	1.009	14.08			5/28/2010	13.95
Springer	S1120-56125	1120	2010	1.763	22.25			5/28/2010	12.62
Springer	S1120-57112	1120	2010	0.4719768	13.4134912			5/30/2010	28.42
Springer	S1120-57176	1120	2010	1.3530002	3.08260357			5/30/2010	2.28
Springer	S1120-57184	1120	2010	0.0314651	1.83289942			5/30/2010	58.25
Springer	S1120-57193	1120	2010	0.0314651	7.41491129			5/30/2010	235.65
Springer	S1120-58153	1120	2010	2.359884	27.1602369			5/30/2010	11.51
Springer	S1120-58161	1120	2010	0.0314651	46.4056808			5/30/2010	1474.83
Springer	S1120-58170	1120	2010	0.0314651	16.8293492			5/30/2010	534.86
Springer	S1120-58057	1120	2010	0.097	11.33			6/3/2010	116.80
Springer	S1120-58075	1120	2010	0.003	8.02			6/3/2010	2673.33
Springer	S1120-58175	1120	2010	0.21	23.17			6/3/2010	110.33
Springer	S1120-58185	1120	2010	0.003	5.43			6/3/2010	1810.00
Springer	S1120-60051	1120	2010	0.003	18.83			6/7/2010	6276.67
Springer	S1120-60067	1120	2010	0.881	23.25			6/7/2010	26.39
Springer	S1120-60071	1120	2010	0.003	33.58			6/7/2010	11193.33
Springer	S1120-60098	1120	2010	0.831	23.33			6/7/2010	28.07
Springer	S1120-60112	1120	2010	1.769	26.67			6/7/2010	15.08
Springer	S1120-60120	1120	2010	1.094	16.5			6/7/2010	15.08
Springer	S1120-60137	1120	2010	2.209	28.58			6/7/2010	12.94
Springer	S1120-60154	1120	2010	6.688	31.67			6/7/2010	4.74
Springer	S1120-60165	1120	2010	3.656	25.08			6/7/2010	6.86
Springer	S1120-60182	1120	2010	10.719	42.92			6/7/2010	4.00
Springer	S1120-61408	1120	2010	12.25	46.5			6/14/2010	3.80
Springer	S1120-61435	1120	2010	3.75	34.33			6/14/2010	9.15
Springer	S1120-61482	1120	2010	0.192	48.17			6/14/2010	250.89
Springer	S1120-61492	1120	2010	0.347	76.17			6/14/2010	219.51
Springer	S1120-61502	1120	2010	0.003	16.5			6/14/2010	5500.00
Springer	S1036-2014	1036	2010	18.125	16.83			6/15/2010	0.93
Springer	S1036-2015	1036	2010	7.312	11.75			6/15/2010	1.61
Springer	S1036-2018	1036	2010	0.666	17.25			6/15/2010	25.90
Springer	S1036-2051	1036	2010	5.031	14.33			6/15/2010	2.85
Springer	S1036-3088	1036	2010	28.937	11.92			6/18/2010	0.41
Springer	S1036-3093	1036	2010	16.719	23.33			6/18/2010	1.40
Springer	S1036-3096	1036	2010	8.375	20.58			6/18/2010	2.46
Springer	S1048-15050	1048	2010	26.187	43.67			6/18/2010	1.67
Springer	S1048-15054	1048	2010	64.687	37.58			6/18/2010	0.58
Springer	S1048-15058	1048	2010	35.625	30.92			6/18/2010	0.87
Springer	S1048-15062	1048	2010	18.844	43.33			6/18/2010	2.30
Springer	S1048-15066	1048	2010	9.219	33.58			6/18/2010	3.64
Springer	S1048-15070	1048	2010	28.188	55.67			6/18/2010	1.97
Springer	S1048-15074	1048	2010	77.188	45.42			6/18/2010	0.59
Springer	S1048-16009	1048	2010	13.469	16.67			6/21/2010	1.24
Springer	S1048-16018	1048	2010	5.094	9.58			6/21/2010	1.88
Springer	S1048-16027	1048	2010	2.522	19.92			6/21/2010	7.90
Springer	S1048-16062	1048	2010	1.097	20.67			6/21/2010	18.84
Springer	S1048-16066	1048	2010	13.594	11.83			6/21/2010	0.87
Springer	S1048-16076	1048	2010	12.438	27.25			6/21/2010	2.19
Springer	S1048-16078	1048	2010	31.25	36.92			6/21/2010	1.18
Springer	S1036-3075	1036	2010	3.813	22.17			6/23/2010	5.81
Springer	S1036-3111	1036	2010	3.469	19.17			6/23/2010	5.53
Springer	S1036-4011	1036	2010	6.594	17.58			6/23/2010	2.67
Springer	S1120-62444	1120	2010	1.05	24.42			6/24/2010	23.26
Springer	S1120-62466	1120	2010	0.944	87.5			6/24/2010	92.69
Springer	S1120-62483	1120	2010	0.631	6.44			6/24/2010	10.21
Springer	S1120-62507	1120	2010	1.003	2.76			6/24/2010	2.75
Springer	S1120-62508	1120	2010	1.309	2.3			6/24/2010	1.76
Springer	S1120-62526	1120	2010	2.347	161.67			6/24/2010	68.88
Springer	S1120-62540	1120	2010	1.084	3.7			6/24/2010	3.41
Springer	S1120-62581	1120	2010	1.266	27.17			6/24/2010	21.46
Springer	S1120-62601	1120	2010	0.691	8.11			6/24/2010	11.74
Springer	S1120-62626	1120	2010	2.128	79.5			6/24/2010	37.36
Springer	S1120-64001	1120	2010	1.025	4.95			6/29/2010	4.83
Springer	S1120-64008	1120	2010	0.609	33.42			6/29/2010	54.88
Springer	S1120-64012	1120	2010	1.609	130			6/29/2010	80.80
Springer	S1120-64016	1120	2010	0.036	1.34			6/29/2010	37.22
Springer	S1120-64024	1120	2010	0.003	0.26			6/29/2010	86.67
Springer	S1120-64032	1120	2010	0.012	1.3			6/29/2010	108.33
Springer	S1120-64047	1120	2010	1.353	9.58			6/29/2010	7.08
Springer	S1120-64062	1120	2010	1.216	2.14			6/29/2010	1.76
Springer	S1120-64073	1120	2010	0.747	0.12			6/29/2010	0.16
Springer	S1120-64084	1120	2010	2.713	52.58			6/29/2010	19.38
Springer	S1120-64095	1120	2010	0.769	3.29			6/29/2010	4.28
Springer	S1120-63106	1120	2010	0.906	12.42			7/6/2010	13.71
Springer	S1120-63116	1120	2010	0.944	15.08			7/6/2010	15.97
Springer	S1120-63122	1120	2010	1.144	13			7/6/2010	11.36
Springer	S1120-63130	1120	2010	1.325	8.75			7/6/2010	6.60
Springer	S1120-65107	1120	2010	3.437	10.42			7/15/2010	3.03
Springer	S1120-65113	1120	2010	1.391	6.26			7/15/2010	4.50
Springer	S1120-65121	1120	2010	2.316	18.08			7/15/2010	7.81
Springer	S1120-65130	1120	2010	1.744	9.58			7/15/2010	5.49
Springer	S1120-66007	1120	2010	3.531	19.5			7/19/2010	5.52
Springer	S1120-66029	1120	2010	1.009	11.17			7/19/2010	11.07
Springer	S1120-66031	1120	2010	1.028	3			7/19/2010	2.92
Springer	S1120-66037	1120	2010	2.472	8.58			7/19/2010	3.47
Springer	S1120-66043	1120	2010	2.256	15.67			7/19/2010	6.95
Springer	S1120-66049	1120	2010	4.344	7.99			7/19/2010	1.84
Springer	S1120-66087	1120	2010	1.5	5.55			7/19/2010	3.70
Springer	S1108-48021	1108	2010	1.419	0.01			7/20/2010	0.01
Springer	S1108-48027	1108	2010	2.522	20			7/20/2010	7.93
Springer	S1108-48031	1108	2010	2.447	15.58			7/20/2010	6.37
Springer	S1108-48038	1108	2010	2.469	11.5			7/20/2010	4.66
Springer	S1108-48086	1108	2010	4.344	16.75			7/20/2010	3.86
Springer	S1108-48091	1108	2010	1.694	14.33			7/20/2010	8.46
Springer	S1108-48215	1108	2010	1.959	15.08			7/20/2010	7.70
Springer	S1108-48220	1108	2010	1.422	3.46			7/20/2010	2.43
Springer	S1108-48225	1108	2010	1.784	0.33			7/20/2010	0.18
Springer	S1036-7001	1036	2010	25	26.58			7/22/2010	1.06
Springer	S1036-7004	1036	2010	43.125	38.17			7/22/2010	0.89
Springer	S1036-7016	1036	2010	25.281	23.5			7/22/2010	0.93
Springer	S1036-7022	1036	2010	37.188	81.83			7/22/2010	2.20
Springer	S1036-7031	1036	2010	1.4	59.58			7/22/2010	42.56
Springer	S1036-7037	1036	2010	2.072	43.5			7/22/2010	20.99
Springer	S1036-7071	1036	2010	10.688	20.25			7/22/2010	1.89
Springer	S1036-7086	1036	2010	7.25	51.08			7/22/2010	7.05
Springer	S1108-47000	1108	2010	2.259	23.33			7/22/2010	10.33
Springer	S1108-47009	1108	2010	1.806	30			7/22/2010	16.61
Springer	S1108-47037	1108	2010	0.747	19.33			7/22/2010	25.88
Springer	S1108-47115	1108	2010	1.406	18			7/22/2010	12.80
Springer	S1108-47165	1108	2010	1.291	39			7/22/2010	30.21
Springer	S1036-6000	1036	2010	27.219	58.42			7/25/2010	2.15
Springer	S1036-6001	1036	2010	40	40.42			7/25/2010	1.01
Springer	S1036-6030	1036	2010	18.156	47.67			7/25/2010	2.63
Springer	S1120-69045	1120	2010	1.209	7.51			7/27/2010	6.21
Springer	S1120-69075	1120	2010	0.553	4.02			7/27/2010	7.27
Springer	S1120-69079	1120	2010	0.925	7.47			7/27/2010	8.08
Springer	S1120-69102	1120	2010	0.85	0.94			7/27/2010	1.11
Springer	S1120-69114	1120	2010	1.097	5.06			7/27/2010	4.61
Springer	S1036-8071	1036	2010	3.25	29			7/31/2010	8.92
Springer	S1036-8119	1036	2010	4.312	9.42			8/1/2010	2.18
Springer	S1036-10003	1036	2010	4.688	26.58			8/5/2010	5.67
Springer	S1036-10017	1036	2010	30.562	57			8/5/2010	1.87
Springer	S1036-10023	1036	2010	6.281	36.67			8/5/2010	5.84
Springer	S1036-10065	1036	2010	14.156	44.25			8/5/2010	3.13
Springer	S1036-10078	1036	2010	13.281	43.17			8/5/2010	3.25
Springer	S1036-10033	1036	2010	17.938	46.25			8/9/2010	2.58
Springer	S1036-10045	1036	2010	46.875	44.5			8/9/2010	0.95
Springer	S1036-10092	1036	2010	28.031	38			8/9/2010	1.36
Springer	S1036-10096	1036	2010	24	61.42			8/9/2010	2.56
Springer	S1036-10102	1036	2010	28.75	28.5			8/9/2010	0.99
Springer	S1108-49070	1108	2010	1.928	33.33			8/11/2010	17.29
Springer	S1108-49076	1108	2010	0.947	9.5			8/11/2010	10.03
Springer	S1108-49107	1108	2010	1.631	23.58			8/11/2010	14.46
Springer	S1108-49120	1108	2010	0.616	11.25			8/11/2010	18.26
Springer	S1108-49147	1108	2010	0.319	15.25			8/11/2010	47.81
Springer	S1108-49158	1108	2010	0.841	10.67			8/11/2010	12.69
Springer	S1108-49209	1108	2010	1.231	13.42			8/11/2010	10.90
Springer	S1108-49216	1108	2010	0.694	10.58			8/11/2010	15.24
Springer	S1108-49313	1108	2010	1.072	6.52			8/11/2010	6.08
Springer	S1108-49342	1108	2010	0.719	13.25			8/11/2010	18.43
Springer	S1108-49346	1108	2010	0.362	9.67			8/11/2010	26.71
Springer	S1108-52102	1108	2010	0.021	12.08			8/12/2010	575.24
Springer	S1108-52120	1108	2010	0.153	26.5			8/12/2010	173.20
Springer	S1108-52202	1108	2010	1.016	34.83			8/12/2010	34.28
Springer	S1108-52228	1108	2010	0.233	7.01			8/12/2010	30.09
Springer	S1108-53015	1108	2010	2.619	13.83			8/14/2010	5.28
Springer	S1108-53066	1108	2010	1.003	45.33			8/14/2010	45.19
Springer	S1108-53072	1108	2010	1.247	17.08			8/14/2010	13.70
Springer	S1108-53078	1108	2010	0.869	16.92			8/14/2010	19.47
Springer	S1108-53090	1108	2010	0.5	25.25			8/14/2010	50.50
Springer	S1108-50008	1108	2010	0.422	28.33			8/15/2010	67.13
Springer	S1108-50023	1108	2010	1.728	21.75			8/15/2010	12.59
Springer	S1108-50037	1108	2010	3.594	34.08			8/15/2010	9.48
Springer	S1108-50049	1108	2010	1.075	25.75			8/15/2010	23.95
Springer	S1108-50063	1108	2010	0.538	2.53			8/15/2010	4.70
Springer	S1108-50082	1108	2010	3.019	9.75			8/15/2010	3.23
Springer	S1036-11000	1036	2010	1.056	20.58			8/30/2010	19.49
Springer	S1036-11034	1036	2010	1.797	25.58			8/30/2010	14.23
Springer	S1036-11040	1036	2010	3.375	21.83			8/30/2010	6.47
Springer	S1036-11069	1036	2010	2.803	14.67			8/30/2010	5.23
Springer	S1036-11091	1036	2010	1.766	26.33			8/30/2010	14.91
Springer	S1036-11099	1036	2010	2.1	24.67			8/30/2010	11.75
Springer	S1036-11103	1036	2010	1.706	26.83			8/30/2010	15.73
Springer	S1036-11110	1036	2010	1.744	14.5			8/30/2010	8.31

Springer	S1108-54089	1108	2010	1.006	24.08			8/31/2010	23.94
Springer	S1108-54120	1108	2010	2.059	12.58			8/31/2010	6.11
Springer	S1108-54145	1108	2010	2.038	9.5			8/31/2010	4.66
Springer	S1108-54192	1108	2010	2.091	18.83			8/31/2010	9.01
Springer	S1108-54244	1108	2010	5.125	13.75			8/31/2010	2.68
Springer	S1108-51237	1108	2010	1.591	11.75			9/6/2010	7.39
Springer	S1108-51254	1108	2010	0.331	14.67			9/6/2010	44.32
Springer	S1108-51263	1108	2010	1.334	35.83			9/6/2010	26.86
Springer	S1108-51289	1108	2010	3.5	28.08			9/6/2010	8.02
Springer	S1108-51297	1108	2010	0.341	45.83			9/6/2010	134.40
Springer	S1108-51325	1108	2010	0.822	61.33			9/6/2010	74.61
Springer	S1108-57029	1108	2010	3.056	12			9/11/2010	3.93
Springer	S1108-57035	1108	2010	0.834	10.33			9/11/2010	12.39
Springer	S1108-57043	1108	2010	1.703	10.08			9/11/2010	5.92
Springer	S1108-57062	1108	2010	3.219	19.58			9/11/2010	6.08
Springer	S1036-14055	1036	2010	3.312	26.5			9/13/2010	8.00
Springer	S1036-14110	1036	2010	1.722	19			9/13/2010	11.03
Springer	S1108-55026	1108	2010	2.787	67.92			9/13/2010	24.37
Springer	S1108-55153	1108	2010	1.866	21.83			9/13/2010	11.70
Springer	S1108-55196	1108	2010	5.844	30.42			9/13/2010	5.21
Springer	S1108-55200	1108	2010	9.375	34.08			9/13/2010	3.64
Springer	S1108-55236	1108	2010	4.594	18.25			9/13/2010	3.97
Springer	S1108-55242	1108	2010	3.075	30.25			9/13/2010	9.84
Springer	S1108-57080	1108	2010	0.497	8.12			9/13/2010	16.34
Springer	S1108-56137	1108	2010	0.497	14			9/16/2010	28.17
Springer	S1108-56143	1108	2010	1.031	13.33			9/16/2010	12.93
Springer	S1108-56157	1108	2010	0.325	3.62			9/16/2010	11.14
Springer	S1108-55122	1108	2010	0.794	61.75			9/22/2010	77.77
Springer	S1108-55128	1108	2010	0.434	17			9/22/2010	39.17
Springer	S1108-55157	1108	2010	6.75	26.25			9/22/2010	3.89
Springer	S1108-55162	1108	2010	9.406	74.5			9/22/2010	7.92
Springer	S1108-59109	1108	2010	2.547	100			9/22/2010	39.26
Springer	S1108-60318	1108	2010	0.469	12.5			9/22/2010	26.65
Springer	S1108-60483	1108	2010	0.681	14.92			9/22/2010	21.91
Springer	S1108-60615	1108	2010	0.226	3.33			9/22/2010	14.73
Springer	S1108-60627	1108	2010	0.594	67.67			9/22/2010	113.92
Springer	S1108-60708	1108	2010	0.459	64.42			9/22/2010	140.35
Springer	S1108-60201	1108	2010	0.597	19.67			9/24/2010	32.95
Springer	S1108-60205	1108	2010	0.344	8.75			9/24/2010	25.44
Springer	S1108-60209	1108	2010	0.525	14.25			9/24/2010	27.14
Springer	S1108-60905	1108	2010	0.428	10.17			9/24/2010	23.76
Springer	S1108-60913	1108	2010	0.372	11			9/24/2010	29.57
Springer	S1108-60921	1108	2010	0.341	8.33			9/24/2010	24.43
Springer	S1108-61047	1108	2010	0.478	13.67			9/27/2010	28.60
Springer	S1108-61051	1108	2010	0.641	30.83			9/27/2010	48.10
Springer	S1108-61054	1108	2010	0.753	5.04			9/27/2010	6.69
Springer	S1108-61085	1108	2010	0.28	18.58			9/27/2010	66.36
Springer	S1108-61089	1108	2010	0.459	7.13			9/27/2010	15.53
Springer	S1108-61110	1108	2010	0.491	14.67			9/27/2010	29.88
Springer	S1108-63022	1108	2010	0.308	1.45			9/28/2010	4.71
Springer	S1108-63035	1108	2010	0.625	80.75			9/28/2010	129.20
Springer	S1108-63081	1108	2010	0.241	11.08			9/28/2010	45.98
Springer	S1108-63098	1108	2010	0.209	1.65			9/28/2010	7.89
Springer	S1036-15110	1036	2010	2.706	20			10/3/2010	7.39
Springer	S1036-15117	1036	2010	1.819	31			10/3/2010	17.04
Springer	S1096-42006	1096	2010	0.297	25.67			10/5/2010	86.43
Springer	S1108-64104	1108	2010	0.35	28.92			10/7/2010	82.63
Springer	S1108-64116	1108	2010	1.953	39.83			10/7/2010	20.39
Springer	S1108-64128	1108	2010	3.037	18.25			10/7/2010	6.01
Springer	S1108-64140	1108	2010	3.531	11.42			10/7/2010	3.23
Springer	S1108-67011	1108	2010	0.853	10.83			10/7/2010	12.70
Springer	S1108-67046	1108	2010	0.95	73.75			10/7/2010	77.63
Springer	S1108-67074	1108	2010	0.243	18.17			10/7/2010	74.77
Springer	S1096-43020	1096	2010	1.297	20.75			10/10/2010	16.00
Springer	S1096-43028	1096	2010	0.208	6.17			10/10/2010	29.66
Springer	S1096-43060	1096	2010	0.956	19.58			10/10/2010	20.48
Springer	S1096-43064	1096	2010	0.262	4.16			10/10/2010	15.88
Springer	S1108-68530	1108	2010	0.428	18.75			10/14/2010	43.81
Springer	S1108-68541	1108	2010	0.463	2			10/14/2010	4.32
Springer	S1108-68588	1108	2010	1.228	12.67			10/14/2010	10.32
Springer	S1108-68620	1108	2010	0.653	8.01			10/14/2010	12.27
Springer	S1096-44016	1096	2010	0.678	20.17			10/15/2010	29.75
Springer	S1096-44044	1096	2010	1.669	11.83			10/15/2010	7.09
Springer	S1096-44051	1096	2010	0.284	13.08			10/15/2010	46.06
Springer	S1096-44098	1096	2010	1.794	15.42			10/15/2010	8.60
Springer	S1096-44113	1096	2010	2.316	7.29			10/15/2010	3.15
Springer	S1096-44164	1096	2010	0.463	26.75			10/15/2010	57.78
Springer	S1108-68565	1108	2010	0.609	11.83			10/16/2010	19.43
Springer	S1096-45000	1096	2010	2.419	15.58			10/18/2010	6.44
Springer	S1096-45075	1096	2010	1.181	4.25			10/18/2010	3.60
Springer	S1096-45094	1096	2010	1.356	11.5			10/18/2010	8.48
Springer	S1096-45119	1096	2010	0.149	37.42			10/18/2010	251.14
Springer	S1108-65030	1108	2010	0.391	10.67			10/18/2010	27.29
Springer	S1108-65077	1108	2010	0.697	69.5			10/18/2010	99.71
Springer	S1108-65100	1108	2010	0.366	9.58			10/18/2010	26.17
Springer	S1108-65130	1108	2010	0.472	35.67			10/18/2010	75.57
Springer	S1108-70039	1108	2010	0.484	6.48			10/23/2010	13.39
Springer	S1108-70143	1108	2010	0.441	21.17			10/23/2010	48.00
Springer	S1108-70210	1108	2010	0.344	19.08			10/23/2010	55.47
Springer	S1108-70226	1108	2010	0.519	8.13			10/23/2010	15.66
Springer	S1096-46019	1096	2010	1.197	12.75			10/26/2010	10.65
Springer	S1096-46065	1096	2010	0.884	10.92			10/26/2010	12.35
Springer	S1108-70057	1108	2010	0.372	4.6			10/26/2010	12.37
Springer	S1108-70232	1108	2010	0.347	4.46			10/26/2010	12.85
Springer	S1108-71001	1108	2010	0.381	9.5			10/26/2010	24.93
Springer	S1108-71010	1108	2010	0.528	9.83			10/26/2010	18.62
Springer	S1096-46128	1096	2010	0.759	12.58			11/1/2010	16.57
Springer	S1096-46202	1096	2010	0.691	27.67			11/1/2010	40.04
Springer	S1096-46224	1096	2010	1.159	16.08			11/1/2010	13.87
Springer	S1096-46246	1096	2010	0.962	13			11/1/2010	13.51
Springer	S1096-46257	1096	2010	0.344	11.75			11/1/2010	34.16
Springer	S1108-72141	1108	2010	0.122	69.33			11/2/2010	568.28
Springer	S1108-72147	1108	2010	0.463	81.17			11/2/2010	175.31
Springer	S1108-72107	1108	2010	0.603	96.67			11/4/2010	160.32
Springer	S1108-72125	1108	2010	0.316	10			11/4/2010	31.65
Springer	S1108-72135	1108	2010	0.124	47.33			11/4/2010	381.69
Springer	S1108-72177	1108	2010	0.481	11.33			11/4/2010	23.56
Springer	S1024-6121	1024	2010	4	36.67			11/6/2010	9.17
Springer	S1024-6218	1024	2010	22.219	36.25			11/6/2010	1.63
Springer	S1096-48036	1096	2010	2.275	10.42			11/7/2010	4.58
Springer	S1096-48042	1096	2010	3.469	22.58			11/7/2010	6.51
Springer	S1096-48047	1096	2010	1.903	75.92			11/7/2010	39.89
Springer	S1096-48063	1096	2010	1.059	87.5			11/7/2010	82.63
Springer	S1096-48079	1096	2010	2.391	20.83			11/7/2010	8.71
Springer	S1096-48129	1096	2010	1.672	10.17			11/7/2010	6.08
Springer	S1096-48160	1096	2010	0.794	12.17			11/7/2010	15.33
Springer	S1096-49014	1096	2010	1.472	24.58			11/14/2010	16.70
Springer	S1096-49042	1096	2010	0.831	17.92			11/14/2010	21.56
Springer	S1096-49049	1096	2010	2.119	27.67			11/14/2010	13.06
Springer	S1096-49086	1096	2010	0.725	1.63			11/14/2010	2.25
Springer	S1096-49115	1096	2010	1.825	9.25			11/14/2010	5.07
Springer	S1096-49121	1096	2010	0.575	1.59			11/14/2010	2.77
Springer	S1096-49155	1096	2010	0.822	20.42			11/14/2010	24.84
Springer	S1096-50129	1096	2010	4.062	7.91			11/21/2010	1.95
Springer	S1096-50141	1096	2010	0.731	4.23			11/21/2010	5.79
Springer	S1096-50190	1096	2010	1.312	23.83			11/21/2010	18.16
Springer	S1096-50311	1096	2010	0.409	7.86			11/21/2010	19.22
Springer	S1096-50345	1096	2010	0.966	36.67			11/21/2010	37.96
Springer	S1096-54021	1096	2010	0.453	8.67			11/30/2010	19.14
Springer	S1096-54033	1096	2010	1.291	8.83			11/30/2010	6.84
Springer	S1024-7027	1024	2010	28.937	25.17			12/2/2010	0.87
Springer	S1024-7030	1024	2010	24.312	20.58			12/2/2010	0.85
Springer	S1024-7045	1024	2010	11.937	7.98			12/2/2010	0.67
Springer	S1024-7049	1024	2010	32.812	12.25			12/2/2010	0.37
Springer	S1024-7051	1024	2010	54.688	21			12/2/2010	0.38
Springer	S1024-7053	1024	2010	24.406	43.58			12/2/2010	1.79
Springer	S1024-7055	1024	2010	32.812	51			12/2/2010	1.55
Springer	S1096-51028	1096	2010	2.294	34.5			12/3/2010	15.04
Springer	S1096-51145	1096	2010	1.625	98.33			12/3/2010	60.51
Springer	S1096-51154	1096	2010	4.438	50.67			12/3/2010	11.42
Springer	S1096-51187	1096	2010	3.688	19.42			12/3/2010	5.27
Springer	S1096-51200	1096	2010	2.372	32.92			12/3/2010	13.88
Springer	S1096-51206	1096	2010	1.262	65.75			12/3/2010	52.10
Springer	S1096-54114	1096	2010	1.125	18.83			12/3/2010	16.74
Springer	S1096-54124	1096	2010	0.713	6.15			12/3/2010	8.63
Springer	S1096-54129	1096	2010	1.353	3.93			12/3/2010	2.90
Springer	S1024-7043	1024	2010	6.625	31.5			12/4/2010	4.75
Springer	S1096-56092	1096	2010	1.438	42			12/7/2010	29.21
Springer	S1096-56104	1096	2010	2.766	27.92			12/7/2010	10.09
Springer	S1096-52112	1096	2010	1.1	7.25			12/8/2010	6.59
Springer	S1096-52225	1096	2010	0.274	8.33			12/8/2010	30.40
Springer	S1096-52230	1096	2010	1.209	42.58			12/8/2010	35.22
Springer	S1096-52476	1096	2010	1.812	11.92			12/8/2010	6.58
Springer	S1096-52494	1096	2010	1.353	3.93			12/8/2010	2.90
Springer	S1096-61046	1096	2010	1.081	10.08			12/12/2010	9.32
Springer	S1096-61124	1096	2010	1.825	10.17			12/12/2010	5.57
Springer	S1096-61157	1096	2010	1.35	25.33			12/12/2010	18.76
Springer	S1096-60009	1096	2010	0.972	15.08			12/16/2010	15.51
Springer	S1096-60039	1096	2010	0.519	24.83			12/16/2010	47.84
Springer	S1096-60057	1096	2010	0.669	39.83			12/16/2010	59.54
Springer	S1096-60203	1096	2010	1.425	42.67			12/16/2010	29.94
Springer	S1096-60211	1096	2010	0.21	28.17			12/16/2010	134.14
Springer	S1096-60229	1096	2010	2.028	38.92			12/16/2010	19.19
Springer	S1096-60235	1096	2010	0.419	12.5			12/16/2010	29.83
Springer	S1096-62020	1096	2010	1.116	19.08			12/18/2010	17.10
Springer	S1096-62024	1096	2010	0.481	52.17			12/18/2010	108.46
Springer	S1096-62031	1096	2010	2.362	10.17			12/18/2010	4.31
Springer	S1096-62039	1096	2010	0.447	7.32			12/18/2010	16.38
Springer	S1096-62067	1096	2010	1.966	9.25			12/18/2010	4.70
Springer	S1096-62071	1096	2010	0.412	27.08			12/18/2010	65.73
Springer	S1096-62113	1096	2010	2.694	14			12/18/2010	5.20
Springer	S1084-37044	1084	2010	2.669	44.67	0.536	0.085	12/22/2010	16.74
Springer	S1084-37072	1084	2010	2.394	10.67	0.128	0.077	12/22/2010	4.46
Springer	S1084-37084	1084	2010	1.544	28.83	0.346	0.049	12/22/2010	18.67
Springer	S1096-58108	1096	2010	27.563	67.58			12/23/2010	2.45
Springer	S1096-58122	1096	2010	0.869	15.67			12/23/2010	18.03
Springer	S1096-58135	1096	2010	1.525	14.42			12/23/2010	9.46
Springer	S1096-59104	1096	2010	0.953	126.67			12/29/2010	132.92
Springer	S1096-59116	1096	2010	0.744	17.25			12/29/2010	23.19
Springer	S1096-59128	1096	2010	1.641	102.5			12/29/2010	62.46

Springer	S1096-63111	1096	2010	2.906	31.17			12/29/2010	10.73
Springer	S1096-63114	1096	2010	2.594	30.75			12/29/2010	11.85
Springer	S1084-38011	1084	2010	1.191	9.83	0.118	0.038	12/31/2010	8.25
Springer	S1084-38030	1084	2010	1.138	10.92	0.131	0.036	12/31/2010	9.60
Springer	S1084-38047	1084	2010	0.972	29.25	0.351	0.031	12/31/2010	30.09
Springer	S1084-38068	1084	2010	1.831	15.75	0.189	0.059	12/31/2010	8.60
Springer	S1084-38084	1084	2010	3.281	9.92	0.119	0.105	12/31/2010	3.02
Springer	S1084-38100	1084	2010	3.281	12.08	0.145	0.105	12/31/2010	3.68
Springer	S1084-38522	1084	2010	1.75	13.17	0.158	0.056	12/31/2010	7.53
Springer	S1084-38545	1084	2010	1.347	11.67	0.14	0.043	12/31/2010	8.66
Springer	S1084-38584	1084	2010	0.6	16.08	0.193	0.019	12/31/2010	26.80
Springer	S1084-38590	1084	2010	2.694	26.58	0.319	0.086	12/31/2010	9.87
Springer	S1096-662287	1096	2011	4.781	39.75			1/9/2011	8.31
Springer	S1096-662298	1096	2011	1.722	39.92			1/9/2011	23.18
Springer	S1096-662315	1096	2011	1.509	31.17			1/9/2011	20.66
Springer	S1084-39010	1084	2011	2.5	16	0.192	0.08	1/10/2011	6.40
Springer	S1084-39022	1084	2011	2.231	13.83	0.166	0.071	1/10/2011	6.20
Springer	S1084-39037	1084	2011	1.197	15	0.18	0.038	1/10/2011	12.53
Springer	S1084-39052	1084	2011	1.347	39.08	0.469	0.043	1/10/2011	29.01
Springer	S1084-39067	1084	2011	1.272	16.5	0.198	0.041	1/10/2011	12.97
Springer	S1084-39084	1084	2011	2.597	31.83	0.382	0.083	1/10/2011	12.26
Springer	S1084-39097	1084	2011	2.353	49.42	0.593	0.075	1/10/2011	21.00
Springer	S1084-40033	1084	2011	3.531	14	0.168	0.113	1/10/2011	3.96
Springer	S1084-40094	1084	2011	3.875	16.33	0.196	0.124	1/10/2011	4.21
Springer	S1084-40098	1084	2011	4.281	25.67	0.308	0.137	1/10/2011	6.00
Springer	S1084-40102	1084	2011	3.019	14.83	0.178	0.097	1/10/2011	4.91
Springer	S1084-40105	1084	2011	2.344	22.67	0.272	0.075	1/10/2011	9.67
Springer	S1096-64052	1096	2011	0.775	18.5			1/10/2011	23.87
Springer	S1096-64141	1096	2011	1.028	7.22			1/10/2011	7.02
Springer	S1096-65001	1096	2011	1.669	104.17			1/12/2011	62.41
Springer	S1096-65023	1096	2011	1.916	43.33			1/12/2011	22.61
Springer	S1096-65048	1096	2011	1.034	4.32			1/12/2011	4.18
Springer	S1096-65074	1096	2011	1.103	6.37			1/12/2011	5.78
Springer	S1096-65098	1096	2011	0.584	25			1/12/2011	42.81
Springer	S1096-65104	1096	2011	0.878	24.67			1/12/2011	28.10
Springer	S1096-65110	1096	2011	0.356	6.32			1/12/2011	17.75
Springer	S1084-41003	1084	2011	1.225	32.17	0.386	0.039	1/18/2011	26.26
Springer	S1084-41006	1084	2011	1.662	31.33	0.376	0.053	1/18/2011	18.85
Springer	S1084-41053	1084	2011	2.716	24.58	0.295	0.087	1/18/2011	9.05
Springer	S1084-41058	1084	2011	2.463	22.75	0.273	0.079	1/18/2011	9.24
Springer	S1084-41119	1084	2011	1.65	21.25	0.255	0.053	1/18/2011	12.88
Springer	S1108-74004	1108	2011	1.203	10.58			1/21/2011	8.79
Springer	S1108-74221	1108	2011	1.841	16.67			1/21/2011	9.05
Springer	S1084-42019	1084	2011	4.938	15.33	0.184	0.158	1/23/2011	3.10
Springer	S1084-42024	1084	2011	3.016	44	0.528	0.097	1/23/2011	14.59
Springer	S1084-42054	1084	2011	2.741	25	0.3	0.088	1/23/2011	9.12
Springer	S1084-42059	1084	2011	1.903	12.25	0.147	0.061	1/23/2011	6.44
Springer	S1096-68505	1096	2011	0.866	7.73			1/25/2011	8.93
Springer	S1096-68515	1096	2011	1.269	5.82			1/25/2011	4.59
Springer	S1084-44016	1084	2011	0.878	24.42	0.293	0.028	1/30/2011	27.81
Springer	S1084-44020	1084	2011	0.017	9.92	0.119	0.001	1/30/2011	583.53
Springer	S1084-44040	1084	2011	0.369	36.33	0.436	0.012	1/30/2011	98.46
Springer	S1084-44057	1084	2011	0.107	26.33	0.316	0.003	1/30/2011	246.07
Springer	S1084-44071	1084	2011	1.869	14.58	0.175	0.06	1/30/2011	7.80
Springer	S1084-44118	1084	2011	1.897	15.08	0.181	0.061	1/30/2011	7.95
Springer	S1096-69101	1096	2011	2.722	92.5			1/31/2011	33.98
Springer	S1096-69123	1096	2011	1.5	23.92			1/31/2011	15.95
Springer	S1096-69139	1096	2011	2.759	28			1/31/2011	10.15
Springer	S1084-45014	1084	2011	0.759	4.48	0.054	0.024	2/4/2011	5.90
Springer	S1084-45024	1084	2011	2.541	41.67	0.5	0.081	2/4/2011	16.40
Springer	S1084-45055	1084	2011	4.281	8.92	0.107	0.137	2/4/2011	2.08
Springer	S1084-45064	1084	2011	1.469	21.33	0.256	0.047	2/4/2011	14.52
Springer	S1084-45093	1084	2011	4.281	31.83	0.382	0.137	2/4/2011	7.44
Springer	S1084-45099	1084	2011	1.138	6.83	0.082	0.036	2/4/2011	6.00
Springer	S1084-45117	1084	2011	0.613	30.08	0.361	0.02	2/4/2011	49.07
Springer	S1084-45127	1084	2011	2.994	23	0.276	0.096	2/4/2011	7.68
Springer	S1144-64081	1144	2011	3.281	2.62			2/5/2011	0.80
Springer	S1144-64110	1144	2011	4.5	3.95			2/5/2011	0.88
Springer	S1144-65050	1144	2011	5.375	2.48			2/5/2011	0.46
Springer	S1084-47009	1084	2011	0.484	29.07	0.349	0.015	2/10/2011	60.06
Springer	S1084-47030	1084	2011	1.841	3.95	0.047	0.059	2/10/2011	2.15
Springer	S1084-47075	1084	2011	1.578	2.18	0.026	0.051	2/10/2011	1.38
Springer	S1084-47089	1084	2011	11.688	19.75	0.237	0.374	2/10/2011	1.69
Springer	S1084-47201	1084	2011	1.753	2.18	0.026	0.056	2/10/2011	1.24
Springer	S1084-48059	1084	2011	0.888	21.42	0.257	0.028	2/10/2011	24.12
Springer	S1084-48087	1084	2011	1.756	15.89	0.191	0.056	2/10/2011	9.05
Springer	S1084-48095	1084	2011	1.862	11.22	0.135	0.06	2/10/2011	6.03
Springer	S1084-49067	1084	2011	8.938	69.67	0.836	0.286	2/14/2011	7.79
Springer	S1084-49090	1084	2011	1.475	19.67	0.236	0.047	2/14/2011	13.34
Springer	S1084-49104	1084	2011	3.281	9.17	0.11	0.105	2/14/2011	2.79
Springer	S1084-49111	1084	2011	3.281	16.92	0.203	0.105	2/14/2011	5.16
Springer	S1084-49121	1084	2011	4.062	36.58	0.439	0.13	2/14/2011	9.01
Springer	S1084-50113	1084	2011	3.625	10.5	0.126	0.116	2/20/2011	2.90
Springer	S1084-52001	1084	2011	1.569	7	0.084	0.05	2/20/2011	4.46
Springer	S1084-52019	1084	2011	1.856	9.92	0.119	0.059	2/20/2011	5.34
Springer	S1084-52037	1084	2011	0.606	37.17	0.446	0.019	2/20/2011	61.34
Springer	S1084-52043	1084	2011	1.559	17.67	0.212	0.05	2/20/2011	11.33
Springer	S1084-50118	1084	2011	2.078	24.92	0.299	0.067	2/21/2011	11.99
Springer	S1084-54036	1084	2011	0.762	41.75	0.501	0.024	2/23/2011	54.79
Springer	S1084-54076	1084	2011	0.641	16.17	0.194	0.021	2/23/2011	25.23
Springer	S1084-50021	1084	2011	0.928	31.08	0.373	0.03	2/24/2011	33.49
Springer	S1084-50028	1084	2011	2.25	40	0.48	0.072	2/24/2011	17.78
Springer	S1084-50083	1084	2011	0.984	11.5	0.138	0.032	2/24/2011	11.69
Springer	S1012-5027	1012	2011	4.375	19			2/26/2011	4.34
Springer	S1012-5036	1012	2011	1.225	37.17			2/26/2011	30.34
Springer	S1084-55137	1084	2011	0.891	29.58	0.355	0.029	2/28/2011	33.20
Springer	S1084-55181	1084	2011	1.109	25.58	0.307	0.036	2/28/2011	23.07
Springer	S1084-56016	1084	2011	1.169	19.33	0.232	0.037	3/3/2011	16.54
Springer	S1084-56068	1084	2011	0.6	12.5	0.15	0.019	3/3/2011	20.83
Springer	S1084-53012	1084	2011	0.412	39	0.468	0.013	3/4/2011	94.66
Springer	S1084-53034	1084	2011	0.362	8.5	0.102	0.012	3/4/2011	23.48
Springer	S1084-53039	1084	2011	8.656	19.5	0.234	0.277	3/4/2011	2.25
Springer	S1084-53079	1084	2011	1.009	22.67	0.272	0.032	3/4/2011	22.47
Springer	S1084-53106	1084	2011	1.55	12.33	0.148	0.05	3/4/2011	7.95
Springer	S1084-53113	1084	2011	4.219	62.33	0.748	0.135	3/4/2011	14.77
Springer	S1084-58030	1084	2011	0.775	18	0.216	0.025	3/6/2011	23.23
Springer	S1084-57046	1084	2011	0.713	12.5	0.15	0.023	3/10/2011	17.53
Springer	S1084-57051	1084	2011	1.147	19.75	0.237	0.037	3/10/2011	17.22
Springer	S1084-57066	1084	2011	1.181	5.11	0.061	0.038	3/10/2011	4.33
Springer	S1084-57115	1084	2011	1.375	7.63	0.092	0.044	3/10/2011	5.55
Springer	S1084-57152	1084	2011	1.163	7.53	0.09	0.037	3/10/2011	6.47
Springer	S1072-24013	1072	2011	5.719	13.42			3/14/2011	2.35
Springer	S1072-24042	1072	2011	2.428	12.92			3/14/2011	5.32
Springer	S1072-24046	1072	2011	0.984	8.92			3/14/2011	9.07
Springer	S1072-24073	1072	2011	2.237	7.98			3/14/2011	3.57
Springer	S1072-24102	1072	2011	2.269	9.58			3/14/2011	4.22
Springer	S1084-59033	1084	2011	3.375	23.42	0.281	0.108	3/14/2011	6.94
Springer	S1084-59069	1084	2011	1.378	23.75	0.285	0.044	3/14/2011	17.24
Springer	S1084-60007	1084	2011	2.022	61.25	0.735	0.065	3/16/2011	30.29
Springer	S1084-60019	1084	2011	2.075	53.67	0.644	0.066	3/16/2011	25.87
Springer	S1144-48012	1144	2011	0.117	1.57			3/17/2011	13.42
Springer	S1144-48015	1144	2011	0.4	11.92			3/17/2011	29.80
Springer	S1144-48018	1144	2011	0.109	1.1			3/17/2011	10.09
Springer	S1144-48026	1144	2011	0.126	1.42			3/17/2011	11.27
Springer	S1144-48050	1144	2011	2.109	8.83			3/17/2011	4.19
Springer	S1144-48059	1144	2011	0.534	27.92			3/17/2011	52.28
Springer	S1144-48063	1144	2011	0.236	10.08			3/17/2011	42.71
Springer	S1144-48066	1144	2011	0.156	1.32			3/17/2011	8.46
Springer	S1144-49008	1144	2011	0.894	20.83			3/17/2011	23.30
Springer	S1144-49011	1144	2011	0.331	23.25			3/17/2011	70.24
Springer	S1144-49014	1144	2011	3.187	36.5			3/17/2011	11.45
Springer	S1144-49017	1144	2011	0.316	14.75			3/17/2011	46.68
Springer	S1144-49031	1144	2011	0.509	68.25			3/17/2011	134.09
Springer	S1144-49034	1144	2011	0.256	46.92			3/17/2011	183.28
Springer	S1144-49037	1144	2011	0.175	15.33			3/17/2011	87.60
Springer	S1144-49042	1144	2011	0.691	29.17			3/17/2011	42.21
Springer	S1144-49069	1144	2011	0.083	49.42			3/17/2011	595.42
Springer	S1144-49073	1144	2011	0.147	19.67			3/17/2011	133.81
Springer	S1144-49076	1144	2011	0.178	17			3/17/2011	95.51
Springer	S1144-49099	1144	2011	0.628	44.75			3/17/2011	71.26
Springer	S1144-49113	1144	2011	0.096	16.58			3/17/2011	172.71
Springer	S1144-50032	1144	2011	0.459	18.42			3/17/2011	40.13
Springer	S1144-50042	1144	2011	1.219	29.92			3/17/2011	24.54
Springer	S1144-50045	1144	2011	0.362	37.08			3/17/2011	102.43
Springer	S1144-50048	1144	2011	0.312	5.51			3/17/2011	17.66
Springer	S1144-50078	1144	2011	0.322	30.67			3/17/2011	95.25
Springer	S1144-50081	1144	2011	0.362	14.67			3/17/2011	40.52
Springer	S1144-50084	1144	2011	0.223	42.67			3/17/2011	191.35
Springer	S1144-50117	1144	2011	0.384	8.42			3/17/2011	21.93
Springer	S1144-50120	1144	2011	0.416	32.5			3/17/2011	78.13
Springer	S1144-50123	1144	2011	0.494	0.62			3/17/2011	1.26
Springer	S1144-50126	1144	2011	0.264	30.75			3/17/2011	116.48
Springer	S1144-50156	1144	2011	0.487	29.92			3/17/2011	61.44
Springer	S1144-50159	1144	2011	0.403	46.17			3/17/2011	114.57
Springer	S1144-50162	1144	2011	0.544	38.92			3/17/2011	71.54
Springer	S1144-50165	1144	2011	0.544	1.15			3/17/2011	2.11
Springer	S1144-51007	1144	2011	0.981	16.08			3/17/2011	16.39
Springer	S1144-51025	1144	2011	0.509	12.33			3/17/2011	24.22
Springer	S1144-51028	1144	2011	0.644	4.83			3/17/2011	7.50
Springer	S1144-51031	1144	2011	0.447	1.44			3/17/2011	3.22
Springer	S1144-51067	1144	2011	0.353	4.28			3/17/2011	12.12
Springer	S1144-51070	1144	2011	0.306	30.83			3/17/2011	100.75
Springer	S1144-51073	1144	2011	0.706	4.28			3/17/2011	6.06
Springer	S1144-51082	1144	2011	0.866	14.42			3/17/2011	16.65
Springer	S1144-51085	1144	2011	0.656	2.24			3/17/2011	3.41
Springer	S1144-59105	1144	2011	0.487	1.4			3/17/2011	2.87
Springer	S1144-59108	1144	2011	0.719	0.93			3/17/2011	1.29
Springer	S1144-59111	1144	2011	0.675	1.3			3/17/2011	1.93
Springer	S1144-59122	1144	2011	0.394	70.25			3/17/2011	178.30
Springer	S1144-59124	1144	2011	1.603	67.08			3/17/2011	41.85
Springer	S1144-59173	1144	2011	0.219	2.07			3/17/2011	9.45
Springer	S1144-59179	1144	2011	1.019	10.42			3/17/2011	10.23
Springer	S1144-59182	1144	2011	1.05	131.67			3/17/2011	125.40
Springer	S1144-59199	1144	2011	0.928	2.78			3/17/2011	3.00
Springer	S1144-59223	1144	2011	0.606	7.98			3/17/2011	13.17
Springer	S1144-59261	1144	2011	0.691	44.42			3/17/2011	64.28
Springer	S1144-59301	1144	2011	1.672	93.33			3/17/2011	55.82

Springer	S1144-59350	1144	2011	0.6	13.92			3/17/2011	23.20
Springer	s1084-63011	1084	2011	1.125	20.33	0.244	0.036	3/20/2011	18.07
Springer	s1084-63031	1084	2011	0.959	10.08	0.121	0.031	3/20/2011	10.51
Springer	s1084-65004	1084	2011	3.019	18.08	0.217	0.097	3/22/2011	5.99
Springer	S1084-46072	1084	2011	2.2	37.33	0.448	0.07	3/24/2011	16.97
Springer	S1084-46077	1084	2011	0.975	22.58	0.271	0.031	3/24/2011	23.16
Springer	S1084-46089	1084	2011	0.675	20.33	0.244	0.022	3/24/2011	30.12
Springer	S1084-46148	1084	2011	0.778	18.67	0.224	0.025	3/24/2011	24.00
Springer	S1084-61014	1084	2011	0.897	13.92	0.167	0.029	3/24/2011	15.52
Springer	S1084-61018	1084	2011	0.928	8.58	0.103	0.03	3/24/2011	9.25
Springer	S1072-25015	1072	2011	1.294	9.67			3/25/2011	7.47
Springer	S1072-25063	1072	2011	1.244	23.17			3/25/2011	18.63
Springer	S1072-25077	1072	2011	1.488	18.42			3/25/2011	12.38
Springer	S1072-25120	1072	2011	1.278	29.92			3/25/2011	23.41
Springer	S1084-65014	1084	2011	0.597	8.09	0.097	0.019	3/25/2011	13.55
Springer	S1084-62016	1084	2011	1.466	40.08	0.481	0.047	3/28/2011	27.34
Springer	S1084-62040	1084	2011	1.688	25.25	0.303	0.054	3/28/2011	14.96
Springer	S1084-62065	1084	2011	1.034	15.42	0.185	0.033	3/28/2011	14.91
Springer	S1084-62150	1084	2011	1.278	38.08	0.457	0.041	3/28/2011	29.80
Springer	S1084-62181	1084	2011	0.653	13.42	0.161	0.021	3/28/2011	20.55
Springer	S1084-66008	1084	2011	0.566	22.58	0.271	0.018	3/28/2011	39.89
Springer	S1084-66038	1084	2011	0.656	19.92	0.239	0.021	3/28/2011	30.37
Springer	S1072-26017	1072	2011	0.218	19.67			3/30/2011	90.23
Springer	S1072-26026	1072	2011	0.566	12.92			3/30/2011	22.83
Springer	S1072-26072	1072	2011	0.252	11.58			3/30/2011	45.95
Springer	S1084-67007	1084	2011	0.616	15.33	0.184	0.02	3/31/2011	24.89
Springer	S1084-67027	1084	2011	1.775	90.83	1.09	0.057	3/31/2011	51.17
Springer	S1072-27006	1072	2011	0.572	33.67			4/1/2011	58.86
Springer	S1072-27042	1072	2011	1.784	28.5			4/1/2011	15.98
Springer	S1072-27075	1072	2011	2.128	33.17			4/1/2011	15.59
Springer	S1072-27098	1072	2011	3.109	46.08			4/1/2011	14.82
Springer	S1072-27108	1072	2011	0.937	7.77			4/1/2011	8.29
Springer	s1072-28017	1072	2011	0.644	16			4/4/2011	24.84
Springer	s1072-28054	1072	2011	2.091	23			4/4/2011	11.00
Springer	s1072-28062	1072	2011	5.406	21.83			4/4/2011	4.04
Springer	s1072-28090	1072	2011	5.719	33.92			4/4/2011	5.93
Springer	s1072-28110	1072	2011	5.219	38.67			4/4/2011	7.41
Springer	s1072-28135	1072	2011	0.572	24.33			4/4/2011	42.53
Springer	s1084-68038	1084	2011	0.956	17.17	0.206	0.031	4/4/2011	17.96
Springer	s1084-68052	1084	2011	1.662	33.5	0.402	0.053	4/4/2011	20.16
Springer	s1084-68062	1084	2011	0.903	24.25	0.291	0.029	4/4/2011	26.85
Springer	S1072-30019	1072	2011	1.953	32.42			4/11/2011	16.60
Springer	S1072-30061	1072	2011	1.731	8.42			4/11/2011	4.86
Springer	S1072-30066	1072	2011	1.05	10.92			4/11/2011	10.40
Springer	S1072-30071	1072	2011	3.469	39.42			4/11/2011	11.36
Springer	S1072-30125	1072	2011	0.466	13.33			4/11/2011	28.61
Springer	S1072-30132	1072	2011	2.669	13.75			4/11/2011	5.15
Springer	S1072-29034	1072	2011	0.731	47.5			4/12/2011	64.98
Springer	S1072-29037	1072	2011	7.031	19.25			4/12/2011	2.74
Springer	S1072-29126	1072	2011	1.537	8.83			4/12/2011	5.74
Springer	S1072-29129	1072	2011	2.459	24.67			4/12/2011	10.03
Springer	S1072-29166	1072	2011	3.563	16.83			4/12/2011	4.72
Springer	S1072-29169	1072	2011	3.187	19.67			4/12/2011	6.17
Springer	S1072-31018	1072	2011	0.456	6.71			4/16/2011	14.71
Springer	S1072-31033	1072	2011	1.016	19.58			4/16/2011	19.27
Springer	S1072-31058	1072	2011	9.719	23.25			4/16/2011	2.39
Springer	S1072-31066	1072	2011	1.653	27.67			4/16/2011	16.74
Springer	S1072-31091	1072	2011	3.281	29.42			4/16/2011	8.97
Springer	S1084-69006	1084	2011	0.453	10.42	0.125	0.014	4/19/2011	23.00
Springer	S1084-69024	1084	2011	0.359	16.92	0.203	0.012	4/19/2011	47.13
Springer	S1072-37008	1072	2011	1.741	15.92			4/22/2011	9.14
Springer	S1072-37038	1072	2011	0.819	18.83			4/22/2011	22.99
Springer	S1072-37063	1072	2011	1.222	50.17			4/22/2011	41.06
Springer	S1072-37098	1072	2011	0.597	35.75			4/22/2011	59.88
Springer	S1072-37118	1072	2011	1.206	17			4/22/2011	14.10
Springer	S1072-36010	1072	2011	1.497	38.83			4/23/2011	25.94
Springer	S1072-36035	1072	2011	2.116	14.33			4/23/2011	6.77
Springer	S1072-36070	1072	2011	0.659	24.25			4/23/2011	36.80
Springer	S1072-36077	1072	2011	0.397	12.5			4/23/2011	31.49
Springer	s1072-40014	1072	2011	2.169	24.67			4/27/2011	11.37
Springer	s1072-40039	1072	2011	2.844	11			4/27/2011	3.87
Springer	s1072-40051	1072	2011	1.953	52.08			4/27/2011	26.67
Springer	S1072-45005	1072	2011	5.187	15.17			5/4/2011	2.92
Springer	S1072-45024	1072	2011	1.2	12.67			5/4/2011	10.56
Springer	S1072-45050	1072	2011	3.25	23.67			5/4/2011	7.28
Springer	S1072-45078	1072	2011	3.187	10.58			5/4/2011	3.32
Springer	S1072-45093	1072	2011	1.066	8.42			5/4/2011	7.90
Springer	S1072-39101	1072	2011	1.175	8.92			5/6/2011	7.59
Springer	S1072-46060	1072	2011	6.25	29.83			5/6/2011	4.77
Springer	S1072-46117	1072	2011	0.888	19.08			5/6/2011	21.49
Springer	S1072-39132	1072	2011	1.187	13.42			5/9/2011	11.31
Springer	S1072-39137	1072	2011	1.822	18.75			5/9/2011	10.29
Springer	S1072-39152	1072	2011	1.303	9.33			5/9/2011	7.16
Springer	S1072-46070	1072	2011	3.437	29.75			5/9/2011	8.66
Springer	S1072-46165	1072	2011	0.722	8.5			5/9/2011	11.77
Springer	S1072-46187	1072	2011	0.406	7.53			5/9/2011	18.55
Springer	S1072-46136	1072	2011	1.559	10.25			5/10/2011	6.57
Springer	S1072-39187	1072	2011	0.587	7.35			5/11/2011	12.52
Springer	S1072-39192	1072	2011	0.609	9			5/11/2011	14.78
Springer	S1072-46015	1072	2011	2.009	23.92			5/16/2011	11.91
Springer	S1072-46042	1072	2011	19.125	32.17			5/16/2011	1.68
Springer	S1072-50027	1072	2011	1.647	23.67			5/16/2011	14.37
Springer	S1072-50034	1072	2011	1.984	20			5/16/2011	10.08
Springer	S1072-50020	1072	2011	2.45	19.67			5/17/2011	8.03
Springer	S1072-48010	1072	2011	0.697	3.78			5/19/2011	5.42
Springer	S1072-48035	1072	2011	1.138	17.58			5/19/2011	15.45
Springer	S1072-48040	1072	2011	0.359	13.25			5/19/2011	36.91
Springer	S1072-48103	1072	2011	0.766	34.17			5/19/2011	44.61
Springer	S1072-48117	1072	2011	0.133	14.5			5/19/2011	109.02
Springer	S1072-48127	1072	2011	0.469	27.58			5/19/2011	58.81
Springer	S1072-52003	1072	2011	3.156	8.75			5/20/2011	2.77
Springer	S1072-52018	1072	2011	1.203	8.08			5/20/2011	6.72
Springer	S1072-51030	1072	2011	1.834	27.33			5/23/2011	14.90
Springer	S1072-51040	1072	2011	0.003	6.07			5/23/2011	2023.33
Springer	S1072-51048	1072	2011	0.013	25.67			5/23/2011	1974.62
Springer	S1072-51056	1072	2011	0.003	13.75			5/23/2011	4583.33
Springer	S1072-47016	1072	2011	2.169	66.08			5/26/2011	30.47
Springer	S1072-47045	1072	2011	0.888	29.08			5/26/2011	32.75
Springer	S1072-47090	1072	2011	0.622	69.75			5/26/2011	112.14
Springer	S1072-47115	1072	2011	0.666	60.33			5/26/2011	90.59
Springer	S1072-47165	1072	2011	1.213	11.67			5/26/2011	9.62
Springer	S1060-21002	1060	2011	2.684	60.92			5/30/2011	22.70
Springer	S1060-21017	1060	2011	0.513	28.08			5/30/2011	54.74
Springer	S1060-20087	1060	2011	1.047	8.92			6/2/2011	8.52
Springer	S1060-20136	1060	2011	0.894	28.08			6/2/2011	31.41
Springer	S1072-54014	1072	2011	1.256	36.08			6/3/2011	28.73
Springer	S1072-54047	1072	2011	0.146	20.33			6/3/2011	139.25
Springer	S1072-54133	1072	2011	0.956	9.08			6/3/2011	9.50
Springer	S1072-54157	1072	2011	0.466	13.17			6/3/2011	28.26
Springer	S1132-60061	1132	2011	3.5	19.75			6/4/2011	5.64
Springer	S1132-60106	1132	2011	4.719	27.25			6/4/2011	5.77
Springer	S1132-60159	1132	2011	5.063	42.42			6/4/2011	8.38
Springer	S1132-60310	1132	2011	6.781	26.17			6/4/2011	3.86
Springer	S1132-60322	1132	2011	5	32.17			6/4/2011	6.43
Springer	S1132-59003	1132	2011	19.562	6.5			6/5/2011	0.33
Springer	S1132-59036	1132	2011	16.75	8.92			6/5/2011	0.53
Springer	S1132-59057	1132	2011	16.531	6.74			6/5/2011	0.41
Springer	S1132-59061	1132	2011	55.312	3.92			6/5/2011	0.07
Springer	S1132-59114	1132	2011	51.875	16.58			6/5/2011	0.32
Springer	S1132-59123	1132	2011	33.438	16.83			6/5/2011	0.50
Springer	S1132-59143	1132	2011	23.031	5.48			6/5/2011	0.24
Springer	s1060-20160	1060	2011	1.203	36.25			6/9/2011	30.13
Springer	s1060-23024	1060	2011	0.267	11.67			6/9/2011	43.71
Springer	s1060-23028	1060	2011	0.238	80.33			6/9/2011	337.52
Springer	s1060-23056	1060	2011	0.766	54.5			6/9/2011	71.15
Springer	s1060-23066	1060	2011	3.312	15.42			6/9/2011	4.66
Springer	s1060-23121	1060	2011	1.453	11.75			6/9/2011	8.09
Springer	s1060-23131	1060	2011	0.459	35.42			6/9/2011	77.17
Springer	s1060-23166	1060	2011	0.196	13.25			6/9/2011	67.60
Springer	s1060-23170	1060	2011	4.219	19.17			6/9/2011	4.54
Springer	s1060-23198	1060	2011	0.242	15.33			6/9/2011	63.35
Springer	S1132-62032	1132	2011	34.063	27.83			6/12/2011	0.82
Springer	S1132-62035	1132	2011	63.75	21.33			6/12/2011	0.33
Springer	S1132-62110	1132	2011	61.563	20.08			6/12/2011	0.33
Springer	S1132-62118	1132	2011	5.219	8.21			6/12/2011	1.57
Springer	S1132-62152	1132	2011	14.719	9.17			6/12/2011	0.62
Springer	S1060-24010	1060	2011	1.984	60.08			6/13/2011	30.28
Springer	S1060-24043	1060	2011	2.269	6.07			6/13/2011	2.68
Springer	S1060-24074	1060	2011	3.813	5.43			6/13/2011	1.42
Springer	S1132-60022	1132	2011	5.937	18.17			6/13/2011	3.06
Springer	S1132-60077	1132	2011	5.187	32.33			6/13/2011	6.23
Springer	S1132-60117	1132	2011	15.25	22.25			6/13/2011	1.46
Springer	S1132-60426	1132	2011	5.406	30.67			6/13/2011	5.67
Springer	S1060-22015	1060	2011	1.484	20.75			6/14/2011	13.98
Springer	S1060-22057	1060	2011	1.028	25.83			6/14/2011	25.13
Springer	S1060-22093	1060	2011	0.756	12.42			6/14/2011	16.43
Springer	S1060-22218	1060	2011	6.125	11			6/14/2011	1.80
Springer	S1060-22227	1060	2011	0.531	7.88			6/14/2011	14.84
Springer	S1060-22284	1060	2011	5.406	11.92			6/14/2011	2.20
Springer	S1060-22298	1060	2011	14	45.92			6/14/2011	3.28
Springer	S1060-22314	1060	2011	0.312	27.67			6/14/2011	88.69
Springer	S1072-55051	1072	2011	0.659	18			6/20/2011	27.31
Springer	S1072-55067	1072	2011	0.497	40.25			6/20/2011	80.99
Springer	S1072-56081	1072	2011	4.188	25.08			6/20/2011	5.99
Springer	S1072-56093	1072	2011	0.431	50.42			6/20/2011	116.98
Springer	S1060-24022	1060	2011	1.778	20.25			6/21/2011	11.39
Springer	S1060-24055	1060	2011	2.256	46.42			6/21/2011	20.58
Springer	S1060-24102	1060	2011	0.516	18.25			6/21/2011	35.37
Springer	s1072-57071	1072	2011	1.403	31.75			6/27/2011	22.63
Springer	s1072-57083	1072	2011	1.303	17.08			6/27/2011	13.11
Springer	S1120-71010	1120	2011	114.688	23.25			6/29/2011	0.20
Springer	S1120-71033	1120	2011	128.75	14.33			6/29/2011	0.11
Springer	S1132-60412	1132	2011	11.437	21.58			6/29/2011	1.89
Springer	S1132-60434	1132	2011	5.219	11.75			6/29/2011	2.25
Springer	S1132-60666	1132	2011	13.375	14.83			6/29/2011	1.11
Springer	S1132-60672	1132	2011	6.406	7.43			6/29/2011	1.16
Springer	S1132-60684	1132	2011	44.375	8.83			6/29/2011	0.20
Springer	S1060-26044	1060	2011	21.085	0.934			6/30/2011	0.04
Springer	S1132-63019	1132	2011	23.281	12.75			6/30/2011	0.55
Springer	S1132-63044	1132	2011	16.375	8.09			6/30/2011	0.49

Springer	S1132-63071	1132	2011	14.375	10.83			6/30/2011	0.75
Springer	S1132-63110	1132	2011	8.562	17.5			6/30/2011	2.04
Springer	S1132-63163	1132	2011	4.406	31			6/30/2011	7.04
Springer	S1132-63178	1132	2011	6.25	19.75			6/30/2011	3.16
Springer	S1132-63203	1132	2011	5.25	13.92			6/30/2011	2.65
Springer	S1060-26011	1060	2011	16.834	6.406			7/3/2011	0.38
Springer	S1060-26050	1060	2011	63.171	0.759			7/3/2011	0.01
Springer	S1060-26193	1060	2011	4.425	1.406			7/6/2011	0.32
Springer	S1060-25038	1060	2011	1	23.83			7/7/2011	23.83
Springer	S1060-25046	1060	2011	0.85	16.67			7/7/2011	19.61
Springer	S1060-25062	1060	2011	2.075	24.33			7/7/2011	11.73
Springer	S1120-71054	1120	2011	27.25	17			7/8/2011	0.62
Springer	S1060-28026	1060	2011	26.002	2.547			7/9/2011	0.10
Springer	S1060-28034	1060	2011	53.17	1.041			7/9/2011	0.02
Springer	S1132-64048	1132	2011	64.062	24.5			7/9/2011	0.38
Springer	S1060-30002	1060	2011	13.001	0.709			7/13/2011	0.05
Springer	S1060-30038	1060	2011	52.754	18.438			7/13/2011	0.35
Springer	S1060-30048	1060	2011	21.418	52.188			7/13/2011	2.44
Springer	S1060-30106	1060	2011	27.335	5.344			7/13/2011	0.20
Springer	S1060-30116	1060	2011	27.252	3.344			7/13/2011	0.12
Springer	S1060-31001	1060	2011	0.566	12.251			7/14/2011	21.64
Springer	S1060-31006	1060	2011	1.072	13.418			7/14/2011	12.52
Springer	S1060-31026	1060	2011	2.825	10.417			7/14/2011	3.69
Springer	S1060-35055	1060	2011	3.781	19.835			7/20/2011	5.25
Springer	S1060-35136	1060	2011	3.156	11.501			7/20/2011	3.64
Springer	S1060-32012	1060	2011	3.25	25.835			7/21/2011	7.95
Springer	S1060-32046	1060	2011	1.075	7.659			7/21/2011	7.12
Springer	S1060-32058	1060	2011	0.994	15.834			7/21/2011	15.93
Springer	S1060-32073	1060	2011	0.578	13.168			7/21/2011	22.78
Springer	S1060-32098	1060	2011	1.119	6.609			7/21/2011	5.91
Springer	S1060-32122	1060	2011	0.859	29.502			7/21/2011	34.34
Springer	S1120-72063	1120	2011	70.938	12.417			7/21/2011	0.18
Springer	S1120-72091	1120	2011	83.438	33.169			7/21/2011	0.40
Springer	S1120-72111	1120	2011	74.375	18.085			7/21/2011	0.24
Springer	S1120-72123	1120	2011	28.656	13.668			7/21/2011	0.48
Springer	S1120-72141	1120	2011	67.5	22.585			7/21/2011	0.33
Springer	S1120-72153	1120	2011	81.25	29.835			7/21/2011	0.37
Springer	S1120-72169	1120	2011	51.25	38.503			7/21/2011	0.75
Springer	S1060-39002	1060	2011	7.938	78.672			7/28/2011	9.91
Springer	S1060-39018	1060	2011	0.466	15.418			7/28/2011	33.09
Springer	S1060-39106	1060	2011	1.422	66.171			7/28/2011	46.53
Springer	s1060-37151	1060	2011	2.394	3.842			7/30/2011	1.60
Springer	s1060-37164	1060	2011	1.984	8.126			7/30/2011	4.10
Springer	s1060-37172	1060	2011	1.912	0.875			7/30/2011	0.46
Springer	S1060-40011	1060	2011	1.525	6.91722			8/1/2011	4.54
Springer	S1060-40032	1060	2011	0.991	2.83356			8/1/2011	2.86
Springer	S1120-73022	1120	2011	52.812	24.502			8/4/2011	0.46
Springer	S1120-73071	1120	2011	35	20.251			8/4/2011	0.58
Springer	S1120-73082	1120	2011	21.844	19.418			8/4/2011	0.89
Springer	S1120-73105	1120	2011	63.125	19.418			8/4/2011	0.31
Springer	S1060-40087	1060	2011	1.409	6.75054			8/7/2011	4.79
Springer	S1060-40109	1060	2011	0.628	0			8/7/2011	0.00
Springer	S1060-40127	1060	2011	1.934	14.25114			8/9/2011	7.37
Springer	S1060-40164	1060	2011	0.819	12.00096			8/11/2011	14.65
Springer	S1060-40168	1060	2011	2.844	7.58394			8/11/2011	2.67
Springer	S1060-43017	1060	2011	1.488	9.709			8/15/2011	6.52
Springer	S1060-43024	1060	2011	6.25	0.533			8/15/2011	0.09
Springer	S1060-43058	1060	2011	1.544	0.833			8/15/2011	0.54
Springer	S1060-43069	1060	2011	3.344	26.418			8/15/2011	7.90
Springer	S1060-43099	1060	2011	15.906	34.752			8/15/2011	2.18
Springer	S1060-43107	1060	2011	5.781	30.335			8/15/2011	5.25
Springer	S1060-43139	1060	2011	1.581	7.117			8/15/2011	4.50
Springer	S1060-43144	1060	2011	3.438	20.835			8/15/2011	6.06
Springer	S1120-74011	1120	2011	50.312	29.252			8/16/2011	0.58
Springer	S1120-74014	1120	2011	31.875	49.67			8/16/2011	1.56
Springer	S1120-74046	1120	2011	22.844	18.668			8/16/2011	0.82
Springer	S1120-74053	1120	2011	14.531	50.42			8/16/2011	3.47
Springer	S1120-74057	1120	2011	36.25	13.501			8/16/2011	0.37
Springer	S1120-74093	1120	2011	9.969	19.918			8/16/2011	2.00
Springer	S1120-74097	1120	2011	14.625	33.919			8/16/2011	2.32
Springer	S1120-74089	1120	2011	7.531	10.584			8/17/2011	1.41
Springer	S1048-20099	1048	2011	1.628	25.502			8/22/2011	15.66
Springer	S1132-67066	1132	2011	1.972	12.918			8/27/2011	6.55
Springer	S1132-67093	1132	2011	0.922	7.976			8/27/2011	8.65
Springer	S1132-67142	1132	2011	1.088	12.668			8/27/2011	11.64
Springer	S1132-67145	1132	2011	3.25	32.335			8/27/2011	9.95
Springer	S1048-20166	1048	2011	3.094	18.501			8/29/2011	5.98
Springer	S1048-20362	1048	2011	1.322	55.254			8/29/2011	41.80
Springer	S1048-20380	1048	2011	2.406	40.253			8/29/2011	16.73
Springer	S1048-20388	1048	2011	1.234	43.003			8/29/2011	34.85
Springer	S1120-74117	1120	2011	11.656	15.584			8/29/2011	1.34
Springer	S1120-75020	1120	2011	8.562	22.418			8/29/2011	2.62
Springer	S1120-75022	1120	2011	8.094	14.334			8/29/2011	1.77
Springer	S1120-75043	1120	2011	9.812	10.834			8/29/2011	1.10
Springer	S1120-75071	1120	2011	7.438	21.918			8/29/2011	2.95
Springer	S1120-75108	1120	2011	6.625	4.917			8/29/2011	0.74
Springer	S1048-20054	1048	2011	4.844	23.502			9/1/2011	4.85
Springer	S1060-45029	1060	2011	0.756	47.503			9/7/2011	62.83
Springer	S1060-45034	1060	2011	0.759	23.835			9/7/2011	31.40
Springer	S1060-45103	1060	2011	0.425	3.234			9/7/2011	7.61
Springer	S1060-45123	1060	2011	0.866	10.167			9/7/2011	11.74
Springer	S1060-45136	1060	2011	0.506	84.172			9/7/2011	166.35
Springer	S1060-45171	1060	2011	1.138	38.836			9/7/2011	34.13
Springer	S1060-45181	1060	2011	3.281	9.001			9/7/2011	2.74
Springer	s1048-21064	1048	2011	1.003	32.752			9/10/2011	32.65
Springer	s1048-21068	1048	2011	3.594	25.668			9/10/2011	7.14
Springer	s1048-21072	1048	2011	4	14.334			9/10/2011	3.58
Springer	s1048-21077	1048	2011	0.638	14.834			9/10/2011	23.25
Springer	s1048-21099	1048	2011	4.219	69.588			9/10/2011	16.49
Springer	s1048-21171	1048	2011	3.097	18.751			9/12/2011	6.05
Springer	s1048-21179	1048	2011	4.469	30.752			9/12/2011	6.88
Springer	s1048-21183	1048	2011	3.531	25.918			9/12/2011	7.34
Springer	s1048-21187	1048	2011	1.394	2.65			9/12/2011	1.90
Springer	s1048-21212	1048	2011	3.844	34.669			9/12/2011	9.02
Springer	S1120-75026	1120	2011	8.062	17.084			9/16/2011	2.12
Springer	S1120-75029	1120	2011	10.469	6.8			9/16/2011	0.65
Springer	S1120-75051	1120	2011	7.281	25.918			9/16/2011	3.56
Springer	S1120-75100	1120	2011	1.766	16.334			9/16/2011	9.25
Springer	S1120-76008	1120	2011	8.125	21.751			9/16/2011	2.68
Springer	S1120-76038	1120	2011	1.256	5.867			9/16/2011	4.67
Springer	S1120-76041	1120	2011	2.584	25.418			9/16/2011	9.84
Springer	S1120-76119	1120	2011	9.625	4.05			9/16/2011	0.42
Springer	S1120-76302	1120	2011	1.688	18.668			9/16/2011	11.06
Springer	S1120-76339	1120	2011	1.459	13.251			9/16/2011	9.08
Springer	S1120-75074	1120	2011	13.719	36.586			9/18/2011	2.67
Springer	S1120-76045	1120	2011	6.031	20.418			9/18/2011	3.39
Springer	S1120-76048	1120	2011	8.688	31.585			9/18/2011	3.64
Springer	S1120-76050	1120	2011	6.219	60.171			9/18/2011	9.68
Springer	S1120-76058	1120	2011	16.25	31.919			9/18/2011	1.96
Springer	S1120-76103	1120	2011	10.719	50.837			9/18/2011	4.74
Springer	S1120-76109	1120	2011	26.938	67.088			9/18/2011	2.49
Springer	S1120-76114	1120	2011	20.812	59.171			9/18/2011	2.84
Springer	S1060-46087	1060	2011	1.116	5.009			9/22/2011	4.49
Springer	S1060-46103	1060	2011	1.072	10.334			9/22/2011	9.64
Springer	S1048-23047	1048	2011	2.966	23.002			9/26/2011	7.76
Springer	S1048-23087	1048	2011	6.031	25.918			9/26/2011	4.30
Springer	S1048-21291	1048	2011	1.469	22.668			9/27/2011	15.43
Springer	S1048-24106	1048	2011	2.509	18.751			9/27/2011	7.47
Springer	S1048-24122	1048	2011	1.356	33.836			9/27/2011	24.95
Springer	S1048-24126	1048	2011	6.406	21.835			9/27/2011	3.41
Springer	S1048-24153	1048	2011	11	11.751			9/27/2011	1.07
Springer	S1048-24203	1048	2011	1.631	26.085			9/27/2011	15.99
Springer	S1048-24252	1048	2011	3.625	20.501			9/27/2011	5.66
Springer	S1108-75014	1108	2011	2.791	3.825			9/29/2011	1.37
Springer	S1108-75026	1108	2011	1.378	65.421			9/29/2011	47.48
Springer	S1108-75038	1108	2011	1.559	6.717			9/29/2011	4.31
Springer	S1108-75044	1108	2011	7.875	6.925			9/29/2011	0.88
Springer	S1108-75063	1108	2011	31.031	26.252			9/29/2011	0.85
Springer	S1108-75067	1108	2011	8.75	9.001			9/29/2011	1.03
Springer	S1108-75093	1108	2011	12.531	20.585			9/29/2011	1.64
Springer	S1108-75130	1108	2011	23.406	21.668			9/29/2011	0.93
Springer	S1060-48011	1060	2011	0.222	18.335			10/1/2011	82.59
Springer	S1060-48044	1060	2011	0.366	18.418			10/1/2011	50.32
Springer	S1060-48086	1060	2011	0.612	27.168			10/1/2011	44.39
Springer	S1060-48104	1060	2011	0.462	26.002			10/1/2011	56.28
Springer	S1108-75008	1108	2011	6.812	1.817			10/1/2011	0.27
Springer	S1108-75030	1108	2011	2.566	14.751			10/1/2011	5.75
Springer	S1108-75054	1108	2011	4.25	28.252			10/1/2011	6.65
Springer	S1108-75086	1108	2011	6.969	10.584			10/1/2011	1.52
Springer	S1108-75083	1108	2011	7.906	5			10/2/2011	0.63
Springer	S1108-75114	1108	2011	9.281	14.418			10/2/2011	1.55
Springer	S1108-75136	1108	2011	6.812	9.917			10/2/2011	1.46
Springer	S1108-76021	1108	2011	1.3	6.984			10/8/2011	5.37
Springer	S1108-76048	1108	2011	2.034	29.002			10/8/2011	14.26
Springer	S1108-76078	1108	2011	6.719	37.336			10/8/2011	5.56
Springer	S1108-76108	1108	2011	13.062	76.505			10/8/2011	5.86
Springer	S1108-77020	1108	2011	18.688	39.169			10/8/2011	2.10
Springer	S1108-77027	1108	2011	8.75	21.168			10/8/2011	2.42
Springer	S1108-77030	1108	2011	6.062	11.084			10/8/2011	1.83
Springer	S1108-77033	1108	2011	4.125	24.918			10/8/2011	6.04
Springer	S1108-77044	1108	2011	4.75	17.001			10/8/2011	3.58
Springer	S1108-77065	1108	2011	18.719	41.003			10/8/2011	2.19
Springer	S1108-77073	1108	2011	35.625	49.837			10/8/2011	1.40
Springer	S1108-77081	1108	2011	9	32.002			10/8/2011	3.56
Springer	S1108-77095	1108	2011	47.188	28.669			10/8/2011	0.61
Springer	S1048-27090	1048	2011	2.653	10.251			10/9/2011	3.86
Springer	S1048-27110	1048	2011	1.022	9.334			10/9/2011	9.13
Springer	S1048-27167	1048	2011	0.251	20.501			10/9/2011	81.68
Springer	s1060-49117	1060	2011	0.675	18.418			10/13/2011	27.29
Springer	s1060-49129	1060	2011	2.647	13.751			10/13/2011	5.19
Springer	S1108-78106	1108	2011	6.75	35.252			10/15/2011	5.22
Springer	S1108-78110	1108	2011	6.344	27.418			10/15/2011	4.32
Springer	S1108-78114	1108	2011	18.969	15.334			10/15/2011	0.81
Springer	S1108-78119	1108	2011	2.222	22.085			10/15/2011	9.94
Springer	S1108-78151	1108	2011	6.156	32.669			10/15/2011	5.31
Springer	S1108-78154	1108	2011	4.75	15.751			10/15/2011	3.32
Springer	S1108-78158	1108	2011	4.125	18.835			10/15/2011	4.57
Springer	S1108-78162	1108	2011	4.656	20.751			10/15/2011	4.46
Springer	S1108-78166	1108	2011	2.019	5.575			10/15/2011	2.76
Springer	s1060-49145	1060	2011	2.684	38.419			10/17/2011	14.31

Springer	s1060-49163	1060	2011	0.794	24.252			10/17/2011	30.54
Springer	S1048-29005	1048	2011	0.741	28.502			10/18/2011	38.46
Springer	S1048-29022	1048	2011	0.903	34.336			10/18/2011	38.02
Springer	S1048-29033	1048	2011	1.256	4.259			10/18/2011	3.39
Springer	S1048-29051	1048	2011	1.041	15.084			10/18/2011	14.49
Springer	S1048-29067	1048	2011	1.781	29.085			10/18/2011	16.33
Springer	S1048-29138	1048	2011	2.025	6.584			10/18/2011	3.25
Springer	S1048-29143	1048	2011	0.859	3.3			10/18/2011	3.84
Springer	S1048-29181	1048	2011	0.734	33.502			10/18/2011	45.64
Springer	S1048-29189	1048	2011	4.719	17.084			10/18/2011	3.62
Springer	S1048-29209	1048	2011	1.75	26.752			10/18/2011	15.29
Springer	S1048-29242	1048	2011	4.719	6.175			10/18/2011	1.31
Springer	S1108-80003	1108	2011	16.312	46.42			10/18/2011	2.85
Springer	S1108-80030	1108	2011	45	56.67			10/18/2011	1.26
Springer	S1108-79050	1108	2011	36.562	26.085			10/21/2011	0.71
Springer	S1108-79067	1108	2011	19.125	36.669			10/21/2011	1.92
Springer	S1108-79069	1108	2011	25.438	27.502			10/21/2011	1.08
Springer	S1108-79097	1108	2011	54.062	19.585			10/21/2011	0.36
Springer	S1108-79127	1108	2011	27	15.918			10/21/2011	0.59
Springer	S1108-79138	1108	2011	15.125	42.419			10/21/2011	2.80
Springer	S1108-79170	1108	2011	40.938	30.752			10/21/2011	0.75
Springer	S1108-79000	1108	2011	20.312	50.17			10/22/2011	2.47
Springer	S1108-79025	1108	2011	24.938	22.001			10/22/2011	0.88
Springer	S1108-82003	1108	2011	77.812	31.252			10/26/2011	0.40
Springer	S1108-81012	1108	2011	47.812	20.168			10/28/2011	0.42
Springer	S1108-81026	1108	2011	47.812	19.835			10/28/2011	0.41
Springer	S1108-81054	1108	2011	53.75	13.918			10/28/2011	0.26
Springer	s1120-79120	1120	2011	53.75	21.168			10/28/2011	0.39
Springer	s1108-85007	1108	2011	40.63	37.75			10/29/2011	0.93
Springer	S1048-29081	1048	2011	3.75	13.168			10/31/2011	3.51
Springer	S1048-29149	1048	2011	2.722	6.459			10/31/2011	2.37
Springer	S1048-29176	1048	2011	2.056	18.001			10/31/2011	8.76
Springer	S1048-29220	1048	2011	3.281	14.501			10/31/2011	4.42
Springer	S1048-29249	1048	2011	3.156	14.501			10/31/2011	4.59
Springer	s1096-71006	1096	2011	8.594	9.251			11/3/2011	1.08
Springer	s1096-71012	1096	2011	3.219	23.668			11/3/2011	7.35
Springer	s1096-71014	1096	2011	6.156	10.667			11/3/2011	1.73
Springer	s1096-71020	1096	2011	9.188	15.668			11/3/2011	1.71
Springer	s1096-71027	1096	2011	15.031	10.167			11/3/2011	0.68
Springer	s1096-71042	1096	2011	1.709	30.419			11/3/2011	17.80
Springer	s1096-71047	1096	2011	11.531	10.417			11/3/2011	0.90
Springer	s1096-71052	1096	2011	13.531	29.335			11/3/2011	2.17
Springer	s1096-71057	1096	2011	11.625	8.751			11/3/2011	0.75
Springer	s1096-71063	1096	2011	12.156	8.584			11/3/2011	0.71
Springer	s1096-71072	1096	2011	3.531	5.067			11/3/2011	1.44
Springer	s1096-71084	1096	2011	16.719	6.084			11/3/2011	0.36
Springer	s1096-71088	1096	2011	4.906	4.85			11/3/2011	0.99
Springer	S1048-33078	1048	2011	2.659	8.667			11/4/2011	3.26
Springer	S1048-33100	1048	2011	1.922	11.084			11/4/2011	5.77
Springer	S1048-33175	1048	2011	1.847	11.917			11/4/2011	6.45
Springer	S1096-73009	1096	2011	5.5	5.9			11/6/2011	1.07
Springer	S1096-73023	1096	2011	5.688	46.836			11/6/2011	8.23
Springer	S1096-73035	1096	2011	10.031	37.836			11/6/2011	3.77
Springer	S1096-73048	1096	2011	8.969	13.668			11/6/2011	1.52
Springer	S1108-84008	1108	2011	45.94	11			11/7/2011	0.24
Springer	S1108-84012	1108	2011	72.81	46.34			11/7/2011	0.64
Springer	S1108-84017	1108	2011	63.44	16			11/7/2011	0.25
Springer	S1108-84025	1108	2011	41.56	24.59			11/7/2011	0.59
Springer	S1108-84051	1108	2011	82.19	32.25			11/7/2011	0.39
Springer	S1108-84062	1108	2011	12.38	62.17			11/7/2011	5.02
Springer	S1108-84118	1108	2011	9.09	41.84			11/7/2011	4.60
Springer	S1108-84139	1108	2011	38.44	11.5			11/7/2011	0.30
Springer	S1108-84145	1108	2011	31	17.17			11/7/2011	0.55
Springer	S1048-32030	1048	2011	1.169	5.959			11/13/2011	5.10
Springer	S1048-32035	1048	2011	1.294	6.317			11/13/2011	4.88
Springer	S1048-32055	1048	2011	0.922	2.333			11/13/2011	2.53
Springer	S1048-32077	1048	2011	0.684	6.3			11/13/2011	9.21
Springer	S1048-32084	1048	2011	1.294	11.751			11/13/2011	9.08
Springer	S1048-32117	1048	2011	2.106	4.425			11/13/2011	2.10
Springer	S1048-32131	1048	2011	1.062	3.534			11/13/2011	3.33
Springer	S1096-72002	1096	2011	16.781	14.168			11/15/2011	0.84
Springer	S1096-72013	1096	2011	11.031	10.917			11/15/2011	0.99
Springer	S1096-72019	1096	2011	10.156	13.084			11/15/2011	1.29
Springer	S1096-72029	1096	2011	7.906	11.501			11/15/2011	1.45
Springer	S1096-72040	1096	2011	9.188	16.001			11/15/2011	1.74
Springer	S1096-72052	1096	2011	10.062	20.001			11/15/2011	1.99
Springer	S1096-72054	1096	2011	7.812	13.251			11/15/2011	1.70
Springer	S1096-72060	1096	2011	8.188	10.834			11/15/2011	1.32
Springer	S1096-72064	1096	2011	4.781	7.234			11/15/2011	1.51
Springer	S1096-72076	1096	2011	9.844	14.584			11/15/2011	1.48
Springer	S1096-72080	1096	2011	5.125	7.601			11/15/2011	1.48
Springer	S1096-72084	1096	2011	16.969	41.586			11/15/2011	2.45
Springer	S1096-72086	1096	2011	11.781	36.086			11/15/2011	3.06
Springer	S1096-72096	1096	2011	17.469	29.002			11/15/2011	1.66
Springer	S1096-72100	1096	2011	23.812	18.835			11/15/2011	0.79
Springer	S1096-72102	1096	2011	3.625	28.835			11/15/2011	7.95
Springer	S1096-72110	1096	2011	13.344	20.001			11/15/2011	1.50
Springer	S1096-72115	1096	2011	5.281	20.501			11/15/2011	3.88
Springer	S1096-72119	1096	2011	7.531	18.668			11/15/2011	2.48
Springer	S1096-72123	1096	2011	7.25	32.335			11/15/2011	4.46
Springer	S1096-72127	1096	2011	6.406	18.001			11/15/2011	2.81
Springer	S1096-72131	1096	2011	14.5	16.084			11/15/2011	1.11
Springer	S1096-72135	1096	2011	10.031	20.335			11/15/2011	2.03
Springer	S1096-72138	1096	2011	3.088	6.992			11/15/2011	2.26
Springer	s1036-16003	1036	2011	3.438	13.334			11/17/2011	3.88
Springer	s1036-16060	1036	2011	3.009	14.751			11/17/2011	4.90
Springer	s1048-33123	1048	2011	1.478	47.003			11/17/2011	31.80
Springer	s1048-33135	1048	2011	5.906	30.002			11/17/2011	5.08
Springer	s1048-33219	1048	2011	1.291	15.834			11/17/2011	12.26
Springer	s1048-33232	1048	2011	1.081	21.168			11/17/2011	19.58
Springer	S1036-18069	1036	2011	2.322	10.167			11/22/2011	4.38
Springer	s1096-74000	1096	2011	15.625	82.505			11/23/2011	5.28
Springer	s1096-74008	1096	2011	28.781	52.67			11/23/2011	1.83
Springer	s1096-74017	1096	2011	36.562	58.004			11/23/2011	1.59
Springer	s1096-74023	1096	2011	17.125	54.254			11/23/2011	3.17
Springer	S1048-34009	1048	2011	1.191	6.409			11/24/2011	5.38
Springer	S1048-34021	1048	2011	1.397	12.668			11/24/2011	9.07
Springer	S1048-34106	1048	2011	1.081	8.501			11/24/2011	7.86
Springer	S1048-34163	1048	2011	0.922	6.775			11/24/2011	7.35
Springer	S1048-34242	1048	2011	1.969	5.809			11/24/2011	2.95
Springer	S1048-34248	1048	2011	1.703	19.001			11/24/2011	11.16
Springer	s1108-82039	1108	2011	39.688	15.501			11/26/2011	0.39
Springer	s1108-83001	1108	2011	31.562	22.335			11/26/2011	0.71
Springer	s1108-83013	1108	2011	15.906	31.085			11/26/2011	1.95
Springer	s1108-83025	1108	2011	2.034	23.002			11/26/2011	11.31
Springer	S1108-87100	1108	2011	34.688	19.418			11/27/2011	0.56
Springer	S1108-87123	1108	2011	12.625	16.834			11/27/2011	1.33
Springer	S1108-87130	1108	2011	74.688	13.834			11/27/2011	0.19
Springer	S1108-87167	1108	2011	45.625	23.752			11/27/2011	0.52
Springer	S1108-87177	1108	2011	28.281	26.085			11/27/2011	0.92
Springer	S1108-87207	1108	2011	30.156	32.919			11/27/2011	1.09
Springer	S1036-17011	1036	2011	3.5	27.335			12/2/2011	7.81
Springer	S1036-17039	1036	2011	2.078	4.525			12/2/2011	2.18
Springer	S1036-17101	1036	2011	2.019	12.918			12/2/2011	6.40
Springer	S1096-75029	1096	2011	43.75	66.004			12/4/2011	1.51
Springer	S1096-75035	1096	2011	7.094	34.669			12/4/2011	4.89
Springer	S1096-75052	1096	2011	26.906	52.003			12/4/2011	1.93
Springer	S1096-75070	1096	2011	39.688	10.584			12/4/2011	0.27
Springer	S1096-75078	1096	2011	22.906	37.836			12/4/2011	1.65
Springer	S1096-75086	1096	2011	6.375	49.42			12/4/2011	7.75
Springer	S1096-75091	1096	2011	8.562	32.752			12/4/2011	3.83
Springer	S1096-75096	1096	2011	21.219	46.336			12/4/2011	2.18
Springer	S1096-75108	1096	2011	13.125	16.668			12/4/2011	1.27
Springer	S1096-75115	1096	2011	7	9.584			12/4/2011	1.37
Springer	S1096-75121	1096	2011	13.75	21.918			12/4/2011	1.59
Springer	S1096-75505	1096	2011	10.844	22.501			12/4/2011	2.07
Springer	S1096-75526	1096	2011	69.062	57.587			12/4/2011	0.83
Springer	S1036-22115	1036	2011	1.606	3.3			12/14/2011	2.05
Springer	S1036-22140	1036	2011	2.25	14.001			12/14/2011	6.22
Springer	S1036-22154	1036	2011	2.144	27.168			12/14/2011	12.67
Springer	S1036-22170	1036	2011	1.2	20.251			12/14/2011	16.88
Springer	S1036-22185	1036	2011	6.531	6.284			12/14/2011	0.96
Springer	S1036-22211	1036	2011	2.934	40.503			12/14/2011	13.80
Springer	S1096-76022	1096	2011	38.75	14.668			12/22/2011	0.38
Springer	S1096-76056	1096	2011	21.418	31.562			12/22/2011	1.47
Springer	S1096-76089	1096	2011	15.918	70.938			12/22/2011	4.46
Springer	S1096-76229	1096	2011	11.094	41.669			12/22/2011	3.76
Springer	S1036-26281	1036	2011	0.809	12.501			12/28/2011	15.45
Springer	S1048-36097	1048	2011	3.05	13.334			12/28/2011	4.37
Springer	S1048-36162	1048	2011	1.516	14.668			12/28/2011	9.68
Springer	S1048-36192	1048	2011	1.081	7.075			12/28/2011	6.54
Springer	S1096-77283	1096	2012	43.438	39.336			1/1/2012	0.91
Springer	S1096-77290	1096	2012	66.25	14.084			1/1/2012	0.21
Springer	S1096-77297	1096	2012	4.719	8.417			1/1/2012	1.78
Springer	S1096-77301	1096	2012	1.266	39.586			1/1/2012	31.27
Springer	S1096-77344	1096	2012	72.5	13.001			1/1/2012	0.18
Springer	S1096-77351	1096	2012	85.625	13.251			1/1/2012	0.15
Springer	S1096-77357	1096	2012	7.375	56.587			1/1/2012	7.67
Springer	S1048-36202	1048	2012	1.175	28.085			1/4/2012	23.90
Springer	S1048-36206	1048	2012	0.738	57.42			1/4/2012	77.80
Springer	S1048-36224	1048	2012	2.078	18.251			1/4/2012	8.78
Springer	S1036-28107	1036	2012	2.244	13.751			1/5/2012	6.13
Springer	S1036-28132	1036	2012	2.447	33.752			1/5/2012	13.79
Springer	S1036-28212	1036	2012	2.65	14.918			1/5/2012	5.63
Springer	s1096-77276	1096	2012	25.312	43.92			1/7/2012	1.74
Springer	s1096-77338	1096	2012	48.75	54.837			1/7/2012	1.12
Springer	s1096-77386	1096	2012	45	24.418			1/7/2012	0.54
Springer	s1096-77401	1096	2012	35.938	24.668			1/7/2012	0.69
Springer	S1084-71013	1084	2012	5.656	2.317	0.028	0.181	1/11/2012	0.41
Springer	S1084-71027	1084	2012	16.469	30.002	0.36	0.527	1/11/2012	1.82
Springer	S1084-71030	1084	2012	9.719	19.085	0.229	0.311	1/11/2012	1.96
Springer	S1084-71032	1084	2012	7.312	12.251	0.147	0.234	1/11/2012	1.68
Springer	S1084-71034	1084	2012	6.375	39.419	0.473	0.204	1/11/2012	6.18
Springer	S1084-71044	1084	2012	17.531	14.418	0.173	0.561	1/11/2012	0.82
Springer	S1084-71048	1084	2012	5.969	13.584	0.163	0.191	1/11/2012	2.28
Springer	S1084-71058	1084	2012	11.469	7.634	0.092	0.367	1/11/2012	0.67
Springer	S1084-71067	1084	2012	7.75	7.901	0.095	0.248	1/11/2012	1.02
Springer	S1084-71072	1084	2012	8.344	20.335	0.244	0.267	1/11/2012	2.44
Springer	S1084-71089	1084	2012	4.625	9.167	0.11	0.148	1/11/2012	1.98
Springer	S1084-71092	1084	2012	9.688	10.917	0.131	0.31	1/11/2012	1.13

Springer	s1036-30188	1036	2012	4.312	34.502			1/12/2012	8.00
Springer	s1036-30221	1036	2012	4.406	17.668			1/12/2012	4.01
Springer	S1084-70000	1084	2012	12.688	56.17	0.674	0.406	1/15/2012	4.43
Springer	S1084-70303	1084	2012	9.062	57.837	0.694	0.29	1/15/2012	6.38
Springer	S1084-70306	1084	2012	17.938	47.253	0.567	0.574	1/15/2012	2.63
Springer	S1084-70331	1084	2012	13.562	29.419	0.353	0.434	1/15/2012	2.17
Springer	S1084-70336	1084	2012	7.312	16.918	0.203	0.234	1/15/2012	2.31
Springer	S1084-70403	1084	2012	5.781	45.503	0.546	0.185	1/15/2012	7.87
Springer	S1084-70405	1084	2012	5.031	6.134	0.074	0.161	1/15/2012	1.22
Springer	S1084-70407	1084	2012	8.094	8.584	0.103	0.259	1/15/2012	1.06
Springer	S1084-70409	1084	2012	5.594	15.251	0.183	0.179	1/15/2012	2.73
Springer	S1084-70411	1084	2012	8.656	29.085	0.349	0.277	1/15/2012	3.36
Springer	S1084-70415	1084	2012	5.562	22.668	0.272	0.178	1/15/2012	4.08
Springer	S1084-70454	1084	2012	2.206	18.335	0.22	0.071	1/15/2012	8.31
Springer	S1084-70458	1084	2012	3.969	39.253	0.471	0.127	1/15/2012	9.89
Springer	S1084-70462	1084	2012	10.438	21.751	0.261	0.334	1/15/2012	2.08
Springer	S1084-70466	1084	2012	5.031	19.668	0.236	0.161	1/15/2012	3.91
Springer	S1084-70522	1084	2012	7.188	8.326	0.1	0.23	1/15/2012	1.16
Springer	S1084-70537	1084	2012	5.469	8.417	0.101	0.175	1/15/2012	1.54
Springer	S1036-30109	1036	2012	2.266	33.252			1/16/2012	14.67
Springer	S1036-30118	1036	2012	2.856	13.668			1/16/2012	4.79
Springer	S1036-30148	1036	2012	6	18.418			1/16/2012	3.07
Springer	S1036-30152	1036	2012	16	42.503			1/16/2012	2.66
Springer	S1036-30180	1036	2012	0.55	14.918			1/16/2012	27.12
Springer	S1036-33000	1036	2012	2.809	25.502			1/22/2012	9.08
Springer	S1036-33089	1036	2012	1.306	5.117			1/22/2012	3.92
Springer	S1036-33102	1036	2012	2.253	3.525			1/22/2012	1.56
Springer	S1036-33109	1036	2012	1.172	12.417			1/22/2012	10.59
Springer	S1036-35041	1036	2012	7.375	17.585			1/22/2012	2.38
Springer	S1036-35045	1036	2012	1.306	10.917			1/22/2012	8.36
Springer	S1024-17014	1024	2012	0.875	37.669			1/26/2012	43.05
Springer	S1024-17055	1024	2012	2.147	41.169			1/26/2012	19.18
Springer	S1036-34101	1036	2012	4.125	26.168			1/29/2012	6.34
Springer	S1084-72015	1084	2012	10.75	19.418	0.233	0.344	1/30/2012	1.81
Springer	S1084-72025	1084	2012	0.844	57.254	0.687	0.027	1/30/2012	67.84
Springer	S1084-72035	1084	2012	2.841	22.418	0.269	0.091	1/30/2012	7.89
Springer	S1084-72045	1084	2012	28.062	20.418	0.245	0.898	1/30/2012	0.73
Springer	S1084-72052	1084	2012	18.438	21.001	0.252	0.59	1/30/2012	1.14
Springer	S1084-72063	1084	2012	6.375	27.669	0.332	0.204	1/30/2012	4.34
Springer	S1084-72074	1084	2012	39.062	10.917	0.131	1.25	1/30/2012	0.28
Springer	S1084-72156	1084	2012	2.697	10.917	0.131	0.086	1/30/2012	4.05
Springer	S1084-72159	1084	2012	2.819	11.167	0.134	0.09	1/30/2012	3.96
Springer	S1084-72176	1084	2012	1.366	5	0.06	0.044	1/30/2012	3.66
Springer	S1084-72179	1084	2012	1.131	8.667	0.104	0.036	1/30/2012	7.66
Springer	S1084-72191	1084	2012	1.353	13.834	0.166	0.043	1/30/2012	10.22
Springer	S1084-72194	1084	2012	6.406	15.584	0.187	0.205	1/30/2012	2.43
Springer	S1084-72207	1084	2012	6.344	17.418	0.209	0.203	1/30/2012	2.75
Springer	S1084-72210	1084	2012	3.938	41.419	0.497	0.126	1/30/2012	10.52
Springer	S1084-72223	1084	2012	8.062	40.586	0.487	0.258	1/30/2012	5.03
Springer	S1084-72226	1084	2012	16.719	22.335	0.268	0.535	1/30/2012	1.34
Springer	S1084-72231	1084	2012	17.438	15.001	0.18	0.558	1/30/2012	0.86
Springer	S1084-72251	1084	2012	11	18.085	0.217	0.352	1/30/2012	1.64
Springer	S1084-72254	1084	2012	11.438	29.169	0.35	0.366	1/30/2012	2.55
Springer	S1084-72264	1084	2012	11.031	8.751	0.105	0.353	1/30/2012	0.79
Springer	S1084-72282	1084	2012	14.438	12.501	0.15	0.462	1/30/2012	0.87
Springer	S1036-34052	1036	2012	2.288	13.418			1/31/2012	5.86
Springer	S1084-73006	1084	2012	70.625	13.418	0.161	2.26	2/5/2012	0.19
Springer	S1084-73033	1084	2012	62.5	22.835	0.274	2	2/5/2012	0.37
Springer	S1084-73057	1084	2012	39.688	11.417	0.137	1.27	2/5/2012	0.29
Springer	S1036-37115	1036	2012	3.066	7.859			2/6/2012	2.56
Springer	S1036-37152	1036	2012	3.078	6.6			2/6/2012	2.14
Springer	S1036-37163	1036	2012	1.472	8.009			2/6/2012	5.44
Springer	S1036-37189	1036	2012	1.45	6.067			2/6/2012	4.18
Springer	S1036-37196	1036	2012	0.878	9.917			2/6/2012	11.29
Springer	S1084-72101	1084	2012	36.562	30.585	0.367	1.17	2/8/2012	0.84
Springer	S1084-74019	1084	2012	9.625	20.251	0.243	0.308	2/8/2012	2.10
Springer	S1084-74022	1084	2012	19.75	16.334	0.196	0.632	2/8/2012	0.83
Springer	S1084-74032	1084	2012	68.438	29.252	0.351	2.19	2/8/2012	0.43
Springer	S1084-74037	1084	2012	49.688	17.084	0.205	1.59	2/8/2012	0.34
Springer	S1084-74049	1084	2012	12.031	20.585	0.247	0.385	2/8/2012	1.71
Springer	S1084-74079	1084	2012	26.844	21.668	0.26	0.859	2/8/2012	0.81
Springer	S1084-74083	1084	2012	50	14.501	0.174	1.6	2/8/2012	0.29
Springer	S1084-74087	1084	2012	62.188	11.584	0.139	1.99	2/8/2012	0.19
Springer	S1084-74110	1084	2012	9.969	20.751	0.249	0.319	2/8/2012	2.08
Springer	S1084-74116	1084	2012	8.781	14.584	0.175	0.281	2/8/2012	1.66
Springer	S1084-76015	1084	2012	49.688	17.751	0.213	1.59	2/10/2012	0.36
Springer	S1084-76096	1084	2012	2.425	23.002	0.276	0.078	2/10/2012	9.49
Springer	S1084-75220	1084	2012	45.625	13.418	0.161	1.46	2/13/2012	0.29
Springer	S1084-75225	1084	2012	43.438	20.168	0.242	1.39	2/13/2012	0.46
Springer	S1084-75254	1084	2012	83.125	30.335	0.364	2.66	2/13/2012	0.36
Springer	S1084-75283	1084	2012	78.75	36.919	0.443	2.52	2/13/2012	0.47
Springer	S1072-59008	1072	2012	7.719	5.925			2/15/2012	0.77
Springer	S1072-59016	1072	2012	3.109	7.1			2/15/2012	2.28
Springer	S1072-59090	1072	2012	5.062	3.317			2/15/2012	0.66
Springer	S1072-59097	1072	2012	8.156	13.084			2/15/2012	1.60
Springer	S1072-59148	1072	2012	11.344	15.834			2/15/2012	1.40
Springer	S1084-75004	1084	2012	19.781	22.251	0.267	0.633	2/15/2012	1.12
Springer	S1084-75123	1084	2012	75.312	69.838	0.838	2.41	2/15/2012	0.93
Springer	S1084-75128	1084	2012	20.406	20.001	0.24	0.653	2/15/2012	0.98
Springer	S1024-19101	1024	2012	8.438	40.419			2/18/2012	4.79
Springer	S1024-19117	1024	2012	16.781	22.668			2/18/2012	1.35
Springer	S1024-19129	1024	2012	21.969	49.753			2/18/2012	2.26
Springer	S1024-19202	1024	2012	2.556	24.918			2/18/2012	9.75
Springer	S1024-19300	1024	2012	2.006	20.001			2/18/2012	9.97
Springer	S1024-23022	1024	2012	3.406	24.585			2/22/2012	7.22
Springer	S1024-23038	1024	2012	1.566	29.669			2/22/2012	18.95
Springer	S1036-39021	1036	2012	0.709	4.167			2/23/2012	5.88
Springer	S1036-39030	1036	2012	2.131	13.501			2/23/2012	6.34
Springer	S1036-39091	1036	2012	1.459	20.918			2/23/2012	14.34
Springer	S1072-60000	1072	2012	3.312	14.751			2/24/2012	4.45
Springer	S1072-60013	1072	2012	3.438	22.001			2/24/2012	6.40
Springer	S1072-60019	1072	2012	0.319	18.501			2/24/2012	58.00
Springer	S1072-60034	1072	2012	0.469	16.584			2/24/2012	35.36
Springer	S1072-60038	1072	2012	0.853	42.92			2/24/2012	50.32
Springer	S1072-60058	1072	2012	1.362	16.918			2/24/2012	12.42
Springer	S1072-60061	1072	2012	3.875	16.751			2/24/2012	4.32
Springer	S1072-60069	1072	2012	3.156	32.252			2/24/2012	10.22
Springer	S1072-60084	1072	2012	4.438	41.753			2/24/2012	9.41
Springer	S1072-60090	1072	2012	1.241	54.17			2/24/2012	43.65
Springer	S1072-60110	1072	2012	0.844	45.086			2/24/2012	53.42
Springer	S1072-60122	1072	2012	19.25	31.169			2/24/2012	1.62
Springer	S1072-60125	1072	2012	7.062	13.418			2/24/2012	1.90
Springer	S1072-60133	1072	2012	2.431	42.419			2/24/2012	17.45
Springer	S1036-40106	1036	2012	0.356	15.251			2/26/2012	42.84
Springer	S1036-40113	1036	2012	0.334	45.586			2/26/2012	136.49
Springer	S1036-40149	1036	2012	0.809	8.667			2/26/2012	10.71
Springer	S1036-40220	1036	2012	0.606	11.751			2/26/2012	19.39
Springer	S1036-40227	1036	2012	0.819	16.251			2/26/2012	19.84
Springer	S1060-52021	1060	2012	34.062	12.167			3/2/2012	0.36
Springer	S1060-52026	1060	2012	5.219	10.334			3/2/2012	1.98
Springer	S1060-52030	1060	2012	7.969	43.753			3/2/2012	5.49
Springer	S1060-52045	1060	2012	4.531	51.67			3/2/2012	11.40
Springer	S1060-52049	1060	2012	3.938	48.337			3/2/2012	12.27
Springer	S1072-60167	1072	2012	5.969	14.918			3/3/2012	2.50
Springer	S1072-60188	1072	2012	7.281	30.335			3/3/2012	4.17
Springer	S1072-60211	1072	2012	1.653	8.751			3/3/2012	5.29
Springer	S1072-60214	1072	2012	4.688	17.668			3/3/2012	3.77
Springer	S1072-60239	1072	2012	1.416	8.334			3/3/2012	5.89
Springer	S1072-60242	1072	2012	7.312	11.501			3/3/2012	1.57
Springer	S1072-60259	1072	2012	3.406	8.334			3/3/2012	2.45
Springer	S1072-60266	1072	2012	1.712	5.909			3/3/2012	3.45
Springer	S1072-60288	1072	2012	1.212	20.001			3/3/2012	16.50
Springer	S1072-60295	1072	2012	6.219	35.336			3/3/2012	5.68
Springer	S1072-60316	1072	2012	5.062	14.751			3/3/2012	2.91
Springer	S1072-60319	1072	2012	6.781	61.171			3/3/2012	9.02
Springer	S1024-22069	1024	2012	8.938	20.751			3/6/2012	2.32
Springer	S1024-22120	1024	2012	2.431	20.668			3/6/2012	8.50
Springer	S1024-22299	1024	2012	1.194	23.918			3/6/2012	20.03
Springer	S1024-26004	1024	2012	2.15	34.252			3/9/2012	15.93
Springer	S1024-26062	1024	2012	3.656	25.918			3/9/2012	7.09
Springer	S1024-26066	1024	2012	4.031	25.668			3/9/2012	6.37
Springer	S1072-61008	1072	2012	9.625	23.335			3/17/2012	2.42
Springer	S1072-61014	1072	2012	15.656	41.836			3/17/2012	2.67
Springer	S1072-61032	1072	2012	6.031	34.086			3/17/2012	5.65
Springer	S1072-61045	1072	2012	12.094	15.584			3/17/2012	1.29
Springer	S1072-61047	1072	2012	17.844	18.501			3/17/2012	1.04
Springer	S1072-61069	1072	2012	3.875	19.668			3/17/2012	5.08
Springer	S1072-61073	1072	2012	9.938	32.002			3/17/2012	3.22
Springer	S1072-61082	1072	2012	15.25	15.834			3/17/2012	1.04
Springer	S1072-61107	1072	2012	28.938	27.919			3/17/2012	0.96
Springer	S1072-61119	1072	2012	13.156	11.251			3/17/2012	0.86
Springer	S1072-61123	1072	2012	23.594	16.001			3/17/2012	0.68
Springer	S1072-62027	1072	2012	40.938	12.501			3/17/2012	0.31
Springer	S1072-62028	1072	2012	66.25	6.184			3/17/2012	0.09
Springer	S1072-62078	1072	2012	8.688	63.838			3/17/2012	7.35
Springer	S1072-62082	1072	2012	70.938	24.168			3/17/2012	0.34
Springer	S1072-62108	1072	2012	65.312	17.334			3/17/2012	0.27
Springer	S1072-62120	1072	2012	45.938	7.609			3/17/2012	0.17
Springer	S1072-62150	1072	2012	76.562	19.835			3/17/2012	0.26
Springer	S1072-62166	1072	2012	50.312	18.835			3/17/2012	0.37
Springer	S1072-62171	1072	2012	2.159	53.837			3/17/2012	24.94
Springer	S1072-63024	1072	2012	8.625	18.918			3/19/2012	2.19
Springer	S1072-63045	1072	2012	1.997	12.668			3/19/2012	6.34
Springer	S1060-53044	1060	2012	12.25	6.017			3/22/2012	0.49
Springer	S1060-53069	1060	2012	10.812	15.834			3/22/2012	1.46
Springer	S1060-53099	1060	2012	1.491	4.75			3/22/2012	3.19
Springer	S1060-53126	1060	2012	12.062	23.335			3/22/2012	1.93
Springer	S1060-53901	1060	2012	6.875	18.335			3/22/2012	2.67
Springer	S1060-53908	1060	2012	7.062	20.001			3/22/2012	2.83
Springer	S1060-53914	1060	2012	19.281	17.835			3/22/2012	0.93
Springer	S1048-40023	1048	2012	2.891	34.086			3/23/2012	11.79
Springer	S1048-40045	1048	2012	4.312	66.588			3/23/2012	15.44
Springer	S1048-40060	1048	2012	3.469	18.585			3/23/2012	5.36
Springer	S1048-40074	1048	2012	8.875	26.668			3/23/2012	3.00
Springer	S1048-40096	1048	2012	2.219	52.503			3/23/2012	23.66
Springer	S1048-40126	1048	2012	3.781	45.253			3/23/2012	11.97
Springer	S1048-40149	1048	2012	3.562	36.586			3/23/2012	10.27
Springer	S1048-40156	1048	2012	4.375	13.918			3/23/2012	3.18
Springer	S1072-66103	1072	2012	3.5	26.002			3/24/2012	7.43
Springer	S1072-66106	1072	2012	0.775	17.001			3/24/2012	21.94

Springer	S1072-66110	1072	2012	33.75	16.584			3/24/2012	0.49
Springer	S1072-66115	1072	2012	76.25	27.168			3/24/2012	0.36
Springer	S1072-66120	1072	2012	62.188	27.335			3/24/2012	0.44
Springer	S1072-66155	1072	2012	12.281	19.501			3/24/2012	1.59
Springer	S1072-66158	1072	2012	52.188	26.668			3/24/2012	0.51
Springer	S1072-66162	1072	2012	60.938	22.001			3/24/2012	0.36
Springer	S1072-66167	1072	2012	76.25	36.502			3/24/2012	0.48
Springer	S1072-67100	1072	2012	7.812	39.586			4/1/2012	5.07
Springer	S1072-67106	1072	2012	22.062	37.086			4/1/2012	1.68
Springer	S1072-67112	1072	2012	29.812	35.252			4/1/2012	1.18
Springer	S1072-67144	1072	2012	10.312	14.084			4/1/2012	1.37
Springer	S1072-67149	1072	2012	23.875	40.669			4/1/2012	1.70
Springer	S1072-67156	1072	2012	57.812	16.668			4/1/2012	0.29
Springer	S1072-68018	1072	2012	8.406	20.418			4/1/2012	2.43
Springer	S1072-68026	1072	2012	4.812	15.834			4/1/2012	3.29
Springer	S1072-68103	1072	2012	8.875	25.668			4/1/2012	2.89
Springer	S1072-68107	1072	2012	5.656	36.919			4/1/2012	6.53
Springer	S1072-68110	1072	2012	9.969	72.755			4/1/2012	7.30
Springer	S1072-68127	1072	2012	9.25	17.168			4/1/2012	1.86
Springer	S1072-68132	1072	2012	6	13.584			4/1/2012	2.26
Springer	S1072-68134	1072	2012	7.406	8.301			4/1/2012	1.12
Springer	S1072-68137	1072	2012	9.625	7.642			4/1/2012	0.79
Springer	S1072-68144	1072	2012	10.25	10.834			4/1/2012	1.06
Springer	S1072-68149	1072	2012	9.688	36.586			4/1/2012	3.78
Springer	S1072-65021	1072	2012	29.656	35.252			4/2/2012	1.19
Springer	S1072-65048	1072	2012	25.844	32.252			4/2/2012	1.25
Springer	S1072-65075	1072	2012	5.219	18.668			4/2/2012	3.58
Springer	S1072-65102	1072	2012	5.406	31.335			4/2/2012	5.80
Springer	S1048-41104	1048	2012	7.312	6.642			4/3/2012	0.91
Springer	S1048-41112	1048	2012	37.188	61.337			4/3/2012	1.65
Springer	S1048-41131	1048	2012	8.375	37.586			4/3/2012	4.49
Springer	S1048-41151	1048	2012	3.406	13.751			4/3/2012	4.04
Springer	S1048-41167	1048	2012	2.569	13.834			4/3/2012	5.38
Springer	S1048-41179	1048	2012	5.719	47.587			4/3/2012	8.32
Springer	S1048-41192	1048	2012	3.625	36.252			4/3/2012	10.00
Springer	S1048-41198	1048	2012	2.319	35.586			4/3/2012	15.35
Springer	S1048-41219	1048	2012	1.972	74.588			4/3/2012	37.82
Springer	S1048-41223	1048	2012	13.188	32.502			4/3/2012	2.46
Springer	S1048-43035	1048	2012	8.781	18.335			4/8/2012	2.09
Springer	S1048-43041	1048	2012	4.156	23.085			4/8/2012	5.55
Springer	S1048-43053	1048	2012	2.753	77.672			4/8/2012	28.21
Springer	S1048-43060	1048	2012	2.034	13.418			4/8/2012	6.60
Springer	S1048-43104	1048	2012	17.406	18.418			4/8/2012	1.06
Springer	S1048-43109	1048	2012	4.219	25.002			4/8/2012	5.93
Springer	S1048-43112	1048	2012	12.969	37.336			4/8/2012	2.88
Springer	S1048-43134	1048	2012	24.875	9.501			4/8/2012	0.38
Springer	S1060-54001	1060	2012	1.094	0.942			4/14/2012	0.86
Springer	S1060-54007	1060	2012	5.25	18.751			4/14/2012	3.57
Springer	S1060-54019	1060	2012	4.844	21.918			4/14/2012	4.52
Springer	S1060-54022	1060	2012	5.781	6.025			4/14/2012	1.04
Springer	S1060-54025	1060	2012	6.188	24.585			4/14/2012	3.97
Springer	S1060-54038	1060	2012	1.566	15.084			4/14/2012	9.63
Springer	S1060-54042	1060	2012	3.719	8.584			4/14/2012	2.31
Springer	S1060-54045	1060	2012	5.438	38.586			4/14/2012	7.10
Springer	S1060-54048	1060	2012	3.281	6.909			4/14/2012	2.11
Springer	S1060-54050	1060	2012	4.062	11.334			4/14/2012	2.79
Springer	S1060-54068	1060	2012	2.806	26.002			4/14/2012	9.27
Springer	S1060-54075	1060	2012	3.969	12.834			4/14/2012	3.23
Springer	S1060-54079	1060	2012	13.219	35.836			4/14/2012	2.71
Springer	S1060-54082	1060	2012	25.312	44.92			4/14/2012	1.77
Springer	S1060-54086	1060	2012	4.344	14.084			4/14/2012	3.24
Springer	S1060-54089	1060	2012	3.122	10.167			4/14/2012	3.26
Springer	S1060-54093	1060	2012	4.375	8.417			4/14/2012	1.92
Springer	S1060-54095	1060	2012	3.312	21.501			4/14/2012	6.49
Springer	S1060-54109	1060	2012	1.319	13.668			4/14/2012	10.36
Springer	S1060-54115	1060	2012	2.241	28.835			4/14/2012	12.87
Springer	S1060-54118	1060	2012	3.875	11.084			4/14/2012	2.86
Springer	S1060-54126	1060	2012	1.681	2.25			4/14/2012	1.34
Springer	S1060-54133	1060	2012	3.969	7.734			4/14/2012	1.95
Springer	S1060-54518	1060	2012	2.544	13.668			4/14/2012	5.37
Springer	S1060-54603	1060	2012	23.938	28.502			4/14/2012	1.19
Springer	S1024-30108	1024	2012	3.688	19.251			4/20/2012	5.22
Springer	S1024-30117	1024	2012	2.234	9.834			4/20/2012	4.40
Springer	S1024-30129	1024	2012	1.222	13.501			4/20/2012	11.05
Springer	S1024-30141	1024	2012	0.856	5.834			4/20/2012	6.82
Springer	S1024-30179	1024	2012	1.575	4.625			4/20/2012	2.94
Springer	S1024-30192	1024	2012	1.097	16.084			4/20/2012	14.66
Springer	S1024-30206	1024	2012	1.091	8.292			4/20/2012	7.60
Springer	S1024-30212	1024	2012	1.003	9.501			4/20/2012	9.47
Springer	S1060-55003	1060	2012	4.219	43.086			4/20/2012	10.21
Springer	S1060-55014	1060	2012	1.55	28.252			4/20/2012	18.23
Springer	S1060-55031	1060	2012	2.972	48.42			4/20/2012	16.29
Springer	S1060-55037	1060	2012	2	17.418			4/20/2012	8.71
Springer	S1060-55042	1060	2012	9.25	27.085			4/20/2012	2.93
Springer	S1060-55069	1060	2012	7.844	25.918			4/20/2012	3.30
Springer	S1060-55074	1060	2012	8.906	33.836			4/20/2012	3.80
Springer	S1060-55082	1060	2012	1.631	41.419			4/20/2012	25.39
Springer	S1060-55086	1060	2012	0.309	46.086			4/20/2012	149.15
Springer	S1060-55098	1060	2012	7.188	21.751			4/20/2012	3.03
Springer	S1060-55113	1060	2012	0.562	52.087			4/20/2012	92.68
Springer	S1060-55126	1060	2012	12.562	29.002			4/20/2012	2.31
Springer	S1060-55137	1060	2012	2.269	31.252			4/20/2012	13.77
Springer	S1060-55140	1060	2012	8.062	21.585			4/20/2012	2.68
Springer	S1060-55143	1060	2012	11.969	11.501			4/20/2012	0.96
Springer	S1060-55156	1060	2012	9.75	10.834			4/20/2012	1.11
Springer	S1060-55201	1060	2012	12.344	17.751			4/20/2012	1.44
Springer	S1060-55204	1060	2012	9.125	16.418			4/20/2012	1.80
Springer	S1060-55225	1060	2012	8.031	19.668			4/20/2012	2.45
Springer	S1060-55228	1060	2012	13.125	25.418			4/20/2012	1.94
Springer	S1060-55060	1060	2012	10.594	49.92			4/23/2012	4.71
Springer	s1060-56009	1060	2012	6	12.167			4/23/2012	2.03
Springer	s1060-56021	1060	2012	10.375	11.584			4/23/2012	1.12
Springer	s1060-56036	1060	2012	5.031	23.502			4/23/2012	4.67
Springer	s1060-56048	1060	2012	9.25	13.418			4/23/2012	1.45
Springer	s1060-56060	1060	2012	12.5	9.001			4/23/2012	0.72
Springer	S1060-56088	1060	2012	4.625	25.752			4/26/2012	5.57
Springer	S1060-58008	1060	2012	18.125	38.503			4/26/2012	2.12
Springer	S1060-58029	1060	2012	35.625	40.253			4/26/2012	1.13
Springer	S1060-58047	1060	2012	32.5	54.587			4/26/2012	1.68
Springer	S1060-58083	1060	2012	43.438	23.835			4/26/2012	0.55
Springer	S1060-57202	1060	2012	5.5	15.584			4/28/2012	2.83
Springer	S1060-57206	1060	2012	5.281	5.125			4/28/2012	0.97
Springer	S1060-57210	1060	2012	3.969	15.918			4/28/2012	4.01
Springer	S1060-57215	1060	2012	6.656	23.252			4/28/2012	3.49
Springer	S1060-57219	1060	2012	10.344	39.003			4/28/2012	3.77
Springer	S1060-57243	1060	2012	0.922	2.759			4/28/2012	2.99
Springer	S1060-57246	1060	2012	11.688	30.252			4/28/2012	2.59
Springer	S1060-57250	1060	2012	11.062	17.668			4/28/2012	1.60
Springer	S1060-57254	1060	2012	6.469	12.251			4/28/2012	1.89
Springer	S1060-57258	1060	2012	6.906	32.335			4/28/2012	4.68
Springer	S1060-57302	1060	2012	9.031	6.809			4/28/2012	0.75
Springer	S1060-57324	1060	2012	8.094	6.625			4/28/2012	0.82
Springer	S1060-57344	1060	2012	8.469	18.001			4/28/2012	2.13
Springer	S1060-57387	1060	2012	14.5	9.751			4/28/2012	0.67
Springer	S1060-57400	1060	2012	33.125	14.751			4/28/2012	0.45
Springer	S1060-57425	1060	2012	29.875	13.334			4/28/2012	0.45
Springer	S1060-57428	1060	2012	13.062	9.167			4/28/2012	0.70
Springer	S1060-57437	1060	2012	28.062	14.084			4/28/2012	0.50
Springer	S1060-57450	1060	2012	20.688	47.837			4/28/2012	2.31
Springer	S1060-60009	1060	2012	100.312	35.836			4/30/2012	0.36
Springer	S1060-60018	1060	2012	33.125	20.585			4/30/2012	0.62
Springer	S1060-60030	1060	2012	4.188	17.751			4/30/2012	4.24
Springer	S1060-60042	1060	2012	5.125	22.918			4/30/2012	4.47
Springer	S1060-60054	1060	2012	2.719	21.168			4/30/2012	7.79
Springer	S1036-42006	1036	2012	2.034	27.168			5/1/2012	13.36
Springer	S1036-42019	1036	2012	1.762	42.086			5/1/2012	23.89
Springer	S1036-42026	1036	2012	5.906	19.668			5/1/2012	3.33
Springer	S1036-42050	1036	2012	2.559	18.585			5/1/2012	7.26
Springer	S1036-42054	1036	2012	5.344	27.669			5/1/2012	5.18
Springer	S1036-42085	1036	2012	3.375	21.501			5/1/2012	6.37
Springer	S1036-42090	1036	2012	1.962	16.751			5/1/2012	8.54
Springer	S1036-42102	1036	2012	6.125	26.585			5/1/2012	4.34
Springer	S1036-42126	1036	2012	2.025	33.752			5/1/2012	16.67
Springer	S1036-42130	1036	2012	2.834	27.919			5/1/2012	9.85
Springer	S1060-57315	1060	2012	14.844	9.501			5/5/2012	0.64
Springer	S1060-57318	1060	2012	9.562	14.084			5/5/2012	1.47
Springer	S1060-57339	1060	2012	34.062	14.084			5/5/2012	0.41
Springer	S1060-57342	1060	2012	14.719	8.917			5/5/2012	0.61
Springer	S1060-57370	1060	2012	18.688	13.084			5/5/2012	0.70
Springer	S1060-57382	1060	2012	15.281	11.751			5/5/2012	0.77
Springer	S1060-61109	1060	2012	62.188	18.168			5/5/2012	0.29
Springer	S1060-61112	1060	2012	4.344	5.642			5/5/2012	1.30
Springer	S1060-61115	1060	2012	72.812	23.502			5/5/2012	0.32
Springer	S1060-61219	1060	2012	57.188	18.251			5/5/2012	0.32
Springer	S1060-61276	1060	2012	35.625	40.003			5/5/2012	1.12
Springer	S1060-61279	1060	2012	30.562	30.502			5/5/2012	1.00
Springer	S1036-43110	1036	2012	1.294	22.918			5/7/2012	17.71
Springer	S1036-43114	1036	2012	5.406	35.252			5/7/2012	6.52
Springer	S1036-44029	1036	2012	3.625	49.587			5/14/2012	13.68
Springer	S1036-44042	1036	2012	1.841	32.919			5/14/2012	17.88
Springer	S1036-44071	1036	2012	4.281	28.085			5/14/2012	6.56
Springer	S1060-61015	1060	2012	58.44	48.25			5/14/2012	0.83
Springer	S1060-61035	1060	2012	55.625	44.086			5/14/2012	0.79
Springer	S1060-61051	1060	2012	17.094	6.892			5/14/2012	0.40
Springer	S1060-61061	1060	2012	4.938	21.918			5/14/2012	4.44
Springer	S1060-61136	1060	2012	95	30.502			5/14/2012	0.32
Springer	S1060-61172	1060	2012	52.188	9.751			5/14/2012	0.19
Springer	S1060-61260	1060	2012	83.438	22.835			5/14/2012	0.27
Springer	S1060-61193	1060	2012	67.5	20.418			5/17/2012	0.30
Springer	S1060-61196	1060	2012	38.438	18.335			5/17/2012	0.48
Springer	S1060-61247	1060	2012	7.781	13.584			5/17/2012	1.75
Springer	S1060-61250	1060	2012	2.078	23.752			5/17/2012	11.43
Springer	S1036-45009	1036	2012	1.509	19.835			5/19/2012	13.14
Springer	S1036-45013	1036	2012	2.303	39.419			5/19/2012	17.12
Springer	S1036-45046	1036	2012	6.688	29.085			5/19/2012	4.35
Springer	S1036-45056	1036	2012	1.316	34.586			5/19/2012	26.28
Springer	S1048-44015	1048	2012	10.812	46.42			5/20/2012	4.29
Springer	S1048-44019	1048	2012	8.812	23.085			5/20/2012	2.62
Springer	S1048-44024	1048	2012	2.969	9.584			5/20/2012	3.23
Springer	S1048-44036	1048	2012	2.866	2.942			5/20/2012	1.03

Springer	S1048-44039	1048	2012	4.75	18.918			5/20/2012	3.98
Springer	S1048-44066	1048	2012	2.006	10.501			5/20/2012	5.23
Springer	S1048-44069	1048	2012	5.125	40.919			5/20/2012	7.98
Springer	S1048-44081	1048	2012	3.656	55.754			5/20/2012	15.25
Springer	S1048-44084	1048	2012	26	38.586			5/20/2012	1.48
Springer	S1048-44086	1048	2012	44.375	12.334			5/20/2012	0.28
Springer	S1048-44097	1048	2012	41.875	52.003			5/20/2012	1.24
Springer	S1048-44100	1048	2012	15.438	17.835			5/20/2012	1.16
Springer	S1048-44108	1048	2012	27.281	26.668			5/20/2012	0.98
Springer	S1048-45013	1048	2012	1.328	35.252			5/24/2012	26.55
Springer	S1048-45016	1048	2012	2.228	13.668			5/24/2012	6.13
Springer	S1048-45019	1048	2012	1.575	26.335			5/24/2012	16.72
Springer	S1048-45023	1048	2012	3.812	10.834			5/24/2012	2.84
Springer	S1048-45036	1048	2012	1.684	22.668			5/24/2012	13.46
Springer	S1048-45052	1048	2012	1.328	9.334			5/24/2012	7.03
Springer	S1048-45055	1048	2012	4.031	12.001			5/24/2012	2.98
Springer	S1048-45079	1048	2012	2.447	30.002			5/24/2012	12.26
Springer	S1048-45095	1048	2012	1.309	37.669			5/24/2012	28.78
Springer	S1048-45098	1048	2012	1.784	36.752			5/24/2012	20.60
Springer	S1048-45101	1048	2012	1.966	20.251			5/24/2012	10.30
Springer	S1048-45104	1048	2012	1.472	18.501			5/24/2012	12.57
Springer	S1048-45146	1048	2012	4.062	27.418			5/24/2012	6.75
Springer	S1048-45149	1048	2012	9.688	57.754			5/24/2012	5.96
Springer	S1048-45152	1048	2012	0.675	75.338			5/24/2012	111.61
Springer	S1048-45155	1048	2012	1.269	69.505			5/24/2012	54.77
Springer	S1048-45158	1048	2012	7.062	32.419			5/24/2012	4.59
Springer	S1048-45185	1048	2012	5.75	25.085			5/24/2012	4.36
Springer	S1048-45188	1048	2012	7.125	32.752			5/24/2012	4.60
Springer	S1048-45191	1048	2012	9.906	52.253			5/24/2012	5.27
Springer	S1048-45194	1048	2012	1.962	59.837			5/24/2012	30.50
Springer	S1048-45198	1048	2012	9.406	46.253			5/24/2012	4.92
Springer	S1024-33021	1024	2012	0.991	14.751			5/28/2012	14.88
Springer	S1024-33029	1024	2012	1.588	50.253			5/28/2012	31.65
Springer	S1024-33058	1024	2012	0.978	15.501			5/28/2012	15.85
Springer	S1024-33083	1024	2012	3.25	20.335			5/28/2012	6.26
Springer	S1048-45216	1048	2012	0.675	5.65			5/30/2012	8.37
Springer	S1048-47028	1048	2012	4.344	11.334			5/30/2012	2.61
Springer	S1048-47030	1048	2012	4.062	16.584			5/30/2012	4.08
Springer	S1048-47033	1048	2012	0.325	25.168			5/30/2012	77.44
Springer	S1048-47036	1048	2012	6.938	29.502			5/30/2012	4.25
Springer	S1048-47039	1048	2012	6.5	72.505			5/30/2012	11.15
Springer	S1048-47042	1048	2012	12.125	28.585			5/30/2012	2.36
Springer	S1048-47072	1048	2012	10.938	27.502			5/30/2012	2.51
Springer	S1048-47075	1048	2012	11.281	8.309			5/30/2012	0.74
Springer	S1048-47078	1048	2012	9.781	28.585			5/30/2012	2.92
Springer	S1048-47081	1048	2012	8.719	31.919			5/30/2012	3.66
Springer	S1048-47102	1048	2012	6.594	8.584			5/30/2012	1.30
Springer	S1048-47106	1048	2012	10.781	26.252			5/30/2012	2.44
Springer	S1048-47113	1048	2012	9.031	13.918			5/30/2012	1.54
Springer	S1180-25301	1180	2012	1.869	8.751			5/31/2012	4.68
Springer	S1180-25317	1180	2012	1.997	5.042			5/31/2012	2.52
Springer	S1180-25319	1180	2012	1.434	3.167			5/31/2012	2.21
Springer	S1180-25331	1180	2012	1.306	9.584			5/31/2012	7.34
Springer	S1180-25358	1180	2012	1.297	30.419			5/31/2012	23.45
Springer	S1180-25362	1180	2012	2.1	56.42			5/31/2012	26.87
Springer	S1180-25369	1180	2012	0.8	8.584			5/31/2012	10.73
Springer	S1180-25372	1180	2012	0.956	7.5			5/31/2012	7.85
Springer	S1180-25410	1180	2012	0.775	1.283			5/31/2012	1.66
Springer	S1048-46084	1048	2012	7.75	17.835			6/3/2012	2.30
Springer	S1048-46108	1048	2012	3.5	25.585			6/3/2012	7.31
Springer	S1048-46135	1048	2012	8.469	14.584			6/3/2012	1.72
Springer	S1048-46153	1048	2012	13.562	15.751			6/3/2012	1.16
Springer	S1180-25394	1180	2012	0.881	2.233			6/4/2012	2.53
Springer	S1180-25406	1180	2012	1.234	17.001			6/4/2012	13.78
Springer	S1180-25424	1180	2012	1.094	1.292			6/4/2012	1.18
Springer	S1180-25434	1180	2012	0.756	5.6			6/4/2012	7.41
Springer	S1180-25448	1180	2012	0.944	2.458			6/4/2012	2.60
Springer	S1180-25452	1180	2012	1.278	7.701			6/4/2012	6.03
Springer	S1180-25473	1180	2012	0.662	4.092			6/4/2012	6.18
Springer	S1180-25482	1180	2012	0.809	21.085			6/4/2012	26.06
Springer	S1180-25485	1180	2012	0.403	4.65			6/4/2012	11.54
Springer	S1180-25499	1180	2012	0.847	4.25			6/4/2012	5.02
Springer	S1180-25629	1180	2012	0.8	4.284			6/4/2012	5.36
Springer	S1180-25646	1180	2012	0.928	2.5			6/4/2012	2.69
Springer	S1180-25649	1180	2012	1.056	6.35			6/4/2012	6.01
Springer	S1180-25684	1180	2012	2.484	26.002			6/4/2012	10.47
Springer	S1180-25690	1180	2012	1.4	2.842			6/4/2012	2.03
Springer	S1048-48009	1048	2012	4.344	9.751			6/5/2012	2.24
Springer	S1048-48039	1048	2012	5.094	13.001			6/5/2012	2.55
Springer	S1048-49018	1048	2012	26.906	25.502			6/7/2012	0.95
Springer	S1048-49029	1048	2012	10.188	31.252			6/7/2012	3.07
Springer	S1048-49032	1048	2012	22.469	23.585			6/7/2012	1.05
Springer	S1048-49035	1048	2012	20.594	15.168			6/7/2012	0.74
Springer	S1048-49066	1048	2012	33.125	17.585			6/7/2012	0.53
Springer	S1048-49071	1048	2012	41.25	21.251			6/7/2012	0.52
Springer	S1048-49078	1048	2012	41.562	40.003			6/7/2012	0.96
Springer	S1048-49086	1048	2012	21.031	20.501			6/7/2012	0.97
Springer	S1048-49110	1048	2012	34.375	7.5			6/7/2012	0.22
Springer	S1048-49120	1048	2012	32.188	15.918			6/7/2012	0.49
Springer	S1048-49142	1048	2012	54.688	16.668			6/7/2012	0.30
Springer	S1024-34135	1024	2012	1.231	41.919			6/8/2012	34.05
Springer	S1024-34209	1024	2012	2	22.668			6/8/2012	11.33
Springer	S1024-34228	1024	2012	3.969	26.335			6/8/2012	6.64
Springer	S1024-34231	1024	2012	1.103	33.836			6/8/2012	30.68
Springer	S1012-7229	1012	2012	1.372	21.918			6/10/2012	15.98
Springer	S1012-7286	1012	2012	0.625	7.159			6/10/2012	11.45
Springer	S1012-7292	1012	2012	1.197	34.752			6/10/2012	29.03
Springer	S1048-50030	1048	2012	1.181	9.751			6/13/2012	8.26
Springer	S1048-50100	1048	2012	11.031	39.753			6/13/2012	3.60
Springer	S1048-50108	1048	2012	5.094	12.918			6/13/2012	2.54
Springer	S1048-50114	1048	2012	7.344	9.251			6/13/2012	1.26
Springer	S1048-50119	1048	2012	6.031	12.251			6/13/2012	2.03
Springer	S1048-50122	1048	2012	1.656	6.384			6/13/2012	3.86
Springer	S1048-50134	1048	2012	4.406	22.001			6/13/2012	4.99
Springer	S1048-50150	1048	2012	14.281	42.003			6/13/2012	2.94
Springer	S1048-50155	1048	2012	13.219	15.251			6/13/2012	1.15
Springer	S1048-50166	1048	2012	7.156	15.918			6/13/2012	2.22
Springer	S1012-10216	1012	2012	2.566	17.418			6/15/2012	6.79
Springer	S1012-10219	1012	2012	2.294	27.835			6/15/2012	12.13
Springer	S1012-10228	1012	2012	4.188	21.335			6/15/2012	5.09
Springer	S1048-51019	1048	2012	10.688	34.419			6/20/2012	3.22
Springer	S1048-51103	1048	2012	4.281	10.917			6/20/2012	2.55
Springer	S1048-51110	1048	2012	7.344	12.751			6/20/2012	1.74
Springer	S1048-51112	1048	2012	10.906	6.592			6/20/2012	0.60
Springer	S1048-51115	1048	2012	5.875	14.918			6/20/2012	2.54
Springer	S1048-51127	1048	2012	9.812	26.585			6/20/2012	2.71
Springer	S1048-51139	1048	2012	6.906	26.252			6/20/2012	3.80
Springer	S1048-51144	1048	2012	11.719	13.834			6/20/2012	1.18
Springer	S1048-51147	1048	2012	7.344	7.384			6/20/2012	1.01
Springer	S1048-51150	1048	2012	6.688	11.334			6/20/2012	1.69
Springer	S1048-52048	1048	2012	32.812	40.753			6/22/2012	1.24
Springer	S1048-52083	1048	2012	83.75	34.419			6/22/2012	0.41
Springer	S1048-52140	1048	2012	20.125	17.168			6/22/2012	0.85
Springer	S1048-52146	1048	2012	6.062	24.918			6/22/2012	4.11
Springer	S1048-52152	1048	2012	7	19.418			6/22/2012	2.77
Springer	S1048-52170	1048	2012	3.281	28.002			6/22/2012	8.53
Springer	S1048-53101	1048	2012	4.531	15.834			6/26/2012	3.49
Springer	S1048-53103	1048	2012	6.156	21.501			6/26/2012	3.49
Springer	S1048-53105	1048	2012	3.938	14.501			6/26/2012	3.68
Springer	S1048-53106	1048	2012	2.488	25.835			6/26/2012	10.38
Springer	S1048-53109	1048	2012	48.438	35.336			6/26/2012	0.73
Springer	S1048-53113	1048	2012	60.312	22.418			6/26/2012	0.37
Springer	S1048-53117	1048	2012	67.188	8.834			6/26/2012	0.13
Springer	S1048-53121	1048	2012	49.375	15.751			6/26/2012	0.32
Springer	S1048-53125	1048	2012	46.875	55.587			6/26/2012	1.19
Springer	S1048-53131	1048	2012	9.375	9.334			6/26/2012	1.00
Springer	S1048-53136	1048	2012	27.375	37.836			6/26/2012	1.38
Springer	S1048-53165	1048	2012	5.656	12.501			6/26/2012	2.21
Springer	S1048-53167	1048	2012	1.616	19.001			6/26/2012	11.76
Springer	S1048-53169	1048	2012	65	25.918			6/26/2012	0.40
Springer	S1048-53177	1048	2012	33.125	19.085			6/26/2012	0.58
Springer	S1048-53186	1048	2012	42.188	20.501			6/26/2012	0.49
Springer	S1048-53203	1048	2012	70.312	31.919			6/26/2012	0.45
Springer	S1048-53214	1048	2012	49.375	39.419			6/26/2012	0.80
Springer	S1036-46013	1036	2012	6.688	24.252			7/2/2012	3.63
Springer	S1036-46031	1036	2012	4.125	17.835			7/2/2012	4.32
Springer	S1036-46037	1036	2012	8.125	10.917			7/2/2012	1.34
Springer	S1036-46042	1036	2012	20.969	36.169			7/2/2012	1.72
Springer	S1036-46045	1036	2012	23.688	25.252			7/2/2012	1.07
Springer	S1036-46057	1036	2012	20.031	18.085			7/2/2012	0.90
Springer	S1036-46060	1036	2012	14.875	30.419			7/2/2012	2.04
Springer	S1036-46063	1036	2012	39.688	12.584			7/2/2012	0.32
Springer	S1036-46073	1036	2012	1.2	21.918			7/2/2012	18.27
Springer	S1036-46084	1036	2012	3.719	15.251			7/2/2012	4.10
Springer	S1036-46087	1036	2012	1.403	5			7/2/2012	3.56
Springer	S1036-46105	1036	2012	15.375	30.419			7/2/2012	1.98
Springer	S1036-46202	1036	2012	12.125	11.917			7/2/2012	0.98
Springer	S1036-46205	1036	2012	1.828	11.167			7/2/2012	6.11
Springer	S1036-46218	1036	2012	24.312	29.252			7/2/2012	1.20
Springer	S1036-46224	1036	2012	3.5	18.835			7/2/2012	5.38
Springer	S1036-46230	1036	2012	18.594	40.836			7/2/2012	2.20
Springer	S1036-46231	1036	2012	5.906	47.503			7/2/2012	8.04
Springer	S1036-46245	1036	2012	11.375	53.254			7/2/2012	4.68
Springer	S1036-46251	1036	2012	1.347	21.835			7/2/2012	16.21
Springer	S1036-46260	1036	2012	16.156	32.419			7/2/2012	2.01
Springer	S1036-46269	1036	2012	19.75	37.502			7/2/2012	1.90
Springer	S1036-46273	1036	2012	28.625	35.419			7/2/2012	1.24
Springer	S1036-46278	1036	2012	3.844	20.501			7/2/2012	5.33
Springer	S1036-46292	1036	2012	6.438	55.17			7/2/2012	8.57
Springer	S1024-35149	1024	2012	14.469	17.918			7/5/2012	1.24
Springer	S1024-36106	1024	2012	3.119	30.419			7/5/2012	9.75
Springer	S1024-36124	1024	2012	8.469	19.835			7/5/2012	2.34
Springer	S1024-36132	1024	2012	4.438	23.585			7/5/2012	5.31
Springer	S1024-36146	1024	2012	10.781	19.751			7/5/2012	1.83
Springer	S1024-36148	1024	2012	1.828	15.418			7/5/2012	8.43
Springer	S1024-36151	1024	2012	30.781	20.585			7/5/2012	0.67
Springer	S1024-36207	1024	2012	7.062	46.836			7/5/2012	6.63
Springer	S1024-36210	1024	2012	15.344	26.418			7/5/2012	1.72
Springer	S1024-36219	1024	2012	14.406	57.671			7/5/2012	4.00
Springer	S1024-36229	1024	2012	2.484	28.335			7/5/2012	11.41

Springer	S1024-36241	1024	2012	4.875	38.169			7/5/2012	7.83
Springer	S1024-36258	1024	2012	22.875	30.085			7/5/2012	1.32
Springer	S1024-36273	1024	2012	2.441	29.919			7/5/2012	12.26
Springer	S1024-36277	1024	2012	1.141	27.502			7/5/2012	24.10
Springer	S1024-38104	1024	2012	1.119	5.917			7/11/2012	5.29
Springer	S1024-38110	1024	2012	1.188	17.835			7/11/2012	15.01
Springer	S1024-38133	1024	2012	1.019	15.001			7/11/2012	14.72
Springer	S1024-38137	1024	2012	1.391	24.252			7/11/2012	17.43
Springer	S1024-38178	1024	2012	2.544	18.335			7/11/2012	7.21
Springer	S1024-38188	1024	2012	1.003	42.419			7/11/2012	42.29
Springer	S1024-38204	1024	2012	1.022	28.002			7/11/2012	27.40
Springer	S1024-38228	1024	2012	4.625	29.669			7/11/2012	6.41
Springer	S1024-38230	1024	2012	1.972	22.251			7/11/2012	11.28
Springer	S1036-47048	1036	2012	8.188	42.169			7/11/2012	5.15
Springer	S1036-47072	1036	2012	5.406	14.834			7/11/2012	2.74
Springer	S1036-47093	1036	2012	2.497	11.167			7/11/2012	4.47
Springer	S1036-49017	1036	2012	3.781	18.751			7/11/2012	4.96
Springer	S1036-49038	1036	2012	13	13.251			7/11/2012	1.02
Springer	S1036-49062	1036	2012	6.156	11.084			7/11/2012	1.80
Springer	S1024-38008	1024	2012	0.866	18.251			7/12/2012	21.08
Springer	S1036-48005	1036	2012	4.531	38.503			7/13/2012	8.50
Springer	S1036-48007	1036	2012	2.181	34.586			7/13/2012	15.86
Springer	S1036-48009	1036	2012	22.344	27.252			7/13/2012	1.22
Springer	S1036-48017	1036	2012	10.75	42.336			7/13/2012	3.94
Springer	S1036-48025	1036	2012	1.444	20.751			7/13/2012	14.37
Springer	S1036-48028	1036	2012	1.947	81.339			7/13/2012	41.78
Springer	S1036-48047	1036	2012	2.078	41.586			7/13/2012	20.01
Springer	S1036-48051	1036	2012	1.203	17.585			7/13/2012	14.62
Springer	S1036-48063	1036	2012	1.422	38.169			7/13/2012	26.84
Springer	S1036-48066	1036	2012	1.216	36.919			7/13/2012	30.36
Springer	S1036-48077	1036	2012	3.375	42.253			7/13/2012	12.52
Springer	S1036-48089	1036	2012	6.781	42.67			7/13/2012	6.29
Springer	S1036-48093	1036	2012	2.162	71.171			7/13/2012	32.92
Springer	S1036-48096	1036	2012	2.369	41.086			7/13/2012	17.34
Springer	S1036-48099	1036	2012	58.438	52.42			7/13/2012	0.90
Springer	S1036-48218	1036	2012	1.544	19.085			7/13/2012	12.36
Springer	S1036-48224	1036	2012	1.588	44.92			7/13/2012	28.29
Springer	S1036-48228	1036	2012	4.062	40.586			7/13/2012	9.99
Springer	S1036-48233	1036	2012	1.206	85.006			7/13/2012	70.49
Springer	S1036-48241	1036	2012	6.188	22.835			7/13/2012	3.69
Springer	S1036-48255	1036	2012	3.188	52.503			7/13/2012	16.47
Springer	S1036-48259	1036	2012	1.259	30.169			7/13/2012	23.96
Springer	S1036-48262	1036	2012	6.75	44.086			7/13/2012	6.53
Springer	S1036-50004	1036	2012	5.438	27.752			7/20/2012	5.10
Springer	S1036-50016	1036	2012	5.219	44.42			7/20/2012	8.51
Springer	S1036-50019	1036	2012	8.344	50.17			7/20/2012	6.01
Springer	S1036-50022	1036	2012	23.062	46.42			7/20/2012	2.01
Springer	S1036-50029	1036	2012	4.438	74.172			7/20/2012	16.71
Springer	S1036-50032	1036	2012	10.156	47.336			7/20/2012	4.66
Springer	S1036-50035	1036	2012	3.625	46.253			7/20/2012	12.76
Springer	S1036-50041	1036	2012	6.875	23.002			7/20/2012	3.35
Springer	S1036-50064	1036	2012	14.031	45.086			7/20/2012	3.21
Springer	S1036-50066	1036	2012	7.531	32.586			7/20/2012	4.33
Springer	S1036-50078	1036	2012	2.069	34.919			7/20/2012	16.88
Springer	S1036-50086	1036	2012	7.25	37.252			7/20/2012	5.14
Springer	S1036-50092	1036	2012	11.125	53.837			7/20/2012	4.84
Springer	S1036-50100	1036	2012	22.906	31.002			7/20/2012	1.35
Springer	S1036-50107	1036	2012	9.5	14.751			7/20/2012	1.55
Springer	S1036-50116	1036	2012	6.25	35.169			7/20/2012	5.63
Springer	S1036-50119	1036	2012	5.656	36.419			7/20/2012	6.44
Springer	S1036-50135	1036	2012	6.969	11.834			7/20/2012	1.70
Springer	S1036-50138	1036	2012	13.156	26.335			7/20/2012	2.00
Springer	S1036-52012	1036	2012	8.969	9.584			7/20/2012	1.07
Springer	S1036-52021	1036	2012	6.719	11.667			7/20/2012	1.74
Springer	S1036-52042	1036	2012	27.031	25.002			7/20/2012	0.92
Springer	S1036-51070	1036	2012	1.666	36.752			7/24/2012	22.06
Springer	S1036-51109	1036	2012	3.906	72.838			7/24/2012	18.65
Springer	S1036-51114	1036	2012	5.156	40.003			7/24/2012	7.76
Springer	S1036-51120	1036	2012	5.656	26.002			7/24/2012	4.60
Springer	S1036-51125	1036	2012	4.062	12.918			7/24/2012	3.18
Springer	S1036-51129	1036	2012	8.562	65.421			7/24/2012	7.64
Springer	S1036-51134	1036	2012	5.844	25.002			7/24/2012	4.28
Springer	S1036-51138	1036	2012	11.719	20.585			7/24/2012	1.76
Springer	S1036-51151	1036	2012	6.344	24.585			7/24/2012	3.88
Springer	S1036-51158	1036	2012	7.094	10.167			7/24/2012	1.43
Springer	S1036-51163	1036	2012	4.406	38.919			7/24/2012	8.83
Springer	S1036-51167	1036	2012	5.75	31.835			7/24/2012	5.54
Springer	S1036-51189	1036	2012	6.438	19.085			7/24/2012	2.96
Springer	S1036-51194	1036	2012	1.888	35.752			7/24/2012	18.94
Springer	S1036-51201	1036	2012	8.688	27.669			7/24/2012	3.18
Springer	S1036-51215	1036	2012	2.669	19.751			7/24/2012	7.40
Springer	S1036-51219	1036	2012	5.531	18.335			7/24/2012	3.31
Springer	S1036-51222	1036	2012	3.103	61.171			7/24/2012	19.71
Springer	S1036-51227	1036	2012	2.669	34.419			7/24/2012	12.90
Springer	S1036-51232	1036	2012	2.053	49.503			7/24/2012	24.11
Springer	S1180-27002	1180	2012	1.266	35.419			7/30/2012	27.98
Springer	S1180-27012	1180	2012	0.784	7.576			7/30/2012	9.66
Springer	S1180-27104	1180	2012	0.788	5.409			7/30/2012	6.86
Springer	S1180-27107	1180	2012	1.034	3.584			7/30/2012	3.47
Springer	S1180-27134	1180	2012	1.547	32.252			7/30/2012	20.85
Springer	S1180-27140	1180	2012	0.941	3.275			7/30/2012	3.48
Springer	S1180-27143	1180	2012	0.769	0.892			7/30/2012	1.16
Springer	S1180-27154	1180	2012	1.184	70.755			7/30/2012	59.76
Springer	S1180-27183	1180	2012	0.791	1.742			7/30/2012	2.20
Springer	S1180-27190	1180	2012	0.891	1.967			7/30/2012	2.21
Springer	S1180-27193	1180	2012	0.897	1.783			7/30/2012	1.99
Springer	S1180-27196	1180	2012	1.1	16.751			7/30/2012	15.23
Springer	S1180-27210	1180	2012	2.191	85.006			7/30/2012	38.80
Springer	S1180-27236	1180	2012	0.897	1.267			7/30/2012	1.41
Springer	S1180-27239	1180	2012	1.003	2.033			7/30/2012	2.03
Springer	S1036-53001	1036	2012	11.844	30.169			7/31/2012	2.55
Springer	S1036-53005	1036	2012	13.188	17.501			7/31/2012	1.33
Springer	S1036-53010	1036	2012	58.438	24.002			7/31/2012	0.41
Springer	S1036-53019	1036	2012	45.938	24.668			7/31/2012	0.54
Springer	S1036-53026	1036	2012	18.844	18.168			7/31/2012	0.96
Springer	S1036-53039	1036	2012	48.75	25.585			7/31/2012	0.52
Springer	S1036-53061	1036	2012	27.219	29.335			7/31/2012	1.08
Springer	S1036-53064	1036	2012	21.75	24.502			7/31/2012	1.13
Springer	S1036-53074	1036	2012	20.188	28.002			7/31/2012	1.39
Springer	S1036-53076	1036	2012	15	27.752			7/31/2012	1.85
Springer	S1036-53079	1036	2012	8.875	28.252			7/31/2012	3.18
Springer	S1036-53082	1036	2012	39.688	52.003			7/31/2012	1.31
Springer	S1036-53092	1036	2012	37.5	48.337			7/31/2012	1.29
Springer	S1036-53094	1036	2012	37.5	37.502			7/31/2012	1.00
Springer	S1036-53097	1036	2012	11.094	20.418			7/31/2012	1.84
Springer	S1036-53105	1036	2012	18.938	52.087			7/31/2012	2.75
Springer	S1036-52063	1036	2012	47.812	67.755			8/1/2012	1.42
Springer	S1024-39247	1024	2012	3.25	6.942			8/3/2012	2.14
Springer	S1024-39298	1024	2012	2.2	11.667			8/3/2012	5.30
Springer	S1036-55108	1036	2012	8.469	22.001			8/9/2012	2.60
Springer	S1036-55115	1036	2012	12.406	10.501			8/9/2012	0.85
Springer	S1036-55120	1036	2012	4.75	8.834			8/9/2012	1.86
Springer	S1036-55124	1036	2012	5.938	15.418			8/9/2012	2.60
Springer	S1036-55135	1036	2012	7.562	13.168			8/9/2012	1.74
Springer	S1036-55139	1036	2012	7.188	28.669			8/9/2012	3.99
Springer	S1036-55166	1036	2012	70	21.001			8/9/2012	0.30
Springer	S1036-55173	1036	2012	32.812	14.001			8/9/2012	0.43
Springer	S1036-55178	1036	2012	35.312	20.335			8/9/2012	0.58
Springer	S1036-55206	1036	2012	4.969	5.934			8/9/2012	1.19
Springer	S1036-55209	1036	2012	7.75	24.418			8/9/2012	3.15
Springer	S1036-55213	1036	2012	6.625	8.142			8/9/2012	1.23
Springer	S1036-55216	1036	2012	5.906	11.834			8/9/2012	2.00
Springer	S1036-55218	1036	2012	4.938	5.584			8/9/2012	1.13
Springer	S1036-55222	1036	2012	6.156	11.417			8/9/2012	1.85
Springer	S1036-55227	1036	2012	31.562	29.335			8/9/2012	0.93
Springer	S1024-40028	1024	2012	7.5	41.419			8/14/2012	5.52
Springer	S1024-40059	1024	2012	4.375	29.919			8/14/2012	6.84
Springer	S1024-40086	1024	2012	8.5	21.668			8/14/2012	2.55
Springer	S1024-40114	1024	2012	5.906	8.917			8/14/2012	1.51
Springer	S1024-40118	1024	2012	8.188	20.168			8/14/2012	2.46
Springer	S1024-40145	1024	2012	10.438	25.835			8/14/2012	2.48
Springer	S1024-40201	1024	2012	22.406	36.836			8/14/2012	1.64
Springer	S1024-40206	1024	2012	3.969	34.252			8/14/2012	8.63
Springer	S1024-40218	1024	2012	2.947	43.586			8/14/2012	14.79
Springer	S1024-40221	1024	2012	12.125	13.918			8/14/2012	1.15
Springer	S1024-40230	1024	2012	5.469	20.418			8/14/2012	3.73
Springer	S1024-40232	1024	2012	5.531	31.669			8/14/2012	5.73
Springer	S1024-40239	1024	2012	40	20.585			8/14/2012	0.51
Springer	S1024-40244	1024	2012	1.441	26.752			8/14/2012	18.56
Springer	S1024-40249	1024	2012	18.625	25.668			8/14/2012	1.38
Springer	S1024-40253	1024	2012	5.031	14.001			8/14/2012	2.78
Springer	S1024-40263	1024	2012	50	21.085			8/14/2012	0.42
Springer	S1024-40273	1024	2012	6.531	22.668			8/14/2012	3.47
Springer	S1168-35022	1168	2012	1.322	17.835			8/19/2012	13.49
Springer	S1168-35038	1168	2012	1.312	4.5			8/19/2012	3.43
Springer	S1168-35045	1168	2012	2.075	10.001			8/19/2012	4.82
Springer	S1168-35070	1168	2012	1.081	3.742			8/19/2012	3.46
Springer	S1168-35080	1168	2012	0.875	0.808			8/19/2012	0.92
Springer	S1168-35092	1168	2012	0.866	7.517			8/19/2012	8.68
Springer	S1168-35104	1168	2012	0.762	13.084			8/19/2012	17.17
Springer	S1168-35138	1168	2012	0.838	15.251			8/19/2012	18.20
Springer	S1168-35149	1168	2012	0.672	14.918			8/19/2012	22.20
Springer	S1012-19009	1012	2012	1.812	36.919			8/23/2012	20.37
Springer	S1012-19042	1012	2012	1.8	16.084			8/23/2012	8.94
Springer	S1012-19082	1012	2012	3.688	39.003			8/23/2012	10.58
Springer	S1168-34003	1168	2012	2.334	35.669			8/23/2012	15.28
Springer	S1168-34007	1168	2012	0.978	0.817			8/23/2012	0.84
Springer	S1168-34043	1168	2012	0.725	76.755			8/23/2012	105.87
Springer	S1168-34047	1168	2012	1.044	9.251			8/23/2012	8.86
Springer	S1168-34051	1168	2012	1.091	23.335			8/23/2012	21.39
Springer	S1168-34090	1168	2012	1.059	14.668			8/23/2012	13.85
Springer	S1168-34094	1168	2012	0.606	1.408			8/23/2012	2.32
Springer	S1168-34149	1168	2012	0.556	14.834			8/23/2012	26.68
Springer	S1168-35178	1168	2012	0.781	11.501			8/23/2012	14.73
Springer	S1168-35193	1168	2012	0.822	6.684			8/23/2012	8.13
Springer	S1024-42027	1024	2012	2.097	25.085			8/28/2012	11.96
Springer	S1024-42045	1024	2012	8.281	27.752			8/28/2012	3.35
Springer	S1024-42069	1024	2012	18.781	60.337			8/28/2012	3.21
Springer	S1024-42090	1024	2012	4.75	19.585			8/28/2012	4.12
Springer	S1036-56202	1036	2012	13.562	11.084			8/29/2012	0.82

Springer	S1036-56207	1036	2012	2.262	13.334			8/29/2012	5.89
Springer	S1036-56214	1036	2012	66.25	42.086			8/29/2012	0.64
Springer	S1036-56216	1036	2012	13.094	18.335			8/29/2012	1.40
Springer	S1036-56219	1036	2012	14.584	3.781			8/29/2012	0.26
Springer	S1036-56227	1036	2012	11.469	13.918			8/29/2012	1.21
Springer	S1036-56235	1036	2012	37.812	34.252			8/29/2012	0.91
Springer	S1036-56239	1036	2012	7.469	10.167			8/29/2012	1.36
Springer	S1036-56006	1036	2012	11.562	21.835			8/30/2012	1.89
Springer	S1036-56015	1036	2012	7.312	30.835			8/30/2012	4.22
Springer	S1036-56024	1036	2012	3.125	21.085			8/30/2012	6.75
Springer	S1024-41004	1024	2012	2.434	10.667			9/1/2012	4.38
Springer	S1024-41030	1024	2012	28.188	15.584			9/1/2012	0.55
Springer	S1024-41036	1024	2012	12.375	18.585			9/1/2012	1.50
Springer	S1024-41042	1024	2012	25.219	19.835			9/1/2012	0.79
Springer	S1024-41070	1024	2012	11.469	6.834			9/1/2012	0.60
Springer	S1024-41076	1024	2012	5.094	17.668			9/1/2012	3.47
Springer	S1024-41085	1024	2012	15.25	13.668			9/1/2012	0.90
Springer	S1024-41109	1024	2012	5.594	18.501			9/1/2012	3.31
Springer	S1024-41115	1024	2012	18.562	18.168			9/1/2012	0.98
Springer	S1024-41118	1024	2012	9.781	25.502			9/1/2012	2.61
Springer	S1024-41129	1024	2012	3.156	21.168			9/1/2012	6.71
Springer	S1024-41204	1024	2012	1.684	47.17			9/1/2012	28.01
Springer	S1012-21066	1012	2012	2.219	22.001			9/2/2012	9.91
Springer	S1012-21092	1012	2012	1.247	7.817			9/2/2012	6.27
Springer	S1012-21157	1012	2012	5.062	20.585			9/2/2012	4.07
Springer	S1012-21177	1012	2012	1.991	6.142			9/2/2012	3.08
Springer	S1012-21221	1012	2012	2.153	25.252			9/2/2012	11.73
Springer	S1012-23103	1012	2012	2.028	53.587			9/5/2012	26.42
Springer	S1012-23108	1012	2012	6.188	76.422			9/5/2012	12.35
Springer	S1012-23116	1012	2012	1.519	35.086			9/5/2012	23.10
Springer	S1168-36028	1168	2012	0.484	11.417			9/6/2012	23.59
Springer	S1168-36131	1168	2012	1.594	25.835			9/6/2012	16.21
Springer	S1168-36162	1168	2012	1.481	23.918			9/6/2012	16.15
Springer	S1168-36171	1168	2012	0.769	20.751			9/6/2012	26.98
Springer	S1168-36178	1168	2012	0.988	45.586			9/6/2012	46.14
Springer	S1168-36187	1168	2012	1.072	22.668			9/6/2012	21.15
Springer	S1168-36214	1168	2012	0.809	1.792			9/6/2012	2.22
Springer	S1168-36236	1168	2012	0.859	5.092			9/6/2012	5.93
Springer	S1168-36243	1168	2012	1.159	24.168			9/6/2012	20.85
Springer	S1168-36263	1168	2012	0.797	1.067			9/6/2012	1.34
Springer	S1168-36290	1168	2012	0.734	0.739			9/6/2012	1.01
Springer	S1168-36293	1168	2012	5.375	9.917			9/6/2012	1.85
Springer	S1168-36301	1168	2012	1.088	34.086			9/6/2012	31.33
Springer	S1168-36320	1168	2012	0.878	0.942			9/6/2012	1.07
Springer	S1024-43002	1024	2012	0.966	59.837			9/9/2012	61.94
Springer	S1024-43005	1024	2012	7.969	39.253			9/9/2012	4.93
Springer	S1024-43028	1024	2012	13.031	45.42			9/9/2012	3.49
Springer	S1024-43039	1024	2012	7.375	47.17			9/9/2012	6.40
Springer	S1024-43043	1024	2012	54.375	32.085			9/9/2012	0.59
Springer	S1024-43046	1024	2012	2.225	51.087			9/9/2012	22.96
Springer	S1024-43049	1024	2012	3.084	48.42			9/9/2012	15.70
Springer	S1024-43054	1024	2012	3.875	50.587			9/9/2012	13.05
Springer	S1024-43057	1024	2012	13.875	48.587			9/9/2012	3.50
Springer	S1024-43074	1024	2012	4.312	51.587			9/9/2012	11.96
Springer	S1024-43077	1024	2012	5.531	44.253			9/9/2012	8.00
Springer	S1024-43080	1024	2012	7.125	39.419			9/9/2012	5.53
Springer	S1024-44101	1024	2012	2.25	37.252			9/9/2012	16.56
Springer	S1024-44104	1024	2012	2.319	38.253			9/9/2012	16.50
Springer	S1024-44107	1024	2012	6.156	23.502			9/9/2012	3.82
Springer	S1024-44110	1024	2012	8.594	45.586			9/9/2012	5.30
Springer	S1024-44137	1024	2012	3.281	45.586			9/9/2012	13.89
Springer	S1024-44140	1024	2012	5.656	54.92			9/9/2012	9.71
Springer	S1024-44143	1024	2012	4.812	40.503			9/9/2012	8.42
Springer	S1024-44146	1024	2012	9.625	21.251			9/9/2012	2.21
Springer	S1024-44149	1024	2012	10.125	27.168			9/9/2012	2.68
Springer	S1012-24101	1012	2012	0.947	6.842			9/11/2012	7.22
Springer	S1012-24107	1012	2012	1.097	7.667			9/11/2012	6.99
Springer	S1012-24145	1012	2012	2.416	13.584			9/11/2012	5.62
Springer	S1012-24151	1012	2012	0.712	7.567			9/11/2012	10.63
Springer	S1024-45201	1024	2012	1.212	20.001			9/11/2012	16.50
Springer	S1024-45205	1024	2012	3.125	22.501			9/11/2012	7.20
Springer	S1024-45214	1024	2012	2.834	12.501			9/11/2012	4.41
Springer	S1024-45218	1024	2012	4.656	43.42			9/11/2012	9.33
Springer	S1024-45221	1024	2012	36.875	21.835			9/11/2012	0.59
Springer	S1024-45282	1024	2012	7.625	47.92			9/11/2012	6.28
Springer	S1024-43110	1024	2012	48.125	45.003			9/14/2012	0.94
Springer	S1024-43113	1024	2012	49.688	50.587			9/14/2012	1.02
Springer	S1024-43201	1024	2012	33.438	31.752			9/14/2012	0.95
Springer	S1024-43218	1024	2012	17.406	29.169			9/14/2012	1.68
Springer	S1024-43224	1024	2012	12	25.335			9/14/2012	2.11
Springer	S1024-43231	1024	2012	18.906	51.17			9/14/2012	2.71
Springer	S1024-43300	1024	2012	15.438	25.418			9/14/2012	1.65
Springer	S1024-43305	1024	2012	35.312	29.252			9/14/2012	0.83
Springer	S1024-43311	1024	2012	40.312	24.502			9/14/2012	0.61
Springer	S1024-46006	1024	2012	4.594	14.751			9/19/2012	3.21
Springer	S1024-46021	1024	2012	7.688	13.501			9/19/2012	1.76
Springer	S1024-46039	1024	2012	8.25	27.168			9/19/2012	3.29
Springer	S1024-46060	1024	2012	5.969	12.668			9/19/2012	2.12
Springer	S1024-46078	1024	2012	7.406	21.668			9/19/2012	2.93
Springer	S1024-46093	1024	2012	9.219	30.169			9/19/2012	3.27
Springer	S1024-47105	1024	2012	2.231	22.501			9/22/2012	10.09
Springer	S1024-47109	1024	2012	12.688	75.422			9/22/2012	5.94
Springer	S1024-47113	1024	2012	2.422	22.168			9/22/2012	9.15
Springer	S1024-47121	1024	2012	5.938	41.169			9/22/2012	6.93
Springer	S1024-47140	1024	2012	3.047	14.584			9/22/2012	4.79
Springer	S1024-47142	1024	2012	1.416	16.001			9/22/2012	11.30
Springer	S1024-47145	1024	2012	7.531	49.587			9/22/2012	6.58
Springer	S1024-47160	1024	2012	3.125	25.585			9/22/2012	8.19
Springer	S1024-47163	1024	2012	7.5	27.585			9/22/2012	3.68
Springer	S1024-47177	1024	2012	3.906	21.251			9/22/2012	5.44
Springer	S1024-47179	1024	2012	13.688	32.169			9/22/2012	2.35
Springer	S1024-47182	1024	2012	27.719	28.252			9/22/2012	1.02
Springer	S1024-47204	1024	2012	2.609	29.419			9/22/2012	11.28
Springer	S1012-26054	1012	2012	0.991	10.251			9/26/2012	10.34
Springer	S1012-26061	1012	2012	1.15	16.168			9/26/2012	14.06
Springer	S1024-50001	1024	2012	2.572	8.267			10/4/2012	3.21
Springer	S1024-50006	1024	2012	2.616	24.668			10/4/2012	9.43
Springer	S1024-50016	1024	2012	9.031	13.001			10/4/2012	1.44
Springer	S1024-50026	1024	2012	9.656	20.918			10/4/2012	2.17
Springer	S1024-50104	1024	2012	3.219	70.421			10/4/2012	21.88
Springer	S1024-50109	1024	2012	5.281	46.253			10/4/2012	8.76
Springer	S1024-50120	1024	2012	11.438	29.169			10/4/2012	2.55
Springer	S1024-50124	1024	2012	8.469	22.085			10/4/2012	2.61
Springer	S1024-50144	1024	2012	45	34.586			10/4/2012	0.77
Springer	S1024-50147	1024	2012	40.938	23.585			10/4/2012	0.58
Springer	S1024-50151	1024	2012	16.625	18.585			10/4/2012	1.12
Springer	S1024-50154	1024	2012	16.469	18.835			10/4/2012	1.14
Springer	S1024-50157	1024	2012	20.844	32.169			10/4/2012	1.54
Springer	S1024-50171	1024	2012	4.312	25.585			10/4/2012	5.93
Springer	S1024-50185	1024	2012	3.781	9.251			10/4/2012	2.45
Springer	S1024-50206	1024	2012	3.125	47.17			10/4/2012	15.09
Springer	S1024-50234	1024	2012	8.75	21.168			10/4/2012	2.42
Springer	S1024-50245	1024	2012	5.188	35.502			10/4/2012	6.84
Springer	S1024-50249	1024	2012	2.484	50.67			10/4/2012	20.40
Springer	S1024-50253	1024	2012	1.262	30.085			10/4/2012	23.84
Springer	S1024-50260	1024	2012	4.031	29.419			10/4/2012	7.30
Springer	S1024-50277	1024	2012	5.844	45.836			10/4/2012	7.84
Springer	S1024-50291	1024	2012	1.975	49.003			10/4/2012	24.81
Springer	S1024-50299	1024	2012	15.281	17.251			10/4/2012	1.13
Springer	S1024-50303	1024	2012	2.038	21.835			10/4/2012	10.71
Springer	S1024-50307	1024	2012	1.006	41.669			10/4/2012	41.42
Springer	S1024-50311	1024	2012	3.719	31.669			10/4/2012	8.52
Springer	S1012-27007	1012	2012	1.922	19.168			10/8/2012	9.97
Springer	S1012-27087	1012	2012	2.078	8.751			10/8/2012	4.21
Springer	S1012-27123	1012	2012	1.459	48.837			10/8/2012	33.47
Springer	S1012-28053	1012	2012	4.031	19.918			10/9/2012	4.94
Springer	S1012-28075	1012	2012	3.125	22.251			10/9/2012	7.12
Springer	S1012-28125	1012	2012	5.75	17.168			10/9/2012	2.99
Springer	S1012-28130	1012	2012	6.469	16.918			10/9/2012	2.62
Springer	S1024-49013	1024	2012	6.938	29.169			10/9/2012	4.20
Springer	S1024-49022	1024	2012	6.125	16.751			10/9/2012	2.73
Springer	S1024-49031	1024	2012	6.688	21.585			10/9/2012	3.23
Springer	S1024-49040	1024	2012	14.844	27.252			10/9/2012	1.84
Springer	S1024-49049	1024	2012	24.375	21.335			10/9/2012	0.88
Springer	S1024-49058	1024	2012	28.062	17.001			10/9/2012	0.61
Springer	S1024-50023	1024	2012	7.188	32.419			10/12/2012	4.51
Springer	S1024-50028	1024	2012	10.969	17.918			10/12/2012	1.63
Springer	S1024-50030	1024	2012	13.812	15.501			10/12/2012	1.12
Springer	S1024-50032	1024	2012	17.938	14.668			10/12/2012	0.82
Springer	S1024-50040	1024	2012	38.438	25.418			10/12/2012	0.66
Springer	S1024-50047	1024	2012	60.938	15.834			10/12/2012	0.26
Springer	S1024-50054	1024	2012	51.562	23.335			10/12/2012	0.45
Springer	S1024-50061	1024	2012	25.5	10.334			10/12/2012	0.41
Springer	S1024-52041	1024	2012	6.406	17.501			10/23/2012	2.73
Springer	S1024-52042	1024	2012	5.531	26.335			10/23/2012	4.76
Springer	S1024-52046	1024	2012	8.156	5.575			10/23/2012	0.68
Springer	S1024-52048	1024	2012	8.781	10.501			10/23/2012	1.20
Springer	S1024-52051	1024	2012	8.656	21.251			10/23/2012	2.46
Springer	S1024-52056	1024	2012	11.812	46.336			10/23/2012	3.92
Springer	S1024-52061	1024	2012	6.625	13.584			10/23/2012	2.05
Springer	S1024-52066	1024	2012	3.719	17.668			10/23/2012	4.75
Springer	S1012-30033	1012	2012	14.75	40.419			10/31/2012	2.74
Springer	S1012-30036	1012	2012	2.978	33.836			10/31/2012	11.36
Springer	S1012-30039	1012	2012	3.5	25.502			10/31/2012	7.29
Springer	S1012-30066	1012	2012	6.625	13.668			10/31/2012	2.06
Springer	S1012-30084	1012	2012	1.191	34.752			10/31/2012	29.18
Springer	S1012-30087	1012	2012	4.406	7.734			10/31/2012	1.76
Springer	S1012-30090	1012	2012	1.194	28.835			10/31/2012	24.15
Springer	S1012-30110	1012	2012	2.972	20.418			10/31/2012	6.87
Springer	S1012-30125	1012	2012	1.65	8.584			10/31/2012	5.20
Springer	S1012-30128	1012	2012	57.812	23.418			10/31/2012	0.41
Springer	S1012-30131	1012	2012	23.531	25.668			10/31/2012	1.09
Springer	S1012-30157	1012	2012	4.156	19.335			10/31/2012	4.65
Springer	S1012-30159	1012	2012	18.031	13.501			10/31/2012	0.75
Springer	S1012-30162	1012	2012	12.656	32.752			10/31/2012	2.59
Springer	S1012-30165	1012	2012	12.5	24.835			10/31/2012	1.99
Springer	S1012-30170	1012	2012	17.5	36.002			10/31/2012	2.06
Springer	S1012-30173	1012	2012	1.481	14.584			10/31/2012	9.85
Springer	S1156-43020	1156	2012	1.356	11.917			10/31/2012	8.79
Springer	S1156-43024	1156	2012	0.853	8.276			10/31/2012	9.70

Springer	S1156-43066	1156	2012	1.197	3.092			10/31/2012	2.58
Springer	S1156-43070	1156	2012	1.769	39.086			10/31/2012	22.09
Springer	S1156-43082	1156	2012	0.891	5.417			10/31/2012	6.08
Springer	S1156-43127	1156	2012	0.869	9.917			10/31/2012	11.41
Springer	S1156-43173	1156	2012	1.659	0.679			10/31/2012	0.41
Springer	S1156-43177	1156	2012	1.825	5.425			10/31/2012	2.97
Springer	S1156-43195	1156	2012	0.831	11.084			10/31/2012	13.34
Springer	S1156-43250	1156	2012	0.816	10.001			10/31/2012	12.26
Springer	S1024-54038	1024	2012	26.562	17.668			11/7/2012	0.67
Springer	S1024-54047	1024	2012	5.906	9.751			11/7/2012	1.65
Springer	S1024-54050	1024	2012	6.031	8.417			11/7/2012	1.40
Springer	S1024-54052	1024	2012	9.281	12.918			11/7/2012	1.39
Springer	S1024-54055	1024	2012	9.188	31.585			11/7/2012	3.44
Springer	S1024-54058	1024	2012	10.75	30.169			11/7/2012	2.81
Springer	S1024-54061	1024	2012	0.584	48.003			11/7/2012	82.20
Springer	S1000-9215	1000	2012	1.475	8.201			11/11/2012	5.56
Springer	S1000-9240	1000	2012	4.688	22.001			11/11/2012	4.69
Springer	S1156-44001	1156	2012	0.953	4.417			11/15/2012	4.63
Springer	S1156-44005	1156	2012	0.872	1.317			11/15/2012	1.51
Springer	S1156-44009	1156	2012	0.897	0.728			11/15/2012	0.81
Springer	S1156-44043	1156	2012	1.928	50.003			11/15/2012	25.94
Springer	S1156-44058	1156	2012	0.775	0.614			11/15/2012	0.79
Springer	S1156-44062	1156	2012	0.978	0.992			11/15/2012	1.01
Springer	S1024-53009	1024	2012	26	57.337			11/18/2012	2.21
Springer	S1024-53140	1024	2012	18.594	15.334			11/18/2012	0.82
Springer	S1024-53147	1024	2012	36.25	21.668			11/18/2012	0.60
Springer	S1012-32005	1012	2012	17.188	31.002			11/21/2012	1.80
Springer	S1012-32008	1012	2012	15.656	15.668			11/21/2012	1.00
Springer	S1012-32011	1012	2012	15.125	5.742			11/21/2012	0.38
Springer	S1012-32014	1012	2012	7.906	20.918			11/21/2012	2.65
Springer	S1012-32046	1012	2012	13.125	24.668			11/21/2012	1.88
Springer	S1012-32049	1012	2012	6.875	19.751			11/21/2012	2.87
Springer	S1012-32052	1012	2012	10.281	14.834			11/21/2012	1.44
Springer	S1012-32080	1012	2012	4.719	11.667			11/21/2012	2.47
Springer	S1012-32083	1012	2012	5	15.168			11/21/2012	3.03
Springer	S1012-32086	1012	2012	2.075	15.334			11/21/2012	7.39
Springer	S1012-32112	1012	2012	12.344	19.001			11/21/2012	1.54
Springer	S1012-32122	1012	2012	6.594	13.418			11/21/2012	2.03
Springer	S1012-32125	1012	2012	24.469	25.085			11/21/2012	1.03
Springer	S1012-32136	1012	2012	33.125	53.004			11/21/2012	1.60
Springer	S1012-32150	1012	2012	23.156	19.085			11/21/2012	0.82
Springer	S1012-32163	1012	2012	8.5	29.002			11/21/2012	3.41
Springer	S1012-32180	1012	2012	4.062	9.334			11/21/2012	2.30
Springer	S1012-32214	1012	2012	10.406	16.001			11/21/2012	1.54
Springer	S1012-32241	1012	2012	1.297	19.501			11/21/2012	15.04
Springer	S1012-32265	1012	2012	1.106	45.753			11/21/2012	41.37
Springer	S1012-32269	1012	2012	2.384	25.585			11/21/2012	10.73
Springer	S1012-32300	1012	2012	3.656	122.508			11/21/2012	33.51
Springer	S1012-32305	1012	2012	1.834	29.169			11/21/2012	15.90
Springer	S1012-33328	1012	2012	1.866	25.252			11/27/2012	13.53
Springer	S1012-33334	1012	2012	20.281	66.838			11/27/2012	3.30
Springer	S1012-33009	1012	2012	1.55	24.002			11/28/2012	15.49
Springer	S1012-33028	1012	2012	1.372	40.253			11/28/2012	29.34
Springer	S1012-33040	1012	2012	5.031	43.67			11/28/2012	8.68
Springer	S1012-33055	1012	2012	6.094	31.335			11/28/2012	5.14
Springer	S1012-33072	1012	2012	3.188	34.252			11/28/2012	10.74
Springer	S1012-33218	1012	2012	2.156	36.586			11/28/2012	16.97
Springer	S1012-33240	1012	2012	8.219	26.335			11/28/2012	3.20
Springer	S1144-66006	1144	2012	0.531	30.085			11/30/2012	56.66
Springer	S1144-66018	1144	2012	1.409	18.501			11/30/2012	13.13
Springer	S1144-66030	1144	2012	3.344	28.419			11/30/2012	8.50
Springer	S1144-66053	1144	2012	0.616	6.534			11/30/2012	10.61
Springer	S1144-66062	1144	2012	2.566	46.003			11/30/2012	17.93
Springer	S1144-66070	1144	2012	0.669	8.417			11/30/2012	12.58
Springer	S1144-66090	1144	2012	0.778	1.85			11/30/2012	2.38
Springer	S1144-66115	1144	2012	1.444	25.835			11/30/2012	17.89
Springer	S1144-66125	1144	2012	0.809	1.325			11/30/2012	1.64
Springer	s1012-34048	1012	2012	5.25	65.421			12/2/2012	12.46
Springer	s1012-34053	1012	2012	11.688	37.669			12/2/2012	3.22
Springer	s1012-34058	1012	2012	8.156	33.752			12/2/2012	4.14
Springer	S1012-34101	1012	2012	5.594	27.502			12/2/2012	4.92
Springer	S1012-34105	1012	2012	14.781	27.085			12/2/2012	1.83
Springer	S1012-34120	1012	2012	3.906	15.501			12/2/2012	3.97
Springer	S1012-34123	1012	2012	0.969	92.506			12/2/2012	95.47
Springer	S1012-34126	1012	2012	2.909	18.501			12/2/2012	6.36
Springer	S1012-34128	1012	2012	6.656	13.001			12/2/2012	1.95
Springer	S1012-34130	1012	2012	41.25	23.918			12/2/2012	0.58
Springer	S1012-34134	1012	2012	12.469	60.504			12/2/2012	4.85
Springer	S1012-34141	1012	2012	5.625	23.502			12/2/2012	4.18
Springer	S1012-34155	1012	2012	5.125	17.168			12/2/2012	3.35
Springer	S1012-34159	1012	2012	4.969	16.584			12/2/2012	3.34
Springer	S1012-34163	1012	2012	1.688	53.504			12/2/2012	31.70
Springer	S1012-34165	1012	2012	4.75	19.751			12/2/2012	4.16
Springer	S1012-34167	1012	2012	41.875	33.169			12/2/2012	0.79
Springer	S1012-34171	1012	2012	8.594	35.502			12/2/2012	4.13
Springer	S1012-35036	1012	2012	2.497	44.67			12/6/2012	17.89
Springer	S1012-35253	1012	2012	2.791	12.918			12/6/2012	4.63
Springer	S1012-37093	1012	2012	18.438	34.586			12/9/2012	1.88
Springer	S1012-37095	1012	2012	14.219	24.835			12/9/2012	1.75
Springer	S1012-37120	1012	2012	32.812	46.503			12/9/2012	1.42
Springer	S1012-37131	1012	2012	23.688	45.586			12/9/2012	1.92
Springer	S1012-37141	1012	2012	46.25	41.086			12/9/2012	0.89
Springer	S1156-45107	1156	2012	1.038	10.251			12/9/2012	9.88
Springer	S1156-45118	1156	2012	1.284	3.559			12/9/2012	2.77
Springer	S1156-45122	1156	2012	0.959	23.002			12/9/2012	23.99
Springer	S1156-45126	1156	2012	1.247	32.169			12/9/2012	25.80
Springer	S1012-36021	1012	2012	2.497	26.002			12/12/2012	10.41
Springer	S1012-36042	1012	2012	25.531	60.254			12/12/2012	2.36
Springer	S1012-36063	1012	2012	5.219	21.085			12/12/2012	4.04
Springer	S1012-36081	1012	2012	7.219	17.835			12/12/2012	2.47
Springer	S1012-36100	1012	2012	3.281	19.251			12/12/2012	5.87
Springer	S1012-39025	1012	2012	14.938	30.669			12/14/2012	2.05
Springer	S1012-39042	1012	2012	3.097	20.835			12/14/2012	6.73
Springer	S1012-39056	1012	2012	23.219	15.668			12/14/2012	0.67
Springer	S1012-39030	1012	2012	62.188	34.752			12/28/2012	0.56
Springer	S1012-40003	1012	2012	1.709	13.334			12/28/2012	7.80
Springer	S1012-40106	1012	2012	2.375	12.251			12/28/2012	5.16
Springer	S1012-40110	1012	2012	5.406	18.751			12/28/2012	3.47
Springer	S1012-40119	1012	2012	15.438	34.752			12/28/2012	2.25
Springer	S1012-40130	1012	2012	3.75	17.918			12/28/2012	4.78
Springer	S1012-40137	1012	2012	7.469	29.335			12/28/2012	3.93
Springer	S1012-40140	1012	2012	55	24.835			12/28/2012	0.45
Springer	S1012-40142	1012	2012	29.469	50.92			12/28/2012	1.73
Springer	S1012-40147	1012	2012	6.719	23.918			12/28/2012	3.56
Springer	S1012-40156	1012	2012	3.906	16.668			12/28/2012	4.27
Springer	S1012-40162	1012	2012	16.031	25.752			12/28/2012	1.61
Springer	S1012-41102	1012	2012	3.5	17.585			12/28/2012	5.02
Springer	S1012-41114	1012	2012	1.15	30.335			12/28/2012	26.38
Springer	S1012-41126	1012	2012	2.131	34.919			12/28/2012	16.39
Springer	S1012-41135	1012	2012	3.219	24.002			12/28/2012	7.46
Springer	S1012-41139	1012	2012	1.341	32.169			12/28/2012	23.99
Springer	S1012-41144	1012	2012	2.516	23.585			12/28/2012	9.37
Springer	S1144-67164	1144	2012	0.853	3.184			12/28/2012	3.73
Springer	S1144-67518	1144	2012	0.709	2.183			12/28/2012	3.08
Springer	S1144-67534	1144	2012	0.812	1.008			12/28/2012	1.24
Springer	S1144-67544	1144	2012	0.806	23.252			12/28/2012	28.85
Springer	S1144-67573	1144	2012	2.397	29.585			12/28/2012	12.34
Springer	S1144-67577	1144	2012	0.859	9.667			12/28/2012	11.25
Springer	S1144-67603	1144	2012	1.453	20.918			12/28/2012	14.40
Springer	S1144-67608	1144	2012	1.009	9.751			12/28/2012	9.66
Springer	S1012-38031	1012	2012	14.312	31.419			12/29/2012	2.20
Springer	S1012-38034	1012	2012	4.781	44.42			12/29/2012	9.29
Springer	S1012-38044	1012	2012	7	65.504			12/29/2012	9.36
Springer	S1012-38063	1012	2012	18.906	48.587			12/29/2012	2.57
Springer	S1012-38064	1012	2012	8.062	36.752			12/29/2012	4.56
Springer	S1012-38078	1012	2012	5.906	48.337			12/29/2012	8.18
Springer	S1012-38085	1012	2012	58.438	32.669			12/29/2012	0.56
Springer	S1012-38094	1012	2012	49.688	35.586			12/29/2012	0.72
Springer	S1012-38099	1012	2012	4.875	59.254			12/29/2012	12.15
Springer	S1012-38105	1012	2012	6.188	28.419			12/29/2012	4.59
Springer	S1012-38112	1012	2012	8.125	55.004			12/29/2012	6.77
Springer	S1012-38125	1012	2012	6.469	36.919			12/29/2012	5.71
Springer	S1012-38127	1012	2012	8.438	47.753			12/29/2012	5.66
Springer	S1012-38133	1012	2012	4	38.336			12/29/2012	9.58
Springer	S1012-38139	1012	2012	5.219	43.753			12/29/2012	8.38
Springer	S1012-38167	1012	2012	9.5	32.169			12/29/2012	3.39
Springer	S1000-11152	1000	2012	1.391	16.001			12/30/2012	11.50
Springer	S1000-11168	1000	2012	1.938	68.921			12/30/2012	35.56
Springer	S1012-43003	1012	2012	7.031	25.668			12/31/2012	3.65
Springer	S1012-43021	1012	2012	5	9.834			12/31/2012	1.97
Springer	S1012-38090	1012	2013	21.625	35.002			1/1/2013	1.62
Springer	S1012-38096	1012	2013	39.688	29.752			1/1/2013	0.75
Springer	S1012-38119	1012	2013	6.031	61.837			1/1/2013	10.25
Springer	S1012-38121	1012	2013	25.344	56.087			1/1/2013	2.21
Springer	S1012-38149	1012	2013	5.688	47.587			1/1/2013	8.37
Springer	S1012-38151	1012	2013	4.406	36.336			1/1/2013	8.25
Springer	S1012-38153	1012	2013	15.844	39.669			1/1/2013	2.50
Springer	S1012-38173	1012	2013	4.156	38.836			1/1/2013	9.34
Springer	S1012-38175	1012	2013	12.188	36.919			1/1/2013	3.03
Springer	S1012-38176	1012	2013	31.25	41.003			1/1/2013	1.31
Springer	S1012-38183	1012	2013	18.219	49.087			1/1/2013	2.69
Springer	S1012-38184	1012	2013	11.094	41.086			1/1/2013	3.70
Springer	S1144-68510	1144	2013	0.506	1.183			1/3/2013	2.34
Springer	S1144-68517	1144	2013	0.891	1.3			1/3/2013	1.46
Springer	S1144-68526	1144	2013	0.775	0.812			1/3/2013	1.05
Springer	S1144-68529	1144	2013	0.516	13.251			1/3/2013	25.68
Springer	S1144-68532	1144	2013	0.65	12.918			1/3/2013	19.87
Springer	S1144-68550	1144	2013	0.934	1			1/3/2013	1.07
Springer	S1144-68574	1144	2013	1.381	1.758			1/3/2013	1.27
Springer	S1144-68579	1144	2013	0.55	2.475			1/3/2013	4.50
Springer	S1012-42021	1012	2013	9.438	27.252			1/7/2013	2.89
Springer	S1012-42029	1012	2013	7.75	31.835			1/7/2013	4.11
Springer	S1012-42037	1012	2013	9.906	17.168			1/7/2013	1.73
Springer	S1012-42041	1012	2013	11.906	13.584			1/7/2013	1.14
Springer	S1012-42046	1012	2013	11.062	16.584			1/7/2013	1.50
Springer	S1012-42051	1012	2013	3.188	37.753			1/7/2013	11.84
Springer	S1012-42056	1012	2013	8.562	10.667			1/7/2013	1.25
Springer	S1012-42061	1012	2013	8.875	10.084			1/7/2013	1.14
Springer	S1012-42066	1012	2013	10.844	32.752			1/7/2013	3.02
Springer	S1012-42102	1012	2013	6.25	24.002			1/7/2013	3.84

Springer	S1012-42106	1012	2013	6.469	37.502			1/7/2013	5.80
Springer	S1012-42109	1012	2013	9.188	19.918			1/7/2013	2.17
Springer	S1012-42113	1012	2013	8.281	20.168			1/7/2013	2.44
Springer	S1012-42117	1012	2013	7.969	17.251			1/7/2013	2.16
Springer	S1012-42138	1012	2013	4.344	34.419			1/7/2013	7.92
Springer	S1012-42141	1012	2013	7.594	33.836			1/7/2013	4.46
Springer	S1012-42144	1012	2013	6.719	33.086			1/7/2013	4.92
Springer	S1012-42147	1012	2013	5.438	36.586			1/7/2013	6.73
Springer	S1012-42150	1012	2013	5.75	34.502			1/7/2013	6.00
Springer	S1012-42153	1012	2013	23.281	45.67			1/7/2013	1.96
Springer	S1012-42155	1012	2013	11.875	28.252			1/7/2013	2.38
Springer	S1000-12101	1000	2013	1.116	5.084			1/11/2013	4.56
Springer	S1000-12105	1000	2013	1.234	2.042			1/11/2013	1.65
Springer	S1000-12101	1000	2013	1.116	5.084			1/11/2013	4.56
Springer	S1000-12105	1000	2013	1.234	2.042			1/11/2013	1.65
Springer	S1000-12198	1000	2013	3.719	24.418			1/14/2013	6.57
Springer	S1012-44106	1012	2013	37.812	30.169			1/14/2013	0.80
Springer	S1012-44110	1012	2013	53.438	30.252			1/14/2013	0.57
Springer	S1012-44112	1012	2013	44.062	38.586			1/14/2013	0.88
Springer	S1012-44114	1012	2013	9.812	17.751			1/14/2013	1.81
Springer	S1012-44123	1012	2013	35	39.503			1/14/2013	1.13
Springer	S1012-44127	1012	2013	14.375	32.169			1/14/2013	2.24
Springer	S1012-44129	1012	2013	27.875	25.668			1/14/2013	0.92
Springer	S1012-44136	1012	2013	21.812	36.836			1/14/2013	1.69
Springer	S1012-44138	1012	2013	26.656	37.502			1/14/2013	1.41
Springer	S1012-44140	1012	2013	8.906	28.169			1/14/2013	3.16
Springer	S1012-44142	1012	2013	10.719	25.335			1/14/2013	2.36
Springer	S1012-44146	1012	2013	16.438	33.252			1/14/2013	2.02
Springer	S1012-44149	1012	2013	20.5	37.336			1/14/2013	1.82
Springer	S1012-44152	1012	2013	15.562	31.252			1/14/2013	2.01
Springer	S1132-69009	1132	2013	0.228	23.168			1/14/2013	101.61
Springer	S1132-69012	1132	2013	1.072	35.586			1/14/2013	33.20
Springer	S1132-69030	1132	2013	15.594	18.418			1/14/2013	1.18
Springer	S1132-69033	1132	2013	0.5	8.417			1/14/2013	16.83
Springer	S1132-69037	1132	2013	0.975	6.9			1/14/2013	7.08
Springer	S1012-44006	1012	2013	12.156	14.834			1/15/2013	1.22
Springer	S1012-44044	1012	2013	48.438	28.919			1/15/2013	0.60
Springer	S1012-44056	1012	2013	20.281	32.836			1/15/2013	1.62
Springer	S1012-44062	1012	2013	45.312	35.419			1/15/2013	0.78
Springer	S1012-44066	1012	2013	17.812	17.751			1/15/2013	1.00
Springer	S1000-12158	1000	2013	2.109	24.085			1/16/2013	11.42
Springer	S1000-13150	1000	2013	4.094	44.67			1/19/2013	10.91
Springer	S1000-13162	1000	2013	4.5	21.168			1/19/2013	4.70
Springer	S1000-15024	1000	2013	1.838	10.084			1/21/2013	5.49
Springer	S1000-15029	1000	2013	1.138	10.001			1/21/2013	8.79
Springer	S1000-15037	1000	2013	1.278	8.667			1/21/2013	6.78
Springer	S1000-15067	1000	2013	1.706	10.084			1/21/2013	5.91
Springer	S1000-15105	1000	2013	2.988	19.501			1/21/2013	6.53
Springer	S1132-69062	1132	2013	0.734	5.425			1/21/2013	7.39
Springer	S1132-69065	1132	2013	0.541	3.75			1/21/2013	6.93
Springer	S1132-69082	1132	2013	1.172	16.668			1/21/2013	14.22
Springer	S1132-69094	1132	2013	1.088	7.626			1/21/2013	7.01
Springer	S1132-69109	1132	2013	0.659	6.642			1/21/2013	10.08
Springer	S1000-14124	1000	2013	0.662	15.334			1/25/2013	23.16
Springer	S1000-14135	1000	2013	2.766	21.501			1/25/2013	7.77
Springer	S1000-14241	1000	2013	1.85	25.668			1/25/2013	13.87
Springer	S1000-14086	1000	2013	1.403	9.334			1/26/2013	6.65
Springer	S1132-70004	1132	2013	0.853	55.754			2/2/2013	65.36
Springer	S1132-70008	1132	2013	0.519	6.675			2/2/2013	12.86
Springer	S1132-70011	1132	2013	0.666	0.917			2/2/2013	1.38
Springer	S1132-70028	1132	2013	1.144	1.425			2/2/2013	1.25
Springer	S1132-70032	1132	2013	1.003	1.9			2/2/2013	1.89
Springer	S1132-70092	1132	2013	0.712	4.375			2/2/2013	6.14
Springer	S1132-70096	1132	2013	1.612	28.335			2/2/2013	17.58
Springer	S1132-70108	1132	2013	1.194	13.084			2/2/2013	10.96
Springer	S1132-70148	1132	2013	1.775	45.253			2/2/2013	25.49
Springer	S1000-16015	1000	2013	1.691	10.501			2/3/2013	6.21
Springer	S1000-16038	1000	2013	6.156	28.585			2/3/2013	4.64
Springer	S1000-16065	1000	2013	4.25	22.501			2/3/2013	5.29
Springer	S1000-16090	1000	2013	1.478	22.501			2/3/2013	15.22
Springer	S1000-16145	1000	2013	0.966	55.004			2/3/2013	56.94
Springer	S1000-14178	1000	2013	1.941	51.42			2/7/2013	26.49
Springer	S1000-14299	1000	2013	0.756	29.585			2/7/2013	39.13
Springer	S1132-73101	1132	2013	0.838	0.967			2/16/2013	1.15
Springer	S1132-73106	1132	2013	0.584	2.642			2/16/2013	4.52
Springer	S1132-73111	1132	2013	0.619	6.034			2/16/2013	9.75
Springer	S1132-73118	1132	2013	0.469	11.501			2/16/2013	24.52
Springer	S1132-73155	1132	2013	0.092	7.442			2/16/2013	80.89
Springer	S1132-73162	1132	2013	0.791	19.918			2/16/2013	25.18
Springer	S1132-73182	1132	2013	0.969	6.784			2/16/2013	7.00
Springer	S1000-21035	1000	2013	6.844	34.919			2/19/2013	5.10
Springer	S1000-21105	1000	2013	1.238	34.836			2/19/2013	28.14
Springer	S1000-21112	1000	2013	15.062	28.919			2/19/2013	1.92
Springer	S1132-71204	1132	2013	0.872	3.15			2/19/2013	3.61
Springer	S1132-71217	1132	2013	0.784	1.175			2/19/2013	1.50
Springer	S1132-71223	1132	2013	0.872	10.834			2/19/2013	12.42
Springer	S1132-71246	1132	2013	1.094	24.752			2/19/2013	22.63
Springer	S1132-71251	1132	2013	0.741	1.558			2/19/2013	2.10
Springer	S1132-71263	1132	2013	0.684	0.557			2/19/2013	0.81
Springer	S1132-74037	1132	2013	0.575	13.084			2/19/2013	22.75
Springer	S1132-74073	1132	2013	0.641	0.942			2/19/2013	1.47
Springer	S1132-74080	1132	2013	0.834	11.084			2/19/2013	13.29
Springer	S1132-74094	1132	2013	0.5	4.459			2/19/2013	8.92
Springer	S1132-74101	1132	2013	1.1	1.292			2/19/2013	1.17
Springer	S1132-74113	1132	2013	0.734	3.442			2/19/2013	4.69
Springer	S1132-74123	1132	2013	0.931	1.233			2/19/2013	1.32
Springer	S1132-74135	1132	2013	0.566	0.842			2/19/2013	1.49
Springer	S1000-19190	1000	2013	10.469	20.418			2/21/2013	1.95
Springer	S1000-19250	1000	2013	6.531	20.251			2/21/2013	3.10
Springer	S1000-19256	1000	2013	4.625	22.335			2/21/2013	4.83
Springer	S1000-19295	1000	2013	4.438	24.502			2/21/2013	5.52
Springer	S1000-19311	1000	2013	7.062	23.252			2/21/2013	3.29
Springer	S1000-19338	1000	2013	9	23.085			2/21/2013	2.57
Springer	S1000-19342	1000	2013	5.719	15.084			2/21/2013	2.64
Springer	S1132-76041	1132	2013	0.666	38.419			2/25/2013	57.69
Springer	S1132-76065	1132	2013	1.281	19.751			2/25/2013	15.42
Springer	S1000-22009	1000	2013	1.916	56.087			2/26/2013	29.27
Springer	S1000-22030	1000	2013	4.406	16.668			2/26/2013	3.78
Springer	S1000-22054	1000	2013	2.95	15.834			2/26/2013	5.37
Springer	S1000-22072	1000	2013	6.312	28.252			2/26/2013	4.48
Springer	S1000-22093	1000	2013	24.906	20.668			2/26/2013	0.83
Springer	S1132-75018	1132	2013	3.219	18.251			2/28/2013	5.67
Springer	S1132-75051	1132	2013	0.481	14.334			2/28/2013	29.80
Springer	S1132-75066	1132	2013	0.6	4.959			2/28/2013	8.27
Springer	S1132-75089	1132	2013	1.141	3.417			2/28/2013	2.99
Springer	S1132-75121	1132	2013	0.419	3.342			2/28/2013	7.98
Springer	S1132-75133	1132	2013	0.978	40.586			2/28/2013	41.50
Springer	S1132-75167	1132	2013	1.016	9.917			2/28/2013	9.76
Springer	S1000-19346	1000	2013	12.781	22.168			3/2/2013	1.73
Springer	S1000-23008	1000	2013	12.312	42.586			3/4/2013	3.46
Springer	S1000-23022	1000	2013	3.406	22.501			3/4/2013	6.61
Springer	S1000-23038	1000	2013	3.625	24.252			3/4/2013	6.69
Springer	S1000-23056	1000	2013	2.697	32.169			3/4/2013	11.93
Springer	S1000-23074	1000	2013	9.938	35.919			3/4/2013	3.61
Springer	s1120-81026	1120	2013	1.069	16.501			3/6/2013	15.44
Springer	s1120-81056	1120	2013	0.916	13.834			3/6/2013	15.10
Springer	s1120-81086	1120	2013	0.953	5.167			3/6/2013	5.42
Springer	s1120-80010	1120	2013	0.781	13.834			3/9/2013	17.71
Springer	s1120-80030	1120	2013	0.853	18.918			3/9/2013	22.18
Springer	s1120-80037	1120	2013	0.778	17.334			3/9/2013	22.28
Springer	s1120-80070	1120	2013	0.447	18.418			3/9/2013	41.20
Springer	s1120-80082	1120	2013	0.647	3.292			3/9/2013	5.09
Springer	s1120-80092	1120	2013	0.459	6.617			3/9/2013	14.42
Springer	s1120-80099	1120	2013	0.912	13.251			3/9/2013	14.53
Springer	s1120-80124	1120	2013	0.894	2.308			3/9/2013	2.58
Springer	s1120-80129	1120	2013	0.678	11.917			3/9/2013	17.58
Springer	s1120-80155	1120	2013	0.666	4.917			3/9/2013	7.38
Springer	s1120-80162	1120	2013	0.491	8.151			3/9/2013	16.60
Springer	s1120-80189	1120	2013	0.819	5.575			3/9/2013	6.81
Springer	S1000-24014	1000	2013	8.625	19.835			3/10/2013	2.30
Springer	S1000-24016	1000	2013	7.062	23.502			3/10/2013	3.33
Springer	S1000-24018	1000	2013	25.094	42.836			3/10/2013	1.71
Springer	S1000-24020	1000	2013	13.219	28.335			3/10/2013	2.14
Springer	S1000-24022	1000	2013	9.094	18.835			3/10/2013	2.07
Springer	S1000-24039	1000	2013	8.719	19.501			3/10/2013	2.24
Springer	S1000-24041	1000	2013	11.344	26.502			3/10/2013	2.34
Springer	S1000-24043	1000	2013	6.25	19.001			3/10/2013	3.04
Springer	S1000-24045	1000	2013	10.656	29.335			3/10/2013	2.75
Springer	S1000-24047	1000	2013	15.688	24.085			3/10/2013	1.54
Springer	S1000-24060	1000	2013	1.456	22.752			3/10/2013	15.63
Springer	S1000-24062	1000	2013	1.75	16.751			3/10/2013	9.57
Springer	S1000-24064	1000	2013	4.062	18.251			3/10/2013	4.49
Springer	S1000-24066	1000	2013	13.594	17.001			3/10/2013	1.25
Springer	S1000-24077	1000	2013	4.125	18.335			3/10/2013	4.44
Springer	S1000-24079	1000	2013	4.906	17.084			3/10/2013	3.48
Springer	S1000-24081	1000	2013	20.875	29.502			3/10/2013	1.41
Springer	S1000-24086	1000	2013	6.844	40.253			3/10/2013	5.88
Springer	S1000-24092	1000	2013	2.231	25.585			3/10/2013	11.47
Springer	S1000-24105	1000	2013	19	17.418			3/10/2013	0.92
Springer	S1000-24107	1000	2013	6.844	12.334			3/10/2013	1.80
Springer	S1000-24109	1000	2013	13.969	26.335			3/10/2013	1.89
Springer	S1000-24111	1000	2013	12.812	13.751			3/10/2013	1.07
Springer	s1132-77198	1132	2013	1.238	3.584			3/10/2013	2.89
Springer	s1132-77255	1132	2013	1.444	10.667			3/10/2013	7.39
Springer	S1120-81320	1120	2013	1.331	39.836			3/11/2013	29.93
Springer	S1120-81339	1120	2013	1.009	3.509			3/11/2013	3.48
Springer	S1120-81370	1120	2013	0.888	1.808			3/11/2013	2.04
Springer	S1120-82011	1120	2013	0.469	7.826			3/14/2013	16.69
Springer	S1120-82043	1120	2013	0.55	0.782			3/14/2013	1.42
Springer	S1120-82057	1120	2013	0.947	0.992			3/14/2013	1.05
Springer	S1120-82061	1120	2013	1.144	26.502			3/14/2013	23.17
Springer	S1120-82116	1120	2013	0.319	5.175			3/14/2013	16.22
Springer	S1120-82126	1120	2013	0.688	22.418			3/14/2013	32.58
Springer	S1120-82141	1120	2013	1.634	2.242			3/14/2013	1.37
Springer	S1000-24131	1000	2013	10.938	24.502			3/17/2013	2.24
Springer	S1000-24133	1000	2013	21.375	20.251			3/17/2013	0.95
Springer	S1000-24135	1000	2013	8.969	7.375			3/17/2013	0.82
Springer	S1000-24157	1000	2013	32.188	13.251			3/17/2013	0.41
Springer	S1000-24159	1000	2013	11.125	11.917			3/17/2013	1.07
Springer	S1000-24161	1000	2013	23.406	21.335			3/17/2013	0.91

Springer	S1000-24173	1000	2013	6.688	28.169			3/17/2013	4.21
Springer	S1000-24186	1000	2013	38.125	27.002			3/17/2013	0.71
Springer	S1000-24188	1000	2013	7.312	25.418			3/17/2013	3.48
Springer	S1000-24214	1000	2013	23.844	18.251			3/17/2013	0.77
Springer	S1000-24216	1000	2013	24.188	33.586			3/17/2013	1.39
Springer	S1120-82107	1120	2013	0.709	12.417			3/17/2013	17.51
Springer	S1150-1140	1150	2013	1.538	9.334			3/22/2013	6.07
Springer	S1150-1150	1150	2013	2.025	69.671			3/22/2013	34.41
Springer	S1150-1161	1150	2013	8.719	67.921			3/22/2013	7.79
Springer	S1150-1185	1150	2013	0.875	36.502			3/22/2013	41.72
Springer	S1132-78008	1132	2013	0.853	1.325			3/23/2013	1.55
Springer	S1132-78013	1132	2013	0.744	1.142			3/23/2013	1.53
Springer	S1132-78077	1132	2013	1.469	30.419			3/23/2013	20.71
Springer	S1132-78083	1132	2013	0.806	1.267			3/23/2013	1.57
Springer	S1132-78087	1132	2013	0.512	7.017			3/23/2013	13.71
Springer	S1132-78091	1132	2013	0.734	2.292			3/23/2013	3.12
Springer	S1132-78095	1132	2013	1.041	22.168			3/23/2013	21.29
Springer	S1132-78128	1132	2013	0.853	1.333			3/23/2013	1.56
Springer	S1132-78133	1132	2013	1.372	25.585			3/23/2013	18.65
Springer	S1132-78192	1132	2013	0.509	1.117			3/23/2013	2.19
Springer	S1132-78196	1132	2013	0.531	1.25			3/23/2013	2.35
Springer	S1132-78209	1132	2013	0.856	18.918			3/23/2013	22.10
Springer	S1132-78213	1132	2013	0.962	1.558			3/23/2013	1.62
Springer	S1000-26171	1000	2013	10.031	29.835			3/25/2013	2.97
Springer	S1000-26195	1000	2013	3.594	74.005			3/27/2013	20.59
Springer	S1000-26200	1000	2013	2.194	57.921			3/27/2013	26.40
Springer	S1000-26202	1000	2013	4.25	30.085			3/27/2013	7.08
Springer	S1000-26204	1000	2013	9.562	10.417			3/27/2013	1.09
Springer	S1000-26219	1000	2013	2.4	42.336			3/27/2013	17.64
Springer	S1000-26224	1000	2013	1.444	42.503			3/27/2013	29.43
Springer	S1000-26226	1000	2013	1.722	43.836			3/27/2013	25.46
Springer	S1000-26243	1000	2013	2.441	105.007			3/27/2013	43.02
Springer	S1000-26248	1000	2013	0.984	41.919			3/27/2013	42.60
Springer	S1000-26250	1000	2013	1.431	41.669			3/27/2013	29.12
Springer	S1000-26252	1000	2013	24.812	24.418			3/27/2013	0.98
Springer	S1000-26255	1000	2013	9.812	19.668			3/27/2013	2.00
Springer	S1000-26259	1000	2013	6.281	24.918			3/27/2013	3.97
Springer	S1150-2129	1150	2013	1.291	40.669			3/27/2013	31.50
Springer	S1150-2136	1150	2013	7.344	27.585			3/27/2013	3.76
Springer	S1150-2142	1150	2013	3.594	32.419			3/27/2013	9.02
Springer	S1150-2192	1150	2013	4.281	58.087			3/27/2013	13.57
Springer	S1150-2205	1150	2013	5.688	48.503			3/27/2013	8.53
Springer	S1000-25003	1000	2013	1.944	20.835			3/30/2013	10.72
Springer	S1000-25005	1000	2013	19.281	23.752			3/30/2013	1.23
Springer	S1000-25017	1000	2013	3.5	26.335			3/30/2013	7.52
Springer	S1000-25023	1000	2013	3.812	32.335			3/30/2013	8.48
Springer	S1000-25031	1000	2013	5.562	39.503			3/30/2013	7.10
Springer	S1000-25033	1000	2013	2.903	23.502			3/30/2013	8.10
Springer	S1000-25048	1000	2013	4.281	32.169			3/30/2013	7.51
Springer	S1000-25100	1000	2013	8.188	21.501			3/30/2013	2.63
Springer	S1000-25102	1000	2013	5.281	21.335			3/30/2013	4.04
Springer	S1000-25104	1000	2013	4.688	22.501			3/30/2013	4.80
Springer	S1000-25111	1000	2013	1.6	28.252			3/30/2013	17.66
Springer	S1150-1231	1150	2013	2.956	175.012			4/3/2013	59.21
Springer	S1000-27017	1000	2013	27.844	42.253			4/5/2013	1.52
Springer	S1000-27023	1000	2013	59.375	42.753			4/5/2013	0.72
Springer	S1000-27026	1000	2013	39.062	46.17			4/5/2013	1.18
Springer	S1000-27036	1000	2013	50.312	43.836			4/5/2013	0.87
Springer	S1000-27038	1000	2013	10.875	49.92			4/5/2013	4.59
Springer	S1000-27042	1000	2013	5.312	37.919			4/5/2013	7.14
Springer	S1000-27043	1000	2013	12.688	55.754			4/5/2013	4.39
Springer	S1000-27053	1000	2013	21.156	40.753			4/5/2013	1.93
Springer	S1000-27057	1000	2013	4.531	44.753			4/5/2013	9.88
Springer	S1000-27065	1000	2013	45.938	28.752			4/5/2013	0.63
Springer	S1000-27070	1000	2013	17.094	32.002			4/5/2013	1.87
Springer	S1000-27073	1000	2013	10.344	42.67			4/5/2013	4.13
Springer	S1000-27078	1000	2013	24.062	24.002			4/5/2013	1.00
Springer	S1000-27083	1000	2013	19.031	38.419			4/5/2013	2.02
Springer	S1000-27085	1000	2013	12.531	43.003			4/5/2013	3.43
Springer	S1000-27090	1000	2013	27.125	39.836			4/5/2013	1.47
Springer	S1000-27097	1000	2013	8.531	33.586			4/5/2013	3.94
Springer	S1000-27104	1000	2013	10.469	42.169			4/5/2013	4.03
Springer	S1000-27110	1000	2013	7.469	31.502			4/5/2013	4.22
Springer	S1000-27112	1000	2013	7.5	44.086			4/5/2013	5.88
Springer	S1000-27118	1000	2013	8.75	52.67			4/5/2013	6.02
Springer	S1000-27123	1000	2013	11.688	15.668			4/5/2013	1.34
Springer	S1000-27125	1000	2013	13.188	27.919			4/5/2013	2.12
Springer	S1000-27131	1000	2013	1.647	73.088			4/5/2013	44.38
Springer	S1000-27135	1000	2013	13.688	45.836			4/5/2013	3.35
Springer	S1000-27137	1000	2013	29.688	25.002			4/5/2013	0.84
Springer	S1000-27143	1000	2013	8.281	41.086			4/5/2013	4.96
Springer	S1000-27146	1000	2013	7.188	39.503			4/5/2013	5.50
Springer	S1120-82124	1120	2013	5.062	90.006			4/6/2013	17.78
Springer	S1120-83190	1120	2013	0.588	8.176			4/6/2013	13.90
Springer	S1120-83196	1120	2013	0.631	7.484			4/6/2013	11.86
Springer	S1120-83304	1120	2013	0.478	19.668			4/6/2013	41.15
Springer	S1120-83310	1120	2013	0.512	28.252			4/6/2013	55.18
Springer	S1120-83329	1120	2013	0.709	1.425			4/6/2013	2.01
Springer	S1120-83338	1120	2013	0.453	2.183			4/6/2013	4.82
Springer	S1120-83359	1120	2013	0.29	4.842			4/6/2013	16.70
Springer	S1000-30006	1000	2013	30.438	49.503			4/13/2013	1.63
Springer	S1000-30008	1000	2013	46.875	34.669			4/13/2013	0.74
Springer	S1000-30024	1000	2013	14.812	23.418			4/13/2013	1.58
Springer	S1000-30047	1000	2013	58.438	21.168			4/13/2013	0.36
Springer	S1000-30049	1000	2013	20.906	15.168			4/13/2013	0.73
Springer	S1140-1212	1140	2013	1.312	16.334			4/20/2013	12.45
Springer	S1140-1222	1140	2013	2.378	101.673			4/20/2013	42.76
Springer	S1140-1305	1140	2013	3.091	12.751			4/20/2013	4.13
Springer	S1140-1324	1140	2013	3.531	27.752			4/20/2013	7.86
Springer	C1108-1019	1108	2013	0.981	21.751			5/12/2013	22.17
Springer	C1108-1037	1108	2013	1.697	27.669			5/12/2013	16.30
Springer	C1108-1041	1108	2013	2.7	14.084			5/12/2013	5.22
Springer	C1108-1067	1108	2013	1.153	21.585			5/12/2013	18.72
Springer	C1108-1088	1108	2013	1.441	57.921			5/12/2013	40.20
Springer	C1108-1105	1108	2013	1.5	30.752			5/12/2013	20.50
Springer	C1108-1109	1108	2013	1.562	28.669			5/12/2013	18.35
Springer	C1108-1120	1108	2013	0.547	36.669			5/12/2013	67.04
Springer	C1108-1143	1108	2013	0.744	37.669			5/12/2013	50.63
Springer	S1108-88010	1108	2013	1.338	36.919			5/12/2013	27.59
Springer	S1108-88041	1108	2013	1.906	26.668			5/12/2013	13.99
Springer	S1108-88082	1108	2013	0.331	8.417			5/12/2013	25.43
Springer	S1130-1315	1130	2013	10.812	59.837			5/14/2013	5.53
Springer	S1130-1337	1130	2013	5.625	162.511			5/14/2013	28.89
Springer	S1130-1345	1130	2013	4.469	9.584			5/14/2013	2.14
Springer	S988-5027	988	2013	2.078	18.835			5/15/2013	9.06
Springer	S988-5030	988	2013	2.522	16.751			5/15/2013	6.64
Springer	S988-5058	988	2013	2.897	12.167			5/15/2013	4.20
Springer	S1130-1070	1130	2013	9.219	29.085			5/17/2013	3.15
Springer	S1130-1130	1130	2013	4.344	52.087			5/17/2013	11.99
Springer	S988-7010	988	2013	1.378	10.834			5/20/2013	7.86
Springer	S988-7045	988	2013	2.394	37.669			5/20/2013	15.73
Springer	S1120-85010	1120	2013	0.753	20.251			6/3/2013	26.89
Springer	S1120-85021	1120	2013	0.594	9.084			6/3/2013	15.29
Springer	S1120-85099	1120	2013	0.641	6.517			6/3/2013	10.17
Springer	S1120-85117	1120	2013	2.069	21.835			6/3/2013	10.55
Springer	S1120-85506	1120	2013	0.566	19.918			6/3/2013	35.19
Springer	S1120-85545	1120	2013	0.697	1.8			6/3/2013	2.58
Springer	S988-6180	988	2013	0.466	4.292			6/3/2013	9.21
Springer	S988-6374	988	2013	0.481	11.084			6/3/2013	23.04
Springer	S988-9014	988	2013	1.641	34.419			6/4/2013	20.97
Springer	S988-9089	988	2013	3.75	22.835			6/4/2013	6.09
Springer	S988-9131	988	2013	5.594	23.918			6/4/2013	4.28
Springer	S1000-31050	1000	2013	6.406	11.667			6/5/2013	1.82
Springer	S1000-31056	1000	2013	20.031	10.167			6/5/2013	0.51
Springer	S1000-31062	1000	2013	7.25	33.669			6/5/2013	4.64
Springer	S1000-31075	1000	2013	4.406	27.335			6/5/2013	6.20
Springer	S1000-31078	1000	2013	5.875	17.751			6/5/2013	3.02
Springer	S1130-2030	1130	2013	3.281	13.834			6/5/2013	4.22
Springer	S1130-2300	1130	2013	2.006	3.842			6/5/2013	1.92
Springer	S1130-2306	1130	2013	1.078	11.501			6/5/2013	10.67
Springer	S1130-2310	1130	2013	5.344	17.251			6/5/2013	3.23
Springer	S1130-2317	1130	2013	1.909	22.085			6/5/2013	11.57
Springer	S1130-2332	1130	2013	3.05	5.117			6/5/2013	1.68
Springer	S1130-2348	1130	2013	1.809	6.934			6/5/2013	3.83
Springer	S1130-2355	1130	2013	4.812	9.917			6/5/2013	2.06
Springer	S1000-31028	1000	2013	4.25	13.834			6/7/2013	3.26
Springer	S1000-31038	1000	2013	3	30.752			6/7/2013	10.25
Springer	S1120-86082	1120	2013	1.159	21.751			6/12/2013	18.77
Springer	S1120-86090	1120	2013	0.312	1.833			6/12/2013	5.88
Springer	S1120-86149	1120	2013	0.997	6.7			6/12/2013	6.72
Springer	S1120-86156	1120	2013	0.444	4.759			6/12/2013	10.72
Springer	S1120-86177	1120	2013	2.056	3.942			6/12/2013	1.92
Springer	S1120-86200	1120	2013	0.691	21.251			6/12/2013	30.75
Springer	S1120-86207	1120	2013	0.991	5.117			6/12/2013	5.16
Springer	S988-10050	988	2013	5.219	27.168			6/16/2013	5.21
Springer	S988-10105	988	2013	1.216	26.585			6/16/2013	21.86
Springer	S988-10131	988	2013	1.794	38.003			6/16/2013	21.18
Springer	S1000-28002	1000	2013	5.969	30.169			6/17/2013	5.05
Springer	S1000-28020	1000	2013	8.844	13.001			6/17/2013	1.47
Springer	S1000-28038	1000	2013	9.438	22.668			6/17/2013	2.40
Springer	S1000-28056	1000	2013	5.594	22.668			6/17/2013	4.05
Springer	S1000-28074	1000	2013	6.594	15.751			6/17/2013	2.39
Springer	S1000-28092	1000	2013	8.656	18.835			6/17/2013	2.18
Springer	S1120-87006	1120	2013	20.562	28.919			6/19/2013	1.41
Springer	S1120-87009	1120	2013	22.062	12.001			6/19/2013	0.54
Springer	S1120-87012	1120	2013	63.75	66.754			6/19/2013	1.05
Springer	S1120-87015	1120	2013	15.719	11.667			6/19/2013	0.74
Springer	S1120-87018	1120	2013	35.625	20.418			6/19/2013	0.57
Springer	S1120-87031	1120	2013	17.844	8.142			6/19/2013	0.46
Springer	S1120-87040	1120	2013	31.25	15.918			6/19/2013	0.51
Springer	S1120-87051	1120	2013	43.125	12.334			6/19/2013	0.29
Springer	S1120-87054	1120	2013	35	9.917			6/19/2013	0.28
Springer	S1120-87057	1120	2013	40.938	16.334			6/19/2013	0.40
Springer	S1120-87060	1120	2013	42.188	37.919			6/19/2013	0.90
Springer	S1120-87063	1120	2013	1.606	3.392			6/19/2013	2.11
Springer	S1120-87072	1120	2013	14.094	9.834			6/19/2013	0.70
Springer	S1120-87104	1120	2013	2.366	34.919			6/19/2013	14.76
Springer	S1120-87107	1120	2013	14.25	15.334			6/19/2013	1.08
Springer	S1120-87110	1120	2013	59.375	15.251			6/19/2013	0.26
Springer	S1120-87113	1120	2013	40.625	15.251			6/19/2013	0.38

Springer	S1120-87116	1120	2013	25.906	17.835			6/19/2013	0.69
Springer	S1120-87127	1120	2013	4.156	3.742			6/19/2013	0.90
Springer	S1120-87153	1120	2013	49.062	35.502			6/19/2013	0.72
Springer	S1120-87156	1120	2013	26.812	15.834			6/19/2013	0.59
Springer	S1120-87159	1120	2013	25.969	7.659			6/19/2013	0.29
Springer	S1120-87162	1120	2013	1.062	1.375			6/19/2013	1.29
Springer	S1120-87182	1120	2013	1.978	1.25			6/19/2013	0.63
Springer	S1120-87184	1120	2013	24.188	5.375			6/19/2013	0.22
Springer	S1120-87187	1120	2013	33.75	5.734			6/19/2013	0.17
Springer	S1120-87190	1120	2013	98.438	9.584			6/19/2013	0.10
Springer	S1120-87207	1120	2013	23.375	16.418			6/19/2013	0.70
Springer	S1120-87209	1120	2013	40.312	21.751			6/19/2013	0.54
Springer	S988-11203	988	2013	2.078	18.585			6/20/2013	8.94
Springer	S988-11208	988	2013	1.962	42.419			6/20/2013	21.62
Springer	S988-11321	988	2013	1.719	16.834			6/20/2013	9.79
Springer	S1000-28113	1000	2013	19.625	27.669			6/22/2013	1.41
Springer	S1000-28131	1000	2013	18.906	25.585			6/22/2013	1.35
Springer	S1000-28149	1000	2013	19.719	34.002			6/22/2013	1.72
Springer	S1000-28164	1000	2013	65	37.502			6/22/2013	0.58
Springer	S1000-28179	1000	2013	35	21.835			6/22/2013	0.62
Springer	S1120-88004	1120	2013	1.078	3			7/4/2013	2.78
Springer	S1120-88010	1120	2013	0.778	9.751			7/4/2013	12.53
Springer	S1120-88016	1120	2013	0.847	29.085			7/4/2013	34.34
Springer	S1120-88073	1120	2013	0.994	17.918			7/4/2013	18.03
Springer	S1120-88128	1120	2013	1.272	9.667			7/4/2013	7.60
Springer	S1120-88136	1120	2013	0.594	1.283			7/4/2013	2.16
Springer	S1120-88161	1120	2013	1.278	11.251			7/4/2013	8.80
Springer	S988-15201	988	2013	2.162	14.918			7/8/2013	6.90
Springer	S988-15211	988	2013	1.969	20.668			7/8/2013	10.50
Springer	S1000-33003	1000	2013	8.219	62.004			7/10/2013	7.54
Springer	S1000-33025	1000	2013	15.938	41.003			7/10/2013	2.57
Springer	S1000-33056	1000	2013	1.156	22.752			7/10/2013	19.68
Springer	S1000-33063	1000	2013	2.034	26.252			7/10/2013	12.91
Springer	S1000-33078	1000	2013	3.25	18.918			7/10/2013	5.82
Springer	S1000-33112	1000	2013	2.9	38.669			7/10/2013	13.33
Springer	S1000-33115	1000	2013	1.622	17.751			7/10/2013	10.94
Springer	S1000-33119	1000	2013	13.281	27.335			7/10/2013	2.06
Springer	S1000-33121	1000	2013	2.612	40.586			7/10/2013	15.54
Springer	S1000-33123	1000	2013	35.938	43.253			7/10/2013	1.20
Springer	S1000-33132	1000	2013	4.875	12.584			7/10/2013	2.58
Springer	S1000-33137	1000	2013	11.438	30.252			7/10/2013	2.64
Springer	S1000-33145	1000	2013	1.481	48.253			7/10/2013	32.58
Springer	S988-15106	988	2013	3.438	37.836			7/10/2013	11.01
Springer	S1120-89006	1120	2013	1.459	2.625			7/18/2013	1.80
Springer	S1120-89023	1120	2013	1.272	1.408			7/18/2013	1.11
Springer	S1120-89027	1120	2013	1.553	3.334			7/18/2013	2.15
Springer	S1120-89059	1120	2013	5.562	4.634			7/18/2013	0.83
Springer	S1120-89062	1120	2013	2.369	7.175			7/18/2013	3.03
Springer	S1120-89096	1120	2013	0.912	2.158			7/18/2013	2.37
Springer	S1120-89104	1120	2013	1.422	6.042			7/18/2013	4.25
Springer	S1120-89108	1120	2013	2.056	5.884			7/18/2013	2.86
Springer	S1120-89140	1120	2013	1.956	1.85			7/18/2013	0.95
Springer	S1120-89143	1120	2013	2.112	5.817			7/18/2013	2.75
Springer	S1120-90300	1120	2013	0.797	11.584			7/30/2013	14.53
Springer	S1120-90308	1120	2013	0.834	3.425			7/30/2013	4.11
Springer	S1120-90317	1120	2013	1.675	2.609			7/30/2013	1.56
Springer	S1120-90323	1120	2013	0.622	28.419			7/30/2013	45.69
Springer	S1120-90446	1120	2013	2.097	17.251			7/30/2013	8.23
Springer	S1120-90453	1120	2013	1.253	3.167			7/30/2013	2.53
Springer	S1120-90459	1120	2013	0.997	1.342			7/30/2013	1.35
Springer	S1120-90465	1120	2013	1.391	2.442			7/30/2013	1.76
Springer	S1120-90469	1120	2013	0.959	17.835			7/30/2013	18.60
Springer	S1132-80082	1132	2013	0.647	3.292			7/31/2013	5.09
Springer	S1108-89024	1108	2013	1.394	14.001			8/5/2013	10.04
Springer	S1108-89072	1108	2013	1.259	1.533			8/5/2013	1.22
Springer	S1108-89091	1108	2013	1.562	9.251			8/5/2013	5.92
Springer	S1108-89146	1108	2013	0.6	12.918			8/5/2013	21.53
Springer	S1120-91300	1120	2013	5.562	33.669			8/8/2013	6.05
Springer	S1120-91319	1120	2013	5.688	14.334			8/8/2013	2.52
Springer	S1120-91329	1120	2013	6.625	74.838			8/8/2013	11.30
Springer	S1120-91338	1120	2013	3.25	15.001			8/8/2013	4.62
Springer	S1120-91356	1120	2013	10.5	77.589			8/8/2013	7.39
Springer	S1120-91361	1120	2013	6.75	25.168			8/8/2013	3.73
Springer	S1120-91378	1120	2013	3.188	7.817			8/8/2013	2.45
Springer	S1120-91006	1120	2013	1.262	56.42			8/13/2013	44.71
Springer	S1120-91033	1120	2013	2.897	68.088			8/13/2013	23.50
Springer	S1120-91054	1120	2013	18.781	22.335			8/13/2013	1.19
Springer	S1120-91072	1120	2013	12.438	61.671			8/13/2013	4.96
Springer	S1144-69084	1144	2013	1.006	14.168	0.17	0.032	8/20/2013	14.08
Springer	S1144-69252	1144	2013	1.934	14.751	0.177	0.062	8/20/2013	7.63
Springer	S1144-69276	1144	2013	1.572	14.918	0.179	0.05	8/20/2013	9.49
Springer	S1144-69328	1144	2013	1.059	11.667	0.14	0.034	8/20/2013	11.02
Springer	S1144-69442	1144	2013	1.669	31.002	0.372	0.053	8/20/2013	18.58
Springer	S1144-69470	1144	2013	2.347	35.002	0.42	0.075	8/20/2013	14.91
Springer	S1144-69520	1144	2013	1.241	9.834	0.118	0.04	8/20/2013	7.92
Springer	S1144-69620	1144	2013	1.691	49.753	0.597	0.054	8/20/2013	29.42
Springer	S1144-69650	1144	2013	1.141	24.502	0.294	0.036	8/20/2013	21.47
Springer	S1120-92011	1120	2013	3.75	25.502			8/21/2013	6.80
Springer	S1120-92029	1120	2013	0.538	15.834			8/21/2013	29.43
Springer	S1120-92047	1120	2013	2.825	7			8/21/2013	2.48
Springer	S1120-92616	1120	2013	1.738	4.942			8/21/2013	2.84
Springer	S1120-92629	1120	2013	3.969	7.059			8/21/2013	1.78
Springer	S1120-92635	1120	2013	3.531	5.984			8/21/2013	1.69
Springer	S1108-90604	1108	2013	1.347	5.934			8/25/2013	4.41
Springer	S1108-90611	1108	2013	0.822	14.751			8/25/2013	17.95
Springer	S1108-90617	1108	2013	0.997	16.084			8/25/2013	16.13
Springer	S1108-90652	1108	2013	0.312	1.575			8/25/2013	5.05
Springer	S1108-90658	1108	2013	0.151	4.5			8/25/2013	29.80
Springer	S1108-90661	1108	2013	0.638	1.45			8/25/2013	2.27
Springer	S1108-90665	1108	2013	0.466	25.168			8/25/2013	54.01
Springer	S1108-90676	1108	2013	0.169	1.5			8/25/2013	8.88
Springer	S1108-90701	1108	2013	0.491	10.334			8/25/2013	21.05
Springer	S988-22046	988	2013	23.156	29.085			9/2/2013	1.26
Springer	S988-22601	988	2013	85.312	36.336			9/2/2013	0.43
Springer	S988-22607	988	2013	6.625	41.753			9/2/2013	6.30
Springer	S988-22617	988	2013	5.125	41.169			9/2/2013	8.03
Springer	S988-22674	988	2013	12.312	30.002			9/2/2013	2.44
Springer	S988-22679	988	2013	3.022	46.253			9/2/2013	15.31
Springer	S988-24606	988	2013	2.238	43.586			9/2/2013	19.48
Springer	S988-24616	988	2013	4.844	17.251			9/2/2013	3.56
Springer	S988-24627	988	2013	7.125	25.335			9/2/2013	3.56
Springer	S988-25600	988	2013	5.812	34.252			9/6/2013	5.89
Springer	S988-25604	988	2013	4.25	35.169			9/6/2013	8.28
Springer	S988-25606	988	2013	1.422	43.42			9/6/2013	30.53
Springer	S988-25608	988	2013	15.531	14.084			9/6/2013	0.91
Springer	S988-25616	988	2013	19.344	7.2			9/6/2013	0.37
Springer	S988-25637	988	2013	1.075	28.835			9/6/2013	26.82
Springer	S988-25640	988	2013	7.156	61.921			9/6/2013	8.65
Springer	S988-25671	988	2013	17.656	32.752			9/6/2013	1.86
Springer	S1144-69124	1144	2013	2.047	4.359	0.052	0.066	9/7/2013	2.13
Springer	S1144-69174	1144	2013	1.662	4.359	0.052	0.053	9/7/2013	2.62
Springer	S1144-69355	1144	2013	1.15	6.809	0.082	0.037	9/7/2013	5.92
Springer	S1144-69435	1144	2013	1.253	40.419	0.485	0.04	9/7/2013	32.26
Springer	S1144-69574	1144	2013	1.206	35.919	0.431	0.039	9/7/2013	29.78
Springer	S1144-69768	1144	2013	8.656	10.417	0.125	0.277	9/9/2013	1.20
Springer	S1144-69792	1144	2013	2.353	8.159	0.098	0.075	9/9/2013	3.47
Springer	S1144-69796	1144	2013	3.812	18.501	0.222	0.122	9/9/2013	4.85
Springer	S1144-69859	1144	2013	5.375	9.001	0.108	0.172	9/9/2013	1.67
Springer	S1144-69863	1144	2013	2.988	14.418	0.173	0.096	9/9/2013	4.83
Springer	S1144-69867	1144	2013	2.706	18.001	0.216	0.087	9/9/2013	6.65
Springer	S988-25000	988	2013	26.812	18.168			9/13/2013	0.68
Springer	S988-25034	988	2013	3.875	23.085			9/13/2013	5.96
Springer	S988-25049	988	2013	1.381	106.674			9/13/2013	77.24
Springer	S988-25302	988	2013	28.438	30.252			9/13/2013	1.06
Springer	S988-25305	988	2013	12.031	25.585			9/13/2013	2.13
Springer	S988-26051	988	2013	5.125	21.168			9/18/2013	4.13
Springer	S988-26063	988	2013	19.75	28.669			9/18/2013	1.45
Springer	S988-26206	988	2013	7.906	11.501			9/18/2013	1.45
Springer	S988-26226	988	2013	9.281	16.001			9/18/2013	1.72
Springer	S988-26605	988	2013	11.219	10.084			9/18/2013	0.90
Springer	S988-26608	988	2013	6.625	13.668			9/18/2013	2.06
Springer	S988-26611	988	2013	6.312	19.918			9/18/2013	3.16
Springer	S988-26624	988	2013	3.781	10.751			9/18/2013	2.84
Springer	S988-26629	988	2013	7.875	22.668			9/18/2013	2.88
Springer	S988-26648	988	2013	4.094	24.002			9/18/2013	5.86
Springer	S988-26652	988	2013	6.406	25.752			9/18/2013	4.02
Springer	S988-26655	988	2013	1.922	16.334			9/18/2013	8.50
Springer	S988-26657	988	2013	4.969	21.168			9/18/2013	4.26
Springer	S988-26638	988	2013	11.375	18.418			9/20/2013	1.62
Springer	S1132-81005	1132	2013	1.316	40.086			10/2/2013	30.46
Springer	S1132-81021	1132	2013	2.647	37.086			10/2/2013	14.01
Springer	S1132-81024	1132	2013	3.25	37.669			10/2/2013	11.59
Springer	S1132-81028	1132	2013	2.722	48.42			10/2/2013	17.79
Springer	S1132-81061	1132	2013	3.25	43.67			10/2/2013	13.44
Springer	S1132-81089	1132	2013	3.594	25.585			10/2/2013	7.12
Springer	S1132-81109	1132	2013	4.75	12.751			10/2/2013	2.68
Springer	S1132-81145	1132	2013	5.125	50.92			10/2/2013	9.94
Springer	S1132-81147	1132	2013	3.688	18.585			10/2/2013	5.04
Springer	S1132-81151	1132	2013	14.375	27.752			10/2/2013	1.93
Springer	S1132-81159	1132	2013	5.156	32.836			10/2/2013	6.37
Springer	S1132-81177	1132	2013	3	11.917			10/2/2013	3.97
Springer	S1132-81188	1132	2013	7.062	13.501			10/2/2013	1.91
Springer	S1132-81194	1132	2013	10.719	39.086			10/2/2013	3.65
Springer	S1132-81224	1132	2013	6.719	25.668			10/2/2013	3.82
Springer	s1132-82612	1132	2013	28.906	26.002	0.312	0.925	10/20/2013	0.90
Springer	s1132-82628	1132	2013	20.656	9.751	0.117	0.661	10/20/2013	0.47
Springer	s1132-82639	1132	2013	46.25	91.673	1.1	1.48	10/20/2013	1.98
Springer	s1132-82658	1132	2013	9.406	2.659	0.032	0.301	10/20/2013	0.28
Springer	s1132-82664	1132	2013	23.125	9.251	0.111	0.74	10/20/2013	0.40
Springer	s1132-82674	1132	2013	11.625	15.668	0.188	0.372	10/20/2013	1.35
Springer	s1132-82678	1132	2013	24.844	8.417	0.101	0.795	10/20/2013	0.34
Springer	s1132-82684	1132	2013	1.659	7.809	0.094	0.053	10/20/2013	4.71
Springer	s1132-82704	1132	2013	7.094	25.168	0.302	0.227	10/20/2013	3.55
Springer	s1132-82708	1132	2013	15.062	2.559	0.031	0.482	10/20/2013	0.17
Springer	s1132-82711	1132	2013	1.653	4.325	0.052	0.053	10/20/2013	2.62
Springer	S1108-91610	1108	2013	0.791	27.835	0.334	0.025	10/22/2013	35.19
Springer	S1108-91613	1108	2013	0.419	5.025	0.06	0.013	10/22/2013	11.99
Springer	S1108-91637	1108	2013	1.178	4.109	0.049	0.038	10/22/2013	3.49
Springer	S1108-91654	1108	2013	3.003	54.17	0.65	0.096	10/22/2013	18.04
Springer	S1108-91659	1108	2013	1.031	4.667	0.056	0.033	10/22/2013	4.53

Springer	S1108-91687	1108	2013	1.256	2.4			10/22/2013	1.91
Springer	S1108-91706	1108	2013	1.191	34.586			10/22/2013	29.04
Springer	S1108-91737	1108	2013	3.562	15.918	0.191	0.114	10/22/2013	4.47
Springer	S1108-91743	1108	2013	0.7	37.836	0.454	0.022	10/22/2013	54.05
Springer	S1108-91748	1108	2013	2.969	8.667			10/22/2013	2.92
Springer	S1132-83034	1132	2013	1.956	20.585	0.247	0.063	10/27/2013	10.52
Springer	S1132-83038	1132	2013	2.759	21.085	0.253	0.088	10/27/2013	7.64
Springer	S1132-83053	1132	2013	1.338	4.467	0.054	0.043	10/27/2013	3.34
Springer	S1132-83080	1132	2013	1.503	38.669	0.464	0.048	10/27/2013	25.73
Springer	S1132-83087	1132	2013	2.478	15.584	0.187	0.079	10/27/2013	6.29
Springer	S1132-83108	1132	2013	3.156	20.001	0.24	0.101	10/27/2013	6.34
Springer	S1132-83115	1132	2013	1.669	11.501	0.138	0.053	10/27/2013	6.89
Springer	S1132-83134	1132	2013	3.25	7.776	0.093	0.104	10/27/2013	2.39
Springer	S1132-83137	1132	2013	1.928	18.835	0.226	0.062	10/27/2013	9.77
Springer	S1132-83174	1132	2013	1.712	9.751	0.117	0.055	10/27/2013	5.70
Springer	S1108-92631	1108	2013	1.659	33.169	0.398	0.053	10/30/2013	19.99
Springer	S1108-92634	1108	2013	0.559	3.05	0.037	0.018	10/30/2013	5.46
Springer	S1108-92664	1108	2013	1.981	13.001	0.156	0.063	10/30/2013	6.56
Springer	S1120-93623	1120	2013	0.928	1.308	0.016	0.03	11/2/2013	1.41
Springer	S1120-93651	1120	2013	1.166	4.034	0.048	0.037	11/2/2013	3.46
Springer	S1120-93677	1120	2013	1.269	1.808	0.022	0.041	11/2/2013	1.42
Springer	S1120-93695	1120	2013	1.628	9.834	0.118	0.052	11/2/2013	6.04
Springer	S1120-94610	1120	2013	22.469	25.835	0.31	0.719	11/13/2013	1.15
Springer	S1120-94613	1120	2013	40.938	30.419	0.365	1.31	11/13/2013	0.74
Springer	S1120-94621	1120	2013	40.312	20.335	0.244	1.29	11/13/2013	0.50
Springer	S1120-94639	1120	2013	57.188	43.836	0.526	1.83	11/13/2013	0.77
Springer	S1120-94644	1120	2013	28.031	38.169	0.458	0.897	11/13/2013	1.36
Springer	S1120-94660	1120	2013	55.312	32.836	0.394	1.77	11/13/2013	0.59
Springer	s1108-95626	1108	2013	1.166	4.534	0.054	0.037	11/19/2013	3.89
Springer	s1108-95632	1108	2013	1.116	6.55	0.079	0.036	11/19/2013	5.87
Springer	s1108-95650	1108	2013	0.237	16.168	0.194	0.008	11/19/2013	68.22
Springer	S1120-95639	1120	2013	21.312	10.917	0.131	0.682	11/25/2013	0.51
Springer	S1120-95668	1120	2013	7.031	8.667	0.104	0.225	11/25/2013	1.23
Springer	S1120-95693	1120	2013	40.312	24.335	0.292	1.29	11/25/2013	0.60
Springer	S1120-95718	1120	2013	4.668	9.001	0.108	0.15	11/25/2013	1.93
Springer	S1108-97304	1108	2013	0.544	5.875	0.07	0.017	11/27/2013	10.80
Springer	S1108-97600	1108	2013	9.75	14.584	0.175	0.312	11/27/2013	1.50
Springer	S1108-97636	1108	2013	4	7.901	0.095	0.128	11/27/2013	1.98
Springer	S1108-97641	1108	2013	1.503	2.1	0.025	0.048	11/27/2013	1.40
Springer	S1108-97659	1108	2013	1.441	4.2	0.05	0.046	11/27/2013	2.91
Springer	S1108-97663	1108	2013	4.406	13.084	0.157	0.141	11/27/2013	2.97
Springer	S1108-99003	1108	2013	21.344	11.334	0.136	0.683	12/17/2013	0.53
Springer	S1108-98643	1108	2013	1.728	0.449	0.005	0.055	12/18/2013	0.26
Springer	S1108-98796	1108	2013	35	27.752	0.333	1.12	12/18/2013	0.79
Springer	S1108-98822	1108	2013	14	9.167	0.11	0.448	12/18/2013	0.65
Springer	S1108-98826	1108	2013	18.406	14.168	0.17	0.589	12/18/2013	0.77
Springer	S1108-98859	1108	2013	31.875	11.584	0.139	1.02	12/18/2013	0.36
Springer	S1108-98865	1108	2013	70.625	14.834	0.178	2.26	12/18/2013	0.21
Springer	S1108-98877	1108	2013	84.375	26.585	0.319	2.7	12/18/2013	0.32
Springer	S1108-101606	1108	2013	2.625	0.908	0.011	0.084	12/30/2013	0.35
Springer	S1108-101619	1108	2013	6.469	14.168	0.17	0.207	12/30/2013	2.19
Springer	S1108-101659	1108	2013	3.25	2.534	0.03	0.104	12/30/2013	0.78
Springer	S1108-101667	1108	2013	8.875	37.169	0.446	0.284	12/30/2013	4.19
Springer	S1096-80603	1096	2014	0.722	11.584	0.139	0.023	1/9/2014	16.04
Springer	S1096-80615	1096	2014	0.916	18.001	0.216	0.029	1/9/2014	19.65
Springer	S1096-80621	1096	2014	1.409	31.169	0.374	0.045	1/9/2014	22.12
Springer	S1096-80648	1096	2014	1.606	17.418	0.209	0.051	1/9/2014	10.85
Springer	S1096-80680	1096	2014	1.456	24.835	0.298	0.047	1/9/2014	17.06
Springer	S1108-103605	1108	2014	4.469	12.084	0.145	0.143	1/20/2014	2.70
Springer	S1108-103623	1108	2014	0.494	0.634	0.008	0.016	1/20/2014	1.28
Springer	S1108-103632	1108	2014	2.194	16.084	0.193	0.07	1/20/2014	7.33
Springer	S1108-103664	1108	2014	1.031	10.751	0.129	0.033	1/20/2014	10.43
Springer	S1108-103679	1108	2014	0.628	2.35	0.028	0.02	1/20/2014	3.74
Springer	S1108-103682	1108	2014	0.819	8.151	0.098	0.026	1/20/2014	9.95
Springer	S1108-103701	1108	2014	0.559	23.752	0.285	0.018	1/20/2014	42.49
Springer	S1108-106608	1108	2014	3.156	33.919	0.407	0.101	1/24/2014	10.75
Springer	S1108-106612	1108	2014	14.875	14.918	0.179	0.476	1/24/2014	1.00
Springer	S1108-106625	1108	2014	47.188	48.003	0.576	1.51	1/24/2014	1.02
Springer	S1108-106629	1108	2014	16.938	16.168	0.194	0.542	1/24/2014	0.95
Springer	S1108-106635	1108	2014	40.625	21.085	0.253	1.3	1/24/2014	0.52
Springer	S1108-106646	1108	2014	24.062	21.751	0.261	0.77	1/24/2014	0.90
Springer	S1108-106653	1108	2014	49.062	17.585	0.211	1.57	1/24/2014	0.36
Springer	S1108-106661	1108	2014	35.938	19.085	0.229	1.15	1/24/2014	0.53
Springer	S1108-106676	1108	2014	30.594	17.334	0.208	0.979	1/24/2014	0.57
Springer	S1108-107602	1108	2014	34.062	24.585	0.295	1.09	1/28/2014	0.72
Springer	S1108-107620	1108	2014	65.625	43.92	0.527	2.1	1/28/2014	0.67
Springer	S1108-107657	1108	2014	12.281	40.253	0.483	0.393	1/28/2014	3.28
Springer	S1108-108607	1108	2014	0.55	1.817	0.022	0.018	2/5/2014	3.30
Springer	S1108-108625	1108	2014	0.947	10.751	0.129	0.03	2/5/2014	11.35
Springer	S1108-108632	1108	2014	0.631	8.501	0.102	0.02	2/5/2014	13.47
Springer	S1108-108723	1108	2014	0.838	36.336	0.436	0.027	2/5/2014	43.36
Springer	S1108-108741	1108	2014	1.066	13.168	0.158	0.034	2/5/2014	12.35
Springer	S1108-108747	1108	2014	1.112	1.583	0.019	0.036	2/5/2014	1.42
Springer	S1108-108755	1108	2014	1.359	3.9	0.047	0.044	2/5/2014	2.87
Springer	S1108-108758	1108	2014	0.997	10.917	0.131	0.032	2/5/2014	10.95
Springer	S1108-108796	1108	2014	0.634	7.926	0.095	0.02	2/5/2014	12.50
Springer	S1108-109607	1108	2014	6.75	1.317	0.016	0.216	2/10/2014	0.20
Springer	S1108-109612	1108	2014	1.709	1.567	0.019	0.055	2/10/2014	0.92
Springer	S1108-109622	1108	2014	1.606	1.075	0.013	0.051	2/10/2014	0.67
Springer	S1108-109690	1108	2014	21.5	12.167	0.146	0.688	2/10/2014	0.57
Springer	S1108-109720	1108	2014	1.931	0.685	0.008	0.062	2/10/2014	0.35
Springer	S1108-110602	1108	2014	6.125	13.251	0.159	0.196	2/20/2014	2.16
Springer	S1108-110612	1108	2014	0.744	0.883	0.011	0.024	2/20/2014	1.19
Springer	S1108-110624	1108	2014	0.991	0.819	0.01	0.032	2/20/2014	0.83
Springer	S1108-110635	1108	2014	2.153	52.337	0.628	0.069	2/20/2014	24.31
Springer	S1108-110680	1108	2014	0.778	12.001	0.144	0.025	2/20/2014	15.43
Springer	S1108-110695	1108	2014	0.384	8.501	0.102	0.012	2/20/2014	22.14
Springer	S1108-110700	1108	2014	0.466	1.817	0.022	0.015	2/20/2014	3.90
Springer	S1108-104225	1108	2014	4.281	52.92	0.635	0.137	2/24/2014	12.36
Springer	S1108-104242	1108	2014	5.688	40.753	0.489	0.182	2/24/2014	7.16
Springer	S1108-104308	1108	2014	2.988	186.679	2.24	0.096	2/24/2014	62.48
Springer	S1108-104608	1108	2014	1.962	51.337	0.616	0.063	2/24/2014	26.17
Springer	S1108-104612	1108	2014	4.688	5.609	0.067	0.15	2/24/2014	1.20
Springer	S1108-104671	1108	2014	4.094	108.341	1.3	0.131	2/24/2014	26.46
Springer	S1108-104678	1108	2014	3.844	11.834	0.142	0.123	2/24/2014	3.08
Springer	S1108-104684	1108	2014	4.094	153.344	1.84	0.131	2/24/2014	37.46
Springer	S1108-113608	1108	2014	63.125	24.835	0.298	2.02	3/11/2014	0.39
Springer	S1108-113615	1108	2014	42.5	8.917	0.107	1.36	3/11/2014	0.21
Springer	S1108-113631	1108	2014	26.188	9.917	0.119	0.838	3/11/2014	0.38
Springer	S1108-113643	1108	2014	45	7.259	0.087	1.44	3/11/2014	0.16
Springer	S1108-111605	1108	2014	17.125	15.584	0.187	0.548	3/12/2014	0.91
Springer	S1108-111610	1108	2014	5.875	13.834	0.166	0.188	3/12/2014	2.35
Springer	S1108-111619	1108	2014	1.153	17.835	0.214	0.037	3/12/2014	15.47
Springer	S1108-111630	1108	2014	31.875	18.168	0.218	1.02	3/12/2014	0.57
Springer	S1108-111633	1108	2014	9.812	9.001	0.108	0.314	3/12/2014	0.92
Springer	S1108-111643	1108	2014	5.906	1.25	0.015	0.189	3/12/2014	0.21
Springer	S1108-111651	1108	2014	13	14.001	0.168	0.416	3/12/2014	1.08

Springer	S1108-111655	1108	2014	13.938	11.251	0.135	0.446	3/12/2014	0.81
Springer	S1108-111666	1108	2014	0.294	1.1	0.013	0.009	3/12/2014	3.74
Springer	S1108-111671	1108	2014	3.875	19.835	0.238	0.124	3/12/2014	5.12
Springer	S1108-111687	1108	2014	12.344	8.117	0.097	0.395	3/12/2014	0.66
Springer	S1108-105309	1108	2014	0.322	9.251	0.111	0.01	3/13/2014	28.73
Springer	S1108-105613	1108	2014	5.125	5.142	0.062	0.164	3/13/2014	1.00
Springer	S1108-105623	1108	2014	0.641	22.085	0.265	0.02	3/13/2014	34.45
Springer	S1108-105633	1108	2014	3.438	2.408	0.029	0.11	3/13/2014	0.70
Springer	S1108-105638	1108	2014	1.153	1.408	0.017	0.037	3/13/2014	1.22
Springer	S1108-105704	1108	2014	3.25	6.734	0.081	0.104	3/13/2014	2.07
Springer	S1108-105834	1108	2014	5.344	6.117	0.073	0.171	3/13/2014	1.14
Springer	S1108-105838	1108	2014	3.781	15.334	0.184	0.121	3/13/2014	4.06
Springer	S1108-112608	1108	2014	46.875	42.92	0.515	1.5	3/17/2014	0.92
Springer	S1108-112622	1108	2014	7.719	10.251	0.123	0.247	3/17/2014	1.33
Springer	S1108-112630	1108	2014	28.438	14.584	0.175	0.91	3/17/2014	0.51
Springer	S1108-112646	1108	2014	20.875	36.086	0.433	0.668	3/17/2014	1.73
Springer	S1108-112658	1108	2014	24.688	7.467	0.09	0.79	3/17/2014	0.30
Springer	S1108-112667	1108	2014	50	24.585	0.295	1.6	3/17/2014	0.49
Springer	s1096-82603	1096	2014	0.975	14.751	0.177	0.031	3/18/2014	15.13
Springer	s1096-82610	1096	2014	1.544	37.586	0.451	0.049	3/18/2014	24.34
Springer	s1096-82630	1096	2014	1.112	2.725	0.033	0.036	3/18/2014	2.45
Springer	s1096-82638	1096	2014	0.944	77.922	0.935	0.03	3/18/2014	82.54
Springer	s1096-82650	1096	2014	0.734	7.192	0.086	0.024	3/18/2014	9.80
Springer	s1096-82661	1096	2014	1.081	16.501	0.198	0.035	3/18/2014	15.26
Springer	s1096-82678	1096	2014	1.569	14.751	0.177	0.05	3/18/2014	9.40
Springer	s1096-82704	1096	2014	0.631	17.918	0.215	0.02	3/18/2014	28.40
Springer	s1096-82708	1096	2014	1.459	0.527	0.006	0.047	3/18/2014	0.36
Springer	s1096-82757	1096	2014	1.781	3.017	0.036	0.057	3/18/2014	1.69
Springer	S1096-83621	1096	2014	0.434	19.251	0.231	0.014	3/24/2014	44.36
Springer	S1096-83645	1096	2014	1.638	19.751	0.237	0.052	3/24/2014	12.06
Springer	S1096-83666	1096	2014	1.328	41.503	0.498	0.042	3/24/2014	31.25
Springer	S1096-83684	1096	2014	0.941	34.002	0.408	0.03	3/24/2014	36.13
Springer	S1096-83694	1096	2014	2.072	2.025	0.024	0.066	3/24/2014	0.98
Springer	S1096-83803	1096	2014	6	28.502	0.342	0.192	3/24/2014	4.75
Springer	S1096-84602	1096	2014	0.659	8.667	0.104	0.021	3/24/2014	13.15
Springer	S1096-84604	1096	2014	0.478	6.909	0.083	0.015	3/24/2014	14.45
Springer	S1096-84639	1096	2014	0.781	4.625	0.056	0.025	3/24/2014	5.92
Springer	S1096-84642	1096	2014	0.512	7.384	0.089	0.016	3/24/2014	14.42
Springer	S1096-84645	1096	2014	1.109	51.337	0.616	0.036	3/24/2014	46.29
Springer	S1096-84687	1096	2014	0.8	17.001	0.204	0.026	3/24/2014	21.25
Springer	S1096-84690	1096	2014	0.922	10.417	0.125	0.03	3/24/2014	11.30
Springer	s1096-85651	1096	2014	1.556	11.751	0.141	0.05	3/31/2014	7.55
Springer	s1096-85654	1096	2014	0.344	0.733	0.009	0.011	3/31/2014	2.13
Springer	s1096-85691	1096	2014	0.45	1.625	0.02	0.014	3/31/2014	3.61
Springer	s1096-85736	1096	2014	1.294	1.358	0.016	0.041	3/31/2014	1.05
Springer	s1096-85741	1096	2014	0.481	1.2	0.014	0.015	3/31/2014	2.49
Springer	S1096-87601	1096	2014	0.75	1.533	0.018	0.024	4/8/2014	2.04
Springer	S1096-87620	1096	2014	1.712	2.158	0.026	0.055	4/8/2014	1.26
Springer	S1096-87634	1096	2014	1.275	0.691	0.008	0.041	4/8/2014	0.54
Springer	S1096-87648	1096	2014	0.609	3.842	0.046	0.02	4/8/2014	6.31
Springer	S1096-87664	1096	2014	1.341	4.075	0.049	0.043	4/8/2014	3.04
Springer	S1096-87671	1096	2014	0.544	21.335	0.256	0.017	4/8/2014	39.22
Springer	S1096-86610	1096	2014	2.75	15.751	0.189	0.088	4/15/2014	5.73
Springer	S1096-86629	1096	2014	0.703	6.6	0.079	0.022	4/15/2014	9.39
Springer	S1096-86661	1096	2014	0.525	30.002	0.36	0.017	4/15/2014	57.15
Springer	S1096-86735	1096	2014	1.175	0.79	0.009	0.038	4/15/2014	0.67
Springer	S1096-86756	1096	2014	0.559	0.95	0.011	0.018	4/15/2014	1.70
Springer	S1096-88604	1096	2014	1.216	5.725	0.069	0.039	4/21/2014	4.71
Springer	S1096-88632	1096	2014	2.375	34.002	0.408	0.076	4/21/2014	14.32
Springer	S1096-88646	1096	2014	0.431	-0.298	-0.004	0.014	4/21/2014	-0.69
Springer	S1096-88677	1096	2014	9.5	30.335	0.364	0.304	4/21/2014	3.19
Springer	S1096-88686	1096	2014	0.422	1.508	0.018	0.014	4/21/2014	3.57
Springer	S1096-88695	1096	2014	0.838	0.25	0.003	0.027	4/21/2014	0.30
Springer	S1096-88723	1096	2014	0.547	6.675	0.08	0.018	4/21/2014	12.20
Springer	S1096-88730	1096	2014	1.05	-0.031	0	0.034	4/21/2014	-0.03
Springer	S1096-89623	1096	2014	0.788	6.742	0.081	0.025	5/5/2014	8.56
Springer	S1096-89632	1096	2014	15.656	4.267	0.051	0.501	5/5/2014	0.27
Springer	S1096-89641	1096	2014	50.938	9.834	0.118	1.63	5/5/2014	0.19
Springer	S1096-89701	1096	2014	0.706	0.613	0.007	0.023	5/5/2014	0.87
Springer	S1096-89709	1096	2014	2.416	6.175	0.074	0.077	5/5/2014	2.56
Springer	S1096-89713	1096	2014	22.625	12.501	0.15	0.724	5/5/2014	0.55
Springer	S1096-89769	1096	2014	18.219	15.168	0.182	0.583	5/5/2014	0.83
Springer	S1096-89773	1096	2014	1.294	0.737	0.009	0.041	5/5/2014	0.57
Springer	S1096-89811	1096	2014	15.812	59.087	0.709	0.506	5/5/2014	3.74
Springer	S1096-89837	1096	2014	2.197	12.334	0.148	0.07	5/5/2014	5.61
Springer	S1096-90682	1096	2014	3.312	7.084	0.085	0.106	5/6/2014	2.14
Springer	S1096-90630	1096	2014	5.125	21.168	0.254	0.164	5/12/2014	4.13
Springer	S1096-90646	1096	2014	2.444	11.667	0.14	0.078	5/12/2014	4.77
Springer	S1096-90651	1096	2014	3.125	4	0.048	0.1	5/12/2014	1.28
Springer	S1096-90664	1096	2014	3.438	9.751	0.117	0.11	5/12/2014	2.84
Springer	S1096-91314	1096	2014	1.569	16.084	0.193	0.05	5/14/2014	10.25
Springer	S1096-91619	1096	2014	4.062	11.917	0.143	0.13	5/14/2014	2.93
Springer	S1096-91623	1096	2014	9.344	13.084	0.157	0.299	5/14/2014	1.40
Springer	S1096-91627	1096	2014	6.406	25.502	0.306	0.205	5/14/2014	3.98
Springer	S1096-91631	1096	2014	0.891	12.584	0.151	0.028	5/14/2014	14.12
Springer	S1096-92602	1096	2014	0.438	3.892	0.047	0.014	5/15/2014	8.89
Springer	S1096-92611	1096	2014	0.322	26.168	0.314	0.01	5/15/2014	81.27
Springer	S1096-92621	1096	2014	0.25	7.167	0.086	0.008	5/15/2014	28.67
Springer	S1096-92645	1096	2014	1.738	16.334	0.196	0.056	5/15/2014	9.40
Springer	S1096-92670	1096	2014	0.419	20.918	0.251	0.013	5/15/2014	49.92
Springer	S1096-92679	1096	2014	1.206	27.919	0.335	0.039	5/15/2014	23.15
Springer	S1096-93309	1096	2014	0.753	6.917	0.083	0.024	5/20/2014	9.19
Springer	S1096-93633	1096	2014	0.916	8.292	0.1	0.029	5/20/2014	9.05
Springer	S1096-93643	1096	2014	2.425	11.251	0.135	0.078	5/20/2014	4.64
Springer	S1096-94620	1096	2014	35.938	17.251	0.207	1.15	5/28/2014	0.48
Springer	S1096-94647	1096	2014	59.375	35.419	0.425	1.9	5/28/2014	0.60
Springer	S1096-94673	1096	2014	35.625	6.259	0.075	1.14	5/28/2014	0.18
Springer	S1096-94686	1096	2014	0.597	1.225	0.015	0.019	5/28/2014	2.05
Springer	S1096-94702	1096	2014	19.781	28.335	0.34	0.633	5/28/2014	1.43
Springer	S1096-94741	1096	2014	9.562	27.669	0.332	0.306	5/28/2014	2.89
Springer	S1096-94753	1096	2014	0.872	3.334	0.04	0.028	5/28/2014	3.82
Springer	S1096-94776	1096	2014	3.312	37.336	0.448	0.106	5/28/2014	11.27
Springer	S1096-96605	1096	2014	6.094	59.921	0.719	0.195	6/3/2014	9.83
Springer	S1096-96629	1096	2014	14	55.17	0.662	0.448	6/3/2014	3.94
Springer	S1096-96646	1096	2014	7.781	64.254	0.771	0.249	6/3/2014	8.26
Springer	S1096-96686	1096	2014	7.281	65.754	0.789	0.233	6/3/2014	9.03
Springer	S1096-97611	1096	2014	0.938	1.667	0.02	0.03	6/9/2014	1.78
Springer	S1096-97626	1096	2014	17.5	20.835	0.25	0.56	6/9/2014	1.19
Springer	S1096-97678	1096	2014	16.875	1.667	0.02	0.54	6/9/2014	0.10
Springer	S1096-97692	1096	2014	1.25	1.667	0.02	0.04	6/9/2014	1.33
Springer	S1096-95613	1096	2014	40.938	47.503	0.57	1.31	6/16/2014	1.16
Springer	S1096-95629	1096	2014	39.375	15.001	0.18	1.26	6/16/2014	0.38
Springer	S1096-95666	1096	2014	50.625	32.502	0.39	1.62	6/16/2014	0.64
Springer	S1096-95689	1096	2014	37.188	20.001	0.24	1.19	6/16/2014	0.54
Springer	S1096-98613	1096	2014	20.938	11.667	0.14	0.67	6/19/2014	0.56
Springer	S1096-98621	1096	2014	30.938	23.335	0.28	0.99	6/19/2014	0.75
Springer	S1096-98629	1096	2014	53.438	20.835	0.25	1.71	6/19/2014	0.39
Springer	S1084-77623	1084	2014	2.812	7.5	0.09	0.09	7/7/2014	2.67
Springer	S1084-77669	1084	2014	2.188	15.834	0.19	0.07	7/7/2014	7.24
Springer	S1084-77678	1084	2014	1.875	14.168	0.17	0.06	7/7/2014	7.56
Springer	S1084-77745	1084	2014	2.5	8.334	0.1	0.08	7/7/2014	3.33
Springer	S1084-77761	1084	2014	1.562	7.5	0.09	0.05	7/7/2014	4.80
Springer	S1084-77772	1084	2014	1.875	26.668	0.32	0.06	7/7/2014	14.22
Springer	S1084-77814	1084	2014	4.375	31.669	0.38	0.14	7/7/2014	7.24
Springer	S1084-77828	1084	2014	2.188	10.001	0.12	0.07	7/7/2014	4.57
Springer	S1096-99613	1096	2014	0.938	7.5	0.09	0.03	7/10/2014	8.00
Springer	S1096-99629	1096	2014	0.625	2.5	0.03	0.02	7/10/2014	4.00
Springer	S1096-99695	1096	2014	0.938	16.668	0.2	0.03	7/10/2014	17.77
Springer	S1096-99746	1096	2014	1.25	22.501	0.27	0.04	7/10/2014	18.00
Springer	S1084-79617	1084	2014	1.875	30.002	0.36	0.06	7/22/2014	16.00
Springer	S1084-79628	1084	2014	0.312	1.667	0.02	0.01	7/22/2014	5.34
Springer	S1084-79682	1084	2014	0.312	4.167	0.05	0.01	7/22/2014	13.36
Springer	S1084-79684	1084	2014	0.938	1.667	0.02	0.03	7/22/2014	1.78
Springer	S1096-101608	1096	2014	1.25	2.5	0.03	0.04	7/22/2014	2.00
Springer	S1096-101627	1096	2014	0.312	1.667	0.02	0.01	7/22/2014	5.34
Springer	S1096-101645	1096	2014	1.562	6.667	0.08	0.05	7/22/2014	4.27
Springer	S1084-81636	1084	2014	2.188	19.168	0.23	0.07	8/20/2014	8.76
Springer	S1084-81654	1084	2014	7.812	66.671	0.8	0.25	8/20/2014	8.53
Springer	S1084-81662	1084	2014	19.688	14.168	0.17	0.63	8/20/2014	0.72
Springer	S1084-81690	1084	2014	19.062	5	0.06	0.61	8/20/2014	0.26
Springer	S1108-114609	1108	2014	0.625	1.667	0.02	0.02	8/25/2014	2.67
Springer	S1108-114633	1108	2014	0.938	20.001	0.24	0.03	8/25/2014	21.32
Springer	S1108-114677	1108	2014	1.25	34.169	0.41	0.04	8/25/2014	27.34
Springer	S1108-114682	1108	2014	0.938	0.833	0.01	0.03	8/25/2014	0.89
Springer	S1084-82630	1084	2014	4.375	5.834	0.07	0.14	8/28/2014	1.33
Springer	S1084-82655	1084	2014	3.75	5.834	0.07	0.12	8/28/2014	1.56
Springer	S1084-82670	1084	2014	6.875	11.667	0.14	0.22	8/28/2014	1.70
Springer	S1084-82700	1084	2014	3.125	4.167	0.05	0.1	8/28/2014	1.33
Springer	S1084-82721	1084	2014	1.562	33.336	0.4	0.05	8/28/2014	21.34
Springer	S1108-115631	1108	2014	2.188	17.501	0.21	0.07	8/28/2014	8.00
Springer	S1108-115652	1108	2014	0.938	25.002	0.3	0.03	8/28/2014	26.65
Springer	S1084-81618	1084	2014	0.938	2.5	0.03	0.03	9/2/2014	2.67
Springer	S1084-81622	1084	2014	1.562	5	0.06	0.05	9/2/2014	3.20

Springer	S1084-998001	1084	2014	9.375	35.836	0.43	0.3	9/2/2014	3.82
Springer	S1084-998002	1084	2014	8.438	28.335	0.34	0.27	9/2/2014	3.36
Springer	S1084-998003	1084	2014	15.938	39.169	0.47	0.51	9/2/2014	2.46
Springer	S1084-998004	1084	2014	10.625	43.336	0.52	0.34	9/2/2014	4.08
Springer	S1084-998010	1084	2014	3.75	28.335	0.34	0.12	9/2/2014	7.56
Springer	S1084-998017	1084	2014	53.125	52.503	0.63	1.7	9/2/2014	0.99
Springer	S1084-998018	1084	2014	41.875	34.169	0.41	1.34	9/2/2014	0.82
Springer	S1084-998022	1084	2014	34.062	45.836	0.55	1.09	9/2/2014	1.35
Springer	S1084-998023	1084	2014	47.812	55.837	0.67	1.53	9/2/2014	1.17
Springer	S1084-998024	1084	2014	61.875	71.671	0.86	1.98	9/2/2014	1.16
Springer	S1084-998025	1084	2014	5.938	40.836	0.49	0.19	9/2/2014	6.88
Springer	S1084-998026	1084	2014	10.312	45.836	0.55	0.33	9/2/2014	4.44
Springer	S1084-998027	1084	2014	2.5	32.502	0.39	0.08	9/2/2014	13.00
Springer	S1084-998028	1084	2014	1.562	25.835	0.31	0.05	9/2/2014	16.54
Springer	S1084-998029	1084	2014	3.125	38.336	0.46	0.1	9/2/2014	12.27
Springer	S1084-998030	1084	2014	4.062	39.169	0.47	0.13	9/2/2014	9.64
Springer	S1084-998035	1084	2014	54.688	50.003	0.6	1.75	9/2/2014	0.91
Springer	S1084-998036	1084	2014	33.438	30.835	0.37	1.07	9/2/2014	0.92
Springer	S1084-998037	1084	2014	15.938	32.502	0.39	0.51	9/2/2014	2.04
Springer	S1084-998038	1084	2014	9.688	33.336	0.4	0.31	9/2/2014	3.44
Springer	S1084-998039	1084	2014	8.75	24.168	0.29	0.28	9/2/2014	2.76
Springer	S1084-998042	1084	2014	12.812	47.503	0.57	0.41	9/2/2014	3.71
Springer	S1084-998043	1084	2014	38.125	51.67	0.62	1.22	9/2/2014	1.36
Springer	S1084-998045	1084	2014	25.312	21.668	0.26	0.81	9/2/2014	0.86
Springer	S1084-998046	1084	2014	24.062	50.837	0.61	0.77	9/2/2014	2.11
Springer	S1084-998047	1084	2014	4.375	22.501	0.27	0.14	9/2/2014	5.14
Springer	S1084-998048	1084	2014	23.75	39.169	0.47	0.76	9/2/2014	1.65
Springer	S1084-998050	1084	2014	57.188	40.836	0.49	1.83	9/2/2014	0.71
Springer	S1084-998051	1084	2014	57.5	49.17	0.59	1.84	9/2/2014	0.86
Springer	S1084-998052	1084	2014	14.062	30.002	0.36	0.45	9/2/2014	2.13
Springer	S1084-998056	1084	2014	19.375	35.002	0.42	0.62	9/2/2014	1.81
Springer	S1096-104607	1096	2014	1.25	15.001	0.18	0.04	9/8/2014	12.00
Springer	S1096-104617	1096	2014	3.75	43.336	0.52	0.12	9/8/2014	11.56
Springer	S1096-104646	1096	2014	2.5	29.169	0.35	0.08	9/8/2014	11.67
Springer	S1084-998041	1084	2014	6.562	42.503	0.51	0.21	9/10/2014	6.48
Springer	S1084-83627	1084	2014	1.25	25.835	0.31	0.04	9/15/2014	20.67
Springer	S1084-83659	1084	2014	1.25	15.834	0.19	0.04	9/15/2014	12.67
Springer	S1084-83671	1084	2014	1.25	56.67	0.68	0.04	9/15/2014	45.34
Springer	S1084-83693	1084	2014	0.938	22.501	0.27	0.03	9/15/2014	23.99
Springer	S1084-83776	1084	2014	0.625	2.5	0.03	0.02	9/15/2014	4.00
Springer	S1084-84654	1084	2014	1.25	2.5	0.03	0.04	9/15/2014	2.00
Springer	S1084-83822	1084	2014	0.312	15.834	0.19	0.01	9/18/2014	50.75
Springer	S1084-85753	1084	2014	0.312	5.834	0.07	0.01	9/18/2014	18.70
Springer	S1084-87605	1084	2014	0.828	23.752	0.285	0.026	9/22/2014	28.69
Springer	S1084-87634	1084	2014	0.217	7.409	0.089	0.007	9/22/2014	34.14
Springer	S1084-87641	1084	2014	0.21	12.084	0.145	0.007	9/22/2014	57.54
Springer	S1084-88605	1084	2014	1.275	12.167	0.146	0.041	9/25/2014	9.54
Springer	S1084-88612	1084	2014	1.041	6.5	0.078	0.033	9/25/2014	6.24
Springer	S1084-88648	1084	2014	1.938	14.418	0.173	0.062	9/25/2014	7.44
Springer	S1084-88205	1084	2014	2.944	5.759	0.069	0.094	9/29/2014	1.96
Springer	S1084-999062	1084	2014	15	55.004	0.66	0.48	9/29/2014	3.67
Springer	S1084-999063	1084	2014	7.188	50.003	0.6	0.23	9/29/2014	6.96
Springer	S1084-999064	1084	2014	49.062	25.835	0.31	1.57	9/29/2014	0.53
Springer	S1084-999065	1084	2014	11.875	42.503	0.51	0.38	9/29/2014	3.58
Springer	S1084-999066	1084	2014	5	28.335	0.34	0.16	9/29/2014	5.67
Springer	S1084-999068	1084	2014	16.25	62.504	0.75	0.52	9/29/2014	3.85
Springer	S1084-999069	1084	2014	6.25	75.838	0.91	0.2	9/29/2014	12.13
Springer	S1084-999070	1084	2014	35.625	41.669	0.5	1.14	9/29/2014	1.17
Springer	S1084-999071	1084	2014	42.812	33.336	0.4	1.37	9/29/2014	0.78
Springer	S1084-999072	1084	2014	16.25	29.169	0.35	0.52	9/29/2014	1.80
Springer	S1084-999073	1084	2014	4.375	25.002	0.3	0.14	9/29/2014	5.71
Springer	S1084-997005	1084	2014	11.875	45.003	0.54	0.38	9/30/2014	3.79
Springer	S1084-997006	1084	2014	3.438	27.502	0.33	0.11	9/30/2014	8.00
Springer	S1084-997007	1084	2014	3.75	21.668	0.26	0.12	9/30/2014	5.78
Springer	S1084-997008	1084	2014	2.812	53.337	0.64	0.09	9/30/2014	18.97
Springer	S1084-997009	1084	2014	4.688	41.669	0.5	0.15	9/30/2014	8.89
Springer	S1084-997011	1084	2014	2.5	19.168	0.23	0.08	9/30/2014	7.67
Springer	S1084-997012	1084	2014	3.438	45.003	0.54	0.11	9/30/2014	13.09
Springer	S1084-997013	1084	2014	12.188	35.002	0.42	0.39	9/30/2014	2.87
Springer	S1084-997014	1084	2014	32.188	52.503	0.63	1.03	9/30/2014	1.63
Springer	S1084-997015	1084	2014	31.875	74.172	0.89	1.02	9/30/2014	2.33
Springer	S1084-997016	1084	2014	33.438	37.502	0.45	1.07	9/30/2014	1.12
Springer	S1084-997019	1084	2014	18.125	32.502	0.39	0.58	9/30/2014	1.79
Springer	S1084-997020	1084	2014	24.688	29.169	0.35	0.79	9/30/2014	1.18
Springer	S1084-997021	1084	2014	20.938	19.168	0.23	0.67	9/30/2014	0.92
Springer	S1084-997032	1084	2014	1.25	21.668	0.26	0.04	9/30/2014	17.33
Springer	S1084-997033	1084	2014	2.812	27.502	0.33	0.09	9/30/2014	9.78
Springer	S1084-997034	1084	2014	3.438	20.835	0.25	0.11	9/30/2014	6.06
Springer	S1084-997040	1084	2014	6.562	35.836	0.43	0.21	9/30/2014	5.46
Springer	S1084-997044	1084	2014	42.812	57.504	0.69	1.37	9/30/2014	1.34
Springer	S1084-997057	1084	2014	28.125	38.336	0.46	0.9	9/30/2014	1.36
Springer	S1084-997058	1084	2014	25.625	36.669	0.44	0.82	9/30/2014	1.43
Springer	S1084-997061	1084	2014	6.562	39.169	0.47	0.21	9/30/2014	5.97
Springer	S1084-89302	1084	2014	0.988	12.584	0.151	0.032	10/2/2014	12.74
Springer	S1084-89504	1084	2014	0.872	16.584	0.199	0.028	10/2/2014	19.02
Springer	S1084-89607	1084	2014	2.419	8.301	0.1	0.077	10/2/2014	3.43
Springer	S1084-89822	1084	2014	5.812	6.759	0.081	0.186	10/2/2014	1.16
Springer	S1084-85641	1084	2014	0.625	5	0.06	0.02	10/6/2014	8.00
Springer	S1084-85672	1084	2014	0.312	7.5	0.09	0.01	10/6/2014	24.04
Springer	S1084-85715	1084	2014	0.319	16.834	0.202	0.01	10/6/2014	52.77
Springer	S1084-85724	1084	2014	0.108	5.767	0.069	0.003	10/6/2014	53.40
Springer	S1096-102801	1096	2014	0.092	10.251	0.123	0.003	10/6/2014	111.42
Springer	S1084-90612	1084	2014	0.277	9.501	0.114	0.009	10/21/2014	34.30
Springer	S1084-90659	1084	2014	0.252	16.084	0.193	0.008	10/21/2014	63.83
Springer	S1084-90682	1084	2014	0.199	1.85	0.022	0.006	10/21/2014	9.30
Springer	S1084-90716	1084	2014	0.116	15.418	0.185	0.004	10/21/2014	132.91
Springer	S1084-90806	1084	2014	0.087	4.084	0.049	0.003	10/22/2014	46.94
Springer	S1108-117330	1108	2015	1.725	11.501	0.138	0.055	9/7/2015	6.67
Springer	S1108-117625	1108	2015	3.091	90.841	1.09	0.099	9/8/2015	29.39
Springer	S1108-117635	1108	2015	2.366	18.251	0.219	0.076	9/8/2015	7.71
Springer	S1108-117636	1108	2015	4.594	39.753	0.477	0.147	9/8/2015	8.65
Springer	S1108-117657	1108	2015	3.219	14.251	0.171	0.103	9/8/2015	4.43
Springer	S1084-94100	1084	2015	1.519	11.418	0.137	0.049	9/10/2015	7.52
Springer	S1084-94101	1084	2015	2.178	94.174	1.13	0.07	9/10/2015	43.24
Springer	S1084-94102	1084	2015	3.406	80.673	0.968	0.109	9/10/2015	23.69
Springer	S1084-94103	1084	2015	1.719	15.751	0.189	0.055	9/10/2015	9.16

Springer	S1084-94104	1084	2015	1.553	27.919	0.335	0.05	9/10/2015	17.98
Springer	S1084-94105	1084	2015	1.828	26.835	0.322	0.059	9/10/2015	14.68
Springer	S1084-94106	1084	2015	1.319	27.669	0.332	0.042	9/10/2015	20.98
Springer	S1084-94107	1084	2015	1.591	22.919	0.275	0.051	9/10/2015	14.41
Springer	S1084-94108	1084	2015	0.825	5.6	0.067	0.026	9/10/2015	6.79
Springer	S1084-94109	1084	2015	0.828	16.501	0.198	0.027	9/10/2015	19.93
Springer	S1084-94110	1084	2015	1.169	19.002	0.228	0.037	9/10/2015	16.25
Springer	S1084-94111	1084	2015	1.428	1.775	0.021	0.046	9/10/2015	1.24
Springer	S1084-94112	1084	2015	1.694	0.703	0.008	0.054	9/10/2015	0.41
Springer	S1084-94113	1084	2015	1.713	0.039	0	0.055	9/10/2015	0.02
Springer	S1084-94114	1084	2015	1.803	0.328	0.004	0.058	9/10/2015	0.18
Springer	S1084-94115	1084	2015	1.228	1.508	0.018	0.039	9/10/2015	1.23
Springer	S1084-94116	1084	2015	1.759	23.919	0.287	0.056	9/10/2015	13.60
Springer	S1084-94117	1084	2015	1.038	0.823	0.01	0.033	9/10/2015	0.79
Springer	S1084-94119	1084	2015	2.172	8.917	0.107	0.07	9/10/2015	4.11
Springer	S1084-94120	1084	2015	1.394	8.751	0.105	0.045	9/10/2015	6.28
Springer	S1084-94121	1084	2015	1.859	15.001	0.18	0.06	9/10/2015	8.07
Springer	S1084-94122	1084	2015	1.547	5.117	0.061	0.05	9/10/2015	3.31
Springer	S1084-94123	1084	2015	1.913	8.501	0.102	0.061	9/10/2015	4.44
Springer	S1084-94124	1084	2015	1.575	9.251	0.111	0.05	9/10/2015	5.87
Springer	S1084-94125	1084	2015	1.628	8.501	0.102	0.052	9/10/2015	5.22
Springer	S1084-94126	1084	2015	1.563	7.951	0.095	0.05	9/10/2015	5.09
Springer	S1084-96600	1084	2015	34.375	1.1	16.501	0.48	9/16/2015	0.03
Springer	S1084-96610	1084	2015	38.125	23.085	0.277	1.22	9/16/2015	0.61
Springer	S1084-96619	1084	2015	32.188	1.03	15.668	0.487	9/16/2015	0.03
Springer	S1084-96622	1084	2015	26.688	18.168	0.218	0.854	9/16/2015	0.68
Springer	S1084-96631	1084	2015	44.688	1.43	41.087	0.919	9/16/2015	0.03
Springer	S1084-96659	1084	2015	26.438	7.909	0.095	0.846	9/16/2015	0.30
Springer	S1084-96661	1084	2015	17.125	19.668	0.236	0.548	9/16/2015	1.15
Springer	S1084-96676	1084	2015	36.25	1.16	19.668	0.543	9/16/2015	0.03
Springer	S1096-107606	1096	2015	2.134	6.834	0.082	0.068	9/23/2015	3.20
Springer	S1096-107612	1096	2015	1.019	50.254	0.603	0.033	9/23/2015	49.32
Springer	S1096-107635	1096	2015	4.594	23.335	0.28	0.147	9/23/2015	5.08
Springer	S1096-107657	1096	2015	2.028	8.751	0.105	0.065	9/23/2015	4.32
Springer	S1096-107664	1096	2015	2.691	10.584	0.127	0.086	9/23/2015	3.93
Springer	S1096-107681	1096	2015	1.475	25.002	0.3	0.047	9/23/2015	16.95
Springer	S1096-107684	1096	2015	0.778	7.709	0.093	0.025	9/23/2015	9.91
Springer	S1096-107690	1096	2015	4.656	15.168	0.182	0.149	9/23/2015	3.26
Springer	S1096-107693	1096	2015	1.016	5.1	0.061	0.033	9/23/2015	5.02
Springer	S1096-107701	1096	2015	3.625	7.317	0.088	0.116	9/23/2015	2.02
Springer	S1096-107709	1096	2015	6.156	18.585	0.223	0.197	9/23/2015	3.02
Springer	S1096-107721	1096	2015	4.688	10.501	0.126	0.15	9/23/2015	2.24
Springer	S1096-107723	1096	2015	5.344	34.086	0.409	0.171	9/23/2015	6.38
Springer	S1096-107725	1096	2015	5.094	22.085	0.265	0.163	9/23/2015	4.34
Springer	S1096-108603	1096	2015	1.691	20.752	0.249	0.054	10/2/2015	12.27
Springer	S1096-108617	1096	2015	1.163	14.251	0.171	0.037	10/2/2015	12.25
Springer	S1096-108629	1096	2015	1.247	23.752	0.285	0.04	10/2/2015	19.05
Springer	S1096-108633	1096	2015	1.647	2.217	0.027	0.053	10/2/2015	1.35
Springer	S1096-108645	1096	2015	0.403	1.383	0.017	0.013	10/2/2015	3.43
Springer	S1096-108657	1096	2015	0.556	4.567	0.055	0.018	10/2/2015	8.21
Springer	S1096-108663	1096	2015	0.756	1.717	0.021	0.024	10/2/2015	2.27
Springer	S1096-108692	1096	2015	1.372	7.392	0.089	0.044	10/2/2015	5.39
Springer	S1096-109605	1096	2015	5.375	37.336	0.448	0.172	10/2/2015	6.95
Springer	S1096-109632	1096	2015	1.791	26.168	0.314	0.057	10/7/2015	14.61
Springer	S1096-109640	1096	2015	2.903	17.251	0.207	0.093	10/7/2015	5.94
Springer	S1096-109657	1096	2015	6.938	42.253	0.507	0.222	10/7/2015	6.09
Springer	S1096-109666	1096	2015	3.719	21.918	0.263	0.119	10/7/2015	5.89
Springer	S1096-109679	1096	2015	2.322	33.669	0.404	0.074	10/7/2015	14.50
Springer	S1096-109719	1096	2015	3.812	20.501	0.246	0.122	10/7/2015	5.38
Springer	S1096-109734	1096	2015	1.347	7.784	0.093	0.043	10/7/2015	5.78
Springer	S1096-109735	1096	2015	8.562	13.418	0.161	0.092	10/7/2015	1.57
Springer	S1096-109738	1096	2015	4.156	46.753	0.561	0.133	10/7/2015	11.25
Springer	S1096-109742	1096	2015	4.188	17.751	0.213	0.134	10/7/2015	4.24
Springer	S1096-109746	1096	2015	4.031	42.003	0.504	0.129	10/7/2015	10.42
Springer	S1096-109800	1096	2015	1.853	8.584	0.103	0.059	10/7/2015	4.63
Springer	S1084-97614	1084	2015	2.884	2.667	0.032	0.092	10/11/2015	0.92
Springer	S1084-97619	1084	2015	2.169	1.667	0.02	0.069	10/11/2015	0.77
Springer	S1084-97623	1084	2015	1.616	9.251	0.111	0.052	10/11/2015	5.72
Springer	S1084-97663	1084	2015	0.878	9.167	0.11	0.028	10/11/2015	10.44
Springer	S1084-97666	1084	2015	1.384	10.417	0.125	0.044	10/11/2015	7.53
Springer	S1084-97669	1084	2015	3.469	66.088	0.793	0.111	10/11/2015	19.05
Springer	S1084-97673	1084	2015	2.406	17.418	0.209	0.077	10/11/2015	7.24
Springer	S1084-97693	1084	2015	0.725	1.075	0.013	0.023	10/11/2015	1.48
Springer	S1084-97696	1084	2015	0.922	9.917	0.119	0.03	10/11/2015	10.76
Springer	s1084-98615	1084	2015	0.856	14.418	0.173	0.027	10/22/2015	16.84
Springer	s1084-98618	1084	2015	0.872	17.334	0.208	0.028	10/22/2015	19.88
Springer	s1084-98634	1084	2015	0.569	12.751	0.153	0.018	10/22/2015	22.41
Springer	s1084-98648	1084	2015	0.195	6.942	0.083	0.006	10/22/2015	35.60
Springer	s1084-98692	1084	2015	0.174	1.108	0.013	0.006	10/22/2015	6.37
Springer	s1084-98696	1084	2015	0.975	4.559	0.055	0.031	10/22/2015	4.68
Springer	s1084-98721	1084	2015	0.16	1.492	0.018	0.005	10/22/2015	9.33
Springer	s1084-98724	1084	2015	0.264	1.633	0.02	0.008	10/22/2015	6.19
Springer	s1084-98729	1084	2015	0.212	2.617	0.031	0.007	10/22/2015	12.34
Springer	s1084-98736	1084	2015	0.691	13.418	0.161	0.022	10/22/2015	19.42
Springer	s1084-98754	1084	2015	0.298	2.292	0.028	0.01	10/22/2015	7.69
Springer	s1084-98769	1084	2015	0.375	28.419	0.341	0.012	10/22/2015	75.78
Springer	s1084-98772	1084	2015	0.534	5.084	0.061	0.017	10/22/2015	9.52
Springer	s1084-98779	1084	2015	0.309	2.367	0.028	0.01	10/22/2015	7.66
Springer	s1084-98783	1084	2015	0.156	2.125	0.026	0.005	10/22/2015	13.62
Springer	s1084-98794	1084	2015	0.178	0.85	0.01	0.006	10/22/2015	4.78
Springer	S1084-99830	1084	2015	71.25	30.169	0.362	2.28	10/22/2015	0.42
Springer	S1084-99834	1084	2015	30.094	28.085	0.337	0.963	10/22/2015	0.93
Springer	S1084-99864	1084	2015	35	26.252	0.315	1.12	10/22/2015	0.75
Springer	S1084-99889	1084	2015	63.125	45.253	0.543	2.02	10/22/2015	0.72
Springer	S1084-99893	1084	2015	9.344	39.253	0.471	0.299	10/22/2015	4.20
Springer	S1084-100009	1084	2015	2.778	90.006	1.08	0.089	10/29/2015	32.40
Springer	S1084-100011	1084	2015	2.978	16.834	0.202	0.095	10/29/2015	5.65
Springer	S1084-100050	1084	2015	0.581	14.584	0.175	0.019	10/29/2015	25.10
Springer	S1084-100075	1084	2015	0.428	13.668	0.164	0.014	10/31/2015	31.93
Springer	S1084-100083	1084	2015	0.375	1.05	0.013	0.012	10/31/2015	2.80
Springer	S1084-100100	1084	2015	1.262	0.942	0.011	0.04	10/31/2015	0.75
Springer	S1084-100121	1084	2015	0.522	3.325	0.04	0.017	10/31/2015	6.37
Springer	S1084-100137	1084	2015	1.103	11.584	0.139	0.035	10/31/2015	10.50
Springer	S1084-100309	1084	2015	0.309	3.859	0.046	0.01	10/31/2015	12.49
Springer	S1084-101014	1084	2015	0.158	1.325	0.016	0.005	11/8/2015	8.39
Springer	S1084-101019	1084	2015	0.221	17.001	0.204	0.007	11/8/2015	76.93
Springer	S1084-101031	1084	2015	8.5	27.835	0.334	0.272	11/8/2015	3.27
Springer	S1084-101040	1084	2015	0.7	40.753	0.489	0.022	11/8/2015	58.22
Springer	S1084-101048	1084	2015	0.816	17.751	0.213	0.026	11/8/2015	21.75
Springer	S1084-101060	1084	2015	1.066	75.172	0.902	0.034	11/8/2015	70.52
Springer	S1084-101063	1084	2015	5.312	48.92	0.587	0.17	11/8/2015	9.21
Springer	S1084-101078	1084	2015	0.581	3.609	0.043	0.019	11/8/2015	6.21
Springer	S1084-101085	1084	2015	2.831	12.584	0.151	0.091	11/8/2015	4.45
Springer	S1084-101107	1084	2015	1.159	5.817	0.07	0.037	11/8/2015	5.02
Springer	S1084-101115	1084	2015	0.662	35.669	0.428	0.021	11/8/2015	53.88
Springer	S1084-101120	1084	2015	0.641	5.425	0.065	0.02	11/8/2015	8.46
Springer	S1084-101123	1084	2015	0.307	4.884	0.059	0.01	11/8/2015	15.91
Springer	S1084-101157	1084	2015	3.719	13.168	0.158	0.119	11/8/2015	3.54
Springer	S1084-102009	1084	2015	1.006	15.751	0.189	0.032	11/15/2015	15.66
Springer	S1084-102015	1084	2015	0.419	42.92	0.515	0.013	11/15/2015	102.43

Springer	S1084-102021	1084	2015	0.575	22.585	0.271	0.018	11/15/2015	39.28
Springer	S1084-102028	1084	2015	4.031	8.584	0.103	0.129	11/15/2015	2.13
Springer	S1084-102036	1084	2015	0.831	17.168	0.206	0.027	11/15/2015	20.66
Springer	S1084-102074	1084	2015	1.175	43.503	0.522	0.038	11/15/2015	37.02
Springer	S1084-102078	1084	2015	4.031	59.587	0.715	0.129	11/15/2015	14.78
Springer	S1084-102095	1084	2015	1.738	24.502	0.294	0.056	11/15/2015	14.10
Springer	S1084-102098	1084	2015	1.388	16.418	0.197	0.044	11/15/2015	11.83
Springer	S1084-102142	1084	2015	3.406	31.169	0.374	0.109	11/15/2015	9.15
Springer	S1084-102606	1084	2015	1.947	32.252	0.387	0.062	11/15/2015	16.56
Springer	S1084-103602	1084	2015	5.344	21.335	0.256	0.171	11/20/2015	3.99
Springer	S1084-103609	1084	2015	6.188	19.085	0.229	0.198	11/20/2015	3.08
Springer	S1084-103614	1084	2015	6.969	7.309	0.088	0.223	11/20/2015	1.05
Springer	S1084-103631	1084	2015	1.506	7.534	0.09	0.048	11/20/2015	5.00
Springer	S1084-104637	1084	2015	3.594	10.667	0.128	0.115	11/24/2015	2.97
Springer	S1084-104672	1084	2015	2.406	6.609	0.079	0.077	11/24/2015	2.75
Springer	S1084-104714	1084	2015	2.016	7.459	0.09	0.064	11/24/2015	3.70
Springer	S1072-69193	1072	2015	1.725	0.917	0.011	0.055	11/27/2015	0.53
Springer	S1072-69211	1072	2015	2.319	1.5	0.018	0.074	11/27/2015	0.65
Springer	S1072-69242	1072	2015	0.85	7.534	0.09	0.027	11/27/2015	8.86
Springer	S1072-70622	1072	2015	1.269	4.084	0.049	0.041	11/29/2015	3.22
Springer	S1072-70632	1072	2015	11.188	4.025	0.048	0.358	11/29/2015	0.36
Springer	S1072-70648	1072	2015	39.375	11.751	0.141	1.26	11/29/2015	0.30
Springer	S1072-70666	1072	2015	28.125	30.252	0.363	0.9	11/29/2015	1.08
Springer	S1072-70668	1072	2015	1.162	0.412	0.005	0.037	11/29/2015	0.35
Springer	S1072-70672	1072	2015	1.419	11.667	0.14	0.045	11/29/2015	8.22
Springer	S1072-70686	1072	2015	0.678	0.395	0.005	0.022	11/29/2015	0.58
Springer	S1072-71621	1072	2015	0.428	0.433	0.005	0.014	11/29/2015	1.01
Springer	S1072-71649	1072	2015	10.312	10.917	0.131	0.33	11/29/2015	1.06
Springer	S1072-71707	1072	2015	0.559	1.608	0.019	0.018	11/29/2015	2.88
Springer	S1072-72118	1072	2015	25.438	18.835	0.226	0.814	12/3/2015	0.74
Springer	S1072-72133	1072	2015	14.469	21.085	0.253	0.463	12/3/2015	1.46
Springer	S1072-72626	1072	2015	25.469	25.752	0.309	0.815	12/3/2015	1.01
Springer	S1072-72652	1072	2015	12.688	25.918	0.311	0.406	12/3/2015	2.04
Springer	S1072-72664	1072	2015	22	11.334	0.136	0.704	12/3/2015	0.52
Springer	S1072-72675	1072	2015	41.25	31.335	0.376	1.32	12/3/2015	0.76
Springer	S1072-72686	1072	2015	61.875	20.751	0.249	1.98	12/3/2015	0.34
Springer	S1096-101800	1096	2015	2.631	5.859	0.07	0.084	12/9/2015	2.23
Springer	S1096-106310	1096	2015	7.656	10.917	0.131	0.245	12/9/2015	1.43
Springer	S1096-111243	1096	2015	12.312	174.178	2.09	0.394	12/9/2015	14.15
Springer	S1096-111833	1096	2015	4.688	7.942	0.095	0.15	12/9/2015	1.69
Springer	S1072-74636	1072	2015	2.831	28.335	0.34	0.091	12/12/2015	10.01
Springer	S1072-74645	1072	2015	1.416	100.007	1.2	0.045	12/12/2015	70.63
Springer	S1072-74677	1072	2015	2.134	21.751	0.261	0.068	12/12/2015	10.19
Springer	S1072-73600	1072	2015	43.75	52.92	0.635	1.4	12/14/2015	1.21
Springer	S1072-73605	1072	2015	22.75	21.085	0.253	0.728	12/14/2015	0.93
Springer	S1072-73624	1072	2015	6.75	42.253	0.507	0.216	12/14/2015	6.26
Springer	S1072-73629	1072	2015	0.212	23.668	0.284	0.007	12/14/2015	111.64
Springer	S1072-73648	1072	2015	45.312	16.334	0.196	1.45	12/14/2015	0.36
Springer	S1072-73653	1072	2015	0.656	40.086	0.481	0.021	12/14/2015	61.11
Springer	S1072-73657	1072	2015	0.193	7.842	0.094	0.006	12/14/2015	40.63
Springer	S1072-73675	1072	2015	47.5	34.336	0.412	1.52	12/14/2015	0.72
Springer	S1072-73680	1072	2015	9	5.434	0.065	0.288	12/14/2015	0.60
Springer	S1072-73685	1072	2015	0.366	0.816	0.01	0.012	12/14/2015	2.23
Springer	S1072-73707	1072	2015	48.125	25.752	0.309	1.54	12/14/2015	0.54
Springer	S1072-73718	1072	2015	0.204	1.433	0.017	0.007	12/14/2015	7.02
Springer	S1072-73731	1072	2015	31.562	25.168	0.302	1.01	12/14/2015	0.80
Springer	S1072-73737	1072	2015	29.562	17.751	0.213	0.946	12/14/2015	0.60
Cariboo	C1072-76100	1072	2015	14.344	28.169	0.338	0.459	12/18/2015	1.96
Cariboo	C1072-76122	1072	2015	2.497	16.584	0.199	0.08	12/18/2015	6.64
Cariboo	C1072-76130	1072	2015	2.688	28.752	0.345	0.086	12/18/2015	10.70
Cariboo	C1072-76601	1072	2015	3.344	31.835	0.382	0.107	12/18/2015	9.52
Cariboo	C1072-76606	1072	2015	2.622	19.668	0.236	0.084	12/18/2015	7.50
Cariboo	C1072-76633	1072	2015	5.5	43.753	0.525	0.176	12/18/2015	7.96
Cariboo	C1072-75612	1072	2015	0.322	0.324	0.004	0.01	12/19/2015	1.01
Cariboo	C1072-75625	1072	2015	3.25	0.293	0.004	0.104	12/19/2015	0.09
Cariboo	C1072-75656	1072	2015	0.35	0.146	0.002	0.011	12/19/2015	0.42
Cariboo	C1072-75661	1072	2015	0.227	0.642	0.008	0.007	12/19/2015	2.83
Cariboo	C1072-75667	1072	2015	1.466	5.075	0.061	0.047	12/19/2015	3.46
Cariboo	C1072-77610	1072	2015	0.841	22.335	0.268	0.027	12/23/2015	26.56
Cariboo	C1072-77629	1072	2015	1.106	18.251	0.219	0.035	12/23/2015	16.50
Cariboo	C1072-77662	1072	2015	0.156	0.459	0.006	0.005	12/23/2015	2.94
Cariboo	C1072-77668	1072	2015	0.161	0.677	0.008	0.005	12/23/2015	4.20
Cariboo	C1072-77672	1072	2015	0.497	2.7	0.032	0.016	12/23/2015	5.43
Cariboo	C1072-78608	1072	2015	0.148	6.367	0.076	0.005	12/29/2015	43.02
Cariboo	C1072-78615	1072	2015	0.012	2.692	0.032	0	12/29/2015	224.33
Cariboo	C1072-78618	1072	2015	0.015	0.238	0.003	0	12/29/2015	15.87
Cariboo	C1072-78662	1072	2015	0.172	1.458	0.018	0.006	12/29/2015	8.48
Cariboo	C1072-78665	1072	2015	0.108	2.05	0.025	0.003	12/29/2015	18.98
Cariboo	C1072-78668	1072	2015	0.087	35.086	0.421	0.003	12/29/2015	403.29
Cariboo	C1072-78671	1072	2015	0.219	0.397	0.005	0.007	12/29/2015	1.81
Cariboo	C1072-78687	1072	2015	0.007	0.892	0.011	0	12/29/2015	127.43
Cariboo	C1072-79100	1072	2016	0.243	9.667	0.116	0.008	1/3/2016	39.78
Cariboo	C1072-79150	1072	2016	0.316	3.067	0.037	0.01	1/3/2016	9.71
Cariboo	C1072-79622	1072	2016	0.341	2.975	0.036	0.011	1/3/2016	8.72
Cariboo	C1072-79627	1072	2016	0.394	0.752	0.009	0.013	1/3/2016	1.91
Cariboo	C1072-79632	1072	2016	1.244	7.617	0.091	0.04	1/3/2016	6.12
Cariboo	C1072-79637	1072	2016	2.459	10.417	0.125	0.079	1/3/2016	4.24
Cariboo	C1072-79664	1072	2016	0.4	12.251	0.147	0.013	1/3/2016	30.63
Cariboo	C1072-79679	1072	2016	0.819	6.675	0.08	0.026	1/3/2016	8.15
Cariboo	C1072-79697	1072	2016	1.934	6.242	0.075	0.062	1/3/2016	3.23
Cariboo	C1072-79739	1072	2016	1.003	50.837	0.61	0.032	1/3/2016	50.68
Cariboo	C1072-79752	1072	2016	2.003	5.6	0.067	0.064	1/3/2016	2.80
Cariboo	C1084-106648	1084	2016	3.344	28.169	0.338	0.107	1/8/2016	8.42
Cariboo	C1084-106663	1084	2016	5.469	4.95	0.059	0.175	1/8/2016	0.91
Cariboo	C1072-80606	1072	2016	0.712	5.592	0.067	0.023	1/12/2016	7.85
Cariboo	C1072-80611	1072	2016	3.081	4.5	0.054	0.099	1/12/2016	1.46
Cariboo	C1072-80614	1072	2016	2.056	10.834	0.13	0.066	1/12/2016	5.27
Cariboo	C1072-80625	1072	2016	0.838	15.751	0.189	0.027	1/12/2016	18.80
Cariboo	C1072-80632	1072	2016	1.2	5.834	0.07	0.038	1/12/2016	4.86
Cariboo	C1072-80641	1072	2016	1.872	11.001	0.132	0.06	1/12/2016	5.88
Cariboo	C1072-80644	1072	2016	1.078	10.417	0.125	0.034	1/12/2016	9.66
Cariboo	C1072-80647	1072	2016	1.9	7.059	0.085	0.061	1/12/2016	3.72
Cariboo	C1072-80656	1072	2016	1.619	9.334	0.112	0.052	1/12/2016	5.77
Cariboo	C1072-80660	1072	2016	1.084	23.835	0.286	0.035	1/12/2016	21.99
Cariboo	C1072-80672	1072	2016	1.391	13.501	0.162	0.044	1/12/2016	9.71
Cariboo	C1072-80676	1072	2016	1.041	11.584	0.139	0.033	1/12/2016	11.13
Cariboo	C1072-80681	1072	2016	1.503	17.668	0.212	0.048	1/12/2016	11.76
Cariboo	C1072-80686	1072	2016	1.297	9.834	0.118	0.042	1/12/2016	7.58
Cariboo	C1072-80698	1072	2016	1.562	8.001	0.096	0.05	1/12/2016	5.12
Cariboo	C1072-80701	1072	2016	1.716	15.168	0.182	0.055	1/12/2016	8.84
Cariboo	C1060-62100	1060	2016	55.312	32.752	0.393	1.77	1/16/2016	0.59
Cariboo	C1060-62111	1060	2016	39.062	51.92	0.623	1.25	1/16/2016	1.33
Cariboo	C1060-62506	1060	2016	51.562	43.253	0.519	1.65	1/16/2016	0.84
Cariboo	C1060-62511	1060	2016	78.75	45.003	0.54	2.52	1/16/2016	0.57
Cariboo	C1060-62517	1060	2016	69.062	18.835	0.226	2.21	1/16/2016	0.27
Cariboo	C1060-62519	1060	2016	71.562	44.17	0.53	2.29	1/16/2016	0.62
Cariboo	C1060-62610	1060	2016	66.875	40.503	0.486	2.14	1/16/2016	0.61
Cariboo	C1060-62619	1060	2016	55.938	24.918	0.299	1.79	1/16/2016	0.45
Cariboo	C1060-62622	1060	2016	67.188	36.836	0.442	2.15	1/16/2016	0.55
Cariboo	C1060-62626	1060	2016	29.094	24.502	0.294	0.931	1/16/2016	0.84
Cariboo	C1060-62629	1060	2016	49.062	52.17	0.626	1.57	1/16/2016	1.06
Cariboo	C1084-108624	1084	2016	2.775	7.984	0.096	0.089	1/20/2016	2.88
Cariboo	C1084-108640	1084	2016	4	10.917	0.131	0.128	1/20/2016	2.73
Cariboo	C1084-108646	1084	2016	3.406	52.92	0.635	0.109	1/20/2016	15.54
Cariboo	C1084-108651	1084	2016	2.95	19.835	0.238	0.094	1/20/2016	6.72
Cariboo	C1084-108678	1084	2016	7	12.001	0.144	0.224	1/20/2016	1.71
Cariboo	C1084-108704	1084	2016	5.938	10.334	0.124	0.19	1/20/2016	1.74
Cariboo	C1084-108723	1084	2016	1.775	10.917	0.131	0.057	1/20/2016	6.15
Cariboo	C1060-63142	1060	2016	47.188	44.503	0.534	1.51	1/23/2016	0.94
Cariboo	C1060-63624	1060	2016	61.25	22.335	0.268	1.96	1/23/2016	0.36
Cariboo	C1084-109603	1084	2016	2.241	12.668	0.152	0.072	1/28/2016	5.65
Cariboo	C1084-109614	1084	2016	3.969	11.334	0.136	0.127	1/28/2016	2.86
Cariboo	C1084-109623	1084	2016	0.834	2.667	0.032	0.027	1/28/2016	3.20
Cariboo	C1084-109642	1084	2016	0.65	2.575	0.031	0.021	1/28/2016	3.96
Cariboo	C1084-109653	1084	2016	4.656	8.584	0.103	0.149	1/28/2016	1.84
Cariboo	C1084-109656	1084	2016	1.269	7.3	0.088	0.041	1/28/2016	5.75
Cariboo	C1084-109667	1084	2016	2.775	105.007	1.26	0.089	1/28/2016	37.84
Cariboo	C1084-109678	1084	2016	4.312	3.642	0.044	0.138	1/28/2016	0.84
Cariboo	C1084-109686	1084	2016	2.684	2.575	0.031	0.086	1/28/2016	0.96
Cariboo	C1084-109717	1084	2016	2.872	3.217	0.039	0.092	1/28/2016	1.12
Cariboo	C1084-109721	1084	2016	1.769	12.334	0.148	0.057	1/28/2016	6.97
Cariboo	C1072-999101	1072	2016	7.906	18.585	0.223	0.253	2/5/2016	2.35
Cariboo	C1072-999102	1072	2016	39.062	42.836	0.514	1.25	2/5/2016	1.10
Cariboo	C1072-999103	1072	2016	64.375	55.17	0.662	2.06	2/5/2016	0.86
Cariboo	C1072-999104	1072	2016	11.719	29.669	0.356	0.375	2/5/2016	2.53
Cariboo	C1072-999105	1072	2016	22.938	45.42	0.545	0.734	2/5/2016	1.98
Cariboo	C1072-999106	1072	2016	33.125	38.253	0.459	1.06	2/5/2016	1.15
Cariboo	C1072-999107	1072	2016	4.938	34.919	0.419	0.158	2/5/2016	7.07
Cariboo	C1072-999108	1072	2016	5.188	23.918	0.287	0.166	2/5/2016	4.61
Cariboo	C1072-999109	1072	2016	34.688	48.92	0.587	1.11	2/5/2016	1.41

Cariboo	C1072-999110	1072	2016	20.906	63.504	0.762	0.669	2/5/2016	3.04
Cariboo	C1072-999116	1072	2016	12.188	30.002	0.36	0.39	2/5/2016	2.46
Cariboo	C1072-999117	1072	2016	6.375	26.168	0.314	0.204	2/5/2016	4.10
Cariboo	C1072-999119	1072	2016	37.812	64.421	0.773	1.21	2/5/2016	1.70
Cariboo	C1072-999120	1072	2016	33.438	56.254	0.675	1.07	2/5/2016	1.68
Cariboo	C1072-999121	1072	2016	15.969	35.836	0.43	0.511	2/5/2016	2.24
Cariboo	C1072-999122	1072	2016	7.969	35.919	0.431	0.255	2/5/2016	4.51
Cariboo	C1072-999123	1072	2016	1.447	19.835	0.238	0.046	2/5/2016	13.71
Cariboo	C1072-999124	1072	2016	9.094	16.751	0.201	0.291	2/5/2016	1.84
Cariboo	C1072-999127	1072	2016	5	26.918	0.323	0.16	2/5/2016	5.38
Cariboo	C1072-999128	1072	2016	17.656	27.669	0.332	0.565	2/5/2016	1.57
Cariboo	C1072-999129	1072	2016	7.156	32.169	0.386	0.229	2/5/2016	4.50
Cariboo	C1072-999130	1072	2016	31.875	38.086	0.457	1.02	2/5/2016	1.19
Cariboo	C1072-999131	1072	2016	18.25	27.835	0.334	0.584	2/5/2016	1.53
Cariboo	C1072-999136	1072	2016	23.594	54.504	0.654	0.755	2/5/2016	2.31
Cariboo	C1072-999137	1072	2016	5.469	23.752	0.285	0.175	2/5/2016	4.34
Cariboo	C1072-999138	1072	2016	8.281	31.169	0.374	0.265	2/5/2016	3.76
Cariboo	C1072-999139	1072	2016	16.656	34.169	0.41	0.533	2/5/2016	2.05
Cariboo	C1072-999141	1072	2016	18.625	41.169	0.494	0.596	2/5/2016	2.21
Cariboo	C1072-999142	1072	2016	5.156	22.335	0.268	0.165	2/5/2016	4.33
Cariboo	C1072-999143	1072	2016	7.125	29.085	0.349	0.228	2/5/2016	4.08
Cariboo	C1072-999144	1072	2016	41.25	23.835	0.286	1.32	2/5/2016	0.58
Cariboo	C1072-999145	1072	2016	31.25	46.67	0.56	1	2/5/2016	1.49
Cariboo	C1072-999146	1072	2016	43.125	31.252	0.375	1.38	2/5/2016	0.72
Cariboo	C1072-999147	1072	2016	10.312	26.252	0.315	0.33	2/5/2016	2.55
Cariboo	C1072-999148	1072	2016	2.712	23.168	0.278	0.087	2/5/2016	8.54
Cariboo	C1072-999149	1072	2016	21.531	33.252	0.399	0.689	2/5/2016	1.54
Cariboo	C1072-999150	1072	2016	13.531	26.252	0.315	0.433	2/5/2016	1.94
Cariboo	C1072-999151	1072	2016	3.625	17.251	0.207	0.116	2/5/2016	4.76
Cariboo	C1072-999152	1072	2016	10.75	29.585	0.355	0.344	2/5/2016	2.75
Cariboo	C1072-999165	1072	2016	23.656	36.669	0.44	0.757	2/5/2016	1.55
Cariboo	C1072-999166	1072	2016	1.291	10.917	0.131	0.041	2/5/2016	8.46
Cariboo	C1084-105100	1084	2016	0.806	10.167	0.122	0.026	2/5/2016	12.61
Cariboo	C1084-105145	1084	2016	5.312	7.876	0.094	0.17	2/5/2016	1.48
Cariboo	C1084-105306	1084	2016	4.219	5.459	0.066	0.135	2/5/2016	1.29
Cariboo	C1084-105606	1084	2016	2.138	2.375	0.028	0.068	2/5/2016	1.11
Cariboo	C1084-105620	1084	2016	2.509	4.984	0.06	0.08	2/5/2016	1.99
Cariboo	C1084-105628	1084	2016	4.906	0.739	0.009	0.157	2/5/2016	0.15
Cariboo	C1084-105640	1084	2016	1.878	7.717	0.093	0.06	2/5/2016	4.11
Cariboo	C1084-107509	1084	2016	0.434	7.017	0.084	0.014	2/8/2016	16.17
Cariboo	C1084-107605	1084	2016	0.681	11.167	0.134	0.022	2/8/2016	16.40
Cariboo	C1084-107642	1084	2016	0.512	40.253	0.483	0.016	2/8/2016	78.62
Cariboo	C1084-110301	1084	2016	9.906	16.251	0.195	0.317	2/13/2016	1.64
Cariboo	C1084-110310	1084	2016	2.419	12.251	0.147	0.077	2/13/2016	5.06
Cariboo	C1084-110316	1084	2016	7.031	10.667	0.128	0.225	2/13/2016	1.52
Cariboo	C1084-110323	1084	2016	9.844	24.002	0.288	0.315	2/13/2016	2.44
Cariboo	C1084-110603	1084	2016	5.75	40.753	0.489	0.184	2/13/2016	7.09
Cariboo	C1084-110623	1084	2016	1.344	18.085	0.217	0.043	2/13/2016	13.46
Cariboo	C1084-110639	1084	2016	9.156	15.418	0.185	0.293	2/13/2016	1.68
Cariboo	C1084-110644	1084	2016	6.156	6.625	0.08	0.197	2/13/2016	1.08
Cariboo	C1072-81616	1072	2016	2.691	9.417	0.113	0.086	2/16/2016	3.50
Cariboo	C1072-81638	1072	2016	2.628	12.918	0.155	0.084	2/16/2016	4.92
Cariboo	C1072-81647	1072	2016	3.844	13.251	0.159	0.123	2/16/2016	3.45
Cariboo	C1072-81654	1072	2016	0.984	9.334	0.112	0.032	2/16/2016	9.49
Cariboo	C1072-81673	1072	2016	2.75	3.8	0.046	0.088	2/16/2016	1.38

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C	NP
							%	%			%C	%C	kgCaCO3/t
82	49 1130 A	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite Volcanic	0.09	-0.01	9.2	9.5	#N/A	0.33	41
83	50 1130 B	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.22	0.01	8.9	9.2	#N/A	0.68	53
84	51 55145	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.43	0.01	8.7	9.1	#N/A	0.63	47
85	52 55137	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.28	-0.01	8.5	8.8	#N/A	0.44	47
86	71 55135	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.57	-0.01	8.8	9.1	#N/A	0.33	37
87	72 55141	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.12	-0.01	8.8	9	#N/A	0.52	48
88	39 1140 A	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite Volcanic	0.03	-0.01	9.2	9.5	#N/A	0.27	36
89	40 1140 B	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.21	-0.01	8.9	9.2	#N/A	0.49	48
90	42 54642	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.99	0.01	9	9.3	#N/A	0.35	43
91	43 55148	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.81	-0.01	8.8	9.2	#N/A	0.35	42
92	44 55136	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.05	0.01	8.5	8.8	#N/A	0.46	43
93	45 55685	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.46	0.01	8.8	9.2	#N/A	0.25	29
94	46 55666	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.16	0.01	8.8	9.2	#N/A	0.33	38
95	47 55670	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.13	0.01	8.9	9.4	#N/A	0.22	28
96	48 55681	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1	-0.01	8.8	9	#N/A	0.68	70
97	26 1150 A	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.03	0.01	9	9.4	#N/A	0.52	52
98	27 1150 B	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.36	0.01	9	9.4	#N/A	0.30	46
99	28 1150 C	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.18	0.03	9	9.4	#N/A	0.27	33
100	29 62673	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.06	0.04	9.2	9.5	#N/A	0.27	36
101	30 62690	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.14	0.03	9	9.4	#N/A	0.30	39
102	31 77864	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.88	0.03	8.9	9.2	#N/A	0.27	31
103	32 77880	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.65	0.02	8.7	9	#N/A	0.68	68
104	33 77889	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.5	0.03	8.7	9.1	#N/A	0.25	35
105	34 63774	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.53	0.01	9.3	9.6	#N/A	0.22	25
106	35 63781	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.29	0.02	8.7	9	#N/A	0.44	49
107	36 63755	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.87	0.02	9.1	9.4	#N/A	0.14	20
108	37 63995	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.04	0.02	9.2	9.6	#N/A	0.33	40
109	38 54609	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.49	-0.01	9.1	9.4	#N/A	0.27	39
110	COMP#1	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.21	-0.01	8.5	8.1	#N/A	0.44	47
111	COMP#3	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.13	-0.01	8.5	8.1	#N/A	0.22	39
112	COMP#2	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.15	-0.01	8.9	8.6	#N/A	0.22	33
113	COMP#4	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.74	-0.01	8.4	7.8	#N/A	0.33	39
114	COMP#5	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.97	-0.01	8.5	7.8	#N/A	0.22	34
115	COMP#8	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.92	-0.01	8.7	8.1	#N/A	0.33	45
116	COMP#10	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.11	-0.01	8.7	8	#N/A	0.22	33
117	COMP#11	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.93	-0.01	8.6	8	#N/A	0.27	38
118	COMP#19	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.7	-0.01	9	8.1	#N/A	0.22	31
119	77766	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.7	-0.01	8.7	8	#N/A	0.27	33
120	77807	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.6	0.03	9	7.9	#N/A	0.11	26
121	77718	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.5	0.03	8.7	7.7	#N/A	0.11	27
122	77761	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.61	0.01	9.1	7.8	#N/A	0.11	23
123	77762	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.75	0.01	8.7	8	#N/A	0.27	37
124	77765	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.44	-0.01	9.2	8.2	#N/A	0.05	24
125	77767	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.23	0.03	8.7	7.9	#N/A	0.16	25
126	77769	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1	0.03	8.9	8	#N/A	0.22	32
127	77770	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.99	0.02	8.3	7.7	#N/A	0.55	55
128	77774	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.07	0.02	8.8	8.1	#N/A	0.05	23
129	77806	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.89	0.03	8.9	8	#N/A	0.16	29
130	COMP#1	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.21	-0.01	8.5	8.1	#N/A	0.44	47
131	COMP#2	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.15	-0.01	8.9	8.6	#N/A	0.22	33
132	COMP#3	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.13	-0.01	8.5	8.1	#N/A	0.22	39
133	COMP#4	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.74	-0.01	8.4	7.8	#N/A	0.33	39
134	COMP#5	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.97	-0.01	8.5	7.8	#N/A	0.22	34
135	20-57438	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.42	0.02	8.1	7.7	#N/A	0.05	8
136	22-57431	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.46	0.02	8.7	8.1	#N/A	0.49	36
137	23-57440	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.37	0.01	8.4	7.6	#N/A	-0.05	11
138	24-57003	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.88	0.01	8.8	8.4	#N/A	0.11	23
139	25-57010	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.18	0.01	8.5	7.8	#N/A	0.11	10
140	26-57441	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.24	0.01	8.5	7.7	#N/A	0.11	12
141	27-57446	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.38	-0.01	8	7.3	#N/A	-0.05	15
142	28-57448	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.2	-0.01	8.4	8.1	#N/A	0.11	20
143	30-57053	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.42	0.02	8.2	8.1	#N/A	0.49	62
144	31-57033	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.89	-0.01	8.9	8.5	#N/A	0.33	38
145	32-57035	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.48	0.01	8.1	7.8	#N/A	-0.05	18
146	33-57067	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.28	0.01	8.9	8.1	#N/A	0.11	16
147	34-57096	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.64	0.01	8.7	8	#N/A	0.16	19
148	35-57101	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.33	0.01	9	8.2	#N/A	0.76	36
149	36-57103	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.71	0.02	8.6	8	#N/A	0.27	35
150	37-57107	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.15	0.02	8.4	7.8	#N/A	-0.05	11
151	39-57688	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.1	-0.01	8.2	7.7	#N/A	0.11	27
152	40-57694	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.41	-0.01	8.8	8.5	#N/A	0.27	37
153	COMP#41	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.21	-0.01	8.9	8.7	#N/A	0.44	50
154	COMP#65	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.07	-0.01	8.9	8.9	#N/A	0.27	38
155	COMP#44	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.27	-0.01	9.3	8.9	#N/A	0.22	34
156	COMP#45	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.21	-0.01	8.9	8.5	#N/A	0.11	26
157	COMP#53	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.2	-0.01	8.9	8.8	#N/A	0.38	44
158	COMP#66	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.07	-0.01	8.9	8.7	#N/A	0.33	41
159	COMP#68	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.17	-0.01	9.3	8.9	#N/A	0.22	41
452	56439	Boundary Pit	#N/A	Blast Hole Cuttings	56439	#N/A	0.216	#N/A	#N/A	#N/A	#N/A	0.58	48.41666667
453	56439 dup	Boundary Pit	#N/A	Blast Hole Cuttings	56439 dup	#N/A	0.214	#N/A	#N/A	#N/A	#N/A	0.57	47.33333333
454	56440	Boundary Pit	#N/A	Blast Hole Cuttings	56440	#N/A	0.164	#N/A	#N/A	#N/A	#N/A	0.76	63.08333333
455	56440 dup	Boundary Pit	#N/A	Blast Hole Cuttings	56440 dup	#N/A	0.167	#N/A	#N/A	#N/A	#N/A	0.76	63.08333333
456	56442	Boundary Pit	#N/A	Blast Hole Cuttings	56442	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.26	21.75
457	79152	Boundary Pit	#N/A	Blast Hole Cuttings	79152	#N/A	0.126	#N/A	#N/A	#N/A	#N/A	0.24	20.25
458	56446	Boundary Pit	#N/A	Blast Hole Cuttings	56446	#N/A	0.917	#N/A	#N/A	#N/A	#N/A	0.81	67.08333333
459	56448	Boundary Pit	#N/A	Blast Hole Cuttings	56448	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.28	22.91666667
460	79157	Boundary Pit	#N/A	Blast Hole Cuttings	79157	#N/A	0.25	#N/A	#N/A	#N/A	#N/A	0.25	20.83333333
461	79165	Boundary Pit	#N/A	Blast Hole Cuttings	79165	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.94	78.58333333
462	79162	Boundary Pit	#N/A	Blast Hole Cuttings	79162	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.33	27.66666667
463	79163	Boundary Pit	#N/A	Blast Hole Cuttings	79163	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.80	66.66666667
464	79409	Boundary Pit	#N/A	Blast Hole Cuttings	79409	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.42	35
465	79413	Boundary Pit	#N/A	Blast Hole Cuttings	79413	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	1.15	95.83333333
466	79454	Boundary Pit	#N/A	Blast Hole Cuttings	79454	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.24	20.25
467	79455	Boundary Pit	#N/A	Blast Hole Cuttings	79455	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.26	21.66666667
468	79456	Boundary Pit	#N/A	Blast Hole Cuttings	79456	#N/A	0.054	#N/A	#N/A	#N/A	#N/A	0.46	38.58333333
469	79457	Boundary Pit	#N/A	Blast Hole Cuttings	79457	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.15	12.66666667
470	79464	Boundary Pit	#N/A	Blast Hole Cuttings	79464	#N/A	0.453	#N/A	#N/A	#N/A	#N/A	0.78	65.25
471	79401	Boundary Pit	B1180-12	Blast Hole Cuttings	79401	#N/A	2.48	#N/A	#N/A	#N/A	#N/A	0.34	28.5
472	79401	Boundary Pit	B1180-12	Blast Hole Cuttings	79401	#N/A	2.05	#N/A	#N/A	#N/A	#N/A	0.17	14.41666667
473	79402	Boundary Pit	B1180-12	Blast Hole Cuttings	79402	#N/A	0.911	#N/A	#N/A	#N/A	#N/A	0.16	12.91666667
474	79402	Boundary Pit	B1180-12	Blast Hole Cuttings	79402	#N/A	1.46	#N/A	#N/A	#N/A	#N/A	0.32	26.66666667
475	79403	Boundary Pit	B1180-12	Blast Hole Cuttings	79403	#N/A	0.886	#N/A	#N/A	#N/A	#N/A	0.13	10.75
476	79403	Boundary Pit	B1180-12	Blast Hole Cuttings	79403	#N/A	1.08	#N/A	#N/A	#N/A	#N/A	0.13	10.91666667
477	79404	Boundary Pit	B1180-12	Blast Hole Cuttings	79404	#N/A	0.74	#N/A	#N/A	#N/A	#N/A	0.22	18.25
478	79404	Boundary Pit	B1180-12	Blast Hole Cuttings	79404	#N/A	0.872	#N/A	#N/A	#N/A	#N/A	0.30	24.66666667
479	M82319	Boundary Pit	B1168-13	Blast Hole Cuttings	M82319	#N/A	0.019	#N/A	#N/A	#N/A	#N/A	0.36	29.75
480	79153	Boundary Pit	B1168-12	Blast Hole Cuttings	79153	#N/A	1.35	#N/A	#N/A	#N/A	#N/A	0.37	30.91666667
481	79154	Boundary Pit	B1168-12	Blast Hole Cuttings	79154	#N/A	1.52	#N/A	#N/A	#N/A	#N/A	0.36	30.33333333
482	79155	Boundary Pit	B1168-12	Blast Hole Cuttings	79155	#N/A	1.23	#N/A	#N/A	#N/A	#N/A	0.48	39.91666667
483	56447	Boundary Pit	B1168-11	Blast Hole Cuttings	56447	#N/A	0.904	#N/A	#N/A	#N/A	#N/A	0.31	25.5
484	56446	Boundary Pit	B1168-11	Blast Hole Cuttings	56446	#N/A	0.917	#N/A	#N/A	#N/A	#N/A	0.81	67.08333333
485	79451	Boundary Pit	B1156-23	Blast Hole Cuttings	79451	#N/A	1.44	#N/A	#N/A	#N/A	#N/A	0.47	39.5
486	79452	Boundary Pit	B1156-23	Blast Hole Cuttings	79452	#N/A	1.07	#N/A	#N/A	#N/A	#N/A	0.69	57.16666667
487	79411	Boundary Pit	B1156-22	Blast Hole Cuttings	79411	#N/A	1.22	#N/A	#N/A	#N/A	#N/A	0.47	39.41666667
488	79412	Boundary Pit	B1156-22	Blast Hole Cuttings	79412	#N/A	1.05	#N/A	#N/A	#N/A	#N/A	0.41	34.08333333
489	79413	Boundary Pit	B1156-22	Blast Hole Cuttings	79413	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	1.15	95.83333333
490	79165	Boundary Pit	B1156-20	Blast Hole Cuttings	79165	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.94	78.58333333
491	79159	Boundary Pit	B1156-19	Blast Hole Cuttings	79159	#N/A	0.854	#N/A	#N/A	#N/A	#N/A	0.11	9.25
492	79160	Boundary Pit	B1156-19	Blast Hole Cuttings	79160	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	0.17	14.5
493	79156	Boundary Pit	B1156-18	Blast Hole Cuttings	79156	#N/A	1.65	#N/A	#N/A	#N/A	#N/A	0.42	34.91666667
494	79151	Boundary Pit	B1156-15	Blast Hole Cuttings	79151	#N/A	0.818	#N/A	#N/A	#N/A	#N/A	0.08	6.833333333
495	79152	Boundary Pit	B1156-15	Blast Hole Cuttings	79152	#N/A	0.126	#N/A	#N/A	#N/A	#N/A	0.24	20.25
496	56448	Boundary Pit	B1156-11	Blast Hole Cuttings	56448	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.28	22.91666667
497	56441	Boundary Pit	B1156-07	Blast Hole Cuttings	56441	#N/A	0.985	#N/A	#N/A	#N/A	#N/A	0.49	40.75
498	56442	Boundary Pit	B1156-07	Blast Hole Cuttings	56442	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.26	21.75
499	56443	Boundary Pit	B1156-07	Blast Hole Cuttings	56443	#N/A	0.376	#N/A	#N/A	#N/A	#N/A	0.42	34.83333333
500	56439	Boundary Pit	B1156-05	Blast Hole Cuttings	56439	#N/A	0.216	#N/A	#N/A	#N/A	#N/A	0.58	48.41666667
501	56439 dup	Boundary Pit	B1156-05	Blast Hole Cuttings	56439 dup	#N/A	0.214	#N/A	#N/A	#N/A	#N/A	0.57	47.33333333
502	56440	Boundary Pit	B1156-05	Blast Hole Cuttings	56440	#N/A	0.164	#N/A	#N/A	#N/A	#N/A	0.76	63.08333333
503	56440 dup	Boundary Pit	B1156-05	Blast Hole Cuttings	56440 dup	#N/A	0.167	#N/A	#N/A	#N/A	#N/A	0.76	63.08333333
504	M82320	Boundary Pit	B1144-23	Blast Hole Cuttings	M82320	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.24	19.58333333
505	M 79203	Boundary Pit	B1144-20	Blast Hole Cuttings	M 79203	#N/A	1.24	#N/A	#N/A	#N/A	#N/A	0.51	42.58333333
506	M 79204	Boundary Pit	B1144-20	Blast Hole Cuttings	M 79204	#N/A	2.41	#N/A	#N/A	#N/A	#N/A	0.43	35.58333333
507	M 79467	Boundary Pit	B1144-16	Blast Hole Cuttings	M 79467	#N/A	0.915	#N/A	#N/A	#N/A	#N/A	1.07	89.16666667
508	M 79468	Boundary Pit	B1144-16	Blast Hole Cuttings	M 79468	#N/A	1.11	#N/A	#N/A	#N/A	#N/A	0.22	18.5
509	79454	Boundary Pit	B1144-13	Blast Hole Cuttings	79454	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.24	20.25
510	79461	Boundary Pit	B1144-13	Blast Hole Cuttings	79461	#N/A	1.61	#N/A	#N/A	#N/A	#N/A	0.45	37.75
511	79463	Boundary Pit	B1144-13	Blast Hole Cuttings	79463	#N/A	0.872	#N/A	#N/A	#N/A	#N/A	0.22	18.08333333
512	79464	Boundary Pit	B1144-13	Blast Hole Cuttings	79464	#N/A	0.453	#N/A	#N/A	#N/A	#N/A	0.78	65.25
513	79408	Boundary Pit	B1144-11	Blast Hole Cuttings	79408	#N/A	0.386	#N/A	#N/A	#N/A	#N/A	0.25	21
514	79455	Boundary Pit	B1144-10	Blast Hole Cuttings	79455	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.26	21.66666667
515	79161	Boundary Pit	B1144-08	Blast Hole Cuttings	79161	#N/A	1.17	#N/A	#N/A	#N/A	#N/A	0.47	39.08333333
516	79162	Boundary Pit	B1144-08	Blast Hole Cuttings	79162	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.33	27.66666667
517	79163	Boundary Pit	B1144-08	Blast Hole Cuttings	79163	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.80	66.66666667
518	79409	Boundary Pit	B1144-08	Blast Hole Cuttings	79409	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.42	35
519	79410	Boundary Pit	B1144-08	Blast Hole Cuttings	79410	#N/A	1.68	#N/A	#N/A	#N/A	#N/A	0.33	27.08333333
520	79157	Boundary Pit	B1144-05	Blast Hole Cuttings	79157	#N/A	0.25	#N/A	#N/A	#N/A	#N/A	0.25	20.83333333
521	M79201	Boundary Pit	B1132-5	Blast Hole Cuttings	M79201	#N/A	0.028	#N/A	#N/A	#N/A	#N/A	0.05	4.5
522	M 79469	Boundary Pit	B1132-4	Blast Hole Cuttings	M 79469	#N/A	0.067	#N/A	#N/A	#N/A	#N/A	0.11	9.083333333
523	M79212	Boundary Pit	B1132-19	Blast Hole Cuttings	M79212	#N/A	0.489	#N/A	#N/A	#N/A	#N/A	0.71	59
524	M79213	Boundary Pit	B1132-19	Blast Hole Cuttings	M79213	#N/A	0.07	#N/A	#N/A	#N/A	#N/A	0.32	26.75
525	M79420	Boundary Pit	B1132-17	Blast Hole Cuttings	M79420	#N/A	1.07	#N/A	#N/A	#N/A	#N/A	0.24	19.66666667
526	M79421	Boundary Pit	B1132-17	Blast Hole Cuttings	M79421	#N/A	0.467	#N/A	#N/A	#N/A	#N/A	0.84	70.25
527	M79419	Boundary Pit	B1132-16	Blast Hole Cuttings	M79419	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	0.14	11.33333333
528	M79418	Boundary Pit	B1132-13	Blast Hole Cuttings	M79418	#N/A	0.041	#N/A	#N/A	#N/A	#N/A	0.09	7.416666667
529	M79210	Boundary Pit	B1132-11	Blast Hole Cuttings	M79210	#N/A	0.051	#N/A	#N/A	#N/A	#N/A	0.11	8.916666667
530	M79209	Boundary Pit	B1132-10	Blast Hole Cuttings	M79209	#N/A	1.07	#N/A	#N/A	#N/A	#N/A	0.22	17.91666667
531	79457	Boundary Pit	B1132-02	Blast Hole Cuttings	79457	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.15	12.66666667
532	79456	Boundary Pit	B1132-01	Blast Hole Cuttings	79456	#N/A	0.054	#N/A	#N/A	#N/A	#N/A	0.46	38.58333333
533	M 82338	Boundary Pit	B1120-21	Blast Hole Cuttings	M 82338	#N/A	2	#N/A	#N/A	#N/A	#N/A	0.27	22.66666667
534	M 82339	Boundary Pit	B1120-21	Blast Hole Cuttings	M 82339	#N/A	0.767	#N/A	#N/A	#N/A	#N/A	1.66	138.3333333
535	M82481	Boundary Pit	B1120-19	Blast Hole Cuttings	M82481	#N/A	0.075	#N/A	#N/A	#N/A	#N/A	0.19	15.41666667
536	M82480	Boundary Pit	B1120-18	Blast Hole Cuttings	M82480	#N/A	0.031	#N/A	#N/A	#N/A	#N/A	0.22	18.25
537	M79168	Boundary Pit	B1120-12	Blast Hole Cuttings	M79168	#N/A	0.155	#N/A	#N/A	#N/A	#N/A	0.41	34.08333333
538	M79167	Boundary Pit	B1120-11	Blast Hole Cuttings	M79167	#N/A	0.056	#N/A	#N/A	#N/A	#N/A	0.05	4.416666667
539	M79166	Boundary Pit	B1120-10	Blast Hole Cuttings	M79166	#N/A	0.787	#N/A	#N/A	#N/A	#N/A	0.33	27.75
540	M79220	Boundary Pit	B1120-09	Blast Hole Cuttings	M79220	#N/A	0.116	#N/A	#N/A	#N/A	#N/A	0.43	35.58333333
541	M79219	Boundary Pit	B1120-08	Blast Hole Cuttings	M79219	#N/A	0.896	#N/A	#N/A	#N/A	#N/A	0.73	60.5
542	M79215	Boundary Pit	B1120-07	Blast Hole Cuttings	M79215	#N/A	0.061	#N/A	#N/A	#N/A	#N/A	0.07	6.083333333
543	M79214	Boundary Pit	B1120-06	Blast Hole Cuttings	M79214	#N/A	0.081	#N/A	#N/A	#N/A	#N/A	0.10	8.416666667
544	M 82677	Boundary Pit	B1108-13	Blast Hole Cuttings	M 82677	#N/A	1.28	#N/A	#N/A	#N/A	#N/A	0.54	45
545	82316	Boundary Pit	B1108-12	Blast Hole Cuttings	82316	#N/A	0.072	#N/A	#N/A	#N/A	#N/A	0.06	4.833333333
546	82317	Boundary Pit	B1108-12	Blast Hole Cuttings	82317	#N/A	0.064	#N/A	#N/A	#N/A	#N/A	0.05	4.25
547	M82303	Boundary Pit	B1108-11	Blast Hole Cuttings	M82303	#N/A	0.086	#N/A	#N/A	#N/A	#N/A	0.06	5.166666667
548	M82304	Boundary Pit	B1108-10	Blast Hole Cuttings	M82304	#N/A	0.038	#N/A	#N/A	#N/A	#N/A	0.09	7.166666667
549	M82301	Boundary Pit	B1108-09	Blast Hole Cuttings	M82301	#N/A	0.852	#N/A	#N/A	#N/A	#N/A	0.35	29.25
550	M82302	Boundary Pit	B1108-09	Blast Hole Cuttings	M82302	#N/A	0.111	#N/A	#N/A	#N/A	#N/A	0.06	4.916666667
551	M82496	Boundary Pit	B1108-06	Blast Hole Cuttings	M82496	#N/A	0.613	#N/A	#N/A	#N/A	#N/A	0.37	30.83333333

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C	NP
							%	%			%C	%C	kgCaCO3/t
552	M82497	Boundary Pit	B1108-05	Blast Hole Cuttings	M82497	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.14	11.83333333
553	M82478	Boundary Pit	B1108-01	Blast Hole Cuttings	M82478	#N/A	0.03	#N/A	#N/A	#N/A	#N/A	0.15	12.41666667
554	82501	Boundary Pit	B1096-8	Blast Hole Cuttings	82501	#N/A	0.056	#N/A	#N/A	#N/A	#N/A	0.03	2.833333333
555	82502	Boundary Pit	B1096-5	Blast Hole Cuttings	82502	#N/A	0.049	#N/A	#N/A	#N/A	#N/A	0.22	18.41666667
556	82503	Boundary Pit	B1096-2	Blast Hole Cuttings	82503	#N/A	0.082	#N/A	#N/A	#N/A	#N/A	0.21	17.75
557	M82323	Boundary Pit	B1096-18	Blast Hole Cuttings	M82323	#N/A	0.059	#N/A	#N/A	#N/A	#N/A	0.08	6.583333333
558	M82322	Boundary Pit	B1096-17	Blast Hole Cuttings	M82322	#N/A	0.032	#N/A	#N/A	#N/A	#N/A	0.17	14
559	M82321	Boundary Pit	B1096-16	Blast Hole Cuttings	M82321	#N/A	0.115	#N/A	#N/A	#N/A	#N/A	0.12	9.583333333
560	M 82516	Boundary Pit	B1096-15	Blast Hole Cuttings	M 82516	#N/A	0.086	#N/A	#N/A	#N/A	#N/A	0.16	12.91666667
561	M 82517	Boundary Pit	B1096-15	Blast Hole Cuttings	M 82517	#N/A	0.414	#N/A	#N/A	#N/A	#N/A	0.21	17.16666667
562	M 82514	Boundary Pit	B1096-13	Blast Hole Cuttings	M 82514	#N/A	0.107	#N/A	#N/A	#N/A	#N/A	0.44	36.41666667
563	M 82515	Boundary Pit	B1096-13	Blast Hole Cuttings	M 82515	#N/A	0.078	#N/A	#N/A	#N/A	#N/A	0.11	9.416666667
564	M 82513	Boundary Pit	B1096-11	Blast Hole Cuttings	M 82513	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	0.26	21.66666667
565	M 82512	Boundary Pit	B1096-09	Blast Hole Cuttings	M 82512	#N/A	0.07	#N/A	#N/A	#N/A	#N/A	0.06	5.333333333
566	M82318	Boundary Pit	B1084-2	Blast Hole Cuttings	M82318	#N/A	0.042	#N/A	#N/A	#N/A	#N/A	0.15	12.83333333
567	M 82530	Boundary Pit	B1084-09	Blast Hole Cuttings	M 82530	#N/A	0.073	#N/A	#N/A	#N/A	#N/A	0.14	11.33333333
568	M 82676	Boundary Pit	B1072-04	Blast Hole Cuttings	M 82676	#N/A	0.088	#N/A	#N/A	#N/A	#N/A	0.12	10.08333333
569	M 82529	Boundary Pit	B1072-01	Blast Hole Cuttings	M 82529	#N/A	0.048	#N/A	#N/A	#N/A	#N/A	0.10	8.666666667
570	1065-1	Boundary Pit	#N/A	Blast Hole Cuttings	1065-1	#N/A	0.479	#N/A	#N/A	#N/A	#N/A	0.72	59.75
571	1084-2	Boundary Pit	#N/A	Blast Hole Cuttings	1084-2	#N/A	1.28	#N/A	#N/A	#N/A	#N/A	0.63	52.58333333
572	1111-1	Boundary Pit	#N/A	Blast Hole Cuttings	1111-1	#N/A	0.044	#N/A	#N/A	#N/A	#N/A	1.06	88.33333333
573	1526-2	Boundary Pit	#N/A	Blast Hole Cuttings	1526-2	#N/A	0.252	#N/A	#N/A	#N/A	#N/A	0.96	79.58333333
574	1639-1	Boundary Pit	#N/A	Blast Hole Cuttings	1639-1	#N/A	0.096	#N/A	#N/A	#N/A	#N/A	0.82	68.66666667
591	Z1030-04	SE Zone	#N/A	Blast Hole Cuttings	Z1030-04	#N/A	0.661	#N/A	#N/A	#N/A	#N/A	0.20	16.83333333
592	Z1030-05	SE Zone	#N/A	Blast Hole Cuttings	Z1030-05	#N/A	0.959	#N/A	#N/A	#N/A	#N/A	0.19	15.66666667
593	Z1030-06	SE Zone	#N/A	Blast Hole Cuttings	Z1030-06	#N/A	0.663	#N/A	#N/A	#N/A	#N/A	0.15	12.08333333
594	Z1030-07	SE Zone	#N/A	Blast Hole Cuttings	Z1030-07	#N/A	0.756	#N/A	#N/A	#N/A	#N/A	0.08	6.583333333
595	Z1030-07	SE Zone	#N/A	Blast Hole Cuttings	Z1030-07	#N/A	1.7	#N/A	#N/A	#N/A	#N/A	0.11	9.5
596	Z1030-08	SE Zone	#N/A	Blast Hole Cuttings	Z1030-08	#N/A	0.685	#N/A	#N/A	#N/A	#N/A	0.19	15.75
597	Z1030-08	SE Zone	#N/A	Blast Hole Cuttings	Z1030-08	#N/A	0.767	#N/A	#N/A	#N/A	#N/A	0.09	7.166666667
598	Z1030-09	SE Zone	#N/A	Blast Hole Cuttings	Z1030-09	#N/A	0.471	#N/A	#N/A	#N/A	#N/A	0.25	20.66666667
599	Z1030-09	SE Zone	#N/A	Blast Hole Cuttings	Z1030-09	#N/A	0.689	#N/A	#N/A	#N/A	#N/A	0.13	10.5
600	Z1030-10	SE Zone	#N/A	Blast Hole Cuttings	Z1030-10	#N/A	0.928	#N/A	#N/A	#N/A	#N/A	0.21	17.5
601	Z1040-01	SE Zone	#N/A	Blast Hole Cuttings	Z1040-01	#N/A	0.185	#N/A	#N/A	#N/A	#N/A	0.03	2.666666667
602	Z1040-04	SE Zone	#N/A	Blast Hole Cuttings	Z1040-04	#N/A	0.754	#N/A	#N/A	#N/A	#N/A	0.05	3.916666667
603	Z1040-05	SE Zone	#N/A	Blast Hole Cuttings	Z1040-05	#N/A	0.819	#N/A	#N/A	#N/A	#N/A	0.07	5.833333333
604	Z1040-06	SE Zone	#N/A	Blast Hole Cuttings	Z1040-06	#N/A	1.52	#N/A	#N/A	#N/A	#N/A	0.10	8.083333333
605	Z1040-07	SE Zone	#N/A	Blast Hole Cuttings	Z1040-07	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.07	5.583333333
606	Z1040-08	SE Zone	#N/A	Blast Hole Cuttings	Z1040-08	#N/A	0.55	#N/A	#N/A	#N/A	#N/A	0.03	2.166666667
607	Z1040-09	SE Zone	#N/A	Blast Hole Cuttings	Z1040-09	#N/A	0.94	#N/A	#N/A	#N/A	#N/A	0.11	9.25
608	Z1040-10	SE Zone	#N/A	Blast Hole Cuttings	Z1040-10	#N/A	0.482	#N/A	#N/A	#N/A	#N/A	0.11	8.75
609	Z1040-11	SE Zone	#N/A	Blast Hole Cuttings	Z1040-11	#N/A	0.729	#N/A	#N/A	#N/A	#N/A	0.06	5.166666667
610	Z1040-12	SE Zone	#N/A	Blast Hole Cuttings	Z1040-12	#N/A	0.315	#N/A	#N/A	#N/A	#N/A	0.08	6.5
611	Z1040-13	SE Zone	#N/A	Blast Hole Cuttings	Z1040-13	#N/A	0.583	#N/A	#N/A	#N/A	#N/A	0.23	19.25
612	Z1040-14	SE Zone	#N/A	Blast Hole Cuttings	Z1040-14	#N/A	0.898	#N/A	#N/A	#N/A	#N/A	0.14	11.83333333
613	Z1040-15	SE Zone	#N/A	Blast Hole Cuttings	Z1040-15	#N/A	0.798	#N/A	#N/A	#N/A	#N/A	0.16	13
614	Z1050-02	SE Zone	#N/A	Blast Hole Cuttings	Z1050-02	#N/A	0.323	#N/A	#N/A	#N/A	#N/A	0.04	3
615	Z1050-03	SE Zone	#N/A	Blast Hole Cuttings	Z1050-03	#N/A	0.478	#N/A	#N/A	#N/A	#N/A	0.02	1.916666667
616	Z1050-04	SE Zone	#N/A	Blast Hole Cuttings	Z1050-04	#N/A	0.679	#N/A	#N/A	#N/A	#N/A	0.11	9.333333333
617	Z1050-05	SE Zone	#N/A	Blast Hole Cuttings	Z1050-05	#N/A	0.91	#N/A	#N/A	#N/A	#N/A	0.09	7.5
618	Z1050-06	SE Zone	#N/A	Blast Hole Cuttings	Z1050-06	#N/A	0.886	#N/A	#N/A	#N/A	#N/A	0.09	7.75
619	Z1050-07	SE Zone	#N/A	Blast Hole Cuttings	Z1050-07	#N/A	0.708	#N/A	#N/A	#N/A	#N/A	0.18	14.58333333
620	Z1050-09	SE Zone	#N/A	Blast Hole Cuttings	Z1050-09	#N/A	0.427	#N/A	#N/A	#N/A	#N/A	0.08	6.25
621	Z1050-10	SE Zone	#N/A	Blast Hole Cuttings	Z1050-10	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.21	17.83333333
622	Z1060-05	SE Zone	#N/A	Blast Hole Cuttings	Z1060-05	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	0.13	11.08333333
623	Z1060-09	SE Zone	#N/A	Blast Hole Cuttings	Z1060-09	#N/A	0.472	#N/A	#N/A	#N/A	#N/A	0.09	7.75
624	106257	SE Zone	#N/A	Blast Hole Cuttings	106257	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.97	80.58
625	106276	SE Zone	#N/A	Blast Hole Cuttings	106276	#N/A	0.091	#N/A	#N/A	#N/A	#N/A	0.43	35.42
626	106585	SE Zone	#N/A	Blast Hole Cuttings	106585	#N/A	0.105	#N/A	#N/A	#N/A	#N/A	0.23	19.5
627	106740	SE Zone	#N/A	Blast Hole Cuttings	106740	#N/A	0.218	#N/A	#N/A	#N/A	#N/A	0.31	25.42
628	106838	SE Zone	#N/A	Blast Hole Cuttings	106838	#N/A	0.148	#N/A	#N/A	#N/A	#N/A	0.40	33.42
629	106933	SE Zone	#N/A	Blast Hole Cuttings	106933	#N/A	2.49	#N/A	#N/A	#N/A	#N/A	0.54	44.67
630	107035	SE Zone	#N/A	Blast Hole Cuttings	107035	#N/A	0.168	#N/A	#N/A	#N/A	#N/A	0.31	25.83
631	107291	SE Zone	#N/A	Blast Hole Cuttings	107291	#N/A	0.226	#N/A	#N/A	#N/A	#N/A	0.10	8.29
632	109016	SE Zone	#N/A	Blast Hole Cuttings	109016	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.67	55.83
633	109054	SE Zone	#N/A	Blast Hole Cuttings	109054	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.30	25.08
634	109323	SE Zone	#N/A	Blast Hole Cuttings	109323	#N/A	1.7	#N/A	#N/A	#N/A	#N/A	0.23	19.25
635	109434	SE Zone	#N/A	Blast Hole Cuttings	109434	#N/A	0.074	#N/A	#N/A	#N/A	#N/A	0.15	12.83
636	109445	SE Zone	#N/A	Blast Hole Cuttings	109445	#N/A	1.47	#N/A	#N/A	#N/A	#N/A	0.10	7.99
637	111916	SE Zone	#N/A	Blast Hole Cuttings	111916	#N/A	0.16	#N/A	#N/A	#N/A	#N/A	0.23	18.83
638	23048	SE Zone	#N/A	Blast Hole Cuttings	23048	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.22	18.25
639	23617	SE Zone	#N/A	Blast Hole Cuttings	23617	#N/A	0.713	#N/A	#N/A	#N/A	#N/A	0.19	15.92
640	23892	SE Zone	#N/A	Blast Hole Cuttings	23892	#N/A	0.049	#N/A	#N/A	#N/A	#N/A	0.11	9.08
641	30964	SE Zone	#N/A	Blast Hole Cuttings	30964	#N/A	0.624	#N/A	#N/A	#N/A	#N/A	0.57	47.25
642	90607	SE Zone	#N/A	Blast Hole Cuttings	90607	#N/A	1.89	#N/A	#N/A	#N/A	#N/A	0.45	37.58
643	106606	SE Zone	#N/A	Blast Hole Cuttings	106606	#N/A	0.026	#N/A	#N/A	#N/A	#N/A	0.22	18.67
644	106622	SE Zone	#N/A	Blast Hole Cuttings	106622	#N/A	0.061	#N/A	#N/A	#N/A	#N/A	0.12	9.75
645	106718	SE Zone	#N/A	Blast Hole Cuttings	106718	#N/A	0.189	#N/A	#N/A	#N/A	#N/A	0.46	38.33
646	106854	SE Zone	#N/A	Blast Hole Cuttings	106854	#N/A	0.172	#N/A	#N/A	#N/A	#N/A	0.14	12
647	106867	SE Zone	#N/A	Blast Hole Cuttings	106867	#N/A	0.315	#N/A	#N/A	#N/A	#N/A	0.31	25.67
648	107253	SE Zone	#N/A	Blast Hole Cuttings	107253	#N/A	0.085	#N/A	#N/A	#N/A	#N/A	0.35	29.42
649	109028	SE Zone	#N/A	Blast Hole Cuttings	109028	#N/A	0.397	#N/A	#N/A	#N/A	#N/A	0.81	67.42
650	109463	SE Zone	#N/A	Blast Hole Cuttings	109463	#N/A	0.543	#N/A	#N/A	#N/A	#N/A	0.48	40.17
651	111998	SE Zone	#N/A	Blast Hole Cuttings	111998	#N/A	0.101	#N/A	#N/A	#N/A	#N/A	0.30	25
652	121049	SE Zone	#N/A	Blast Hole Cuttings	121049	#N/A	0.487	#N/A	#N/A	#N/A	#N/A	0.84	69.75
653	121071	SE Zone	#N/A	Blast Hole Cuttings	121071	#N/A	0.547	#N/A	#N/A	#N/A	#N/A	0.26	21.83
654	121157	SE Zone	#N/A	Blast Hole Cuttings	121157	#N/A	0.84	#N/A	#N/A	#N/A	#N/A	0.27	22.75
655	30768	SE Zone	#N/A	Blast Hole Cuttings	30768	#N/A	0.662	#N/A	#N/A	#N/A	#N/A	0.28	23.17
656	30977	SE Zone	#N/A	Blast Hole Cuttings	30977	#N/A	0.399	#N/A	#N/A	#N/A	#N/A	0.68	56.33
657	30988	SE Zone	#N/A	Blast Hole Cuttings	30988	#N/A	0.235	#N/A	#N/A	#N/A	#N/A	0.59	49.17
658	1520	SE Zone	#N/A	Blast Hole Cuttings	1520	#N/A	0.428	#N/A	#N/A	#N/A	#N/A	0.03	2.666666667
659	1922	SE Zone	#N/A	Blast Hole Cuttings	1922	#N/A	0.296	#N/A	#N/A	#N/A	#N/A	0.05	3.75
660	1926	SE Zone	#N/A	Blast Hole Cuttings	1926	#N/A	0.013	#N/A	#N/A	#N/A	#N/A	0.02	1.833333333
661	2324	SE Zone	#N/A	Blast Hole Cuttings	2324	#N/A	0.161	#N/A	#N/A	#N/A	#N/A	0.05	3.75
662	2328	SE Zone	#N/A	Blast Hole Cuttings	2328	#N/A	0.107	#N/A	#N/A	#N/A	#N/A	0.05	4.25
663	2726	SE Zone	#N/A	Blast Hole Cuttings	2726	#N/A	0.218	#N/A	#N/A	#N/A	#N/A	0.05	4.416666667
664	2730	SE Zone	#N/A	Blast Hole Cuttings	2730	#N/A	0.054	#N/A	#N/A	#N/A	#N/A	0.27	22.08333333
665	3124	SE Zone	#N/A	Blast Hole Cuttings	3124	#N/A	0.533	#N/A	#N/A	#N/A	#N/A	0.19	15.66666667
666	3128	SE Zone	#N/A	Blast Hole Cuttings	3128	#N/A	0.038	#N/A	#N/A	#N/A	#N/A	0.04	3.5
667	3132	SE Zone	#N/A	Blast Hole Cuttings	3132	#N/A	0.07	#N/A	#N/A	#N/A	#N/A	0.03	2.083333333
668	2013	SE Zone	#N/A	Blast Hole Cuttings	2013	#N/A	0.173	#N/A	#N/A	#N/A	#N/A	0.12	9.583333333
669	2106	SE Zone	#N/A	Blast Hole Cuttings	2106	#N/A	0.608	#N/A	#N/A	#N/A	#N/A	0.08	6.916666667
670	2114	SE Zone	#N/A	Blast Hole Cuttings	2114	#N/A	0.466	#N/A	#N/A	#N/A	#N/A	0.16	13.66666667
671	2007	SE Zone	#N/A	Blast Hole Cuttings	2007	#N/A	0.502	#N/A	#N/A	#N/A	#N/A	0.07	5.916666667
672	2218	SE Zone	#N/A	Blast Hole Cuttings	2218	#N/A	0.546	#N/A	#N/A	#N/A	#N/A	0.13	10.75
673	2244	SE Zone	#N/A	Blast Hole Cuttings	2244	#N/A	0.265	#N/A	#N/A	#N/A	#N/A	0.21	17.5
674	2248	SE Zone	#N/A	Blast Hole Cuttings	2248	#N/A	1.14	#N/A	#N/A	#N/A	#N/A	0.09	7.416666667
675	2203	SE Zone	#N/A	Blast Hole Cuttings	2203	#N/A	0.396	#N/A	#N/A	#N/A	#N/A	0.10	8.333333333
676	5005	SE Zone	#N/A	Blast Hole Cuttings	5005	#N/A	0.944	#N/A	#N/A	#N/A	#N/A	0.24	19.66666667
677	5064	SE Zone	#N/A	Blast Hole Cuttings	5064	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.34	28.16666667
678	5500	SE Zone	#N/A	Blast Hole Cuttings	5500	#N/A	1.36	#N/A	#N/A	#N/A	#N/A	0.26	21.33333333
679	5508	SE Zone	#N/A	Blast Hole Cuttings	5508	#N/A	1.77	#N/A	#N/A	#N/A	#N/A	0.19	15.66666667
680	5512	SE Zone	#N/A	Blast Hole Cuttings	5512	#N/A	0.492	#N/A	#N/A	#N/A	#N/A	0.23	18.83333333
681	5527	SE Zone	#N/A	Blast Hole Cuttings	5527	#N/A	0.646	#N/A	#N/A	#N/A	#N/A	0.18	15.25
682	5529	SE Zone	#N/A	Blast Hole Cuttings	5529	#N/A	0.961	#N/A	#N/A	#N/A	#N/A	0.19	15.41666667
683	5544	SE Zone	#N/A	Blast Hole Cuttings	5544	#N/A	1.88	#N/A	#N/A	#N/A	#N/A	0.23	19.08333333
684	6511	SE Zone	#N/A	Blast Hole Cuttings	6511	#N/A	0.538	#N/A	#N/A	#N/A	#N/A	0.19	15.58333333
685	6516	SE Zone	#N/A	Blast Hole Cuttings	6516	#N/A	0.389	#N/A	#N/A	#N/A	#N/A	0.21	17.83333333
686	6570	SE Zone	#N/A	Blast Hole Cuttings	6570	#N/A	2.63	#N/A	#N/A	#N/A	#N/A	0.30	25.16666667
687	6580	SE Zone	#N/A	Blast Hole Cuttings	6580	#N/A	1.43	#N/A	#N/A	#N/A	#N/A	0.24	20.25
688	Z10006	SE Zone	#N/A	Blast Hole Cuttings	Z10006	#N/A	1.16	#N/A	#N/A	#N/A	#N/A	0.10	8.166666667
689	Z10009	SE Zone	#N/A	Blast Hole Cuttings	Z10009	#N/A	1.51	#N/A	#N/A	#N/A	#N/A	0.07	6
690	Z10019	SE Zone	#N/A	Blast Hole Cuttings	Z10019	#N/A	0.823	#N/A	#N/A	#N/A	#N/A	0.06	5.333333333
691	Z10042	SE Zone	#N/A	Blast Hole Cuttings	Z10042	#N/A	0.662	#N/A	#N/A	#N/A	#N/A	0.19	15.41666667
692	Z10045	SE Zone	#N/A	Blast Hole Cuttings	Z10045	#N/A	1.55	#N/A	#N/A	#N/A	#N/A	0.04	3
693	5212	SE Zone	Z1080-05	Blast Hole Cuttings	5212	#N/A	1.56	#N/A	#N/A	#N/A	#N/A	0.04	3.333333333
694	7283	SE Zone	Z1080-05	Blast Hole Cuttings	7283	#N/A	2.17	#N/A	#N/A	#N/A	#N/A	0.06	4.583333333
695	5092	SE Zone	Z1080-05	Blast Hole Cuttings	5092	#N/A	1.16	#N/A	#N/A	#N/A	#N/A	0.06	4.833333333
696	5203	SE Zone	Z1080-05	Blast Hole Cuttings	5203	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	0.05	4.5
697	5267	SE Zone	Z1080-05	Blast Hole Cuttings	5267	#N/A	0.411	#N/A	#N/A	#N/A	#N/A	0.03	2.083333333
698	5246	SE Zone	Z1080-05	Blast Hole Cuttings	5246	#N/A	0.866	#N/A	#N/A	#N/A	#N/A	0.05	4.5
699	7273	SE Zone	Z1080-05	Blast Hole Cuttings	7273	#N/A	1.96	#N/A	#N/A	#N/A	#N/A	0.13	10.91666667
700	7315	SE Zone	Z1080-05	Blast Hole Cuttings	7315	#N/A	0.362	#N/A	#N/A	#N/A	#N/A	0.03	2.166666667
701	7263	SE Zone	Z1080-05	Blast Hole Cuttings	7263	#N/A	0.445	#N/A	#N/A	#N/A	#N/A	0.07	6.083333333
702	7202	SE Zone	Z1080-05	Blast Hole Cuttings	7202	#N/A	0.168	#N/A	#N/A	#N/A	#N/A	0.03	2.416666667
703	7297	SE Zone	Z1080-05	Blast Hole Cuttings	7297	#N/A	0.77	#N/A	#N/A	#N/A	#N/A	0.14	11.66666667
704	7319	SE Zone	Z1080-05	Blast Hole Cuttings	7319	#N/A	0.422	#N/A	#N/A	#N/A	#N/A	0.38	31.33333333
705	7182	SE Zone	Z1080-05	Blast Hole Cuttings	7182	#N/A	0.547	#N/A	#N/A	#N/A	#N/A	0.69	57.66666667
706	7001	SE Zone	Z1070-07	Blast Hole Cuttings	7001	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	0.32	26.58333333
707	11019	SE Zone	Z1060-11	Blast Hole Cuttings	11019	#N/A	1.03	#N/A	#N/A	#N/A	#N/A	0.22	17.91666667
708	11024	SE Zone	Z1060-11	Blast Hole Cuttings	11024	#N/A	1.8	#N/A	#N/A	#N/A	#N/A	0.23	19
709	11035	SE Zone	Z1060-11	Blast Hole Cuttings	11035	#N/A	1.1	#N/A	#N/A	#N/A	#N/A	0.14	11.91666667
710	11043	SE Zone	Z1060-11	Blast Hole Cuttings	11043	#N/A	0.624	#N/A	#N/A	#N/A	#N/A	0.11	9
711	11057	SE Zone	Z1060-11	Blast Hole Cuttings	11057	#N/A	2.6	#N/A	#N/A	#N/A	#N/A	0.11	8.833333333
712	11255	SE Zone	Z1060-11	Blast Hole Cuttings	11255	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.22	18.66666667
713	11314	SE Zone	Z1060-11	Blast Hole Cuttings	11314	#N/A	1.98	#N/A	#N/A	#N/A	#N/A	0.12	9.583333333
714	11443	SE Zone	Z1060-11	Blast Hole Cuttings	11443	#N/A	0.226	#N/A	#N/A	#N/A	#N/A	0.27	22.08333333
715	11512	SE Zone	Z1060-11	Blast Hole Cuttings	11512	#N/A	1.9	#N/A	#N/A	#N/A	#N/A	0.09	7.083333333
716	11608	SE Zone	Z1060-11	Blast Hole Cuttings	11608	#N/A	1.43	#N/A	#N/A	#N/A	#N/A	0.07	5.75
717	11216	SE Zone	Z1060-11	Blast Hole Cuttings	11216	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.02	1.5
718	11222	SE Zone	Z1060-11	Blast Hole Cuttings	11222	#N/A	0.848	#N/A	#N/A	#N/A	#N/A	0.09	7.166666667
719	11211	SE Zone	Z1060-11	Blast Hole Cuttings	11211	#N/A	0.007	#N/A	#N/A	#N/A	#N/A	0.28	23.08333333
720	11325	SE Zone	Z1060-11	Blast Hole Cuttings	11325	#N/A	0.265	#N/A	#N/A	#N/A	#N/A	0.21	17.25
721	11405	SE Zone	Z1060-11	Blast Hole Cuttings	11405	#N/A	0.004	#N/A	#N/A	#N/A	#N/A	0.04	3.25
722	11809	SE Zone	Z1060-11	Blast Hole Cuttings	11809	#N/A	0.103	#N/A	#N/A	#N/A	#N/A	0.64	53
723	P1060-01	Pond Zone	Pond Pit. Holes: 1154, 1017, 1020, 1104, 1043, 1049	Blast Hole Cuttings	P1060-01	#N/A	0.548	#N/A	#N/A	#N/A	#N/A	1.74	145
724	P1070-01	Pond Zone	Pond Pit. Holes: 1149, 1090, 1027, 1032, 1092, 1069	Blast Hole Cuttings	P1070-01	#N/A	0.291	#N/A	#N/A	#N/A	#N/A	0.07	5.666666667
725	P1070-01	Pond Zone	Pond Pit. Holes: 1053, 1056, 1017, 1021, 1024, 1086	Blast Hole Cuttings	P1070-01	#N/A	0.688	#N/A	#N/A	#N/A	#N/A	0.15	12.83333333
726	P1070-01	Pond Zone	Pond Pit. Holes: 1051, 1108, 1111, 1136, 1154, 1147	Blast Hole Cuttings	P1070-01	#N/A	0.224	#N/A	#N/A	#N/A	#N/A	0.17	14.08333333
727	P1070-02	Pond Zone	Pond Pit. Holes: 2006, 2057, 2112, 2052	Blast Hole Cuttings	P1070-02	#N/A	0.024	#N/A	#N/A	#N/A	#N/A	0.01	1.166666667
728	P1080-01	Pond Zone	Pond Pit. Holes: 1270, 1075, 1078, 1241	Blast Hole Cuttings	P1080-01	#N/A	0.127	#N/A	#N/A	#N/A	#N/A	0.11	9.25
729	P1080-01	Pond Zone	Pond Pit. Holes: 1069, 1219, 1061, 1237	Blast Hole Cuttings	P1080-01	#N/A	0.124	#N/A	#N/A	#N/A	#N/A	0.04	3.25
730	1104	Pond Zone	Pond. 1040	Blast Hole Cuttings	1104	#N/A	0.349	#N/A	#N/A	#N/A	#N/A	0.21	17.16666667
731	1062	Pond Zone	Pond. 1040	Blast Hole Cuttings	1062	#N/A	0.043	#N/A	#N/A	#N/A	#N/A	0.02	1.833333333
732	1086	Pond Zone	Pond. 1040	Blast Hole Cuttings	1086	#N/A	0.058	#N/A	#N/A	#N/A	#N/A	0.02	1.583333333
733	1018	Pond Zone	Pond. 1040	Blast Hole Cuttings	1018	#N/A	0.037	#N/A	#N/A	#N/A	#N/A	0.04	3.583333333
734	1032	Pond Zone	Pond. 1040	Blast Hole Cuttings	1032	#N/A	0.066	#N/A	#N/A	#N/A	#N/A	1.45	120.8333333
735	1035	Pond Zone	Pond. 1040	Blast Hole Cuttings	1035	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.41	33.83333333
736	1038	Pond Zone	Pond. 1040	Blast Hole Cuttings	1038	#N/A	0.044	#N/A	#N/A	#N/A	#N/A	0.53	44.08333333
737	1053	Pond Zone	Pond. 1040	Blast Hole Cuttings	1053	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.26	21.75
738	1056	Pond Zone	Pond. 1040	Blast Hole Cuttings	1056	#N/A	0.037	#N/A	#N/A	#N/A	#N/A	0.18	15.25
739	1059	Pond Zone	Pond. 1040	Blast Hole Cuttings	1059	#N/A	0.06	#N/A	#N/A	#N/A	#N/A	0.32	27
740	1077	Pond Zone	Pond. 1040	Blast Hole Cuttings	1077	#N/A	0.345	#N/A	#N/A	#N/A	#N/A	0.26	21.91666667
741	1080	Pond Zone	Pond. 1040	Blast Hole Cuttings	1080	#N/A	0.066	#N/A	#N/A	#N/A	#N/A	0.35	28.83333333
742	1083	Pond Zone	Pond. 1040	Blast Hole Cuttings	1083	#N/A	0.153	#N/A	#N/A	#N/A	#N/A	0.49	40.41666667
743	1101	Pond Zone	Pond. 1040	Blast Hole Cuttings	1101	#N/A	0.03	#N/A	#N/A	#N/A	#N/A	0.24	20.16666667
744	1108	Pond Zone	Pond. 1040	Blast Hole Cuttings	1108	#N/A	0.198	#N/A	#N/A	#N/A	#N/A	0.19	15.66666667
745	1111	Pond Zone	Pond. 1040	Blast Hole Cuttings	1111	#N/A	0.379	#N/A	#N/A	#N/A	#N/A	0.30	25

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C	NP
							%	%			%C	%C	kgCaCO3/t
746	1123	Pond Zone	Pond. 1040	Blast Hole Cuttings	1123	#N/A	0.294	#N/A	#N/A	#N/A	#N/A	0.22	18.5
747	1126	Pond Zone	Pond. 1040	Blast Hole Cuttings	1126	#N/A	0.343	#N/A	#N/A	#N/A	#N/A	0.30	25.25
748	1129	Pond Zone	Pond. 1040	Blast Hole Cuttings	1129	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.36	30.08333333
749	1141	Pond Zone	Pond. 1040	Blast Hole Cuttings	1141	#N/A	0.065	#N/A	#N/A	#N/A	#N/A	0.15	12.66666667
750	1144	Pond Zone	Pond. 1040	Blast Hole Cuttings	1144	#N/A	0.294	#N/A	#N/A	#N/A	#N/A	0.22	18.58333333
751	1158	Pond Zone	Pond. 1040	Blast Hole Cuttings	1158	#N/A	0.467	#N/A	#N/A	#N/A	#N/A	0.26	21.75
752	2002	Pond Zone	Pond. 1040	Blast Hole Cuttings	2002	#N/A	0.682	#N/A	#N/A	#N/A	#N/A	0.19	15.83333333
753	2006	Pond Zone	Pond. 1040	Blast Hole Cuttings	2006	#N/A	1.39	#N/A	#N/A	#N/A	#N/A	0.21	17.08333333
754	2016	Pond Zone	Pond. 1040	Blast Hole Cuttings	2016	#N/A	0.46	#N/A	#N/A	#N/A	#N/A	0.28	23.5
755	2031	Pond Zone	Pond. 1040	Blast Hole Cuttings	2031	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.60	49.91666667
756	2040	Pond Zone	Pond. 1040	Blast Hole Cuttings	2040	#N/A	0.511	#N/A	#N/A	#N/A	#N/A	0.08	6.666666667
757	2042	Pond Zone	Pond. 1040	Blast Hole Cuttings	2042	#N/A	0.87	#N/A	#N/A	#N/A	#N/A	0.26	21.83333333
758	2061	Pond Zone	Pond. 1040	Blast Hole Cuttings	2061	#N/A	1.43	#N/A	#N/A	#N/A	#N/A	0.89	74.5
759	2104	Pond Zone	Pond. 1040	Blast Hole Cuttings	2104	#N/A	2.39	#N/A	#N/A	#N/A	#N/A	0.36	30
760	2111	Pond Zone	Pond. 1040	Blast Hole Cuttings	2111	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	0.22	18.25
761	2113	Pond Zone	Pond. 1040	Blast Hole Cuttings	2113	#N/A	0.301	#N/A	#N/A	#N/A	#N/A	0.17	13.75
762	2123	Pond Zone	Pond. 1040	Blast Hole Cuttings	2123	#N/A	0.282	#N/A	#N/A	#N/A	#N/A	0.09	7.75
763	2019	Pond Zone	Pond. 1040	Blast Hole Cuttings	2019	#N/A	0.176	#N/A	#N/A	#N/A	#N/A	0.03	2.333333333
764	2045	Pond Zone	Pond. 1040	Blast Hole Cuttings	2045	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.03	2.416666667
765	2073	Pond Zone	Pond. 1040	Blast Hole Cuttings	2073	#N/A	0.084	#N/A	#N/A	#N/A	#N/A	0.01	0.416666667
766	2076	Pond Zone	Pond. 1040	Blast Hole Cuttings	2076	#N/A	0.309	#N/A	#N/A	#N/A	#N/A	0.37	31.16666667
767	5102	Pond Zone	Pond. 1040	Blast Hole Cuttings	5102	#N/A	0.731	#N/A	#N/A	#N/A	#N/A	1.27	105.8333333
768	5105	Pond Zone	Pond. 1040	Blast Hole Cuttings	5105	#N/A	1.14	#N/A	#N/A	#N/A	#N/A	1.03	85.83333333
769	5108	Pond Zone	Pond. 1040	Blast Hole Cuttings	5108	#N/A	1.52	#N/A	#N/A	#N/A	#N/A	0.54	45
770	5111	Pond Zone	Pond. 1040	Blast Hole Cuttings	5111	#N/A	2.41	#N/A	#N/A	#N/A	#N/A	0.98	81.41666667
771	5114	Pond Zone	Pond. 1040	Blast Hole Cuttings	5114	#N/A	1.88	#N/A	#N/A	#N/A	#N/A	0.11	9.416666667
772	5117	Pond Zone	Pond. 1040	Blast Hole Cuttings	5117	#N/A	0.221	#N/A	#N/A	#N/A	#N/A	0.05	4.166666667
773	5305	Pond Zone	Pond. 1040	Blast Hole Cuttings	5305	#N/A	2.34	#N/A	#N/A	#N/A	#N/A	0.26	21.5
774	5308	Pond Zone	Pond. 1040	Blast Hole Cuttings	5308	#N/A	2.58	#N/A	#N/A	#N/A	#N/A	0.29	24.33333333
775	5311	Pond Zone	Pond. 1040	Blast Hole Cuttings	5311	#N/A	2.48	#N/A	#N/A	#N/A	#N/A	0.08	6.25
776	5314	Pond Zone	Pond. 1040	Blast Hole Cuttings	5314	#N/A	0.797	#N/A	#N/A	#N/A	#N/A	0.11	9.083333333
777	5317	Pond Zone	Pond. 1040	Blast Hole Cuttings	5317	#N/A	0.647	#N/A	#N/A	#N/A	#N/A	0.22	18.16666667
778	1005	Pond Zone	Pond. 1050	Blast Hole Cuttings	1005	#N/A	0.115	#N/A	#N/A	#N/A	#N/A	0.17	14
779	1016	Pond Zone	Pond. 1050	Blast Hole Cuttings	1016	#N/A	0.023	#N/A	#N/A	#N/A	#N/A	0.17	14.08333333
780	1029	Pond Zone	Pond. 1050	Blast Hole Cuttings	1029	#N/A	0.14	#N/A	#N/A	#N/A	#N/A	0.16	13.08333333
781	1032	Pond Zone	Pond. 1050	Blast Hole Cuttings	1032	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.16	13.08333333
782	1035	Pond Zone	Pond. 1050	Blast Hole Cuttings	1035	#N/A	0.316	#N/A	#N/A	#N/A	#N/A	0.58	48
783	1038	Pond Zone	Pond. 1050	Blast Hole Cuttings	1038	#N/A	0.093	#N/A	#N/A	#N/A	#N/A	0.66	54.58333333
784	1057	Pond Zone	Pond. 1050	Blast Hole Cuttings	1057	#N/A	0.039	#N/A	#N/A	#N/A	#N/A	0.16	13
785	1060	Pond Zone	Pond. 1050	Blast Hole Cuttings	1060	#N/A	0.182	#N/A	#N/A	#N/A	#N/A	0.16	13.33333333
786	1063	Pond Zone	Pond. 1050	Blast Hole Cuttings	1063	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.52	43.66666667
787	1066	Pond Zone	Pond. 1050	Blast Hole Cuttings	1066	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.19	16.16666667
788	1069	Pond Zone	Pond. 1050	Blast Hole Cuttings	1069	#N/A	0.264	#N/A	#N/A	#N/A	#N/A	0.17	14.25
789	1073	Pond Zone	Pond. 1050	Blast Hole Cuttings	1073	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.18	14.75
790	1096	Pond Zone	Pond. 1050	Blast Hole Cuttings	1096	#N/A	0.082	#N/A	#N/A	#N/A	#N/A	0.18	14.75
791	1099	Pond Zone	Pond. 1050	Blast Hole Cuttings	1099	#N/A	0.197	#N/A	#N/A	#N/A	#N/A	0.35	29.33333333
792	1103	Pond Zone	Pond. 1050	Blast Hole Cuttings	1103	#N/A	0.069	#N/A	#N/A	#N/A	#N/A	0.17	14.16666667
793	1106	Pond Zone	Pond. 1050	Blast Hole Cuttings	1106	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	0.16	13.41666667
794	1110	Pond Zone	Pond. 1050	Blast Hole Cuttings	1110	#N/A	2.95	#N/A	#N/A	#N/A	#N/A	0.30	24.83333333
795	1113	Pond Zone	Pond. 1050	Blast Hole Cuttings	1113	#N/A	0.184	#N/A	#N/A	#N/A	#N/A	0.16	13.08333333
796	1134	Pond Zone	Pond. 1050	Blast Hole Cuttings	1134	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.14	11.75
797	1139	Pond Zone	Pond. 1050	Blast Hole Cuttings	1139	#N/A	0.193	#N/A	#N/A	#N/A	#N/A	0.21	17.83333333
798	1142	Pond Zone	Pond. 1050	Blast Hole Cuttings	1142	#N/A	2.96	#N/A	#N/A	#N/A	#N/A	0.35	29.16666667
799	1145	Pond Zone	Pond. 1050	Blast Hole Cuttings	1145	#N/A	0.608	#N/A	#N/A	#N/A	#N/A	0.21	17.83333333
800	1149	Pond Zone	Pond. 1050	Blast Hole Cuttings	1149	#N/A	0.207	#N/A	#N/A	#N/A	#N/A	0.65	54.33333333
801	1152	Pond Zone	Pond. 1050	Blast Hole Cuttings	1152	#N/A	0.082	#N/A	#N/A	#N/A	#N/A	0.16	13.33333333
802	1502	Pond Zone	Pond. 1050	Blast Hole Cuttings	1502	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	0.21	17.25
803	2037	Pond Zone	Pond. 1050	Blast Hole Cuttings	2037	#N/A	1.13	#N/A	#N/A	#N/A	#N/A	0.31	25.41666667
804	2040	Pond Zone	Pond. 1050	Blast Hole Cuttings	2040	#N/A	1.27	#N/A	#N/A	#N/A	#N/A	0.12	9.833333333
805	2112	Pond Zone	Pond. 1050	Blast Hole Cuttings	2112	#N/A	3.81	#N/A	#N/A	#N/A	#N/A	1.47	122.5
806	2118	Pond Zone	Pond. 1050	Blast Hole Cuttings	2118	#N/A	2.38	#N/A	#N/A	#N/A	#N/A	1.33	110.8333333
807	2122	Pond Zone	Pond. 1050	Blast Hole Cuttings	2122	#N/A	2.34	#N/A	#N/A	#N/A	#N/A	2.12	176.6666667
808	2115	Pond Zone	Pond. 1050	Blast Hole Cuttings	2115	#N/A	1.9	#N/A	#N/A	#N/A	#N/A	6.33	527.5
809	2125	Pond Zone	Pond. 1050	Blast Hole Cuttings	2125	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.44	37
810	2104	Pond Zone	Pond. 1050	Blast Hole Cuttings	2104	#N/A	0.425	#N/A	#N/A	#N/A	#N/A	6.88	573.3333333
811	2025	Pond Zone	Pond. 1050	Blast Hole Cuttings	2025	#N/A	0.523	#N/A	#N/A	#N/A	#N/A	0.04	3
812	2028	Pond Zone	Pond. 1050	Blast Hole Cuttings	2028	#N/A	0.087	#N/A	#N/A	#N/A	#N/A	0.02	1.916666667
813	2030	Pond Zone	Pond. 1050	Blast Hole Cuttings	2030	#N/A	0.177	#N/A	#N/A	#N/A	#N/A	0.15	12.75
814	2052	Pond Zone	Pond. 1050	Blast Hole Cuttings	2052	#N/A	0.292	#N/A	#N/A	#N/A	#N/A	0.02	1.75
815	2054	Pond Zone	Pond. 1050	Blast Hole Cuttings	2054	#N/A	0.049	#N/A	#N/A	#N/A	#N/A	0.02	1.75
816	2056	Pond Zone	Pond. 1050	Blast Hole Cuttings	2056	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	1.04	86.66666667
817	2078	Pond Zone	Pond. 1050	Blast Hole Cuttings	2078	#N/A	0.18	#N/A	#N/A	#N/A	#N/A	0.04	3.583333333
818	2081	Pond Zone	Pond. 1050	Blast Hole Cuttings	2081	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.35	29.41666667
819	2094	Pond Zone	Pond. 1050	Blast Hole Cuttings	2094	#N/A	0.072	#N/A	#N/A	#N/A	#N/A	0.51	42.08333333
820	2099	Pond Zone	Pond. 1050	Blast Hole Cuttings	2099	#N/A	0.563	#N/A	#N/A	#N/A	#N/A	0.61	51.16666667
821	2043	Pond Zone	Pond. 1050	Blast Hole Cuttings	2043	#N/A	2.81	#N/A	#N/A	#N/A	#N/A	0.12	10
822	2046	Pond Zone	Pond. 1050	Blast Hole Cuttings	2046	#N/A	1.41	#N/A	#N/A	#N/A	#N/A	0.15	12.83333333
823	2129	Pond Zone	Pond. 1050	Blast Hole Cuttings	2129	#N/A	1.62	#N/A	#N/A	#N/A	#N/A	0.13	11.16666667
824	2134	Pond Zone	Pond. 1050	Blast Hole Cuttings	2134	#N/A	1.57	#N/A	#N/A	#N/A	#N/A	0.68	56.83333333
825	2139	Pond Zone	Pond. 1050	Blast Hole Cuttings	2139	#N/A	2.2	#N/A	#N/A	#N/A	#N/A	0.08	6.833333333
826	2144	Pond Zone	Pond. 1050	Blast Hole Cuttings	2144	#N/A	0.181	#N/A	#N/A	#N/A	#N/A	0.23	19.16666667
827	P3025	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3025	#N/A	0.027	#N/A	#N/A	#N/A	#N/A	0.07	6.083333333
828	P3034	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3034	#N/A	0.016	#N/A	#N/A	#N/A	#N/A	0.04	3.666666667
829	P3043	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3043	#N/A	0.022	#N/A	#N/A	#N/A	#N/A	0.01	1
830	P3052	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3052	#N/A	0.547	#N/A	#N/A	#N/A	#N/A	0.02	1.583333333
831	P3061	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3061	#N/A	0.255	#N/A	#N/A	#N/A	#N/A	0.01	1.083333333
832	P3070	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3070	#N/A	0.017	#N/A	#N/A	#N/A	#N/A	0.11	8.916666667
833	P3076	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3076	#N/A	0.02	#N/A	#N/A	#N/A	#N/A	0.01	0.416666667
834	P3082	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3082	#N/A	0.073	#N/A	#N/A	#N/A	#N/A	0.01	0.666666667
835	P3088	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3088	#N/A	0.18	#N/A	#N/A	#N/A	#N/A	0.03	2.166666667
836	P3095	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3095	#N/A	0.017	#N/A	#N/A	#N/A	#N/A	0.02	1.583333333
837	P3099	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3099	#N/A	0.308	#N/A	#N/A	#N/A	#N/A	0.01	1
838	P3105	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3105	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.01	1.083333333
839	5134	Pond Zone	Pond. 1050	Blast Hole Cuttings	5134	#N/A	1.56	#N/A	#N/A	#N/A	#N/A	0.87	72.5
840	5146	Pond Zone	Pond. 1050	Blast Hole Cuttings	5146	#N/A	1.48	#N/A	#N/A	#N/A	#N/A	0.26	21.91666667
841	5158	Pond Zone	Pond. 1050	Blast Hole Cuttings	5158	#N/A	1.23	#N/A	#N/A	#N/A	#N/A	0.28	23.25
842	5167	Pond Zone	Pond. 1050	Blast Hole Cuttings	5167	#N/A	1.85	#N/A	#N/A	#N/A	#N/A	0.19	15.58333333
843	5219	Pond Zone	Pond. 1050	Blast Hole Cuttings	5219	#N/A	1.99	#N/A	#N/A	#N/A	#N/A	2.22	185
844	5223	Pond Zone	Pond. 1050	Blast Hole Cuttings	5223	#N/A	2.98	#N/A	#N/A	#N/A	#N/A	0.38	31.5
845	5227	Pond Zone	Pond. 1050	Blast Hole Cuttings	5227	#N/A	2.08	#N/A	#N/A	#N/A	#N/A	0.26	22
846	5233	Pond Zone	Pond. 1050	Blast Hole Cuttings	5233	#N/A	0.401	#N/A	#N/A	#N/A	#N/A	0.18	14.91666667
847	5223	Pond Zone	Pond. 1050	Blast Hole Cuttings	5223	#N/A	2.98	#N/A	#N/A	#N/A	#N/A	0.38	31.5
848	5227	Pond Zone	Pond. 1050	Blast Hole Cuttings	5227	#N/A	2.08	#N/A	#N/A	#N/A	#N/A	0.26	22
849	5233	Pond Zone	Pond. 1050	Blast Hole Cuttings	5233	#N/A	0.401	#N/A	#N/A	#N/A	#N/A	0.18	14.91666667
850	5103	Pond Zone	Pond. 1050	Blast Hole Cuttings	5103	#N/A	0.505	#N/A	#N/A	#N/A	#N/A	0.06	5.083333333
851	5112	Pond Zone	Pond. 1050	Blast Hole Cuttings	5112	#N/A	0.214	#N/A	#N/A	#N/A	#N/A	0.06	4.833333333
852	5120	Pond Zone	Pond. 1050	Blast Hole Cuttings	5120	#N/A	0.281	#N/A	#N/A	#N/A	#N/A	0.07	5.416666667
853	5208	Pond Zone	Pond. 1050	Blast Hole Cuttings	5208	#N/A	0.304	#N/A	#N/A	#N/A	#N/A	0.06	4.583333333
854	5212	Pond Zone	Pond. 1050	Blast Hole Cuttings	5212	#N/A	0.111	#N/A	#N/A	#N/A	#N/A	0.06	4.75
855	5216	Pond Zone	Pond. 1050	Blast Hole Cuttings	5216	#N/A	0.324	#N/A	#N/A	#N/A	#N/A	1.56	130
856	P1060-1009	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1009	#N/A	0.043	#N/A	#N/A	#N/A	#N/A	0.05	3.916666667
857	P1060-1020	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1020	#N/A	0.34	#N/A	#N/A	#N/A	#N/A	0.03	2.666666667
858	P1060-1034	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1034	#N/A	0.114	#N/A	#N/A	#N/A	#N/A	0.01	1.166666667
859	P1060-1131	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1131	#N/A	0.039	#N/A	#N/A	#N/A	#N/A	0.00	0.083333333
860	P1060-1176	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1176	#N/A	0.058	#N/A	#N/A	#N/A	#N/A	0.16	13.41666667
861	P2010	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2010	#N/A	0.163	#N/A	#N/A	#N/A	#N/A	0.12	10.33333333
862	P2013	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2013	#N/A	0.011	#N/A	#N/A	#N/A	#N/A	0.02	1.416666667
863	P2016	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2016	#N/A	0.011	#N/A	#N/A	#N/A	#N/A	0.03	2.166666667
864	P2019	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2019	#N/A	0.117	#N/A	#N/A	#N/A	#N/A	0.03	2.333333333
865	P2022	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2022	#N/A	0.161	#N/A	#N/A	#N/A	#N/A	0.05	3.833333333
866	P2025	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2025	#N/A	0.58	#N/A	#N/A	#N/A	#N/A	0.28	23.5
867	P2028	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2028	#N/A	0.255	#N/A	#N/A	#N/A	#N/A	0.06	4.833333333
868	P2031	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2031	#N/A	0.136	#N/A	#N/A	#N/A	#N/A	0.05	3.833333333
869	P2034	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2034	#N/A	0.148	#N/A	#N/A	#N/A	#N/A	0.02	1.916666667
870	P2037	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2037	#N/A	0.199	#N/A	#N/A	#N/A	#N/A	0.04	3.166666667
871	P2074	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2074	#N/A	0.012	#N/A	#N/A	#N/A	#N/A	0.05	4.25
872	P2076	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2076	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.06	5.25
873	P2078	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2078	#N/A	0.065	#N/A	#N/A	#N/A	#N/A	0.06	4.75
874	P2080	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2080	#N/A	0.552	#N/A	#N/A	#N/A	#N/A	0.04	3
875	P2082	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2082	#N/A	0.179	#N/A	#N/A	#N/A	#N/A	0.04	3.583333333
876	P2086	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2086	#N/A	0.425	#N/A	#N/A	#N/A	#N/A	0.03	2.666666667
877	3008	Pond Zone	Pond. 1060	Blast Hole Cuttings	3008	#N/A	0.291	#N/A	#N/A	#N/A	#N/A	0.12	10.33333333
878	3017	Pond Zone	Pond. 1060	Blast Hole Cuttings	3017	#N/A	0.659	#N/A	#N/A	#N/A	#N/A	0.64	53.5
879	3026	Pond Zone	Pond. 1060	Blast Hole Cuttings	3026	#N/A	1.44	#N/A	#N/A	#N/A	#N/A	0.50	41.66666667
880	3035	Pond Zone	Pond. 1060	Blast Hole Cuttings	3035	#N/A	1.6	#N/A	#N/A	#N/A	#N/A	0.18	15.25
881	3044	Pond Zone	Pond. 1060	Blast Hole Cuttings	3044	#N/A	0.408	#N/A	#N/A	#N/A	#N/A	0.16	12.91666667
882	3071	Pond Zone	Pond. 1060	Blast Hole Cuttings	3071	#N/A	0.273	#N/A	#N/A	#N/A	#N/A	0.12	9.666666667
883	3075	Pond Zone	Pond. 1060	Blast Hole Cuttings	3075	#N/A	0.14	#N/A	#N/A	#N/A	#N/A	0.57	47.5
884	3078	Pond Zone	Pond. 1060	Blast Hole Cuttings	3078	#N/A	1.19	#N/A	#N/A	#N/A	#N/A	1.86	155
885	3082	Pond Zone	Pond. 1060	Blast Hole Cuttings	3082	#N/A	0.539	#N/A	#N/A	#N/A	#N/A	0.15	12.33333333
886	3087	Pond Zone	Pond. 1060	Blast Hole Cuttings	3087	#N/A	0.834	#N/A	#N/A	#N/A	#N/A	0.19	15.83333333
887	3092	Pond Zone	Pond. 1060	Blast Hole Cuttings	3092	#N/A	0.202	#N/A	#N/A	#N/A	#N/A	0.12	9.75
888	5005	Pond Zone	Pond. 1060	Blast Hole Cuttings	5005	#N/A	0.734	#N/A	#N/A	#N/A	#N/A	0.23	19.33333333
889	5011	Pond Zone	Pond. 1060	Blast Hole Cuttings	5011	#N/A	1.74	#N/A	#N/A	#N/A	#N/A	0.20	16.41666667
890	5020	Pond Zone	Pond. 1060	Blast Hole Cuttings	5020	#N/A	3.45	#N/A	#N/A	#N/A	#N/A	0.34	28.16666667
891	5052	Pond Zone	Pond. 1060	Blast Hole Cuttings	5052	#N/A	0.471	#N/A	#N/A	#N/A	#N/A	0.17	14.33333333
892	5058	Pond Zone	Pond. 1060	Blast Hole Cuttings	5058	#N/A	2.86	#N/A	#N/A	#N/A	#N/A	0.20	17
893	5060	Pond Zone	Pond. 1060	Blast Hole Cuttings	5060	#N/A	1	#N/A	#N/A	#N/A	#N/A	0.19	15.91666667
894	5068	Pond Zone	Pond. 1060	Blast Hole Cuttings	5068	#N/A	0.192	#N/A	#N/A	#N/A	#N/A	0.29	24.41666667
895	5070	Pond Zone	Pond. 1060	Blast Hole Cuttings	5070	#N/A	0.246	#N/A	#N/A	#N/A	#N/A	0.22	18.33333333
896	5078	Pond Zone	Pond. 1060	Blast Hole Cuttings	5078	#N/A	0.96	#N/A	#N/A	#N/A	#N/A	0.25	20.91666667

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
1	SD 1 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	7.4	7.6	#N/A	-0.05
2	SD 1 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	7.4	7.7	#N/A	-0.05
3	SD 2 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	6.8	7.2	#N/A	-0.05
4	SD 2 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	-0.01	-0.01	6.9	7.3	#N/A	-0.05
5	SD 3 - 1	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.25	0.02	7.9	8.1	#N/A	0.86
6	SD 3 - 2	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.13	0.01	7.9	7.9	#N/A	0.52
7	SD 3 - 3	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.23	0.01	8.3	8.1	#N/A	0.50
8	SD 3 - 4	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.53	0.02	8	8	#N/A	1.01
9	SD 3 - 5	Springer Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.58	0.01	7.9	8	#N/A	1.12
10	CPD 1	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.32	-0.01	8.1	8.2	#N/A	0.48
11	CPD 2	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.44	0.02	8	8	#N/A	0.71
12	CPD 3	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.17	0.02	8	8	#N/A	0.85
13	CPD 4	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.41	0.01	8.2	8.2	#N/A	0.54
14	CPD 5	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.78	0.02	8	8.2	#N/A	0.72
15	CPD 6	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.84	0.01	8.1	8	#N/A	0.75
16	CPD 7	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.36	0.01	8.2	8.2	#N/A	0.52
17	CPD 8	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.47	0.01	8.1	8.2	#N/A	0.55
18	CPD 9	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.49	0.01	8.2	8.2	#N/A	0.52
19	CPD 10	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.32	0.01	8.1	8.1	#N/A	0.50
20	CPD 11	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.07	0.02	8	8	#N/A	0.67
21	CPD 12	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	1.15	0.02	7.8	7.9	#N/A	0.85
22	CPD 13	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.6	0.02	8	8.1	#N/A	0.64
23	CPD 14	Cariboo Pit	Cariboo Pit Backfill	Waste Rock	#N/A	#N/A	0.96	0.03	7.9	8	#N/A	1.02
24	HWD 1	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.44	0.02	7.7	7.8	#N/A	0.46
25	HWD 2	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.08	0.02	8.1	8.2	#N/A	0.82
26	HWD 3	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.28	0.03	7.9	7.8	#N/A	0.41
27	HWD 4	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.19	0.02	7.8	8	#N/A	0.38
28	HWD 5	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.13	-0.01	8	8.1	#N/A	0.55
29	HWD 6	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.25	0.01	8	8	#N/A	0.78
30	HWD 7	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.17	0.02	7.9	8	#N/A	1.21
31	63 DP6 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.2	0.01	8.3	0	#N/A	1.31
32	64 DP7 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.01	-0.01	8.5	0	#N/A	0.22
33	65 DP8 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.05	0.01	8.6	0	#N/A	0.71
34	66 DP9 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.23	0.02	8.1	0	#N/A	1.75
35	67 DP10 (-2MM)	Unknown	Cariboo Pit Backfill HW	Waste Rock	#N/A	#N/A	0.12	0.01	8.2	0	#N/A	1.09
36	Jan 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jan 2001 Sample - 1-2 mm	LG Breccia	0.26	-0.01	8	#N/A	0.94	#N/A
37	Jan 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jan 2001 Sample - 2-2 mm	0	0.39	-0.01	not/ss	#N/A	0.34	#N/A
38	Feb 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Feb 2001 Sample - 1-2 mm	LG Breccia	0.35	-0.01	not/ss not/ss	#N/A	0.34	#N/A
39	Feb 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Feb 2001 Sample - 2-2 mm	0	0.29	-0.01	0	#N/A	0.86	#N/A
40	Mar 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Mar 2001 Sample - 2-2 mm	LG Breccia	0.14	-0.01	7.8	#N/A	-0.09	#N/A
41	May 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	May 2001 Sample - 1-2 mm	0	0.33	-0.01	7.9	#N/A	0.77	#N/A
42	Mar 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Mar 2001 Sample - 1-2 mm	0	0.1	-0.01	7.9	#N/A	0.69	#N/A
43	Apr 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Apr 2001 Sample - 1-2 mm	0	0.28	-0.01	8	#N/A	0.43	#N/A
44	Apr 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Apr 2001 Sample - 2-2 mm	Monzonite	0.08	-0.01	7.9	#N/A	0.17	#N/A
45	May 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	May 2001 Sample - 2-2 mm	0	0.24	-0.01	not/ss	#N/A	0.51	#N/A
46	Jun 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jun 2001 Sample - 1-2 mm	Monzonite	0.45	-0.01	not/ss not/ss	#N/A	0.60	#N/A
47	Jun 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Jun 2001 Sample - 2-2 mm	0	0.48	-0.01	0	#N/A	0.51	#N/A
48	July 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	July 2001 Sample - 1-2 mm	0	0.28	-0.01	7.9	#N/A	0.94	#N/A
49	July 2001 Sample - 2-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	July 2001 Sample - 2-2 mm	0	0.3	-0.01	not/ss 8.8	#N/A	1.03	#N/A
50	Aug 2001 Sample - 1-2 mm	Cariboo Pit	Cariboo Pit	-2 mm Muck	Aug 2001 Sample - 1-2 mm	Monzonite	0.22	-0.01	8.6	#N/A	0.09	#N/A
51	Aug 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Aug 2001 Sample - 2+2 mm	0	0.28	0.03	0	#N/A	0.69	#N/A
52	Sep 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 1+2 mm	0	0.2	0.01	8.6	#N/A	0.09	#N/A
53	Sep 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 2+2 mm	0	0.31	0.01	8.7	#N/A	0.69	#N/A
54	Oct 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Oct 2001 Sample - 1+2 mm	Monzonite	0.22	-0.01	8.5	#N/A	0.09	#N/A
55	Oct 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Oct 2001 Sample - 2+2 mm	0	0.46	0.01	8.4	#N/A	0.94	#N/A
56	Jan 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Jan 2001 Sample - 2+2 mm	LG Breccia	0.13	0.01	9.1	#N/A	0.09	#N/A
57	Feb 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Feb 2001 Sample - 2+2 mm	0	0.16	0.01	9	#N/A	0.17	#N/A
58	Mar 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Mar 2001 Sample - 2+2 mm	LG Breccia	0.07	-0.01	8.8	#N/A	-0.09	#N/A
59	Apr 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Apr 2001 Sample - 2+2 mm	Monzonite	0.04	-0.01	8.9	#N/A	-0.09	#N/A
60	May 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	May 2001 Sample - 2+2 mm	0	0.15	-0.01	8.9	#N/A	-0.09	#N/A
61	Jun 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Jun 2001 Sample - 2+2 mm	Monzonite	0.27	0.01	9	#N/A	0.09	#N/A
62	July 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	July 2001 Sample - 2+2 mm	Monzonite	0.13	-0.01	8.9	#N/A	0.17	#N/A
63	Sep 2001 Sample - 1+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 1+2 mm	0	0.2	0.01	8.6	#N/A	0.09	#N/A
64	Sep 2001 Sample - 2+2 mm	Cariboo Pit	Cariboo Pit	+2 mm Muck	Sep 2001 Sample - 2+2 mm	0	0.31	0.01	8.7	#N/A	0.69	#N/A
65	BD 1 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 1	0	0.23	#N/A	7.4	7.7	#N/A	#N/A
66	BD 1 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 2	0	0.18	#N/A	7.6	7.7	#N/A	#N/A
67	BD 1 - 3	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 3	0	0.14	#N/A	7.5	7.6	#N/A	#N/A
68	BD 1 - 4	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 4	0	0.39	#N/A	7.7	7.6	#N/A	#N/A
69	BD 1 - 5	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 5	0	0.46	#N/A	8.1	8.1	#N/A	#N/A
70	BD 1 - 6	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 6	0	0.4	#N/A	8.1	8.2	#N/A	#N/A
71	BD 1 - 7	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 7	0	0.32	#N/A	8.2	8.3	#N/A	#N/A
72	BD 1 - 8	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 8	0	0.45	#N/A	8.1	8.2	#N/A	#N/A
73	BD 1 - 9	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 9	0	0.47	#N/A	8	8.1	#N/A	#N/A
74	BD 1 - 10	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 1 - 10	0	0.44	#N/A	7.9	7.9	#N/A	#N/A
75	BD 2 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 2 - 1	0	0.51	#N/A	8.1	8.1	#N/A	#N/A
76	BD 2 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 2 - 2	0	0.41	#N/A	7.8	7.9	#N/A	#N/A
77	BD 3 - 1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 3 - 1	0	0.06	#N/A	7.9	8	#N/A	#N/A
78	BD 3 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 3 - 2	0	0.05	#N/A	7.8	8.1	#N/A	#N/A
79	BD 4 -1	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 -1	0	0.07	#N/A	7.8	8	#N/A	#N/A
80	BD 4 - 2	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 - 2	0	0.08	#N/A	7.6	7.8	#N/A	#N/A
81	BD 4 - 3	Bell Dump	Bell Dump	Waste Rock -2 mm	BD 4 - 3	0	0.03	#N/A	7.8	8	#N/A	#N/A
82	49 1130 A	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite Volcanic	0.09	-0.01	9.2	9.5	#N/A	0.33
83	50 1130 B	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.22	0.01	8.9	9.2	#N/A	0.68
84	51 55145	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.43	0.01	8.7	9.1	#N/A	0.63
85	52 55137	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.28	-0.01	8.5	8.8	#N/A	0.44
86	71 55135	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.57	-0.01	8.8	9.1	#N/A	0.33
87	72 55141	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.12	-0.01	8.8	9	#N/A	0.52
88	39 1140 A	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite Volcanic	0.03	-0.01	9.2	9.5	#N/A	0.27
89	40 1140 B	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.21	-0.01	8.9	9.2	#N/A	0.49
90	42 54642	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.99	0.01	9	9.3	#N/A	0.35
91	43 55148	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.81	-0.01	8.8	9.2	#N/A	0.35
92	44 55136	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.05	0.01	8.5	8.8	#N/A	0.46
93	45 55685	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.46	0.01	8.8	9.2	#N/A	0.25
94	46 55666	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.16	0.01	8.8	9.2	#N/A	0.33

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
1	SD 1 - 1	15	0.7	8.41	10	2130	1	-2	3.76	-0.5	28	77	1745	0.061	5.74	6	3.34	2.19	1420	-1	2.14	33	1820	4	-5	-1	374	0.31	174	10	84
2	SD 1 - 2	16	0.7	7.89	7	2130	1.1	-2	4.46	-0.5	33	126	1560	0.063	6.42	6	3.4	2.92	1530	1	1.75	51	1850	8	-5	-1	398	0.27	190	10	99
3	SD 2 - 1	12	0.8	8.34	16	2340	1.1	-2	3.54	-0.5	35	102	2570	0.093	7.13	9	3.9	2.62	1225	-1	1.49	39	1710	5	-5	-1	402	0.31	239	10	88
4	SD 2 - 2	14	0.7	7.73	15	1850	1	-2	4.46	-0.5	36	146	1415	0.052	6.77	9	3.06	3.22	1410	1	1.83	59	1450	7	-5	-1	427	0.32	214	10	89
5	SD 3 - 1	100	1	8.33	32	1420	1.1	-2	5.59	-0.5	25	46	1965	0.06	5.53	20	2.71	1.86	916	16	2.26	23	1330	4	-5	3	452	0.34	198	10	67
6	SD 3 - 2	65	1	9.02	34	1710	1.1	-2	4.89	-0.5	26	28	1885	0.07	6.23	13	2.6	1.52	1070	8	2.55	9	1460	6	-5	2	539	0.38	208	10	73
7	SD 3 - 3	67	0.9	8.8	38	1570	1.1	-2	4.61	-0.5	30	43	2090	0.079	6.18	13	2.97	1.81	958	16	2.51	22	1520	-2	-5	3	506	0.35	219	10	66
8	SD 3 - 4	114	1	8.42	29	1410	1.2	-2	6.24	-0.5	29	61	1675	0.035	6.29	13	2.67	1.98	1270	19	2.04	32	1530	3	-5	3	468	0.34	207	10	84
9	SD 3 - 5	114	1.6	8.82	48	1160	1.2	-2	5.7	-0.5	27	19	4760	0.063	6.81	22	3.53	1.36	1000	14	2.07	6	1350	5	-5	5	424	0.3	224	10	75
10	CPD 1	50	1	8.93	21	1520	1.1	2	3.82	-0.5	24	31	2470	0.08	5.9	13	3.56	1.53	705	15	2.65	14	1350	3	-5	5	501	0.36	202	10	64
11	CPD 2	79	1.2	9.06	46	260	1.2	2	4.59	-0.5	36	30	2820	0.057	7	20	3.77	1.42	645	55	2.52	9	1380	-2	-5	6	468	0.33	205	10	61
12	CPD 3	84	1.3	9.37	38	330	1.3	2	4.55	-0.5	33	22	3200	0.046	7.28	22	4.39	1.23	584	41	2.46	6	1370	5	-5	7	499	0.32	196	10	59
13	CPD 4	62	0.9	9.47	21	1630	1.1	2	4.92	-0.5	27	36	1885	0.042	6.41	10	3.64	1.69	897	23	2.77	14	1540	3	-5	3	546	0.36	225	10	78
14	CPD 5	84	1.1	9.23	36	1130	1.2	2	6.07	-0.5	31	23	1975	0.037	7.02	14	3.23	1.67	1045	27	2.39	7	1550	2	-5	4	544	0.39	217	10	85
15	CPD 6	80	1.2	9.23	32	730	1.1	2	5.21	-0.5	31	30	1985	0.043	6.89	15	3.31	1.58	972	30	2.63	11	1480	5	-5	4	528	0.37	217	10	91
16	CPD 7	58	0.9	9.05	31	1640	1	2	4.28	-0.5	24	37	1875	0.046	6.07	11	3.7	1.53	826	16	2.64	16	1460	2	-5	2	525	0.37	214	10	73
17	CPD 8	62	1.1	9.32	43	1690	1.1	2	4.24	-0.5	25	54	2470	0.055	6.26	15	4.24	1.7	803	32	2.71	23	1390	5	6	4	523	0.37	231	10	75
18	CPD 9	64	0.6	8.26	30	1400	1.4	2	3.85	-0.5	21	38	1945	0.057	5.64	14	3.85	1.54	825	38	2.64	21	1280	11	-5	3	465	0.33	207	-10	83
19	CPD 10	59	0.9	8.15	23	1470	1.4	2	3.9	-0.5	22	30	1800	0.067	5.92	15	3.55	1.46	964	16	2.48	14	1260	11	-5	3	514	0.33	196	-10	79
20	CPD 11	77	0.8	8.23	32	1100	1.5	2	4.26	-0.5	26	19	2200	0.049	6.27	19	3.64	1.3	741	35	2.53	6	1190	9	-5	5	470	0.32	185	-10	69
21	CPD 12	90	0.8	8.29	45	830	1.6	2	4.55	-0.5	28	18	2250	0.046	6.43	24	3.59	1.35	757	43	2.51	6	1240	13	-5	7	440	0.32	192	-10	64
22	CPD 13	74	0.9	8.54	23	1380	1.6	2	4.35	1.1	26	19	2160	0.071	6.33	15	3.57	1.5	998	31	2.47	7	1390	11	-5	3	508	0.35	202	-10	105
23	CPD 14	113	0.7	8.35	36	800	1.6	2	5.18	-0.5	23	14	1880	0.033	5.89	19	2.88	1.29	770	32	2.73	6	1190	11	-5	5	398	0.31	194	-10	62
24	HWD 1	61	0.5	7.84	28	1700	1.5	-2	4.03	-0.5	28	31	2390	0.086	6.28	12	3.86	1.56	1095	25	1.84	13	1540	7	-5	4	439	0.31	212	-10	72
25	HWD 2	104	-0.5	8.43	13	1920	1.5	-2	7.86	-0.5	20	12	617	0.014	5.75	10	2.01	2.05	1415	3	1.83	4	1560	13	5	-1	567	0.39	216	-10	96
26	HWD 3	57	0.5	7.88	23	1730	1.5	-2	4.24	-0.5	25	28	1980	0.084	5.84	14	3.12	1.58	1170	13	2.08	13	1610	11	-5	2	434	0.31	190	-10	76
27	HWD 4	52	0.6	8.48	34	1460	1.8	-2	3.2	0.6	28	40	2490	0.138	5.73	13	3.98	1.65	821	27	2.42	22	1360	12	-5	3	400	0.32	218	-10	60
28	HWD 5	67	0.6	8.65	14	1470	1.5	-2	4.7	-0.5	16	44	2040	0.064	4.61	7	3.06	1.57	825	4	2.87	25	1190	11	-5	4	580	0.37	177	-10	65
29	HWD 6	92	-0.5	8.36	11	1440	1.6	-2	5.25	0.7	21	61	1975	0.057	5.27	18	3.41	1.99	937	11	2.49	42	1290	10	-5	3	470	0.33	213	-10	73
30	HWD 7	122	0.7	7.64	28	1300	1.4	-2	5.45	-0.5	13	31	2610	0.039	3.75	10	3.84	1.58	728	3	2.24	18	1040	8	-5	3	373	0.31	246	-10	48
31	63 DP6 (-2MM)	139	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
32	64 DP7 (-2MM)	31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
33	65 DP8 (-2MM)	101	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
34	66 DP9 (-2MM)	171	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
35	67 DP10 (-2MM)	102	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
36	Jan 2001 Sample - 1-2 mm	67	0.2	7.82	16	1360	0.5	-2	6.16	0.5	26	134	3580	0.07	6.07	70	2.73	3.02	845	67	2.17	53	1220	8	1	2.8	492	0.37	355	-10	74
37	Jan 2001 Sample - 2-2 mm	not/ss	0.2	7.65	9	1900	1	-2	4.1	1	21	220	3630	#N/A	6.79	160	2.96	2.08	890	6	2.31	128	1240	24	#N/A	#N/A	831	0.42	314	20	120
38	Feb 2001 Sample - 1-2 mm	not/ss 64	0.6	7.3	11	1360	0.5	-2	3.83	-0.5	19	123	3510	0.023	6.36	90	2.58	1.81	780	5	2.29	63	1290	22	0	0	698	0.38	276	10	96
39	Feb 2001 Sample - 2-2 mm	0	-0.2	7.39	16	1210	0.5	-2	4.68	-0.5	16	102	2870	0	4.79	50	1.44	1.77	605	48	2.58	43	990	8	0	0	574	0.37	247	10	42
40	Mar 2001 Sample - 2-2 mm	16	0.2	7.96	12	1290	1	-2	2.81	-0.5	19	20	5300	0.212	7.57	160	1.9	1.75	665	5	2.96	7	1810	6	0.2	1.6	463	0.35	378	20	40
41	May 2001 Sample - 1-2 mm	60	0.2	8.05	16	1350	1	2	5.13	-0.5	22	86	3480	0.03	5.2	60	2.77	2.53	735	150	2.37	33	1150	10	0.6	3	475	0.36	276	-10	58
42	Mar 2001 Sample - 1-2 mm	53	0.2	7.44	11	1480	0.5	-2	4.51	-0.5	16	20	1475	0.018	4.83	30	2.37	1.67	715	-1	2.04	10	1200	14	0.2	0.8	494	0.33	246	10	58
43	Apr 2001 Sample - 1-2 mm	42	0.4	6.75	10	1060	1	-2	2.84	-0.5	12	30	2240	0.014	4	150	4.01	1.14	550	5	1.87	11	640	14	1.8	2.2	366	0.23	227	10	100
44	Apr 2001 Sample - 2-2 mm	31	0.2	6.54	9	1090	0.5	-2	2.72	-0.5	22	53	4780	0.251	6.67	130	1.52	2.09	1685	-1	1.5	22	1720	8	0.8	1.6	400	0.39	261	10	64
45	May 2001 Sample - 2-2 mm	not/ss	0.2	8.17	11	980	0.5	-2	4.76	-0.5	20	190	2990	not/ss	6.88	140	2.66	1.94	635	54	2.4	99	1260	10	#N/A	#N/A	556	0.36	319	-10	62
46	Jun 2001 Sample - 1-2 mm	not/ss 47	0.4	7.93	13	1200	0.5	-2	4.44	-0.5	23	219	4690	not/ss 0.041	6.72	150	3.69	2.17	715	12	2.24	76	1370	10	#N/A	#N/A	553	0.39	299	-10	66
47	Jun 2001 Sample - 2-2 mm	0	0.6	7.49	27	960	0.5	12	3.82	-0.5	20	121	4610	0	6.76	130	3.4	1.65	625	6	2.12	61	1340	8	0	0	470	0.36	322	-10	60
48	July 2001 Sample - 1-2 mm	73	0.4	7.88	24	1170	1	-2	5.78	-0.5	20	103	2890	0.018	5.29	150	2.36	2.49	740	3	1.69	58	1600	8	0.8	3	557	0.38	245	-10	60
49	July 2001 Sample - 2-2 mm	75	0.6	7.42	27	1260	0.5	-2	5.52	-0.5	21	88	2510	0.018	5.43	140	2.36	2.46	745	4	1.61	47	1640	8	0.2	2.2	499	0.38	247	-10	58
50	Aug 2001 Sample - 1-2 mm	16	-0.5	6.34	5	1140	2	-2	2.9	-0.5	17	54	6830	0.298	7.96	100	4.21	1.48	700	3	2.41	6	980	10	5	7	419	0.33	340	-10	80
51	Aug 2001 Sample - 2+2 mm	96	0.5	6.52	5	2730	2	-2	4.6	-0.5	19	65	3010	0.026	5.75	100	2.84	1.95	785	7	3.04	34	1490	16	15	3	746	0.39	208	-10	76
52	Sep 2001 Sample - 1+2 mm	16	-0.5	6.5	5	1110	2	-2	2.8	-0.5	17	47	6470	0.299	7.78	70	4.29	1.48	690	8	2.43	6	990	8	5	7	401	0.34	336	-10	72
53	Sep 2001 Sample - 2+2 mm	90	0.5	6.83	5	2730	2	-2	4.8	-0.5	19	59	3350	0.028	5.94	100	3	1.97	800	9	3.18	33	1510	12	5	3	746	0.4	214	-10	78
54	Oct 2001 Sample - 1+2 mm	19	0.5	6.38	5	1150	2	-2	3	-0.5	16	26	6580	0.285	7	90	4.26	1.42	680	6	2.53	2	990	10	10	7	422	0.32	307	-10	68
55	Oct 2001 Sample - 2+2 mm	94	-0.5	6.53	15	2120	2	-2	5	-0.5	18	41	5300	0.045	6.26	200	3.11	1.59	755	11	3.14	11	1090	14	5	4	547	0.35	232	-10	82
56	Jan 2001 Sample - 2+2 mm	21	-0.2	8.67	6	1640	0.5	-2	2.86	-0.5	14	47	1160	0.005	4.29	40	3.62	1.44	775	3	3.3	15	1490	4	-0.2	1	632	0.36	175	-10	58
57	Feb 2001 Sample - 2+2 mm	22	0.2	8.49	9	1220	0.5	-2	2.62	-0.5	14	34	1440	0.009	4.35	30	3.1	1.31	440	9	3.54	4	1130	4	-0.2	2	574	0.32	233	-10	30
58	Mar 2001 Sample - 2+2 mm	14	-0.2	8.21	9	1250	1	-2	2.16	-0.5	15	20	2040	0.076	5.17	70	2.98	1.25	415	5	3.42	3	1490	2	-0.2	2	486	0.29	261	-10	26
59	Apr 2001 Sample - 2+2 mm	13	0.4	7.97	6	1080	0.5	-2	2.02	-0.5	15	32	2340	0.162	6.04	50	4.41	1.23	395	2	2.63	7	1080	4	0.2	1	391	0.3	239	-10	40
60	May 2001 Sample - 2+2 mm	20	0.4	8.34	7	860	0.5	-2	2.83	-0.5	19	18	1745	0.026	7.28	70	2.67	1.88	495	2	3.03	5	1250	2	-0.2	1	561	0.38	272	-10	48
61	Jun 2001 Sample - 2+2 mm	28	-0.2	7.99	13	890	0.5	-2	3.08	-0.5	18	21	2300	0.01	6.12	90	3.02	1.63	535	2	3.08	7	1300	2	-0.2	2	582	0.35	253	-10	44
62	July 2001 Sample - 2+2 mm	24	0.2	8.91	13	1190	0.5	-2	3.86	-0.5	16	20	1255	0.006	5.66	50	2.76	1.8	570	1	2.98	7	1280	2	-0.2	1	665	0.38	243	-10	44
63	Sep 2001 Sample - 1+2 mm	16	-0.5	6.5	5	1110	2	-2	2.8	-0.5	17	47	6470	0.299	7.78	70	4.29	1.48	690	8	2.43	6	990	8	5	7	401	0.34	336	-10	72
64	Sep 2001 Sample - 2+2 mm	90	0.5	6.83	5	2730	2	-2	4.8	-0.5	19	59	3350	0.028	5.94	100	3	1.97	800	9	3.18	33	1510	12	5	3	746	0.4	214	-10	78
65	BD 1 - 1	106	1.2	9.38	25	1940	1	-2	6.98	-0.5	24	23	1995	0.047	6.1	10	2.59	1.55	1375	2	2.43	4	1540	6	-5	2	642	0.36	197	10	93
66	BD 1 - 2	95	1	9.36	28	2000	1	-2	7.24	-0.5	23	23	876	0.019	6.18	8	2.24	1.82	1405	6	2.53	6	1700	4	-5	1	647	0.41	216	10	89
67	BD 1 - 3	103	0.9	8.91	18	1770	0.9	-2	7.62	-0.5	26	18	602	0.009	6.48	7	2.12	1.96	1510	3	2.23	5	1650	8	-5	1	594	0.38	230	10	96
68	BD 1 - 4	100	0.8	9.06	22	1580	1.1	-2	5.21	-0.5	23	28	2480	0.033	6.12	12	3.66	1.37	738	26	2.69	9	1350	4	-5	4	524	0.34	206	10	58
69	BD 1 - 5	119	1.1	8.58	28	1570	1.1	-2	6.07	-0.5	24	27	2190	0.034	6.12	17	3.41	1.73	773	32	2.31	11	1460	-2	-5	2	544	0.35	233	10	52
70	BD 1 - 6	110	1	8.68	26	1560	1.1	-2	6.26	-0.5	26	31	2300	0.046	6.05	14	3.56	1.78	823	23	2.27	10	1440	9	-5	4	532	0.32	234	10	58
71	BD 1 - 7	72	1	9.59	26	1580	1.1	-2	4.76	-0.5	24	26	2500	0.068	6.05	10	3.59	1.44	753	17	2.94	8	1380	4	6	2	560	0.37	206	10	63
72	BD 1 - 8	72	1.1	9.33	21	1570	1.1	-2	4.39	-0.5	26	35	2770	0.054	6.26	11	3.8	1.44	679	30	2.78	9	1470	6	-5	3	527	0.37	215	10	59
73	BD 1 - 9	60	1.2	9.51	23	1570	1.2	-2	3.7	-0.5	30	26	3140	0.087	6.57	14	3.97	1.32	684	28	2.81	9	1380	3	-5	5	529	0.33	215	10	56
74	BD 1 - 10	66	1.1	9.39	21	1390	1.3	-2	3.73	-0.5	33	24	2740	0.099	6.68	14	3.73	1.37	776	39	2.74	7	1380	6	-5	5	458	0.32	217	10	54
75	BD 2 - 1	107	1.2	8.93	24	1330	1.2	-2	5.37	-0.5	27	19	2900	0.075	5.89	12	3.16	1.37	631	25	2.47	7	1330	7	-5	5	477	0.32	198	10	50
76	BD 2 - 2	135	0.8	8.72	12	1540	1.1	-2	6.1	-0.5	24	19	2580	0.036	5.74	9	3	1.19	596	19	2.17	4	1290	-2	-5	3	406	0.31	191	10	45
77	BD 3 - 1	31	0.8	9.93	33	2190	1	-2	6.84	-0.5	27	18	428	0.014	6.47	10	1.95	1.79	1605	1	2.47	7	1870	5	-5	-1	579	0.37	222	10	118
78	BD 3 - 2	28	1	9.62	31	2490	1	-2	6.59	-0.5	26	23	488	0.019	6.37	13	2.01	1.74	1595	-1	2.34	5	1850	7	-5	-1	599	0.38	211	10	115
79	BD 4 -1	46	0.9	8.58	19	2040	1	-2	5.9	-0.5	26	58	776	0.025	5.9	13	2.14	2.25	1210	1	2.14	46	1610	7	-5	1	667	0.39	211	10	78
80	BD 4 - 2	35	0.8	9.29	15	2130	0.9	-2	5.73	-0.5	28	43	827	0.018	6.33	11	2.39	1.99	1305	1	2.39	24	1710	4	-5	-1	632	0.4	224	10	87
81	BD 4 - 3	73	0.7	9.58	14	2620	1	-2	6.9	-0.5	27	21	458	0.013	6.28	7	2.2	1.79	1445	1	2.55	10	1750	4	-5	-1	616	0.41	229	10	82
82	49 1130 A	41	-0.5	5.65	25	1810	1.5	-2	5	-0.5	23	16	902	#N/A	6.03	40	2.62	1.67	1380	5	2.73	-1	1600	12	5	-1	679	0.45	249	-10	90
83	50 1130 B	53	-0.5	6.17	50	1490	2.5	-2	2.6	-0.5	19	44	1770	#N/A	5.69	160	4.01	1.17	490	11	2.91	8	1160	12	10	1	501	0.32	192	-10	50
84	51 55145	47	-0.5	6.88	15	1280	1.5	-2	2.3	-0.5	10	32	228	#N/A	3.6	50	2.64	0.83	515	8	4.09	1	850	14	5	-1	506	0.29	125	-10	38
85	52 55137	47	-0.5	6.99	25	330	1	-2	1.7	-0.5	8	17	934	#N/A	3.57	110	4.34	0.62	265	8	3.52	1	740	8	-5	2	539	0.29	124	-10	24
86	71 55135	37	-0.5	6.86	10	1400	1	4	1.85	-0.5	6	31	746	#N/A	3.12	70	4.84	0.68	390	6	3.23	-1	720	6	5	1	508	0.27	120	-10	30
87	72 55141	48	-0.5	5.91	45	500	1.5	-2	2.3	-0.5	16	21	2160	#N/A	5.8	110	3.51	0.95	440	8	3.54	2	1180	10	-5	3	529	0.31	198	-10	36
88	39 1140 A	36	-0.5	5.66	20	1930	2	-2	5.4	-0.5	24	16	240	#N/A	5.87	20	2.42	1.71	1420	6	2.55	-1	1630	8	5	-1	728	0.45	249	-10	94
89	40 1140 B	48	-0.5	5.79	20	1440	2	-2	3	-0.5	20	46	1185	#N/A	5.17	90	3.64	1.26	680	16	2.47	8	1210	16	5	1	500	0.33	204	-10	58
90	42 54642	43	-0.5	6.39	20	1010	2	-2	2	-0.5	18	26	1860	#N/A	7.34	40	2.41	1.04	500	9	3.8	2	1090	16	-5	2	432	0.28	234	-10	34
91	43 55148	42	-0.5	6.78	15	960	2	8	1.85	-0.5	12	36	1835	#N/A	4	50	4.94	0.74	345	17	3.01	-1	1040	12	5	3	520	0.28	205	-10	34
92	44 55136	43	-0.5	6.59	20	440	1.5	-2	1.7	-0.5	11	25	1210	#N/A	3.34	110	5.13	0.6	270	16	2.59	-1	920	14	-5	2	459	0.28	173	-10	32
93	45 55685	29	-0.5	7.89	5	290	1	-2	1.7	-0.5	11	42	151	#N/A	3.34	130	2.05	0.83	305	6	4.54	-1	750	14	-5	3	576	0.27	105	-10	30
94	46 55666	38	0.5	6.35	10	600	1.5	4	1.85	-0.5	12	23	1240	#N/A	3.64	190	5.68	0.65	440	6	2.71	1	750	12	5	2	414	0.28	150	-10	34

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
95	47 55670	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.13	0.01	8.9	9.4	#N/A	0.22
96	48 55681	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1	-0.01	8.8	9	#N/A	0.68
97	26 1150 A	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.03	0.01	9	9.4	#N/A	0.52
98	27 1150 B	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.36	0.01	9	9.4	#N/A	0.30
99	28 1150 C	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.18	0.03	9	9.4	#N/A	0.27
100	29 62673	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.06	0.04	9.2	9.5	#N/A	0.27
101	30 62690	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.14	0.03	9	9.4	#N/A	0.30
102	31 77864	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.88	0.03	8.9	9.2	#N/A	0.27
103	32 77880	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.65	0.02	8.7	9	#N/A	0.68
104	33 77889	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.5	0.03	8.7	9.1	#N/A	0.25
105	34 63774	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.53	0.01	9.3	9.6	#N/A	0.22
106	35 63781	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.29	0.02	8.7	9	#N/A	0.44
107	36 63755	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.87	0.02	9.1	9.4	#N/A	0.14
108	37 63995	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.04	0.02	9.2	9.6	#N/A	0.33
109	38 54609	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.49	-0.01	9.1	9.4	#N/A	0.27
110	COMP#1	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.21	-0.01	8.5	8.1	#N/A	0.44
111	COMP#3	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.13	-0.01	8.5	8.1	#N/A	0.22
112	COMP#2	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.15	-0.01	8.9	8.6	#N/A	0.22
113	COMP#4	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.74	-0.01	8.4	7.8	#N/A	0.33
114	COMP#5	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.97	-0.01	8.5	7.8	#N/A	0.22
115	COMP#8	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.92	-0.01	8.7	8.1	#N/A	0.33
116	COMP#10	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.11	-0.01	8.7	8	#N/A	0.22
117	COMP#11	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.93	-0.01	8.6	8	#N/A	0.27
118	COMP#19	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.7	-0.01	9	8.1	#N/A	0.22
119	77766	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.7	-0.01	8.7	8	#N/A	0.27
120	77807	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.6	0.03	9	7.9	#N/A	0.11
121	77718	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.5	0.03	8.7	7.7	#N/A	0.11
122	77761	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.61	0.01	9.1	7.8	#N/A	0.11
123	77762	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.75	0.01	8.7	8	#N/A	0.27
124	77765	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.44	-0.01	9.2	8.2	#N/A	0.05
125	77767	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.23	0.03	8.7	7.9	#N/A	0.16
126	77769	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1	0.03	8.9	8	#N/A	0.22
127	77770	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.99	0.02	8.3	7.7	#N/A	0.55
128	77774	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.07	0.02	8.8	8.1	#N/A	0.05
129	77806	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.89	0.03	8.9	8	#N/A	0.16
130	COMP#1	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.21	-0.01	8.5	8.1	#N/A	0.44
131	COMP#2	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.15	-0.01	8.9	8.6	#N/A	0.22
132	COMP#3	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.13	-0.01	8.5	8.1	#N/A	0.22
133	COMP#4	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.74	-0.01	8.4	7.8	#N/A	0.33
134	COMP#5	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.97	-0.01	8.5	7.8	#N/A	0.22
135	20-57438	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.42	0.02	8.1	7.7	#N/A	0.05
136	22-57431	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.46	0.02	8.7	8.1	#N/A	0.49
137	23-57440	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.37	0.01	8.4	7.6	#N/A	-0.05
138	24-57003	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.88	0.01	8.8	8.4	#N/A	0.11
139	25-57010	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.18	0.01	8.5	7.8	#N/A	0.11
140	26-57441	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.24	0.01	8.5	7.7	#N/A	0.11
141	27-57446	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.38	-0.01	8	7.3	#N/A	-0.05
142	28-57448	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.2	-0.01	8.4	8.1	#N/A	0.11
143	30-57053	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.42	0.02	8.2	8.1	#N/A	0.49
144	31-57033	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.89	-0.01	8.9	8.5	#N/A	0.33
145	32-57035	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.48	0.01	8.1	7.8	#N/A	-0.05
146	33-57067	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.28	0.01	8.9	8.1	#N/A	0.11
147	34-57096	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.64	0.01	8.7	8	#N/A	0.16
148	35-57101	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.33	0.01	9	8.2	#N/A	0.76
149	36-57103	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.71	0.02	8.6	8	#N/A	0.27
150	37-57107	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	1.15	0.02	8.4	7.8	#N/A	-0.05
151	39-57688	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.1	-0.01	8.2	7.7	#N/A	0.11
152	40-57694	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.41	-0.01	8.8	8.5	#N/A	0.27
153	COMP#41	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.21	-0.01	8.9	8.7	#N/A	0.44
154	COMP#65	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.07	-0.01	8.9	8.9	#N/A	0.27
155	COMP#44	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.27	-0.01	9.3	8.9	#N/A	0.22
156	COMP#45	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	East Breccia waste	0.21	-0.01	8.9	8.5	#N/A	0.11
157	COMP#53	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	Volcanic	0.2	-0.01	8.9	8.8	#N/A	0.38
158	COMP#66	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.07	-0.01	8.9	8.7	#N/A	0.33
159	COMP#68	Bell Pit	Bell Pit	Blast Hole Cuttings	#N/A	West Wall Diorite	0.17	-0.01	9.3	8.9	#N/A	0.22
160	Feb 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite	0.11	-0.01	8.1	8	#N/A	0.60
161	Mar 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic	0.1	0.01	8.2	8	#N/A	0.87
162	Apr 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite	0.05	-0.01	7.7	7.1	#N/A	-0.05
163	May 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite	0.04	-0.01	8.1	8.1	#N/A	0.55
164	Jun 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	East Breccia waste	1.32	0.02	7.6	not/ss	#N/A	0.44
165	Jun 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	East Breccia waste	1.41	0.05	6.7	not/ss	#N/A	-0.05
166	Jul 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic West Wall Diorite	0.93	-0.01	7.8	7.9	#N/A	0.71
167	Jul 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	0.07	-0.01	8	8	#N/A	1.04
168	Aug 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic West Wall Diorite East Breccia waste	0.86	0.02	8	0	#N/A	1.15
169	Aug 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	0.44	0.01	8.2	0	#N/A	0.55
170	Aug 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	1.45	0.02	8	0	#N/A	0.55
171	Sep 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic	0.82	0.02	8	0	#N/A	1.15
172	Sep 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite East Breccia waste	0.57	0.02	8.1	0	#N/A	0.60
173	Sep 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	1.99	0.03	8.6	0	#N/A	0.55
174	Oct 2001 Sample 1-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	Volcanic	0.88	0.03	8.1	0	#N/A	1.20
175	Oct 2001 Sample 2-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	West Wall Diorite East Breccia waste	0.45	0.01	8.1	0	#N/A	0.60
176	Oct 2001 Sample 3-2 mm	Bell Pit	Bell Pit	-2 mm Muck	#N/A	0	1.64	0.02	8.1	0	#N/A	1.15
177	Mar 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	Volcanic	0.08	-0.01	8.7	8	#N/A	0.22
178	May 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	West Wall Diorite	0.03	-0.01	8.6	8.1	#N/A	0.16
179	Jun 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	East Breccia waste	0.92	0.02	8.7	not/ss	#N/A	0.11
180	Jun 2001 Sample 2+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	East Breccia waste	1.5	0.03	8.2	8.1	#N/A	0.05
181	Sep 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	Volcanic	0.65	-0.01	8.3	0	#N/A	0.79
182	Sep 2001 Sample 2+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	West Wall Diorite East Breccia waste	0.74	0.01	8.7	0	#N/A	0.46
183	Sep 2001 Sample 3+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	0	1.28	0.03	8.7	0	#N/A	0.27
184	Oct 2001 Sample 1+2 mm	Bell Pit	Bell Pit	+2 mm Muck	#N/A	Volcanic	0.69	-0.01	8.4	0	#N/A	0.71
185	102 - 10 - 100	Springer Pit	Springer Pit	DD Core	102 - 10 - 100	#N/A	0.04	0.04	8.8	#N/A	#N/A	#N/A
186	102 - 100 - 200	Springer Pit	Springer Pit	DD Core	102 - 100 - 200	#N/A	0.05	0.03	8.8	#N/A	#N/A	#N/A
187	102 - 200 - 300	Springer Pit	Springer Pit	DD Core	102 - 200 - 300	#N/A	0.05	0.04	8.8	#N/A	#N/A	#N/A
188	102 - 300 - 400	Springer Pit	Springer Pit	DD Core	102 - 300 - 400	#N/A	0.13	0.03	8.8	#N/A	#N/A	#N/A
189	102 - 400 - 500	Springer Pit	Springer Pit	DD Core	102 - 400 - 500	#N/A	0.21	0.05	9	#N/A	#N/A	#N/A
190	102 - 500 - 600	Springer Pit	Springer Pit	DD Core	102 - 500 - 600	#N/A	0.16	0.04	8.9	#N/A	#N/A	#N/A
191	103 - 10 - 100	Springer Pit	Springer Pit	DD Core	103 - 10 - 100	#N/A	0.01	0.01	8.9	#N/A	#N/A	#N/A
192	103 - 100 - 200	Springer Pit	Springer Pit	DD Core	103 - 100 - 200	#N/A	0	0	8.9	#N/A	#N/A	#N/A
193	103 - 200 - 300	Springer Pit	Springer Pit	DD Core	103 - 200 - 300	#N/A	0	0	8.9	#N/A	#N/A	#N/A
194	103 - 300 - 400	Springer Pit	Springer Pit	DD Core	103 - 300 - 400	#N/A	0.05	0.03	8.8	#N/A	#N/A	#N/A
195	103 - 400 - 500	Springer Pit	Springer Pit	DD Core	103 - 400 - 500	#N/A	0.04	0.04	9	#N/A	#N/A	#N/A

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
95	47 55670	28	-0.5	7.72	5	510	1.5	-2	1.65	-0.5	12	57	284	#N/A	3.5	80	2.39	0.84	470	13	4.71	-1	810	12	-5	1	509	0.29	125	-10	54
96	48 55681	70	0.5	5.31	145	710	1	-2	2.5	-0.5	15	17	1860	#N/A	2.88	390	6.13	0.53	410	50	1.5	1	980	10	5	2	251	0.25	243	-10	54
97	26 1150 A	52	-0.5	5.69	15	1940	1.5	-2	5.4	-0.5	24	15	211	#N/A	5.93	20	2.28	1.79	1465	4	2.57	-1	1680	8	-5	-1	710	0.45	254	-10	96
98	27 1150 B	46	0.5	5.32	25	1260	1.5	-2	2.4	-0.5	19	50	1890	#N/A	5.11	60	3.55	1.16	505	20	2.43	11	1100	14	-5	2	444	0.29	188	-10	50
99	28 1150 C	33	-0.5	6.73	15	530	1.5	-2	2	-0.5	16	30	1350	#N/A	4.84	80	3.96	0.71	430	45	3.26	-1	870	10	5	2	577	0.31	135	-10	46
100	29 62673	36	-0.5	6.61	30	650	1.5	-2	1.65	-0.5	16	52	1870	#N/A	5.63	80	2.71	0.98	415	30	3.99	4	1070	8	-5	2	429	0.3	172	-10	40
101	30 62690	39	-0.5	7.09	10	590	1.5	-2	1.9	-0.5	13	38	606	#N/A	4.88	50	2.67	1.11	530	9	4.36	3	920	10	-5	2	510	0.31	147	-10	42
102	31 77864	31	-0.5	7.75	15	1090	1.5	-2	2.1	-0.5	14	41	323	#N/A	4.17	120	2.58	1.11	585	13	4.36	4	930	8	-5	1	504	0.32	139	-10	44
103	32 77880	68	-0.5	6.41	20	990	1.5	-2	3.1	-0.5	17	24	1640	#N/A	4.93	110	3.28	0.77	540	90	3.95	3	1010	14	5	2	378	0.3	191	-10	56
104	33 77889	35	-0.5	7.21	5	280	1	-2	1.65	-0.5	10	45	241	#N/A	3.15	110	2.36	0.86	490	48	4.29	3	780	16	5	2	464	0.27	111	-10	64
105	34 63774	25	-0.5	7.28	5	890	1.5	-2	1.65	-0.5	11	32	896	#N/A	3.66	130	3.48	0.9	535	24	4.1	4	750	16	5	1	430	0.28	160	-10	46
106	35 63781	49	-0.5	6.31	20	400	1.5	6	2.4	-0.5	17	46	1955	#N/A	4.15	140	5.85	0.69	410	17	2.57	1	850	10	-5	2	528	0.32	145	-10	36
107	36 63755	20	0.5	7.81	15	1230	2	-2	2	-0.5	18	40	1535	#N/A	3.36	70	7.08	0.95	575	22	2.17	4	980	10	-5	1	546	0.3	162	-10	48
108	37 63995	40	-0.5	5.94	40	830	1.5	-2	3	-0.5	19	85	614	#N/A	3.86	60	5.97	1.04	860	11	2.19	14	940	8	-5	1	239	0.24	238	-10	36
109	38 54609	39	0.5	5.71	5	1440	1.5	-2	2.5	-0.5	12	16	1050	#N/A	4.04	80	5.73	0.95	745	21	2.07	-1	940	12	5	1	420	0.31	204	-10	54
110	COMP#1	47	0.4	8.26	15	1460	0.5	-2	2.96	-0.5	19	59	1185	#N/A	5.1	80	3.71	1.36	490	10	2.7	5	1310	-2	1	0.2	597	0.34	210	-10	42
111	COMP#3	39	0.2	8.39	12	1810	0.5	-2	4.68	-0.5	22	13	340	#N/A	5.29	30	2.67	1.76	1160	5	2.42	1	1580	-2	0.2	-0.2	671	0.38	218	-10	76
112	COMP#2	33	0.2	7.9	14	1550	0.5	-2	4.48	-0.5	24	46	1130	#N/A	5.7	30	3.11	1.99	1040	1	2.26	10	1470	-2	0.4	1	699	0.32	234	-10	64
113	COMP#4	39	-0.2	8.18	23	660	0.5	-2	2.09	-0.5	16	35	602	#N/A	3.99	60	3.11	0.94	415	9	3.11	3	910	-2	-0.2	1.4	448	0.26	143	-10	30
114	COMP#5	34	0.4	7.99	13	830	0.5	-2	2.13	-0.5	17	30	1085	#N/A	4.16	90	4.09	1.04	505	12	2.82	5	1100	-2	0.2	2.4	430	0.26	182	-10	36
115	COMP#8	45	0.2	8.21	9	540	0.5	-2	2.2	-0.5	16	35	1455	#N/A	4.92	180	3.34	1.18	540	27	3.28	3	1260	2	-0.2	2	401	0.28	196	-10	52
116	COMP#10	33	-0.2	7.65	17	360	0.5	-2	1.52	-0.5	13	40	654	#N/A	2.57	80	4.67	0.63	395	27	1.44	1	930	-2	0.2	2.6	231	0.22	234	-10	30
117	COMP#11	38	0.4	7.66	27	1480	0.5	-2	2.09	-0.5	17	46	2000	#N/A	3.11	120	2.96	1.21	475	481	1.41	7	880	2	0.2	3.2	201	0.22	214	-10	50
118	COMP#19	31	0.2	8.12	13	1000	0.5	-2	2.36	-0.5	16	69	1565	#N/A	4.25	70	3.28	1.35	565	14	3.24	13	1050	-2	0.2	2.2	442	0.28	184	-10	36
119	77766	33	-0.2	8.65	9	620	0.5	-2	2.98	-0.5	12	28	948	#N/A	2.7	90	4.32	1.29	670	27	2.23	1	1200	6	0.2	1.8	409	0.33	256	-10	38
120	77807	26	-0.2	10.15	6	1440	0.5	-2	1.89	-0.5	12	38	256	#N/A	3.63	40	2.43	1.17	410	18	4.75	3	940	2	-0.2	1.8	450	0.32	131	-10	30
121	77718	27	-0.2	9.18	6	150	0.5	-2	1.68	-0.5	10	62	129	#N/A	3.31	130	1.81	0.95	390	3	4.29	1	760	6	0.6	0.6	519	0.25	110	-10	40
122	77761	23	-0.2	9.22	7	880	0.5	-2	1.98	-0.5	13	41	207	#N/A	3.5	80	2.37	1.21	585	4	4.75	8	920	6	0.8	1	481	0.3	136	-10	38
123	77762	37	0.2	8.78	16	760	0.5	-2	2.64	-0.5	19	54	970	#N/A	3.76	90	3.06	1.39	595	7	3.84	12	1070	2	0.8	1.6	488	0.29	167	-10	32
124	77765	24	-0.2	8.94	22	1350	0.5	-2	3.22	-0.5	19	95	215	#N/A	4.21	20	2.61	2.08	750	4	3.82	23	1070	-2	0.6	1.2	554	0.3	167	-10	40
125	77767	25	0.8	9.09	15	190	0.5	-2	1.72	-0.5	25	34	3830	#N/A	5.06	280	4.5	1.05	510	19	3.12	4	1260	4	1.4	4.4	468	0.3	236	-10	52
126	77769	32	0.2	8.65	4	1630	0.5	-2	1.96	-0.5	15	33	988	#N/A	3.14	120	7.53	0.81	495	122	1.67	1	990	6	2	2.2	213	0.26	268	-10	46
127	77770	55	-0.2	9.44	27	190	0.5	-2	2.57	-0.5	19	19	891	#N/A	5.58	170	3.94	1.05	455	11	2.94	1	1490	2	0.8	1	610	0.37	252	-10	34
128	77774	23	0.2	9.03	18	270	0.5	-2	2.38	-0.5	16	29	1230	#N/A	3.66	70	4.49	0.99	460	23	2.68	1	1060	2	1.2	3.8	568	0.31	157	-10	30
129	77806	29	0.2	8.6	18	280	0.5	-2	2.69	-0.5	16	64	219	#N/A	3.58	80	2.55	1.46	625	21	3.84	12	930	4	0.6	0.6	596	0.28	139	-10	34
130	COMP#1	47	0.4	8.26	15	1460	0.5	-2	2.96	-0.5	19	59	1185	#N/A	5.1	80	3.71	1.36	490	10	2.7	5	1310	-2	1	0.2	597	0.34	210	-10	42
131	COMP#2	33	0.2	7.9	14	1550	0.5	-2	4.48	-0.5	24	46	1130	#N/A	5.7	30	3.11	1.99	1040	1	2.26	10	1470	-2	0.4	1	699	0.32	234	-10	64
132	COMP#3	39	0.2	8.39	12	1810	0.5	-2	4.68	-0.5	22	13	340	#N/A	5.29	30	2.67	1.76	1160	5	2.42	1	1580	-2	0.2	-0.2	671	0.38	218	-10	76
133	COMP#4	39	-0.2	8.18	23	660	0.5	-2	2.09	-0.5	16	35	602	#N/A	3.99	60	3.11	0.94	415	9	3.11	3	910	-2	-0.2	1.4	448	0.26	143	-10	30
134	COMP#5	34	0.4	7.99	13	830	0.5	-2	2.13	-0.5	17	30	1085	#N/A	4.16	90	4.09	1.04	505	12	2.82	5	1100	-2	0.2	2.4	430	0.26	182	-10	36
135	20-57438	8	-0.2	7.24	12	850	0.5	2	2.7	-0.5	21	31	1505	#N/A	6.84	130	6.09	0.75	1175	28	1.48	-1	1230	10	1.2	2.6	151	0.22	364	10	42
136	22-57431	36	-0.2	7.52	9	1020	0.5	2	2.71	-0.5	15	64	1425	#N/A	5.13	120	6.73	0.75	695	22	1.29	1	940	10	0.8	1.8	169	0.22	272	10	46
137	23-57440	11	-0.2	8.24	7	1090	1	2	0.88	-0.5	9	53	1085	#N/A	4.34	80	5.14	0.97	370	18	2.41	-1	1110	14	0.6	0.8	395	0.26	262	10	40
138	24-57003	23	-0.2	8.12	20	270	0.5	2	3.93	-0.5	31	54	1255	#N/A	5.96	90	3.61	2.23	1075	10	1.98	14	1680	12	0.8	2	521	0.33	273	20	82
139	25-57010	10	-0.2	9.35	17	1270	0.5	2	2.15	0.5	8	34	2410	#N/A	4.12	40	3.73	0.93	485	9	3.08	1	1120	8	0.6	1.8	602	0.33	148	-10	44
140	26-57441	12	0.2	8.67	10	1950	0.5	2	1.3	-0.5	25	28	1475	#N/A	4.19	80	6.02	0.89	720	12	1.86	2	1480	10	0.6	1.2	403	0.23	282	-10	52
141	27-57446	15	0.2	9	26	1680	1	2	1.99	-0.5	20	28	1500	#N/A	5.84	90	3.98	1.13	695	13	2.88	3	1390	10	0.6	1.8	595	0.29	264	-10	52
142	28-57448	20	-0.2	7.87	20	1980	0.5	2	4.77	-0.5	35	49	1045	#N/A	6.06	60	3.87	2.2	1120	11	1.32	17	1580	10	0.8	0.6	541	0.3	261	-10	80
143	30-57053	62	-0.2	8.64	6	1480	1	2	2.68	-0.5	23	17	1335	#N/A	6.12	170	3.85	1.48	475	13	2.05	4	1550	10	0.6	1.2	411	0.3	251	-10	40
144	31-57033	38	-0.2	8.77	21	480	0.5	2	2.31	-0.5	17	43	1330	#N/A	4.36	80	4.07	1.25	390	21	2.87	6	1130	8	0.6	2	572	0.3	156	-10	40
145	32-57035	18	0.2	8.52	16	1110	1	2	2.23	-0.5	23	17	2340	#N/A	7.21	230	3.19	1.33	650	17	2.76	6	2270	10	0.4	1.8	433	0.29	271	-10	44
146	33-57067	16	0.2	8.92	7	1520	0.5	2	1.16	-0.5	13	36	1135	#N/A	3.44	70	6.31	0.96	350	10	2.19	3	1010	10	0.6	1.6	456	0.28	211	-10	40
147	34-57096	19	0.2	9.44	13	520	1	2	1.44	-0.5	14	30	2580	#N/A	5.75	40	2.63	1.15	310	6	3.82	2	1230	8	0.6	2	455	0.29	182	-10	38
148	35-57101	36	-0.2	9.04	19	1650	0.5	2	2.52	-0.5	16	46	1605	#N/A	3.97	60	4.29	1.03	560	9	2.79	5	1170	8	0.6	1.2	584	0.29	176	-10	46
149	36-57103	35	0.6	8.48	15	960	0.5	2	2.77	-0.5	22	37	2250	#N/A	5.81	70	2.98	1.34	580	17	2.81	3	1310	6	0.6	2.6	602	0.34	194	-10	52
150	37-57107	11	-0.2	8.84	10	240	0.5	2	1.19	-0.5	20	34	973	#N/A	3.36	40	2.15	0.92	265	6	4.03	1	740	8	0.6	1.6	580	0.23	110	-10	38
151	39-57688	27	0.2	8.96	20	1730	0.5	2	3.78	-0.5	24	46	1495	#N/A	5.89	100	4.34	2.05	790	31	2.04	13	1420	12	0.8	2	600	0.34	241	-10	64
152	40-57694	37	-0.2	8.44	15	1520	0.5	2	3.62	-0.5	21	37	2170	#N/A	5.32	50	3.62	1.84	685	7	2.35	10	1340	8	0.4	2.2	709	0.32	241	-10	60
153	COMP#41	50	-0.2	8.65	16	1450	0.5	2	3.85	-0.5	18	33	1310	#N/A	4.61	70	3.42	1.64	615	10	2.62	9	1320	10	0.8	1.4	656	0.34	211	-10	62
154	COMP#65	38	-0.2	8.35	10	1920	0.5	2	5.07	-0.5	22	11	178	#N/A	5.02	30	2.21	1.87	1225	3	2.32	3	1710	8	0.8	0.2	695	0.37	227	-10	96
155	COMP#44	34	-0.2	9.16	10	1790	0.5	-2	2.22	-0.5	14	29	1900	#N/A	4.94	70	4.51	1.21	400	26	2.65	4	1280	6	0.6	1.2	570	0.31	210	-10	42
156	COMP#45	26	0.2	9.28	11	1770	0.5	-2	2.81	-0.5	19	16	2180	#N/A	5.04	50	3.73	1.39	675	5	2.96	4	1250	10	0.6	1	662	0.33	196	-10	76
157	COMP#53	44	-0.2	8.84	14	1540	0.5	-2	3.24	-0.5	18	29	1385	#N/A	4.85	60	4	1.46	585	9	2.58	7	1210	8	0.8	1	673	0.32	211	-10	60
158	COMP#66	41	-0.2	8.28	11	1800	0.5	-2	4.83	-0.5	21	17	309	#N/A	5.01	50	2.45	1.9	1140	1	2.22	5	1540	10	0.6	-0.2	654	0.36	222	-10	92
159	COMP#68	41	-0.2	8.64	12	1610	0.5	-2	4.18	-0.5	24	38	1305	#N/A	5.06	50	3.2	1.93	630	4	2.4	10	1460	8	0.6	1.2	773	0.37	267	40	48
160	Feb 2001 Sample 1-2 mm	70	0.2	5.63	10	690	1	-2	4.88	-0.5	39	388	453	#N/A	4.85	160	1.4	7.19	965	1	1.55	335	1320	8	0.2	-0.2	374	0.34	168	-10	58
161	Mar 2001 Sample 1-2 mm	87	-0.2	5.24	13	1070	1	-2	5.14	-0.5	40	354	878	#N/A	5.24	160	1.2	7.03	960	3	1.26	381	1190	8	-0.2	0.2	381	0.32	159	-10	58
162	Apr 2001 Sample 1-2 mm	15	-0.2	9.08	78	1820	0.5	-2	5.44	-0.5	31	58	1095	#N/A	5.78	90	1.43	1.75	1355	8	2.72	12	1490	14	1.4	0.2	626	0.38	220	-10	80
163	May 2001 Sample 1-2 mm	70	-0.2	5.11	4	440	1	-2	5.05	-0.5	39	422	103	#N/A	4.48	60	1.25	7.39	940	-1	1.43	363	1360	4	0.6	-0.2	262	0.35	144	-10	56
164	Jun 2001 Sample 1-2 mm	49	1	7.23	47	200	1	-2	2.6	-0.5	51	42	3720	#N/A	6.36	240	4.19	1.28	895	102	1.63	11	1330	10	1	7.6	275	0.28	288	-10	48
165	Jun 2001 Sample 2-2 mm	10	1	8.71	62	1400	0.5	-2	1.82	-0.5	51	48	2770	#N/A	8.65	350	3.73	1.27	700	133	2.25	8	1190	14	2.8	4.8	457	0.36	208	-10	58
166	Jul 2001 Sample 1-2 mm	71	0.6	8.1	29	1460	0.5	-2	6.07	-0.5	29	118	1180	#N/A	5.27	90	4.09	2.33	980	90	2.09	45	990	10	0.6	2.2	499	0.29	222	-10	64
167	Jul 2001 Sample 2-2 mm	112	-0.2	7.96	12	2300	0.5	-2	7.05	-0.5	23	57	398	#N/A	5.34	60	1.86	2.13	1720	5	1.96	21	1410	6	0.8	0.2	649	0.38	221	-10	86
168	Aug 2001 Sample 1-2 mm	113	0.5	6.54	140	1530	2	-2	4	-0.5	26	91	4440	#N/A	7.24	470	4.78	1.08	585	46	2.18	7	1100	10	20	4	475	0.31	229	-10	62
169	Aug 2001 Sample 2-2 mm	122	-0.5	6.25	25	1580	1.5	-2	5.2	-0.5	20	36	4940	#N/A	6.15	160	4.31	1.32	990	17	2.29	12	1140	12	15	3	553	0.34	218	-10	74
170	Aug 2001 Sample 3-2 mm	73	2	6.71	35	550	2	-2	3	-0.5	31	24	3580	#N/A	7.04	220	4.82	0.99	650	59	2.27	3	920	8	15	4	455	0.3	180	-10	60
171	Sep 2001 Sample 1-2 mm	130	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
172	Sep 2001 Sample 2-2 mm	103	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
173	Sep 2001 Sample 3-2 mm	108	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
174	Oct 2001 Sample 1-2 mm	134	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
175	Oct 2001 Sample 2-2 mm	77	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
176	Oct 2001 Sample 3-2 mm	117	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
177	Mar 2001 Sample 1+2 mm	48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
178	May 2001 Sample 1+2 mm	45	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
179	Jun 2001 Sample 1+2 mm	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
180	Jun 2001 Sample 2+2 mm	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
181	Sep 2001 Sample 1+2 mm	52	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
182	Sep 2001 Sample 2+2 mm	47	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
183	Sep 2001 Sample 3+2 mm	31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
184	Oct 2001 Sample 1+2 mm	51	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
185	102 - 10 - 100	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
186	102 - 100 - 200	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
187	102 - 200 - 300	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
188	102 - 300 - 400	28	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
189	102 - 400 - 500	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
190	102 - 500 - 600	46	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
191	103 - 10 - 100	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
192	103 - 100 - 200	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
193	103 - 200 - 300	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
194	103 - 300 - 400	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
195	103 - 400 - 500	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
196	103 - 500 - 600	Springer Pit	Springer Pit	DD Core	103 - 500 - 600	#N/A	0.34	0.04	8.7	#N/A	#N/A	#N/A
197	105 - 10 - 100	Springer Pit	Springer Pit	DD Core	105 - 10 - 100	#N/A	0.08	0.03	9.2	#N/A	#N/A	#N/A
198	105 - 100 - 200	Springer Pit	Springer Pit	DD Core	105 - 100 - 200	#N/A	0.03	0.03	9	#N/A	#N/A	#N/A
199	105 - 200 - 300	Springer Pit	Springer Pit	DD Core	105 - 200 - 300	#N/A	0.06	0.06	9.1	#N/A	#N/A	#N/A
200	105 - 300 - 400	Springer Pit	Springer Pit	DD Core	105 - 300 - 400	#N/A	0.03	0.03	9.1	#N/A	#N/A	#N/A
201	105 - 400 - 500	Springer Pit	Springer Pit	DD Core	105 - 400 - 500	#N/A	0.08	0.03	9.2	#N/A	#N/A	#N/A
202	105 - 500 - 600	Springer Pit	Springer Pit	DD Core	105 - 500 - 600	#N/A	0.09	0.05	9.3	#N/A	#N/A	#N/A
203	106 - 10 - 100	Springer Pit	Springer Pit	DD Core	106 - 10 - 100	#N/A	0.06	0.02	8.9	#N/A	#N/A	#N/A
204	106 - 100 - 200	Springer Pit	Springer Pit	DD Core	106 - 100 - 200	#N/A	0.02	0.02	8.8	#N/A	#N/A	#N/A
205	106 - 200 - 300	Springer Pit	Springer Pit	DD Core	106 - 200 - 300	#N/A	0.04	0.02	8.9	#N/A	#N/A	#N/A
206	106 - 300 - 400	Springer Pit	Springer Pit	DD Core	106 - 300 - 400	#N/A	0.07	0.01	8.9	#N/A	#N/A	#N/A
207	106 - 400 - 500	Springer Pit	Springer Pit	DD Core	106 - 400 - 500	#N/A	0.03	0.01	9.3	#N/A	#N/A	#N/A
208	106 - 500 - 600	Springer Pit	Springer Pit	DD Core	106 - 500 - 600	#N/A	0.05	0.03	9.3	#N/A	#N/A	#N/A
209	108 - 10 - 100	Springer Pit	Springer Pit	DD Core	108 - 10 - 100	#N/A	0.01	0.01	8.2	#N/A	#N/A	#N/A
210	108 - 100 - 200	Springer Pit	Springer Pit	DD Core	108 - 100 - 200	#N/A	0.04	0.03	8.7	#N/A	#N/A	#N/A
211	108 - 200 - 300	Springer Pit	Springer Pit	DD Core	108 - 200 - 300	#N/A	0.02	0.01	8.7	#N/A	#N/A	#N/A
212	108 - 300 - 400	Springer Pit	Springer Pit	DD Core	108 - 300 - 400	#N/A	0.04	0.02	8.7	#N/A	#N/A	#N/A
213	108 - 400 - 500	Springer Pit	Springer Pit	DD Core	108 - 400 - 500	#N/A	0.04	0.04	9	#N/A	#N/A	#N/A
214	108 - 500 - 600	Springer Pit	Springer Pit	DD Core	108 - 500 - 600	#N/A	0.13	0.08	9.1	#N/A	#N/A	#N/A
215	150 - 10 - 100	Springer Pit	Springer Pit	DD Core	150 - 10 - 100	#N/A	0.06	0.04	8.8	#N/A	#N/A	#N/A
216	150 - 100 - 200	Springer Pit	Springer Pit	DD Core	150 - 100 - 200	#N/A	0.06	0.02	8.7	#N/A	#N/A	#N/A
217	150 - 200 - 300	Springer Pit	Springer Pit	DD Core	150 - 200 - 300	#N/A	0.84	0.02	8.8	#N/A	#N/A	#N/A
218	150 - 300 - 400	Springer Pit	Springer Pit	DD Core	150 - 300 - 400	#N/A	0.67	0.03	8.8	#N/A	#N/A	#N/A
219	150 - 400 - 500	Springer Pit	Springer Pit	DD Core	150 - 400 - 500	#N/A	0.34	0.01	8.9	#N/A	#N/A	#N/A
220	150 - 500 - 600	Springer Pit	Springer Pit	DD Core	150 - 500 - 600	#N/A	0.47	0.01	8.8	#N/A	#N/A	#N/A
221	73093	Springer Pit	Springer Pit	DD Core	73093	#N/A	-0.01	-0.01	9	0	0.218181818	#N/A
222	73113	Springer Pit	Springer Pit	DD Core	73113	#N/A	-0.01	-0.01	8.4	0	0.218181818	#N/A
223	73233	Springer Pit	Springer Pit	DD Core	73233	#N/A	0.01	-0.01	8.4	0	0.272727273	#N/A
224	73253	Springer Pit	Springer Pit	DD Core	73253	#N/A	0.49	-0.01	8	0	0.163636364	#N/A
225	73273	Springer Pit	Springer Pit	DD Core	73273	#N/A	0.8	-0.01	8.1	0	0.545454545	#N/A
226	73293	Springer Pit	Springer Pit	DD Core	73293	#N/A	0.29	-0.01	8	0	0.109090909	#N/A
227	73488	Springer Pit	Springer Pit	DD Core	73488	#N/A	0.31	-0.01	8.3	0	0.054545455	#N/A
228	74333	Springer Pit	Springer Pit	DD Core	74333	#N/A	0.56	-0.01	8.3	0	0.054545455	#N/A
229	74478	Springer Pit	Springer Pit	DD Core	74478	#N/A	0.57	-0.01	8.5	0	0.054545455	#N/A
230	74498	Springer Pit	Springer Pit	DD Core	74498	#N/A	0.18	-0.01	8.7	0	0.272727273	#N/A
231	MP-66	Springer Pit	Springer Pit	DD Core	MP-66	#N/A	0.25	-0.05	9.3	0	0.111818182	#N/A
232	MP-67	Springer Pit	Springer Pit	DD Core	MP-67	#N/A	0.51	0.02	8.2	8.6	0.163636364	#N/A
233	476111	Springer Pit	Springer Pit	DD Core	476111	#N/A	0.04	0.01	7.92	#N/A	0.010909091	0.03
234	146670	Springer Pit	Springer Pit	DD Core	146670	#N/A	1.74	0.04	8.07	#N/A	0.93	0.93
235	146671	Springer Pit	Springer Pit	DD Core	146671	#N/A	2.15	0.01	7.93	#N/A	1.009090909	0.98
236	146672	Springer Pit	Springer Pit	DD Core	146672	#N/A	0.84	0.01	8.21	#N/A	1.120909091	1.13
237	146673	Springer Pit	Springer Pit	DD Core	146673	#N/A	0.96	0.01	8.22	#N/A	0.785454545	0.81
238	146674	Springer Pit	Springer Pit	DD Core	146674	#N/A	2.13	0.02	8.01	#N/A	1.300909091	1.33
239	146675	Springer Pit	Springer Pit	DD Core	146675	#N/A	0.66	0.01	8.34	#N/A	1.180909091	1.20
240	146676	Springer Pit	Springer Pit	DD Core	146676	#N/A	0.09	0.01	8.43	#N/A	2.149090909	2.09
241	146677	Springer Pit	Springer Pit	DD Core	146677	#N/A	0.1	0.01	8.39	#N/A	1.999090909	1.93
242	146678	Springer Pit	Springer Pit	DD Core	146678	#N/A	0.62	0.01	8.27	#N/A	1.669090909	1.64
243	146679	Springer Pit	Springer Pit	DD Core	146679	#N/A	1.58	0.02	8.14	#N/A	1.14	1.14
244	146680	Springer Pit	Springer Pit	DD Core	146680	#N/A	0.86	0.01	8.45	#N/A	1.069090909	1.10
245	146790	Springer Pit	Springer Pit	DD Core	146790	#N/A	2.49	0.08	7.91	#N/A	1.069090909	1.19
246	146791	Springer Pit	Springer Pit	DD Core	146791	#N/A	2.29	0.05	7.98	#N/A	1.030909091	0.97
247	146794	Springer Pit	Springer Pit	DD Core	146794	#N/A	0.15	0.01	8.42	#N/A	1.44	1.43
248	146795	Springer Pit	Springer Pit	DD Core	146795	#N/A	1.66	0.02	8.05	#N/A	0.81	0.83
249	146796	Springer Pit	Springer Pit	DD Core	146796	#N/A	0.69	0.01	8.39	#N/A	1.249090909	1.24
250	146797	Springer Pit	Springer Pit	DD Core	146797	#N/A	0.88	0.02	8	#N/A	1.5	1.51
251	146798	Springer Pit	Springer Pit	DD Core	146798	#N/A	1.1	0.02	8.39	#N/A	1.159090909	1.14
252	146799	Springer Pit	Springer Pit	DD Core	146799	#N/A	0.55	0.01	8.36	#N/A	1.44	1.42
253	146922	Springer Pit	Springer Pit	DD Core	146922	#N/A	1.13	0.01	8.18	#N/A	1.819090909	1.79
254	146923	Springer Pit	Springer Pit	DD Core	146923	#N/A	0.64	0.01	8.45	#N/A	1.300909091	1.27
255	146926	Springer Pit	Springer Pit	DD Core	146926	#N/A	0.52	0.01	8.51	#N/A	0.829090909	0.84
256	465229	Springer Pit	Springer Pit	DD Core	465229	#N/A	0.01	#N/A	8.62	#N/A	0.226363636	0.22
257	470445	Springer Pit	Springer Pit	DD Core	470445	#N/A	0.05	#N/A	8.84	#N/A	0.182727273	0.18
258	465244	Springer Pit	Springer Pit	DD Core	465244	#N/A	0.47	#N/A	8.37	#N/A	0.619090909	0.59
259	465240	Springer Pit	Springer Pit	DD Core	465240	#N/A	0.39	#N/A	8.1	#N/A	0.48	0.45
260	470436	Springer Pit	Springer Pit	DD Core	470436	#N/A	1.1	#N/A	8.06	#N/A	0.57	0.56
261	470423	Springer Pit	Springer Pit	DD Core	470423	#N/A	1.31	#N/A	8.38	#N/A	0.327272727	0.31
262	480754	Springer Pit	Springer Pit	DD Core	480754	#N/A	0.9	#N/A	8.62	#N/A	0.068181818	0.07
263	480757	Springer Pit	Springer Pit	DD Core	480757	#N/A	0.4	#N/A	8.75	#N/A	0.365454545	0.37
264	475695	Springer Pit	Springer Pit	DD Core	475695	#N/A	2.52	#N/A	8.1	#N/A	0.27	0.27
265	475682	Springer Pit	Springer Pit	DD Core	475682	#N/A	1.7	#N/A	8.43	#N/A	0.147272727	0.16
266	475668	Springer Pit	Springer Pit	DD Core	475668	#N/A	2.2	#N/A	8.12	#N/A	0.319090909	0.33
267	480746	Springer Pit	Springer Pit	DD Core	480746	#N/A	1.49	#N/A	8.26	#N/A	0.842727273	0.83
268	475493	Springer Pit	Springer Pit	DD Core	475493	#N/A	0.14	#N/A	9.13	#N/A	0.261818182	0.27
269	475466	Springer Pit	Springer Pit	DD Core	475466	#N/A	0.06	#N/A	8.94	#N/A	0.117272727	0.12
270	475479	Springer Pit	Springer Pit	DD Core	475479	#N/A	0.04	#N/A	9.34	#N/A	0.062727273	0.10
271	481100	Springer Pit	Springer Pit	DD Core	481100	#N/A	0.01	#N/A	8.78	#N/A	0.160909091	0.17
272	474152	Springer Pit	Springer Pit	DD Core	474152	#N/A	0.07	#N/A	9.15	#N/A	0.06	0.09
273	470040	Springer Pit	Springer Pit	DD Core	470040	#N/A	0.02	#N/A	8.71	#N/A	0.188181818	0.19
274	470063	Springer Pit	Springer Pit	DD Core	470063	#N/A	0.01	#N/A	8.57	#N/A	0.515454545	0.51
275	480677	Springer Pit	Springer Pit	DD Core	480677	#N/A	0.04	#N/A	8.89	#N/A	0.163636364	0.14
276	470050	Springer Pit	Springer Pit	DD Core	470050	#N/A	0.03	#N/A	8.6	#N/A	0.392727273	0.40
277	480664	Springer Pit	Springer Pit	DD Core	480664	#N/A	0.16	#N/A	8.48	#N/A	0.158181818	0.15
278	471271	Springer Pit	Springer Pit	DD Core	471271	#N/A	0.02	#N/A	9.23	#N/A	0.079090909	0.09
279	480684	Springer Pit	Springer Pit	DD Core	480684	#N/A	0.06	#N/A	8.9	#N/A	0.144545455	0.15
280	474261	Springer Pit	Springer Pit	DD Core	474261	#N/A	0.01	#N/A	8.71	#N/A	-0.005454545	-0.02
281	480178	Springer Pit	Springer Pit	DD Core	480178	#N/A	0.02	#N/A	8.39	#N/A	0.076363636	0.08
282	471262	Springer Pit	Springer Pit	DD Core	471262	#N/A	0.01	#N/A	9.07	#N/A	0.068181818	0.07
283	471269	Springer Pit	Springer Pit	DD Core	471269	#N/A	0.02	#N/A	9.29	#N/A	0.051818182	0.05
284	470298	Springer Pit	Springer Pit	DD Core	470298	#N/A	1.5	#N/A	8.32	#N/A	0.379090909	0.37
285	470279	Springer Pit	Springer Pit	DD Core	470279	#N/A	0.61	#N/A	8.61	#N/A	0.349090909	0.34
286	262761	Pond Zone	East Wall	DD Core	262761	Volcanic	6.33	0.05	7.66	#N/A	0.14	0.17
287	262775	Pond Zone	East Wall	DD Core	262775	Volcanic	1.06	0.03	8.2	#N/A	0.29	0.29
288	275422	Pond Zone	East Wall	DD Core	275422	Volcanic	0.98	0.01	8.29	#N/A	0.1	0.12
289	482023	Pond Zone	East wall South Ramp	DD Core	482023	Skarn/Vol	0.63	0.01	7.88	#N/A	0.16	0.17
290	482021	Pond Zone	East wall South Ramp	DD Core	482021	Skarn/Vol	0.38	0.01	8.47	#N/A	0.06	0.07
291	482034	Pond Zone	South Ramp	DD Core	482034	Skarn/Vol	0.63	0.01	8.7	#N/A	0.05	0.09
292	482042	Pond Zone	South Ramp	DD Core	482042	Skarn/Vol	0.47	0.01	8.51	#N/A	0.19	0.20
293	482032	Pond Zone	South Ramp	DD Core	482032	Skarn/Vol	0.85	0.01	8.42	#N/A	0.13	0.13
294	482041	Pond Zone	South Ramp	DD Core	482041	Skarn/Vol	0.78	0.01	8.58	#N/A	0.08	0.08
295	499413	Pond Zone	North Wall (Skarn)	DD Core	499413	Skarn	0.58	0.01	8.37	#N/A	0.37	0.39
296	499431	Pond Zone	North Wall (Skarn)	DD Core	499431	Skarn	0.08	0.01	8.42	#N/A	8.54	8.59
297	499502	Pond Zone	Lower North Wall (Skarn)	DD Core	499502	Skarn	0.15	0.01	8.29	#N/A	0.76	0.76
298	499521	Pond Zone	Lower North Wall (Skarn)	DD Core	499521	Skarn	1.59	0.01	8.34	#N/A	0.45	0.46
299	483866	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	483866	Diorite	1.42	0.01	8.48	#N/A	0.06	0.07
300	273110	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	273110	Diorite	0.99	0.02	8.32	#N/A	0.15	0.16
301	273120	Pond Zone	West wall(North 1/2),same rock as above	DD Core	273120	Diorite	0.84	0.01	8.1	#N/A	0.08	0.08
302	483849	Pond Zone	West wall(North 1/2),same rock as below	DD Core	483849	Diorite	0.37	0.01	8.5	#N/A	0.05	0.06
303	464304	Pond Zone	West Wall of South Ramp	DD Core	464304	Diorite	0.11	-0.01	7.99	#N/A	0	0.03
304	499406	Pond Zone	West wall(North 1/2),same Diorite as above with some P alteration	DD Core	499406	Diorite	0.02	0.01	8.27	#N/A	-0.01	0.01
305	464317	Pond Zone	Upper North Wall (monz above Skarn)	DD Core	464317	Monzonite	0.31	-0.01	8.87	#N/A	0.01	0.04

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
196	103 - 500 - 600	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
197	105 - 10 - 100	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
198	105 - 100 - 200	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
199	105 - 200 - 300	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
200	105 - 300 - 400	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
201	105 - 400 - 500	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
202	105 - 500 - 600	43	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
203	106 - 10 - 100	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
204	106 - 100 - 200	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
205	106 - 200 - 300	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
206	106 - 300 - 400	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
207	106 - 400 - 500	44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
208	106 - 500 - 600	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
209	108 - 10 - 100	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
210	108 - 100 - 200	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
211	108 - 200 - 300	33	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
212	108 - 300 - 400	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
213	108 - 400 - 500	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
214	108 - 500 - 600	38	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
215	150 - 10 - 100	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
216	150 - 100 - 200	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
217	150 - 200 - 300	84	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
218	150 - 300 - 400	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
219	150 - 400 - 500	26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
220	150 - 500 - 600	26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
221	73093	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
222	73113	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
223	73233	39	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
224	73253	37	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
225	73273	66	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
226	73293	34	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
227	73488	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
228	74333	21	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
229	74478	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
230	74498	36	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
231	MP-66	44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
232	MP-67	26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
233	476111	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
234	146670	102	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
235	146671	117	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
236	146672	92	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
237	146673	51	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
238	146674	146	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
239	146675	115	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
240	146676	218	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
241	146677	150	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
242	146678	156	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
243	146679	140	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
244	146680	128	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
245	146790	127	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
246	146791	113	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
247	146794	155	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
248	146795	92	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
249	146796	132	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
250	146797	130	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
251	146798	128	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
252	146799	118	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
253	146922	153	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
254	146923	123	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
255	146926	69	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
256	465229	60	0.393	1.84	20	64.3	#N/A	0.05	2.12	0.57	14.7	11.4	960.62	#N/A	3.64	147	0.11	0.89	1479	2.5	0.071	3.7	0.18	7.83	0.17	0.4	439.1	0.06	117	0.7	146.1
257	470445	79	0.186	2.85	11	143.8	#N/A	0.03	2.41	0.6	17.7	9.4	522.51	#N/A	4.36	379	0.25	1.03	791	3.18	0.439	5.6	0.226	17.35	0.1	0.6	990.9	0.097	194	0.2	177.4
258	465244	105	0.345	1.41	33.3	62	#N/A	0.08	3.1	0.22	11.5	12.2	517.73	#N/A	4.44	120	0.06	0.91	1663	11.29	0.012	2.3	0.115	4.8	0.38	1.2	153.8	0.058	113	0.8	70.8
259	465240	96	0.619	1.83	33.5	82.1	#N/A	0.14	2.58	0.98	13.6	11.5	715.44	#N/A	3.57	401	0.07	0.95	1546	5.97	0.016	2.8	0.147	10.04	0.28	4.3	89.6	0.021	125	0.3	85.8
260	470436	113	0.367	2.33	14.9	31.5	#N/A	0.12	3.18	0.19	18.9	13.5	1108.5	#N/A	4.84	105	0.19	1.35	662	18.19	0.119	5.1	0.176	9.13	0.24	3.5	646.3	0.131	169	0.4	61.4
261	470423	89	0.284	2.87	16.8	34.6	#N/A	0.07	2.48	0.09	13.7	9.1	979.52	#N/A	3.87	139	0.15	1.16	611	8.07	0.534	4.5	0.182	7.71	0.22	3.7	962.6	0.089	133	0.4	43.3
262	480754	55	0.25	2.7	10.2	56.1	#N/A	0.03	1.63	0.28	19.7	6.9	509.8	#N/A	4.6	91	0.25	0.82	576	18.17	0.856	4.2	0.155	10.48	0.12	3.5	274.6	0.124	139	0.5	95.8
263	480757	98	0.189	2.38	12.1	60.1	#N/A	0.02	2.38	0.24	13.8	6.9	287.3	#N/A	5.39	79	0.2	0.86	868	16.65	0.68	3.8	0.146	9.57	0.15	2.5	254	0.107	178	0.7	111.9
264	475695	94	0.88	3.09	18	66.6	#N/A	0.2	2.31	0.09	20.2	11.7	778.79	#N/A	5.14	15	0.22	1	495	18.35	1.008	5	0.166	10.7	0.07	8.2	338.9	0.13	150	0.6	40.5
265	475682	96	0.452	3.4	19.4	64.8	#N/A	0.08	1.78	0.62	17.6	11.3	384.19	#N/A	5.03	5	0.32	1.02	513	10.28	1.445	4.2	0.159	7.17	0.09	3.6	212.8	0.163	155	0.3	95.9
266	475668	101	0.796	3.34	19.6	50.1	#N/A	0.13	2.52	0.48	17.7	8.7	253.97	#N/A	4.8	16	0.17	1.13	760	18.42	1.056	3.9	0.171	10.58	0.07	4.5	395.6	0.147	125	0.9	98.2
267	480746	129	0.348	2.23	14.6	56.9	#N/A	0.05	3.75	0.32	18.6	7	436.47	#N/A	5.16	139	0.19	1.47	1065	22.13	0.254	4.8	0.171	10.81	0.21	6.3	76.8	0.127	169	0.5	112.5
268	475493	41	0.151	0.33	3	850.3	#N/A	0.05	1.07	0.04	6.6	13.9	649.9	#N/A	2.68	10	0.03	0.29	219	2.74	0.042	2.8	0.071	5.19	0.07	0.8	55.5	0.083	88	0.5	19.5
269	475466	40	0.211	0.43	4.2	806.1	#N/A	0.03	0.77	0.22	8.9	55.3	506.83	#N/A	2.75	24	0.1	0.54	229	2.78	0.069	16	0.087	7.19	0.16	0.7	102.1	0.08	102	0.3	51.2
270	475479	16	0.135	0.52	5.4	333.2	#N/A	0.05	0.65	0.06	6.7	54.6	503.11	#N/A	1.9	5	0.04	0.57	247	2.06	0.037	10.8	0.073	4.51	0.09	0.4	30.2	0.069	71	0.3	29.1
271	481100	66	0.563	2.37	17.4	240.6	#N/A	0.03	2.37	0.74	20.4	6	148.46	#N/A	3.55	173	0.1	0.8	1185	1.53	0.261	2.3	0.174	24.35	0.17	0.4	369.5	0.055	116	0.5	179.5
272	474152	16	0.117	0.39	6.8	243.5	#N/A	0.13	0.7	0.09	4.9	20.5	244.69	#N/A	1.83	12	0.14	0.31	153	4.85	0.03	4.7	0.065	5.23	0.16	1.1	16.2	0.068	64	1.2	21.1
273	470040	59	0.27	2.17	9.5	127.4	#N/A	0.03	2.05	0.65	9.1	11	218.05	#N/A	2.75	183	0.16	0.49	1025	4.71	0.639	2	0.149	13.25	0.09	0.3	246.1	0.045	110	0.5	148.8
274	470063	76	0.122	1.13	12.4	44.4	#N/A	0.06	2.21	0.34	11.5	12.5	492.87	#N/A	2.64	124	0.09	0.6	1176	1.79	0.009	2.6	0.107	5.11	0.37	0.2	242.5	0.026	95	0.2	138.8
275	480677	65	0.312	2.31	6.8	114.1	#N/A	0.03	1.68	0.43	12.1	8.7	156.76	#N/A	3.87	73	0.15	0.57	509	2.08	1.129	2.6	0.188	10.8	0.11	0.3	210.7	0.08	148	0.2	101.4
276	470050	75	0.291	1.62	9	38.3	#N/A	0.05	2.76	0.6	10	10.6	408.78	#N/A	2.77	117	0.11	0.63	1860	5.95	0.101	2.1	0.12	15.13	0.16	0.5	394.3	0.058	85	0.7	187.7
277	480664	78	0.834	1.74	14.1	147.9	#N/A	0.05	1.98	1.14	19.8	6.5	740.33	#N/A	4.2	504	0.08	1.31	1295	6.77	0.016	3.4	0.188	14.1	0.49	1.8	226.8	0.091	128	0.8	409.4
278	471271	23	0.095	2.14	9.6	617.3	#N/A	-0.02	2.27	0.11	20.2	11.2	218.24	#N/A	4.88	7	0.13	1.21	622	4.87	0.026	4.8	0.114	2.93	0.06	0.3	66.1	0.155	187	0.2	38.7
279	480684	69	0.521	2.8	12.5	283.8	#N/A	0.04	2.18	0.43	13.7	8.3	361.74	#N/A	3.85	144	0.14	0.67	731	3.45	0.921	2.4	0.182	9.95	0.16	0.5	338.3	0.078	125	0.4	92.3
280	474261	12	0.236	1.43	18.7	106.4	#N/A	0.09	1.14	0.21	11.5	11.5	717.72	#N/A	3.57	73	0.14	0.84	414	4.32	0.148	2.4	0.16	4.93	0.18	0.6	35	0.102	115	0.6	39.8
281	480178	34	0.335	3.22	6	101.8	#N/A	0.04	1.89	0.32	13.8	14.8	747.83	#N/A	4.64	97	0.31	0.82	951	2.39	0.866	3.4	0.149	7.27	0.05	0.2	879.3	0.074	162	0.3	98.6
282	471262	26	0.118	2.42	8.6	286.5	#N/A	-0.02	2.63	0.08	21.4	10.6	102.4	#N/A	4.99	6	0.12	1.26	587	2.57	0.028	4.3	0.119	4.11	0.07	0.1	52	0.181	201	0.2	44.5
283	471269	22	0.064	2.37	16.6	752	#N/A	-0.02	2.47	0.11	22.1	9.2	146.86	#N/A	4.92	6	0.14	1.22	638	2.63	0.041	4.3	0.121	3.27	0.09	0.1	80.8	0.18	194	0.2	36.8
284	470298	90	0.448	2.56	19	78	#N/A	0.05	2.63	0.36	18	12.8	564.26	#N/A	4.46	85	0.28	0.9	608	33.74	0.428	4	0.163	16.35	0.2	5	659.9	0.101	147	0.5	86.7
285	470279	78	0.403	2.46	16.8	71.2	#N/A	0.03	2.67	0.81	17.7	6.4	229.47	#N/A	4.74	126	0.2	1.04	755	19.41	0.537	3.6	0.209	24.49	0.15	3.1	181.7	0.125	175	0.6	176.7
286	262761	124	0.763	2.02	30.1	18.5	#N/A	0.88	1.5	0.12	44.2	23.6	752.17	#N/A	8.46	271	0.05	2.53	1184	12.73	0.013	16.6	0.2	5.14	0.3	6.7	104.3	0.228	170	1.3	79.9
287	262775	150	0.158	2.77	15.9	17.1	#N/A	0.14	1.74	0.02	23.1	38.7	95.99	#N/A	5.25	47	0.06	3.17	1287	2.36	0.024	19.4	0.191	2.59	0.14	1.3	92.2	0.213	131	0.7	92.2
288	275422	133	0.221	2.38	11.3	19.4	#N/A	0.31	1.64	0.03	21.9	101.9	236.61	#N/A	4.86	26	0.07	2.49	1204	4.15	0.026	66.2	0.173	4.55	0.1	1.4	57.8	0.201	139	0.6	81.2
289	482023	64	0.898	1.06	13.4	13.3	#N/A	0.05	1.29	3.24	17.6	21.4	798.79	#N/A	2.62	519	0.06	1.02	849	4.39	0.022	6.2	0.121	4.91	0.3	1.3	87.8	0.094	68	0.4	685.4
290	482021	54	0.84	1.07	11.3	21.7	#N/A	0.05	1.24	2.33	13.4	21.6	803.74	#N/A	2.65	272	0.06	0.79	864	3.8	0.034	4.8	0.137	5.75	0.27	1	81.1	0.084	77	0.5	434.5
291	482034	53	1.062	0.91	10.5	22.4	#N/A	0.07	1.38	1.86	14.2	27.4	942.11	#N/A	1.98	302	0.07	0.65	792	5.85	0.024	5.6	0.11	8.69	0.34	1.3	65.7	0.083	63	0.6	508.9
292	482042	73	0.728	1.15	9.1	19.2	#N/A	0.06	1.92	0.48	13.2	27.2	356.72	#N/A	1.56	81	0.12	0.9	837	4.84	0.024	6.5	0.114	2.81	0.33	1.1	58.5	0.084	46	0.5	199.2
293	482032	75	1.01	1.01	14.1	21.6	#N/A	0.08	1.38	2.05	16.1	34.3	922.07	#N/A	2.66	315	0.06	0.98	1124	6.69	0.019	6.2	0.116	8.95	0.37	1.9	74.2	0.084	76	0.7	472.6
294	482041	31	0.616	0.91	10.5	11.8	#N/A	0.1	1.31	0.25	16	31.3	485.48	#N/A	1.81	70	0.12	0.99	800	5.64	0.029	6.8	0.113	3.13	0.39	1.6	52.6	0.088	48	0.5	123
295	499413	130	0.893	1.63	22.9	26.3	#N/A	1.29	4	0.12	26.7	35.3	646.85	#N/A	3.14	69	0.03	1.63	2540	5.09	0.012	13.7	0.129	5.47	0.44	3.4	70.1	0.153	90	0.8	60.6
296	499431	702	0.77	0.56	17.2	12.6	#N/A	1.23	27.67	20.9	7.3	5.5	144.09	#N/A	1.28	1835	0.02	0.25	1182	6.78	0.003	2.4	0.045	265.69	0.58	3.9	347.7	0.022	30	0.9	1970.7
297	499502	129	0.118	1.7	16.7	7.1	#N/A	0.27	6.73	1.14	7.3	19.5	53.54	#N/A	2.35	205	0.06	0.99	3039	12.3	0.007	6.5	0.125	2.85	0.67	0.5	56	0.091	62	1.4	194.4
298	499521	113	1.333	1.05	16	18.8	#N/A	0.34	2.83	0.19	23.3	39.6	595.05	#N/A	2.56	32	0.15	1.1	1502	7	0.004	15.8	0.12	13.98	0.42	4.8	55.3	0.132	62	0.6	66.8
299	483866	32	0.337	1.11	20.7	27	#N/A	0.18	1.12	0.09	26.8	21.9	214.77	#N/A	2.82	38	0.23	1.14	637	3.66	0.027	6.9	0.094	2.71	0.38	2.4	105.6	0.132	55	0.4	53.7
300	273110	78	0.822	0.92	11	42.3	#N/A	0.18	1.48	0.1	17.5	26.8	624.86	#N/A	3.01	23	0.06	0.75	633	4.48	0.034	6.6	0.127	6.9	0.7	2.9	87.9	0.094	71	0.5	55.6
301	273120	60	0.681	0.84	9.3	16.8	#N/A	0.24	1.46	0.19	10.9	20.7	760.22	#N/A	1.72	12	0.06	0.59	724	5.89	0.022	4.7	0.106	13.9	0.22	2.3	50.6	0.074	40	0.4	40
302	483849	19	0.397	0.84	17.5	47.4	#N/A	0.08	0.85	0.44	9.4	14.8	363.92	#N/A	1.9	46	0.03	0.89	487	2.92	0.018	3.9	0.097	3.32	0.35	0.9	70.1	0.068	55	0.3	97.8
303	464304	16	0.152	1.21	17.6	106.1	#N/A	0.14	1.05	0.2	14.3	24.1	271.04	#N/A	2.85	19	0.06	0.6	736	2.55	0.06	5.2	0.145	5.5	0.64	2.2	186.3	0.132	75	0.6	70
304	499406	16	0.205	0.91	13.4	16.3	#N/A	0.33	0.98	0.06	11.7	24	18	#N/A	1.85	17	0.02	0.58	712	2.82	0.049	3.3	0.127	4.05	0.45	1.8	147.2	0.13	49	0.6	33.2
305	464317	15	0.512	1.02	10.7	40.9	#N/A	0.1	1	0.12	11.4	43.6	393.49	#N/A	2.65	11	0.1	0.78	644	2.02	0.06	6.1	0.128	6.22	0.58	1.4	147.4	0.138	80	0.6	45

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
306	464308	Pond Zone	West wall(south 1/2), same rock as above	DD Core	464308	Monzonite	0.25	0.01	8	#N/A	0.03	0.03
307	464315	Pond Zone	West wall(south 1/2),same rock as below	DD Core	464315	Monzonite	0.17	-0.01	8.83	#N/A	0.1	0.11
308	464314	Pond Zone	West Wall of South Ramp	DD Core	464314	Monzonite	0.06	-0.01	8.45	#N/A	0.02	0.05
309	464306	Pond Zone	Ore Zone	DD Core	464306	Fault zone	0.13	0.02	8.62	#N/A	0.29	0.30
310	468311	Pond Zone	Ore Zone	DD Core	468311	Fault zone	0.53	0.01	8.46	#N/A	0.07	0.10
311	468316	Pond Zone	Ore Zone	DD Core	468316	Fault zone	0.18	0.01	8.37	#N/A	0.49	0.49
312	468323	Pond Zone	Ore Zone	DD Core	468323	Monz Dyke	0.96	0.01	8.24	#N/A	0.08	0.09
313	241931	SE Zone	SE Zone	DD Core	241931	KP	1.67	-0.01	8.4	#N/A	0.174545455	#N/A
314	241932	SE Zone	SE Zone	DD Core	241932	KP	0.17	-0.01	9	#N/A	0.092727273	#N/A
315	241933	SE Zone	SE Zone	DD Core	241933	KP	0.45	-0.01	9	#N/A	0.100909091	#N/A
316	241941	SE Zone	SE Zone	DD Core	241941	KP	0.61	-0.01	9.4	#N/A	0.032727273	#N/A
317	241943	SE Zone	SE Zone	DD Core	241943	KP	0.83	-0.01	9.2	#N/A	0.021818182	#N/A
318	255935	SE Zone	SE Zone	DD Core	255935	KP	0.04	-0.01	8.7	#N/A	0.002727273	#N/A
319	255936	SE Zone	SE Zone	DD Core	255936	KP	0.17	-0.01	9	#N/A	0.019090909	#N/A
320	256192	SE Zone	SE Zone	DD Core	256192	KP	1.99	0.01	7.9	#N/A	0.013636364	#N/A
321	256194	SE Zone	SE Zone	DD Core	256194	KP	1.58	0.01	8	#N/A	0.049090909	#N/A
322	241232	SE Zone	SE Zone	DD Core	241232	Mz	0.98	-0.01	9.2	#N/A	0.070909091	#N/A
323	241234	SE Zone	SE Zone	DD Core	241234	Mz	1.09	-0.01	8.6	#N/A	0.171818182	#N/A
324	241392	SE Zone	SE Zone	DD Core	241392	Mz	0.54	-0.01	8.8	#N/A	0.024545455	#N/A
325	241394	SE Zone	SE Zone	DD Core	241394	Mz	1.31	0.01	8.6	#N/A	0.070909091	#N/A
326	241416	SE Zone	SE Zone	DD Core	241416	Mz	0.96	-0.01	8.7	#N/A	0.100909091	#N/A
327	241419	SE Zone	SE Zone	DD Core	241419	Mz	1.32	-0.01	8.8	#N/A	0.057272727	#N/A
328	256208	SE Zone	SE Zone	DD Core	256208	Mz	1.67	-0.01	8.5	#N/A	0.038181818	#N/A
329	256210	SE Zone	SE Zone	DD Core	256210	Mz	0.96	-0.01	8.9	#N/A	0.081818182	#N/A
330	256319	SE Zone	SE Zone	DD Core	256319	Mz	0.49	0.05	6.7	#N/A	0.010909091	#N/A
331	256321	SE Zone	SE Zone	DD Core	256321	Mz	1.91	0.02	7.05	#N/A	0.002727273	#N/A
332	256331	SE Zone	SE Zone	DD Core	256331	Mz	1.65	-0.01	8.7	#N/A	0.027272727	#N/A
333	256332	SE Zone	SE Zone	DD Core	256332	Mz	1.57	-0.01	8.6	#N/A	0.098181818	#N/A
334	258583	SE Zone	SE Zone	DD Core	258583	Mz	2.36	-0.01	8.6	#N/A	0.081818182	#N/A
335	258585	SE Zone	SE Zone	DD Core	258585	Mz	1.1	-0.01	9	#N/A	0.100909091	#N/A
336	259062	SE Zone	SE Zone	DD Core	259062	Mz	1.27	-0.01	8.8	#N/A	0.070909091	#N/A
337	259065	SE Zone	SE Zone	DD Core	259065	Mz	1.82	-0.01	8.5	#N/A	0.040909091	#N/A
338	259250	SE Zone	SE Zone	DD Core	259250	Mz	1.15	0.01	8.2	#N/A	0.133636364	#N/A
339	259253	SE Zone	SE Zone	DD Core	259253	Mz	1.15	0.01	8.3	#N/A	0.152727273	#N/A
340	259502	SE Zone	SE Zone	DD Core	259502	Mz	1.62	0.02	7.5	#N/A	0.010909091	#N/A
341	259505	SE Zone	SE Zone	DD Core	259505	Mz	1.88	-0.01	8.5	#N/A	0.03	#N/A
342	259795	SE Zone	SE Zone	DD Core	259795	Mz	0.17	-0.01	9.5	#N/A	0.114545455	#N/A
343	259796	SE Zone	SE Zone	DD Core	259796	Mz	0.12	-0.01	9.5	#N/A	0.155454545	#N/A
344	260569	SE Zone	SE Zone	DD Core	260569	Mz	0.12	-0.01	9.4	#N/A	0.057272727	#N/A
345	260573	SE Zone	SE Zone	DD Core	260573	Mz	1.52	-0.01	9	#N/A	0.019090909	#N/A
346	261763	SE Zone	SE Zone	DD Core	261763	Mz	0.39	-0.01	9	#N/A	0.24	#N/A
347	261765	SE Zone	SE Zone	DD Core	261765	Mz	0.81	-0.01	9.2	#N/A	0.139090909	#N/A
348	261775	SE Zone	SE Zone	DD Core	261775	Mz	1.33	-0.01	8.8	#N/A	0.125454545	#N/A
349	261776	SE Zone	SE Zone	DD Core	261776	Mz	0.79	-0.01	9	#N/A	0.171818182	#N/A
350	31929	Wight Pit	WB-03-06	DD Core	31929	AP	0.04	-0.01	8.15	#N/A	1.131818182	#N/A
351	32550	Wight Pit	WB-03-11	DD Core	32550	AP	0.05	-0.01	8.57	#N/A	0.632727273	#N/A
352	31636	Wight Pit	WB-03-03	DD Core	31636	BX	0.67	-0.01	8.53	#N/A	1.56	#N/A
353	31598	Wight Pit	WB-03-03	DD Core	31598	BX	3.79	-0.01	8	#N/A	1.2	#N/A
354	31943	Wight Pit	WB-03-06	DD Core	31943	BX	0.88	-0.01	8.3	#N/A	1.082727273	#N/A
355	31998	Wight Pit	WB-03-06	DD Core	31998	BX	0.3	0.02	8.27	#N/A	1.180909091	#N/A
356	32491	Wight Pit	WB-03-11	DD Core	32491	BX	0.47	-0.01	8.4	#N/A	1.189090909	#N/A
357	32539	Wight Pit	WB-03-11	DD Core	32539	BX	0.49	0.02	8.39	#N/A	1.055454545	#N/A
358	32727	Wight Pit	WB-03-14	DD Core	32727	BX	0.86	0.17	7.86	#N/A	1.461818182	#N/A
359	32635	Wight Pit	WB-03-14	DD Core	32635	BXm	0.76	-0.01	8.16	#N/A	1.404545455	#N/A
360	31557	Wight Pit	WB-03-03	DD Core	31557	PP	1.51	-0.01	7.63	#N/A	1.142727273	#N/A
361	31945	Wight Pit	WB-03-06	DD Core	31945	PPg	0.05	-0.01	8.21	#N/A	0.084545455	#N/A
362	32561	Wight Pit	WB-03-11	DD Core	32561	PPg	0.07	-0.01	8.51	#N/A	0.496363636	#N/A
363	32640	Wight Pit	WB-03-14	DD Core	32640	PPg	2.18	-0.01	8.09	#N/A	1.063636364	#N/A
364	32729	Wight Pit	WB-03-14	DD Core	32729	PPg	0.81	0.28	7.97	#N/A	1.060909091	#N/A
365	31603	Wight Pit	WB-03-03	DD Core	31603	PPp	0.83	0.01	8.24	#N/A	0.946363636	#N/A
366	31576	Wight Pit	WB-03-03	DD Core	31576	PPp	1.57	-0.01	8.07	#N/A	0.938181818	#N/A
367	31973	Wight Pit	WB-03-06	DD Core	31973	PPp	0.66	-0.01	8.54	#N/A	0.777272727	#N/A
368	32519	Wight Pit	WB-03-11	DD Core	32519	PPp	0.51	-0.01	8.42	#N/A	0.616363636	#N/A
369	32702	Wight Pit	WB-03-14	DD Core	32702	PPp	1.57	0.02	8.32	#N/A	1.17	#N/A
370	1	Wight Pit	WB-03-01	DD Core	1	#N/A	1.85	0.01	8.4	#N/A	1.096363636	#N/A
371	2	Wight Pit	WB-03-01	DD Core	2	#N/A	0.47	0.01	8.3	#N/A	1.595454545	#N/A
372	3	Wight Pit	WB-03-02	DD Core	3	#N/A	-0.02	<0.01	8.1	#N/A	0.141818182	#N/A
373	4	Wight Pit	WB-03-02	DD Core	4	#N/A	1.79	0.01	8.3	#N/A	1.036363636	#N/A
374	5	Wight Pit	WB-03-03	DD Core	5	#N/A	1.55	0.01	8.4	#N/A	1.025454545	#N/A
375	6	Wight Pit	WB-03-03	DD Core	6	#N/A	1.33	0.01	8.1	#N/A	0.976363636	#N/A
376	7	Wight Pit	WB-03-04	DD Core	7	#N/A	0.51	<0.01	8.6	#N/A	0.965454545	#N/A
377	8	Wight Pit	WB-03-04	DD Core	8	#N/A	-0.02	<0.01	8.1	#N/A	0.319090909	#N/A
378	9	Wight Pit	WB-03-05	DD Core	9	#N/A	1.62	0.01	8.5	#N/A	1.227272727	#N/A
379	10	Wight Pit	WB-03-05	DD Core	10	#N/A	0.65	0.02	8.7	#N/A	1.257272727	#N/A
380	11	Wight Pit	WB-03-06	DD Core	11	#N/A	0.2	<0.01	8.2	#N/A	1.505454545	#N/A
381	12	Wight Pit	WB-03-06	DD Core	12	#N/A	2.37	0.1	6.2	#N/A	0.477272727	#N/A
382	13	Wight Pit	WB-03-07	DD Core	13	#N/A	0.98	0.01	8.6	#N/A	0.951818182	#N/A
383	14	Wight Pit	WB-03-08	DD Core	14	#N/A	0.69	<0.01	8.8	#N/A	0.850909091	#N/A
384	15	Wight Pit	WB-03-08	DD Core	15	#N/A	1.59	0.01	9	#N/A	0.548181818	#N/A
385	16	Wight Pit	WB-03-09	DD Core	16	#N/A	0.7	<0.01	8.9	#N/A	1.175454545	#N/A
386	17	Wight Pit	WB-03-09	DD Core	17	#N/A	0.9	0.01	8.4	#N/A	1.295454545	#N/A
387	18	Wight Pit	WB-03-10	DD Core	18	#N/A	1.04	0.01	9	#N/A	1.107272727	#N/A
388	19	Wight Pit	WB-03-11	DD Core	19	#N/A	0.99	0.01	8.7	#N/A	1.025454545	#N/A
389	20	Wight Pit	WB-03-12	DD Core	20	#N/A	1.13	0.01	9.2	#N/A	0.812727273	#N/A
390	21	Wight Pit	WB-03-12	DD Core	21	#N/A	1.47	0.01	8.4	#N/A	0.69	#N/A
391	22	Wight Pit	WB-03-13	DD Core	22	#N/A	0.08	<0.01	8.7	#N/A	1.006363636	#N/A
392	23	Wight Pit	WB-03-13	DD Core	23	#N/A	1.46	0.01	8.4	#N/A	1.047272727	#N/A
393	24	Wight Pit	WB-03-14	DD Core	24	#N/A	0.49	<0.01	8.3	#N/A	1.415454545	#N/A
394	25	Wight Pit	WB-03-15	DD Core	25	#N/A	0.94	0.01	8.5	#N/A	0.801818182	#N/A
395	26	Wight Pit	WB-03-16	DD Core	26	#N/A	0.16	<0.01	8.7	#N/A	1.055454545	#N/A
396	27	Wight Pit	WB-03-16	DD Core	27	#N/A	0.65	0.01	8.7	#N/A	1.096363636	#N/A
397	28	Wight Pit	WB-03-17	DD Core	28	#N/A	0.86	0.01	8.6	#N/A	1.257272727	#N/A
398	29	Wight Pit	WB-03-17	DD Core	29	#N/A	0.73	<0.01	8.6	#N/A	0.886363636	#N/A
399	30	Wight Pit	WB-03-18	DD Core	30	#N/A	1.03	0.01	8.6	#N/A	1.197272727	#N/A
400	31	Wight Pit	WB-03-18	DD Core	31	#N/A	0.47	<0.01	9.2	#N/A	0.199090909	#N/A
401	32	Wight Pit	WB-03-18	DD Core	32	#N/A	0.67	0.01	8.8	#N/A	0.700909091	#N/A
402	33	Wight Pit	WB-03-19	DD Core	33	#N/A	0.26	0.01	8.6	#N/A	0.54	#N/A
403	34	Wight Pit	WB-03-19	DD Core	34	#N/A	0.1	<0.01	8.7	#N/A	0.534545455	#N/A

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
306	464308	14	0.201	1.03	18.8	67.8	#N/A	0.19	0.97	0.12	11	30.9	160.65	#N/A	2.5	19	0.07	0.47	552	2.5	0.075	3.6	0.126	9.32	0.68	2.2	176.6	0.15	76	0.5	33.8
307	464315	26	0.411	0.98	11.8	70.1	#N/A	0.1	1.48	0.14	10.9	43.3	330.67	#N/A	2.03	18	0.08	0.69	692	2.27	0.063	5.4	0.129	4.29	0.69	0.9	211.7	0.139	65	0.5	46.4
308	464314	15	0.503	1.08	13.2	53	#N/A	0.17	1.44	0.09	14.3	34.9	397.99	#N/A	2.5	12	0.08	0.74	831	2.54	0.055	5.4	0.129	5.53	0.59	1.8	161.7	0.131	73	0.5	60.3
309	464306	115	1.186	1.33	43.3	15.3	#N/A	0.61	4.67	1	8	43.4	955.42	#N/A	1.23	52	0.15	0.59	1178	5.56	0.009	3.4	0.198	3.45	0.38	0.9	17.9	0.102	47	0.5	168.8
310	468311	91	3.229	1.81	30.1	8.2	#N/A	0.14	4.32	0.95	19	26.4	2646.24	#N/A	2.72	147	0.22	1.39	2218	12.43	0.005	5	0.223	9.88	0.4	1.2	24.5	0.122	91	1.2	160.6
311	468316	147	2.166	1.28	37.8	5.5	#N/A	0.27	5.9	0.65	6.7	32.3	1479.66	#N/A	1.75	82	0.03	0.48	1394	4.81	0.005	3.2	0.159	6.2	0.32	1.2	36.9	0.088	51	0.9	103.6
312	468323	64	0.71	1.23	10.9	17.7	#N/A	0.14	1.67	0.29	19.8	17.7	695.19	#N/A	2.48	58	0.08	0.7	617	4.84	0.114	3.9	0.123	7.32	0.13	3.1	45.5	0.032	43	0.4	75.1
313	241931	51	0.2	1.22	15.8	21	#N/A	0.8	1.5	0.1	34.3	17.8	307.6	#N/A	2.95	310	0.08	0.95	645	6.6	0.015	2.7	0.104	4.9	0.6	1.4	159	0.119	72	0.6	46
314	241932	19	0.1	1.3	12.2	24	#N/A	0.2	1.51	0.1	5.6	28.8	37.8	#N/A	1.89	80	0.07	0.76	534	2.4	0.032	2.7	0.081	4	0.6	-0.5	232	0.123	78	0.5	38
315	241933	21	0.1	1.31	18.1	12	#N/A	0.2	1.56	0.1	8.7	18.8	57.9	#N/A	2.2	50	0.06	1.06	768	2.2	0.015	3.3	0.107	5.2	0.5	0.5	144	0.117	70	0.7	47
316	241941	11	0.2	1.14	11.7	21	#N/A	0.3	1.31	0.1	9.2	29.1	130.5	#N/A	1.85	220	0.06	0.55	507	2.6	0.036	1.8	0.061	7.1	0.7	0.7	221	0.119	69	0.4	39
317	241943	10	0.2	0.94	11.8	15	#N/A	0.7	1.04	0.1	13.9	21.2	79.9	#N/A	1.66	340	0.05	0.58	513	4.2	0.023	2	0.057	9.9	0.6	0.7	163	0.094	57	0.4	41
318	255935	6	-0.1	1	7.3	16	#N/A	0.1	0.84	0.1	4.3	25.6	336.4	#N/A	1.57	50	0.05	0.58	531	1.8	0.029	2.6	0.053	5.4	0.6	-0.5	234	0.103	61	0.4	38
319	255936	8	0.1	1.11	9.1	18	#N/A	0.2	0.99	0.1	7.2	26.3	258.5	#N/A	1.78	70	0.05	0.63	516	2	0.03	2.5	0.068	5	0.6	-0.5	235	0.122	68	0.4	41
320	256192	12	0.1	1.81	13.7	88	#N/A	0.4	1.34	0.1	9.8	18	121.9	#N/A	2.53	130	0.08	0.66	347	5.2	0.287	2.2	0.074	11.3	0.4	3	96	0.098	80	0.6	34
321	256194	7	0.1	1.3	13.5	33	#N/A	0.4	1.2	-0.1	11.6	20.9	148.9	#N/A	2.5	220	0.08	0.65	362	11	0.03	2.3	0.078	8.6	0.7	2.4	142	0.119	87	0.8	33
322	241232	21	0.1	1.58	13.6	27	#N/A	0.3	1.86	0.1	11.2	31.8	345.3	#N/A	3.07	120	0.1	0.82	511	9.5	0.045	2.4	0.106	7.1	0.4	1.7	210	0.162	121	1	31
323	241234	45	0.2	1.47	10.2	36	#N/A	0.3	1.96	0.1	11.9	17	392.1	#N/A	3.18	70	0.09	0.77	518	2.7	0.076	2.7	0.104	7	0.3	1.4	112	0.146	119	0.7	31
324	241392	12	0.2	1.77	11.4	110	#N/A	0.3	1.78	0.1	10.3	30	56.4	#N/A	3.03	30	0.09	0.9	743	3.5	0.031	2.8	0.107	5.1	0.5	0.6	201	0.142	118	1	41
325	241394	19	0.1	1.86	14	47	#N/A	0.5	2.07	0.1	9.8	29.2	122.3	#N/A	3.47	40	0.1	1.04	676	3.3	0.044	2.8	0.127	4.2	0.5	1.3	183	0.174	121	1.4	41
326	241416	23	0.1	1.55	10.7	142	#N/A	0.2	1.7	0.1	13.2	14.8	229.8	#N/A	3.54	60	0.13	0.97	580	2.3	0.038	3.2	0.13	3.4	0.3	1.3	120	0.169	140	0.7	36
327	241419	16	0.1	1.46	12.8	100	#N/A	0.2	1.57	0.1	15	17	145.7	#N/A	3.5	90	0.11	0.95	490	1.9	0.035	3.3	0.126	3.1	0.4	1.7	152	0.164	120	0.6	34
328	256208	15	0.1	1.24	14.7	17	#N/A	0.2	1.28	0.1	19.6	21.3	310.1	#N/A	2.69	160	0.06	0.89	451	6.1	0.024	1.9	0.102	2.9	0.9	2.4	236	0.136	94	0.7	35
329	256210	18	0.1	1.52	18.6	23	#N/A	0.2	1.77	0.1	10.5	22.7	229.5	#N/A	2.96	40	0.07	0.95	543	27.1	0.025	2.5	0.109	3.3	0.8	1.6	188	0.134	108	0.9	37
330	256319	6	0.1	1.2	10.5	26	#N/A	0.3	0.85	0.1	5.6	28.2	89.5	#N/A	3.21	220	0.06	0.68	240	7.8	0.032	2.6	0.098	3.1	0.5	2.7	190	0.195	95	0.7	31
331	256321	11	0.2	1.23	17.7	12	#N/A	0.3	0.98	0.1	13	22.2	228.6	#N/A	3.57	250	0.03	0.95	310	11.6	0.025	4.4	0.123	4.2	0.7	3.9	302	0.18	80	0.9	37
332	256331	12	0.4	1.75	12.2	11	#N/A	0.2	2.03	-0.1	13.8	26	276.1	#N/A	3	100	0.03	0.85	427	135.8	0.036	2.7	0.103	9.7	0.5	4	218	0.153	93	0.9	35
333	256332	23	0.2	1.31	13.2	13	#N/A	0.2	1.72	-0.1	13.9	18.7	232.1	#N/A	3.13	100	0.03	0.76	361	65.6	0.026	3	0.115	5.7	0.3	3.3	108	0.118	90	0.6	31
334	258583	21	0.1	1.12	13.3	20	#N/A	0.5	1.05	0.1	11.3	23.7	124.4	#N/A	3.14	100	0.06	1.04	409	2.7	0.027	3.5	0.114	2.5	0.7	1.5	191	0.134	68	0.9	39
335	258585	21	0.1	1.24	9.4	23	#N/A	0.2	1.18	-0.1	9.6	24.8	121.6	#N/A	3.01	60	0.06	1.08	518	1.9	0.026	3	0.112	2	0.8	0.9	234	0.141	85	0.6	43
336	259062	16	0.1	1.52	11.9	24	#N/A	0.2	1.86	-0.1	15.3	21.2	219.7	#N/A	3	40	0.06	0.8	401	4.5	0.02	2.3	0.124	3.3	0.2	1.9	124	0.128	85	0.6	29
337	259065	20	0.1	1.4	10.7	21	#N/A	0.2	1.28	-0.1	12.4	19.1	248.1	#N/A	3.73	40	0.06	1.26	428	2.1	0.022	5.7	0.124	2	0.2	2.1	176	0.141	108	0.7	38
338	259250	38	0.1	2.77	13.2	55	#N/A	0.3	1.94	0.2	18.4	18.1	142.3	#N/A	3.39	140	0.3	1.88	915	2.3	0.39	4	0.156	9.7	0.4	1.4	304	0.147	141	0.5	70
339	259253	30	0.1	2.28	11.1	73	#N/A	0.4	1.95	0.2	12.2	16.6	87.2	#N/A	3.42	90	0.16	1.29	834	1.9	0.396	3.7	0.144	7.1	0.3	1	317	0.145	126	1.2	65
340	259502	10	0.2	1.33	13.2	30	#N/A	0.7	1.11	0.1	14	18.2	299.7	#N/A	2.82	330	0.08	0.96	502	4.2	0.027	3.2	0.111	6.4	0.4	2.2	216	0.162	89	1.1	41
341	259505	14	0.1	1.46	14.7	18	#N/A	0.7	1.64	0.2	13.5	20.9	191.5	#N/A	2.71	330	0.07	0.94	699	2.9	0.025	2.6	0.105	6.4	0.5	1.3	171	0.139	89	1	57
342	259795	15	0.2	0.57	6.2	21	#N/A	0.1	1.09	0.2	3.3	27.2	317.6	#N/A	1.7	70	0.08	0.21	257	4.1	0.029	1.5	0.068	6.9	0.3	0.6	27	0.11	100	0.4	29
343	259796	21	0.2	0.49	7.6	38	#N/A	0.1	1.2	0.2	4.4	45.4	625.4	#N/A	4.84	130	0.1	0.26	291	6.3	0.046	4	0.141	5.6	0.3	-0.5	65	0.119	228	0.4	34
344	260569	12	-0.1	1.31	9	22	#N/A	0.5	1.4	0.1	7.7	22.9	30	#N/A	2.62	190	0.06	0.95	701	3.2	0.029	2.6	0.099	6.1	0.6	-0.5	256	0.157	100	0.6	47
345	260573	16	0.1	1.37	12.5	19	#N/A	0.9	1.52	0.1	14.6	48.2	70.5	#N/A	2.56	300	0.07	0.97	692	6.9	0.033	3.6	0.103	3.6	0.4	0.7	199	0.158	84	1	46
346	261763	31	0.1	1.57	20.7	22	#N/A	0.1	2.41	0.1	11.2	34	203.9	#N/A	3.29	60	0.06	0.78	485	6.7	0.026	4.1	0.114	4.7	0.7	-0.5	186	0.17	121	1.4	34
347	261765	21	-0.1	0.87	11.5	10	#N/A	0.1	1.2	-0.1	11.4	27	124.2	#N/A	2.79	20	0.04	0.58	311	2.9	0.026	2.3	0.101	3	0.4	0.7	103	0.134	88	1	27
348	261775	27	0.2	1.43	15	25	#N/A	0.3	1.77	0.1	15.5	26.4	304.5	#N/A	3.68	160	0.08	0.86	550	5.5	0.026	2.4	0.117	3	0.5	1.6	166	0.148	123	1	38
349	261776	19	0.1	1.35	14.6	35	#N/A	0.2	1.88	0.1	13.1	27.4	252	#N/A	3.58	40	0.07	0.63	578	8.9	0.042	2.9	0.097	3.9	0.5	1.2	122	0.147	110	0.8	37
350	31929	136	1.2	1.2	5	64	#N/A	-3	3.77	1	13	3	0.05	#N/A	4.22	#N/A	0.22	0.82	1965	2	0.03	3	0.145	7	-3	#N/A	96	0.09	156	-2	152
351	32550	97	-0.3	2.43	24	102	#N/A	-3	2.97	-0.5	29	125	0.03	#N/A	7.11	#N/A	0.18	2.39	2821	-1	0.03	52	0.155	-3	4	#N/A	205	0.27	250	-2	123
352	31636	151	1.1	1.58	9	61	#N/A	-3	5.58	0.5	21	10	0.108	#N/A	6.04	#N/A	0.18	1.41	3027	4	0.04	4	0.155	7	-3	#N/A	172	0.13	270	-2	199
353	31598	120	0.9	1.1	20	62	#N/A	-3	4.25	0.9	13	4	0.068	#N/A	4.16	#N/A	0.21	0.85	1545	10	0.04	3	0.126	15	-3	#N/A	125	0.14	128	-2	115
354	31943	113	1.1	0.82	7	51	#N/A	-3	4.33	0.7	19	11	0.118	#N/A	4.93	#N/A	0.13	0.71	2070	5	0.03	5	0.122	5	-3	#N/A	106	0.14	229	-2	164
355	31998	149	1.4	2.01	17	45	#N/A	-3	5.9	0.7	16	4	0.154	#N/A	4.76	#N/A	0.13	1.05	2371	5	0.46	1	0.543	7	-3	#N/A	368	0.11	184	-2	157
356	32491	127	1.2	1.88	9	70	#N/A	-3	4.65	0.5	18	5	0.15	#N/A	5.37	#N/A	0.17	1.41	1799	5	0.03	4	0.181	10	3	#N/A	140	0.13	270	-2	145
357	32539	113	0.7	1.49	7	184	#N/A	-3	4.32	-0.5	13	9	0.069	#N/A	4.14	#N/A	0.21	0.97	1435	4	0.04	5	0.139	7	-3	#N/A	874	0.1	216	-2	113
358	32727	146	0.5	1.86	7	61	#N/A	-3	6.29	-0.5	15	8	0.062	#N/A	4.31	#N/A	0.11	0.96	1477	77	0.06	3	0.145	9	-3	#N/A	144	0.15	209	-2	123
359	32635	116	0.8	1.52	10	56	#N/A	-3	4.7	-0.5	17	6	0.016	#N/A	4.34	#N/A	0.15	1.14	1959	3	0.03	3	0.178	18	3	#N/A	137	0.07	165	-2	121
360	31557	108	0.6	1.14	12	79	#N/A	-3	4.12	0.6	12	5	0.097	#N/A	3.47	#N/A	0.16	0.87	1393	5	0.03	3	0.128	10	-3	#N/A	130	0.02	115	-2	111
361	31945	20	-0.3	1.44	13	124	#N/A	-3	3.62	-0.5	15	8	0.023	#N/A	4.52	#N/A	0.23	1.22	1642	4	0.06	4	0.159	-3	-3	#N/A	108	0.11	167	-2	80
362	32561	61	0.3	2.53	30	140	#N/A	-3	4.06	-0.5	12	7	0.033	#N/A	3.96	#N/A	0.27	0.86	1442	1	0.04	4	0.113	4	-3	#N/A	294	0.16	199	-2	98
363	32640	122	1.5	1.47	21	37	#N/A	-3	3.99	-0.5	16	5	0.133	#N/A	3.97	#N/A	0.22	1.16	2274	11	0.03	4	0.124	19	-3	#N/A	114	0.1	129	2	123
364	32729	121	0.8	1.61	7	103	#N/A	-3	4.46	-0.5	13	2	0.012	#N/A	4.41	#N/A	0.19	1.14	1421	2	0.06	1	0.164	8	-3	#N/A	178	0.17	167	-2	71
365	31603	93	1	1.21	12	67	#N/A	4	3.56	0.6	11	5	0.14	#N/A	3.8	#N/A	0.24	0.92	1707	5	0.04	2	0.125	11	-3	#N/A	155	0.11	183	-2	139
366	31576	91	-0.3	0.88	15	111	#N/A	3	3.28	0.8	7	3	0.01	#N/A	2.5	#N/A	0.2	0.46	1412	13	0.05	1	0.078	29	-3	#N/A	115	-0.01	71	-2	133
367	31973	93	0.4	1.49	10	104	#N/A	-3	3.62	-0.5	14	6	0.02	#N/A	4.26	#N/A	0.14	1.12	1730	6	0.11	1	0.141	6	-3	#N/A	149	0.17	172	-2	75
368	32519	72	0.7	1.86	20	60	#N/A	-3	3.25	-0.5	13	8	0.152	#N/A	4.2	#N/A	0.15	1.09	1264	1	0.04	4	0.126	8	3	#N/A	125	0.17	193	2	93
369	32702	117	0.9	1.26	21	71	#N/A	-3	4.68	-0.5	14	6	0.021	#N/A	4.6	#N/A	0.11	1.08	1356	13	0.03	3	0.166	11	-3	#N/A	420	0.17	174	-2	80
370	1	121	#N/A	#N/A	#N/A	901	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	419	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
371	2	160	#N/A	#N/A	#N/A	1817	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	170	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
372	3	40	#N/A	#N/A	#N/A	1517	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
373	4	119	#N/A	#N/A	#N/A	1758	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	421	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
374	5	107	#N/A	#N/A	#N/A	1545	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	544	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
375	6	109	#N/A	#N/A	#N/A	1548	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	334	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
376	7	88	#N/A	#N/A	#N/A	1847	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	156	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
377	8	47	#N/A	#N/A	#N/A	1480	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
378	9	130	#N/A	#N/A	#N/A	1467	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	593	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
379	10	138	#N/A	#N/A	#N/A	1754	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	285	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.1	#N/A	#N/A	#N/A	#N/A	#N/A
380	11	149	#N/A	#N/A	#N/A	1457	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	146	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
381	12	69	#N/A	#N/A	#N/A	1465	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2394	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	18.6	#N/A	#N/A	#N/A	#N/A	#N/A
382	13	90	#N/A	#N/A	#N/A	1391	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	523	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	#N/A
383	14	98	#N/A	#N/A	#N/A	1437	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	247	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
384	15	57	#N/A	#N/A	#N/A	1301	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	146	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
385	16	130	#N/A	#N/A	#N/A	1322	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	457	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
386	17	143	#N/A	#N/A	#N/A	1279	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	430	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
387	18	121	#N/A	#N/A	#N/A	1321	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	500	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
388	19	110	#N/A	#N/A	#N/A	1556	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	605	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
389	20	93	#N/A	#N/A	#N/A	1592	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	272	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
390	21	81	#N/A	#N/A	#N/A	1001	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	259	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
391	22	128	#N/A	#N/A	#N/A	1402	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	68	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
392	23	121	#N/A	#N/A	#N/A	1289	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	382	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
393	24	130	#N/A	#N/A	#N/A	1721	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	244	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
394	25	102	#N/A	#N/A	#N/A	1417	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	678	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
395	26	123	#N/A	#N/A	#N/A	1033	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	157	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
396	27	132	#N/A	#N/A	#N/A	1643	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	424	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	#N/A
397	28	145	#N/A	#N/A	#N/A	2080	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	555	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
398	29	109	#N/A	#N/A	#N/A	1689	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	373	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
399	30	274	#N/A	#N/A	#N/A	1341	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.7	#N/A	#N/A	#N/A	#N/A	#N/A
400	31	46	#N/A	#N/A	#N/A	820	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	115	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
401	32	97	#N/A	#N/A	#N/A	713	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	470	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.4	#N/A	#N/A	#N/A	#N/A	#N/A
402	33	91	#N/A	#N/A	#N/A	2351	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	199	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	#N/A
403	34	61	#N/A	#N/A	#N/A	1514	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	264	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
404	37	Wight Pit	WB-03-20	DD Core	37	#N/A	0.26	0.02	7.8	#N/A	0.812727273	#N/A
405	38	Wight Pit	WB-03-20	DD Core	38	#N/A	0.3	<0.01	9.1	#N/A	0.499090909	#N/A
406	39	Wight Pit	WB-03-21	DD Core	39	#N/A	0.13	<0.01	8.7	#N/A	0.706363636	#N/A
407	40	Wight Pit	WB-03-22	DD Core	40	#N/A	0.51	<0.01	8.8	#N/A	0.769090909	#N/A
408	41	Wight Pit	WB-03-22	DD Core	41	#N/A	0.05	0.01	8	#N/A	0.962727273	#N/A
409	42	Wight Pit	WB-03-22	DD Core	42	#N/A	1	-0.01	8.5	#N/A	1.115454545	#N/A
410	44	Wight Pit	WB-03-23	DD Core	44	#N/A	0.59	-0.01	8.3	#N/A	1.660909091	#N/A
411	46	Wight Pit	WB-03-24	DD Core	46	#N/A	1.24	0.01	8.8	#N/A	1.303636364	#N/A
412	47	Wight Pit	WB-03-25	DD Core	47	#N/A	0.35	-0.01	8.8	#N/A	0.818181818	#N/A
413	48	Wight Pit	WB-03-25	DD Core	48	#N/A	0.05	-0.01	8	#N/A	1.2	#N/A
414	49	Wight Pit	WB-03-25	DD Core	49	#N/A	0.04	0.01	9.2	#N/A	0.799090909	#N/A
415	50	Wight Pit	WB-03-26	DD Core	50	#N/A	0.25	-0.01	8.9	#N/A	1.071818182	#N/A
416	51	Wight Pit	WB-03-26	DD Core	51	#N/A	0.11	-0.01	9.3	#N/A	0.856363636	#N/A
417	53	Wight Pit	WB-03-27	DD Core	53	#N/A	0.65	-0.01	9.4	#N/A	0.589090909	#N/A
418	54	Wight Pit	WB-03-27	DD Core	54	#N/A	0.38	0.01	8.7	#N/A	0.63	#N/A
419	55	Wight Pit	WB-03-27	DD Core	55	#N/A	0.78	0.01	8.6	#N/A	0.662727273	#N/A
420	56	Wight Pit	WB-03-28	DD Core	56	#N/A	0.75	-0.01	8.3	#N/A	0.616363636	#N/A
421	57	Wight Pit	WB-03-28	DD Core	57	#N/A	0.98	0.01	8.4	#N/A	0.889090909	#N/A
422	58	Wight Pit	WB-03-28	DD Core	58	#N/A	0.71	-0.01	8.8	#N/A	0.621818182	#N/A
423	59	Wight Pit	WB-03-29	DD Core	59	#N/A	0.94	0.01	7.9	#N/A	1.388181818	#N/A
424	62	Wight Pit	WB-03-31	DD Core	62	#N/A	0.62	0.01	8.2	#N/A	0.962727273	#N/A
425	63	Wight Pit	WB-03-31	DD Core	63	#N/A	1.13	0.01	8.1	#N/A	1.145454545	#N/A
426	64	Wight Pit	WB-03-32	DD Core	64	#N/A	2.49	0.01	8	#N/A	1.104545455	#N/A
427	65	Wight Pit	WB-03-32	DD Core	65	#N/A	1.14	0.01	8.3	#N/A	0.758181818	#N/A
428	67	Wight Pit	WB-03-33	DD Core	67	#N/A	0.28	0.01	7.9	#N/A	1.565454545	#N/A
429	69	Wight Pit	WB-03-35	DD Core	69	#N/A	0.78	-0.01	8.7	#N/A	1.273636364	#N/A
430	70	Wight Pit	WB-03-35	DD Core	70	#N/A	0.66	-0.01	8.5	#N/A	1.251818182	#N/A
431	71	Wight Pit	WB-03-35	DD Core	71	#N/A	0.97	-0.01	8.6	#N/A	1.071818182	#N/A
432	74	Wight Pit	WB-03-37	DD Core	74	#N/A	0.56	0.01	8.1	#N/A	0.463636364	#N/A
433	75	Wight Pit	WB-03-37	DD Core	75	#N/A	1.64	0.02	8.4	#N/A	1.388181818	#N/A
434	76	Wight Pit	WB-03-38	DD Core	76	#N/A	0.63	-0.01	8.7	#N/A	0.867272727	#N/A
435	77	Wight Pit	WB-03-38	DD Core	77	#N/A	0.07	-0.01	8.4	#N/A	0.297272727	#N/A
436	79	Wight Pit	WB-03-39	DD Core	79	#N/A	0.52	-0.01	8.3	#N/A	1.205454545	#N/A
437	81	Wight Pit	WB-03-40	DD Core	81	#N/A	0.79	0.01	8.7	#N/A	1.194545455	#N/A
438	82	Wight Pit	WB-03-41	DD Core	82	#N/A	0.7	-0.01	8.5	#N/A	2.086363636	#N/A
439	83	Wight Pit	WB-03-41	DD Core	83	#N/A	0.65	-0.01	8.8	#N/A	1.02	#N/A
440	84	Wight Pit	WB-03-42	DD Core	84	#N/A	0.02	-0.01	8.7	#N/A	0.264545455	#N/A
441	85	Wight Pit	WB-03-42	DD Core	85	#N/A	1.15	0.01	8.5	#N/A	1.407272727	#N/A
442	87	Wight Pit	WB-03-43	DD Core	87	#N/A	0.68	-0.01	8.4	#N/A	1.205454545	#N/A
443	88	Wight Pit	WB-03-44	DD Core	88	#N/A	0.78	0.01	8.2	#N/A	1.418181818	#N/A
444	89	Wight Pit	WB-03-44	DD Core	89	#N/A	0.56	-0.01	8.1	#N/A	0.897272727	#N/A
445	91	Wight Pit	WB-03-46	DD Core	91	#N/A	0.51	-0.01	8.7	#N/A	0.580909091	#N/A
446	92	Wight Pit	WB-03-47	DD Core	92	#N/A	0.13	-0.01	7.8	#N/A	0.316363636	#N/A
447	93	Wight Pit	WB-03-47	DD Core	93	#N/A	0.83	0.01	8.2	#N/A	0.340909091	#N/A
448	94	Wight Pit	WB-03-48	DD Core	94	#N/A	0.37	-0.01	8.4	#N/A	1.036363636	#N/A
449	95	Wight Pit	WB-03-48	DD Core	95	#N/A	0.48	-0.01	8.8	#N/A	1.26	#N/A
450	96	Wight Pit	WB-03-49	DD Core	96	#N/A	0.46	0.01	8.6	#N/A	1.671818182	#N/A
451	97	Wight Pit	WB-03-49	DD Core	97	#N/A	0.97	-0.01	8.5	#N/A	1.131818182	#N/A
452	56439	Boundary Pit	#N/A	Blast Hole Cuttings	56439	#N/A	0.216	#N/A	#N/A	#N/A	#N/A	0.58
453	56439 dup	Boundary Pit	#N/A	Blast Hole Cuttings	56439 dup	#N/A	0.214	#N/A	#N/A	#N/A	#N/A	0.57
454	56440	Boundary Pit	#N/A	Blast Hole Cuttings	56440	#N/A	0.164	#N/A	#N/A	#N/A	#N/A	0.76
455	56440 dup	Boundary Pit	#N/A	Blast Hole Cuttings	56440 dup	#N/A	0.167	#N/A	#N/A	#N/A	#N/A	0.76
456	56442	Boundary Pit	#N/A	Blast Hole Cuttings	56442	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.26
457	79152	Boundary Pit	#N/A	Blast Hole Cuttings	79152	#N/A	0.126	#N/A	#N/A	#N/A	#N/A	0.24
458	56446	Boundary Pit	#N/A	Blast Hole Cuttings	56446	#N/A	0.917	#N/A	#N/A	#N/A	#N/A	0.81
459	56448	Boundary Pit	#N/A	Blast Hole Cuttings	56448	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.28
460	79157	Boundary Pit	#N/A	Blast Hole Cuttings	79157	#N/A	0.25	#N/A	#N/A	#N/A	#N/A	0.25
461	79165	Boundary Pit	#N/A	Blast Hole Cuttings	79165	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.94
462	79162	Boundary Pit	#N/A	Blast Hole Cuttings	79162	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.33
463	79163	Boundary Pit	#N/A	Blast Hole Cuttings	79163	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.80
464	79409	Boundary Pit	#N/A	Blast Hole Cuttings	79409	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.42
465	79413	Boundary Pit	#N/A	Blast Hole Cuttings	79413	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	1.15
466	79454	Boundary Pit	#N/A	Blast Hole Cuttings	79454	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.24
467	79455	Boundary Pit	#N/A	Blast Hole Cuttings	79455	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.26
468	79456	Boundary Pit	#N/A	Blast Hole Cuttings	79456	#N/A	0.054	#N/A	#N/A	#N/A	#N/A	0.46
469	79457	Boundary Pit	#N/A	Blast Hole Cuttings	79457	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.15
470	79464	Boundary Pit	#N/A	Blast Hole Cuttings	79464	#N/A	0.453	#N/A	#N/A	#N/A	#N/A	0.78
471	79401	Boundary Pit	B1180-12	Blast Hole Cuttings	79401	#N/A	2.48	#N/A	#N/A	#N/A	#N/A	0.34
472	79401	Boundary Pit	B1180-12	Blast Hole Cuttings	79401	#N/A	2.05	#N/A	#N/A	#N/A	#N/A	0.17
473	79402	Boundary Pit	B1180-12	Blast Hole Cuttings	79402	#N/A	0.911	#N/A	#N/A	#N/A	#N/A	0.16
474	79402	Boundary Pit	B1180-12	Blast Hole Cuttings	79402	#N/A	1.46	#N/A	#N/A	#N/A	#N/A	0.32
475	79403	Boundary Pit	B1180-12	Blast Hole Cuttings	79403	#N/A	0.886	#N/A	#N/A	#N/A	#N/A	0.13
476	79403	Boundary Pit	B1180-12	Blast Hole Cuttings	79403	#N/A	1.08	#N/A	#N/A	#N/A	#N/A	0.13
477	79404	Boundary Pit	B1180-12	Blast Hole Cuttings	79404	#N/A	0.74	#N/A	#N/A	#N/A	#N/A	0.22
478	79404	Boundary Pit	B1180-12	Blast Hole Cuttings	79404	#N/A	0.872	#N/A	#N/A	#N/A	#N/A	0.30
479	M82319	Boundary Pit	B1168-13	Blast Hole Cuttings	M82319	#N/A	0.019	#N/A	#N/A	#N/A	#N/A	0.36
480	79153	Boundary Pit	B1168-12	Blast Hole Cuttings	79153	#N/A	1.35	#N/A	#N/A	#N/A	#N/A	0.37
481	79154	Boundary Pit	B1168-12	Blast Hole Cuttings	79154	#N/A	1.52	#N/A	#N/A	#N/A	#N/A	0.36
482	79155	Boundary Pit	B1168-12	Blast Hole Cuttings	79155	#N/A	1.23	#N/A	#N/A	#N/A	#N/A	0.48
483	56447	Boundary Pit	B1168-11	Blast Hole Cuttings	56447	#N/A	0.904	#N/A	#N/A	#N/A	#N/A	0.31
484	56446	Boundary Pit	B1168-11	Blast Hole Cuttings	56446	#N/A	0.917	#N/A	#N/A	#N/A	#N/A	0.81
485	79451	Boundary Pit	B1156-23	Blast Hole Cuttings	79451	#N/A	1.44	#N/A	#N/A	#N/A	#N/A	0.47
486	79452	Boundary Pit	B1156-23	Blast Hole Cuttings	79452	#N/A	1.07	#N/A	#N/A	#N/A	#N/A	0.69
487	79411	Boundary Pit	B1156-22	Blast Hole Cuttings	79411	#N/A	1.22	#N/A	#N/A	#N/A	#N/A	0.47
488	79412	Boundary Pit	B1156-22	Blast Hole Cuttings	79412	#N/A	1.05	#N/A	#N/A	#N/A	#N/A	0.41
489	79413	Boundary Pit	B1156-22	Blast Hole Cuttings	79413	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	1.15
490	79165	Boundary Pit	B1156-20	Blast Hole Cuttings	79165	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.94
491	79159	Boundary Pit	B1156-19	Blast Hole Cuttings	79159	#N/A	0.854	#N/A	#N/A	#N/A	#N/A	0.11
492	79160	Boundary Pit	B1156-19	Blast Hole Cuttings	79160	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	0.17
493	79156	Boundary Pit	B1156-18	Blast Hole Cuttings	79156	#N/A	1.65	#N/A	#N/A	#N/A	#N/A	0.42
494	79151	Boundary Pit	B1156-15	Blast Hole Cuttings	79151	#N/A	0.818	#N/A	#N/A	#N/A	#N/A	0.08
495	79152	Boundary Pit	B1156-15	Blast Hole Cuttings	79152	#N/A	0.126	#N/A	#N/A	#N/A	#N/A	0.24
496	56448	Boundary Pit	B1156-11	Blast Hole Cuttings	56448	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.28
497	56441	Boundary Pit	B1156-07	Blast Hole Cuttings	56441	#N/A	0.985	#N/A	#N/A	#N/A	#N/A	0.49
498	56442	Boundary Pit	B1156-07	Blast Hole Cuttings	56442	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.26
499	56443	Boundary Pit	B1156-07	Blast Hole Cuttings	56443	#N/A	0.376	#N/A	#N/A	#N/A	#N/A	0.42
500	56439	Boundary Pit	B1156-05	Blast Hole Cuttings	56439	#N/A	0.216	#N/A	#N/A	#N/A	#N/A	0.58
501	56439 dup	Boundary Pit	B1156-05	Blast Hole Cuttings	56439 dup	#N/A	0.214	#N/A	#N/A	#N/A	#N/A	0.57
502	56440	Boundary Pit	B1156-05	Blast Hole Cuttings	56440	#N/A	0.164	#N/A	#N/A	#N/A	#N/A	0.76
503	56440 dup	Boundary Pit	B1156-05	Blast Hole Cuttings	56440 dup	#N/A	0.167	#N/A	#N/A	#N/A	#N/A	0.76
504	M82320	Boundary Pit	B1144-23	Blast Hole Cuttings	M82320	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.24
505	M 79203	Boundary Pit	B1144-20	Blast Hole Cuttings	M 79203	#N/A	1.24	#N/A	#N/A	#N/A	#N/A	0.51
506	M 79204	Boundary Pit	B1144-20	Blast Hole Cuttings	M 79204	#N/A	2.41	#N/A	#N/A	#N/A	#N/A	0.43
507	M 79467	Boundary Pit	B1144-16	Blast Hole Cuttings	M 79467	#N/A	0.915	#N/A	#N/A	#N/A	#N/A	1.07
508	M 79468	Boundary Pit	B1144-16	Blast Hole Cuttings	M 79468	#N/A	1.11	#N/A	#N/A	#N/A	#N/A	0.22
509	79454	Boundary Pit	B1144-13	Blast Hole Cuttings	79454	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.24

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
404	37	128	#N/A	#N/A	#N/A	1397	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	388	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
405	38	75	#N/A	#N/A	#N/A	758	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	70	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
406	39	84	#N/A	#N/A	#N/A	1665	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	217	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
407	40	96	#N/A	#N/A	#N/A	1487	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	199	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
408	41	170	#N/A	#N/A	#N/A	665	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
409	42	126	#N/A	#N/A	#N/A	1286	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	566	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
410	44	192	#N/A	#N/A	#N/A	1384	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	437	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	#N/A
411	46	142	#N/A	#N/A	#N/A	1613	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	448	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
412	47	102	#N/A	#N/A	#N/A	1798	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	564	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
413	48	188	#N/A	#N/A	#N/A	56	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	33	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
414	49	117	#N/A	#N/A	#N/A	841	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
415	50	125	#N/A	#N/A	#N/A	1537	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	284	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
416	51	111	#N/A	#N/A	#N/A	1726	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	221	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
417	53	64	#N/A	#N/A	#N/A	1241	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	424	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.9	#N/A	#N/A	#N/A	#N/A	#N/A
418	54	110	#N/A	#N/A	#N/A	1907	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	305	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.3	#N/A	#N/A	#N/A	#N/A	#N/A
419	55	81	#N/A	#N/A	#N/A	2121	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	425	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
420	56	99	#N/A	#N/A	#N/A	865	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	382	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
421	57	117	#N/A	#N/A	#N/A	1356	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	792	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.1	#N/A	#N/A	#N/A	#N/A	#N/A
422	58	64	#N/A	#N/A	#N/A	1124	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	251	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.6	#N/A	#N/A	#N/A	#N/A	#N/A
423	59	150	#N/A	#N/A	#N/A	1811	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	123	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
424	62	86	#N/A	#N/A	#N/A	1935	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	113	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
425	63	125	#N/A	#N/A	#N/A	1758	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	250	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
426	64	126	#N/A	#N/A	#N/A	1213	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	948	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
427	65	95	#N/A	#N/A	#N/A	1996	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	523	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	#N/A
428	67	151	#N/A	#N/A	#N/A	1623	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.7	#N/A	#N/A	#N/A	#N/A	#N/A
429	69	104	#N/A	#N/A	#N/A	1056	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	163	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
430	70	137	#N/A	#N/A	#N/A	1592	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	207	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
431	71	96	#N/A	#N/A	#N/A	1559	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	193	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
432	74	65	#N/A	#N/A	#N/A	2159	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	92	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.9	#N/A	#N/A	#N/A	#N/A	#N/A
433	75	123	#N/A	#N/A	#N/A	1644	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	325	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
434	76	92	#N/A	#N/A	#N/A	1716	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	128	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
435	77	84	#N/A	#N/A	#N/A	1745	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	69	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
436	79	136	#N/A	#N/A	#N/A	1524	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	143	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.1	#N/A	#N/A	#N/A	#N/A	#N/A
437	81	148	#N/A	#N/A	#N/A	1307	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	329	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
438	82	161	#N/A	#N/A	#N/A	1069	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	163	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	#N/A	#N/A	#N/A	#N/A	#N/A
439	83	99	#N/A	#N/A	#N/A	1633	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	82	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
440	84	90	#N/A	#N/A	#N/A	1515	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-0.1	#N/A	#N/A	#N/A	#N/A	#N/A
441	85	111	#N/A	#N/A	#N/A	1738	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	92	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.5	#N/A	#N/A	#N/A	#N/A	#N/A
442	87	128	#N/A	#N/A	#N/A	1324	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	230	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
443	88	137	#N/A	#N/A	#N/A	1514	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	419	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
444	89	106	#N/A	#N/A	#N/A	1304	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	162	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
445	91	59	#N/A	#N/A	#N/A	1459	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	123	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
446	92	195	#N/A	#N/A	#N/A	260	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	304	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
447	93	67	#N/A	#N/A	#N/A	1190	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	302	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.3	#N/A	#N/A	#N/A	#N/A	#N/A
448	94	136	#N/A	#N/A	#N/A	1423	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	200	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.9	#N/A	#N/A	#N/A	#N/A	#N/A
449	95	146	#N/A	#N/A	#N/A	1421	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	422	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1	#N/A	#N/A	#N/A	#N/A	#N/A
450	96	161	#N/A	#N/A	#N/A	1469	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	144	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.4	#N/A	#N/A	#N/A	#N/A	#N/A
451	97	125	#N/A	#N/A	#N/A	1371	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	293	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.2	#N/A	#N/A	#N/A	#N/A	#N/A
452	56439	48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
453	56439 dup	47	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
454	56440	63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
455	56440 dup	63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
456	56442	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
457	79152	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
458	56446	67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
459	56448	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
460	79157	21	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
461	79165	79	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
462	79162	28	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
463	79163	67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
464	79409	35	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
465	79413	96	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
466	79454	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
467	79455	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
468	79456	39	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
469	79457	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
470	79464	65	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
471	79401	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
472	79401	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
473	79402	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
474	79402	27	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
475	79403	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
476	79403	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
477	79404	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
478	79404	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
479	M82319	30	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
480	79153	31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
481	79154	30	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
482	79155	40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
483	56447	26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
484	56446	67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
485	79451	40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
486	79452	57	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
487	79411	39	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
488	79412	34	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
489	79413	96	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
490	79165	79	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
491	79159	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
492	79160	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
493	79156	35	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
494	79151	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
495	79152	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
496	56448	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
497	56441	41	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
498	56442	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
499	56443	35	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
500	56439	48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
501	56439 dup	47	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
502	56440	63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
503	56440 dup	63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
504	M82320	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
505	M 79203	43	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
506	M 79204	36	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
507	M 79467	89	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
508	M 79468	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
509	79454	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
510	79461	Boundary Pit	B1144-13	Blast Hole Cuttings	79461	#N/A	1.61	#N/A	#N/A	#N/A	#N/A	0.45
511	79463	Boundary Pit	B1144-13	Blast Hole Cuttings	79463	#N/A	0.872	#N/A	#N/A	#N/A	#N/A	0.22
512	79464	Boundary Pit	B1144-13	Blast Hole Cuttings	79464	#N/A	0.453	#N/A	#N/A	#N/A	#N/A	0.78
513	79408	Boundary Pit	B1144-11	Blast Hole Cuttings	79408	#N/A	0.386	#N/A	#N/A	#N/A	#N/A	0.25
514	79455	Boundary Pit	B1144-10	Blast Hole Cuttings	79455	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.26
515	79161	Boundary Pit	B1144-08	Blast Hole Cuttings	79161	#N/A	1.17	#N/A	#N/A	#N/A	#N/A	0.47
516	79162	Boundary Pit	B1144-08	Blast Hole Cuttings	79162	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.33
517	79163	Boundary Pit	B1144-08	Blast Hole Cuttings	79163	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.80
518	79409	Boundary Pit	B1144-08	Blast Hole Cuttings	79409	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.42
519	79410	Boundary Pit	B1144-08	Blast Hole Cuttings	79410	#N/A	1.68	#N/A	#N/A	#N/A	#N/A	0.33
520	79157	Boundary Pit	B1144-05	Blast Hole Cuttings	79157	#N/A	0.25	#N/A	#N/A	#N/A	#N/A	0.25
521	M79201	Boundary Pit	B1132-5	Blast Hole Cuttings	M79201	#N/A	0.028	#N/A	#N/A	#N/A	#N/A	0.05
522	M 79469	Boundary Pit	B1132-4	Blast Hole Cuttings	M 79469	#N/A	0.067	#N/A	#N/A	#N/A	#N/A	0.11
523	M79212	Boundary Pit	B1132-19	Blast Hole Cuttings	M79212	#N/A	0.489	#N/A	#N/A	#N/A	#N/A	0.71
524	M79213	Boundary Pit	B1132-19	Blast Hole Cuttings	M79213	#N/A	0.07	#N/A	#N/A	#N/A	#N/A	0.32
525	M79420	Boundary Pit	B1132-17	Blast Hole Cuttings	M79420	#N/A	1.07	#N/A	#N/A	#N/A	#N/A	0.24
526	M79421	Boundary Pit	B1132-17	Blast Hole Cuttings	M79421	#N/A	0.467	#N/A	#N/A	#N/A	#N/A	0.84
527	M79419	Boundary Pit	B1132-16	Blast Hole Cuttings	M79419	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	0.14
528	M79418	Boundary Pit	B1132-13	Blast Hole Cuttings	M79418	#N/A	0.041	#N/A	#N/A	#N/A	#N/A	0.09
529	M79210	Boundary Pit	B1132-11	Blast Hole Cuttings	M79210	#N/A	0.051	#N/A	#N/A	#N/A	#N/A	0.11
530	M79209	Boundary Pit	B1132-10	Blast Hole Cuttings	M79209	#N/A	1.07	#N/A	#N/A	#N/A	#N/A	0.22
531	79457	Boundary Pit	B1132-02	Blast Hole Cuttings	79457	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.15
532	79456	Boundary Pit	B1132-01	Blast Hole Cuttings	79456	#N/A	0.054	#N/A	#N/A	#N/A	#N/A	0.46
533	M 82338	Boundary Pit	B1120-21	Blast Hole Cuttings	M 82338	#N/A	2	#N/A	#N/A	#N/A	#N/A	0.27
534	M 82339	Boundary Pit	B1120-21	Blast Hole Cuttings	M 82339	#N/A	0.767	#N/A	#N/A	#N/A	#N/A	1.66
535	M82481	Boundary Pit	B1120-19	Blast Hole Cuttings	M82481	#N/A	0.075	#N/A	#N/A	#N/A	#N/A	0.19
536	M82480	Boundary Pit	B1120-18	Blast Hole Cuttings	M82480	#N/A	0.031	#N/A	#N/A	#N/A	#N/A	0.22
537	M79168	Boundary Pit	B1120-12	Blast Hole Cuttings	M79168	#N/A	0.155	#N/A	#N/A	#N/A	#N/A	0.41
538	M79167	Boundary Pit	B1120-11	Blast Hole Cuttings	M79167	#N/A	0.056	#N/A	#N/A	#N/A	#N/A	0.05
539	M79166	Boundary Pit	B1120-10	Blast Hole Cuttings	M79166	#N/A	0.787	#N/A	#N/A	#N/A	#N/A	0.33
540	M79220	Boundary Pit	B1120-09	Blast Hole Cuttings	M79220	#N/A	0.116	#N/A	#N/A	#N/A	#N/A	0.43
541	M79219	Boundary Pit	B1120-08	Blast Hole Cuttings	M79219	#N/A	0.896	#N/A	#N/A	#N/A	#N/A	0.73
542	M79215	Boundary Pit	B1120-07	Blast Hole Cuttings	M79215	#N/A	0.061	#N/A	#N/A	#N/A	#N/A	0.07
543	M79214	Boundary Pit	B1120-06	Blast Hole Cuttings	M79214	#N/A	0.081	#N/A	#N/A	#N/A	#N/A	0.10
544	M 82677	Boundary Pit	B1108-13	Blast Hole Cuttings	M 82677	#N/A	1.28	#N/A	#N/A	#N/A	#N/A	0.54
545	82316	Boundary Pit	B1108-12	Blast Hole Cuttings	82316	#N/A	0.072	#N/A	#N/A	#N/A	#N/A	0.06
546	82317	Boundary Pit	B1108-12	Blast Hole Cuttings	82317	#N/A	0.064	#N/A	#N/A	#N/A	#N/A	0.05
547	M82303	Boundary Pit	B1108-11	Blast Hole Cuttings	M82303	#N/A	0.086	#N/A	#N/A	#N/A	#N/A	0.06
548	M82304	Boundary Pit	B1108-10	Blast Hole Cuttings	M82304	#N/A	0.038	#N/A	#N/A	#N/A	#N/A	0.09
549	M82301	Boundary Pit	B1108-09	Blast Hole Cuttings	M82301	#N/A	0.852	#N/A	#N/A	#N/A	#N/A	0.35
550	M82302	Boundary Pit	B1108-09	Blast Hole Cuttings	M82302	#N/A	0.111	#N/A	#N/A	#N/A	#N/A	0.06
551	M82496	Boundary Pit	B1108-06	Blast Hole Cuttings	M82496	#N/A	0.613	#N/A	#N/A	#N/A	#N/A	0.37
552	M82497	Boundary Pit	B1108-05	Blast Hole Cuttings	M82497	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.14
553	M82478	Boundary Pit	B1108-01	Blast Hole Cuttings	M82478	#N/A	0.03	#N/A	#N/A	#N/A	#N/A	0.15
554	82501	Boundary Pit	B1096-8	Blast Hole Cuttings	82501	#N/A	0.056	#N/A	#N/A	#N/A	#N/A	0.03
555	82502	Boundary Pit	B1096-5	Blast Hole Cuttings	82502	#N/A	0.049	#N/A	#N/A	#N/A	#N/A	0.22
556	82503	Boundary Pit	B1096-2	Blast Hole Cuttings	82503	#N/A	0.082	#N/A	#N/A	#N/A	#N/A	0.21
557	M82323	Boundary Pit	B1096-18	Blast Hole Cuttings	M82323	#N/A	0.059	#N/A	#N/A	#N/A	#N/A	0.08
558	M82322	Boundary Pit	B1096-17	Blast Hole Cuttings	M82322	#N/A	0.032	#N/A	#N/A	#N/A	#N/A	0.17
559	M82321	Boundary Pit	B1096-16	Blast Hole Cuttings	M82321	#N/A	0.115	#N/A	#N/A	#N/A	#N/A	0.12
560	M 82516	Boundary Pit	B1096-15	Blast Hole Cuttings	M 82516	#N/A	0.086	#N/A	#N/A	#N/A	#N/A	0.16
561	M 82517	Boundary Pit	B1096-15	Blast Hole Cuttings	M 82517	#N/A	0.414	#N/A	#N/A	#N/A	#N/A	0.21
562	M 82514	Boundary Pit	B1096-13	Blast Hole Cuttings	M 82514	#N/A	0.107	#N/A	#N/A	#N/A	#N/A	0.44
563	M 82515	Boundary Pit	B1096-13	Blast Hole Cuttings	M 82515	#N/A	0.078	#N/A	#N/A	#N/A	#N/A	0.11
564	M 82513	Boundary Pit	B1096-11	Blast Hole Cuttings	M 82513	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	0.26
565	M 82512	Boundary Pit	B1096-09	Blast Hole Cuttings	M 82512	#N/A	0.07	#N/A	#N/A	#N/A	#N/A	0.06
566	M82318	Boundary Pit	B1084-2	Blast Hole Cuttings	M82318	#N/A	0.042	#N/A	#N/A	#N/A	#N/A	0.15
567	M 82530	Boundary Pit	B1084-09	Blast Hole Cuttings	M 82530	#N/A	0.073	#N/A	#N/A	#N/A	#N/A	0.14
568	M 82676	Boundary Pit	B1072-04	Blast Hole Cuttings	M 82676	#N/A	0.088	#N/A	#N/A	#N/A	#N/A	0.12
569	M 82529	Boundary Pit	B1072-01	Blast Hole Cuttings	M 82529	#N/A	0.048	#N/A	#N/A	#N/A	#N/A	0.10
570	1065-1	Boundary Pit	#N/A	Blast Hole Cuttings	1065-1	#N/A	0.479	#N/A	#N/A	#N/A	#N/A	0.72
571	1084-2	Boundary Pit	#N/A	Blast Hole Cuttings	1084-2	#N/A	1.28	#N/A	#N/A	#N/A	#N/A	0.63
572	1111-1	Boundary Pit	#N/A	Blast Hole Cuttings	1111-1	#N/A	0.044	#N/A	#N/A	#N/A	#N/A	1.06
573	1526-2	Boundary Pit	#N/A	Blast Hole Cuttings	1526-2	#N/A	0.252	#N/A	#N/A	#N/A	#N/A	0.96
574	1639-1	Boundary Pit	#N/A	Blast Hole Cuttings	1639-1	#N/A	0.096	#N/A	#N/A	#N/A	#N/A	0.82
575	320198	Boundary Pit	ND-06-05 6.1-7.5	DD Core	320198	#N/A	1.14	#N/A	#N/A	#N/A	#N/A	0.74
576	320302	Boundary Pit	ND-06-06 17.5-20	DD Core	320302	#N/A	0.197	#N/A	#N/A	#N/A	#N/A	1.25
577	320380	Boundary Pit	ND-06-07 30-32.5	DD Core	320380	#N/A	0.685	#N/A	#N/A	#N/A	#N/A	1.26
578	320447	Boundary Pit	ND-06-08 22.5-25	DD Core	320447	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.86
579	320534	Boundary Pit	ND-06-09 4.57-5	DD Core	320534	#N/A	0.41	#N/A	#N/A	#N/A	#N/A	0.77
580	320735	Boundary Pit	ND-06-10 5-7.5	DD Core	320735	#N/A	0.511	#N/A	#N/A	#N/A	#N/A	0.97
581	320855	Boundary Pit	ND-06-11 18.75-20	DD Core	320855	#N/A	0.025	#N/A	#N/A	#N/A	#N/A	0.60
582	320880	Boundary Pit	ND-06-11 67.5-70	DD Core	320880	#N/A	1.08	#N/A	#N/A	#N/A	#N/A	1.14
583	215305	Boundary Pit	ND-06-14 45-47.5	DD Core	215305	#N/A	0.298	#N/A	#N/A	#N/A	#N/A	0.82
584	215401	Boundary Pit	ND-06-15 15-15.24	DD Core	215401	#N/A	0.659	#N/A	#N/A	#N/A	#N/A	0.71
585	265862	Boundary Pit	ND-06-16 45-47.5	DD Core	265862	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.75
586	265988	Boundary Pit	ND-06-17 12.5-15	DD Core	265988	#N/A	0.729	#N/A	#N/A	#N/A	#N/A	1.04
587	400129	Boundary Pit	ND-06-18 15-17.5	DD Core	400129	#N/A	0.188	#N/A	#N/A	#N/A	#N/A	0.97
588	400251	Boundary Pit	ND-06-19 7.5-10	DD Core	400251	#N/A	0.186	#N/A	#N/A	#N/A	#N/A	0.66
589	320856	Boundary Pit	ND-06-11 20-22.5	DD Core	320856	#N/A	1.08	#N/A	#N/A	#N/A	#N/A	1.14
590	320881	Boundary Pit	ND-06-11 70-72.5	DD Core	320881	#N/A	0.025	#N/A	#N/A	#N/A	#N/A	0.60
591	Z1030-04	SE Zone	#N/A	Blast Hole Cuttings	Z1030-04	#N/A	0.661	#N/A	#N/A	#N/A	#N/A	0.20
592	Z1030-05	SE Zone	#N/A	Blast Hole Cuttings	Z1030-05	#N/A	0.959	#N/A	#N/A	#N/A	#N/A	0.19
593	Z1030-06	SE Zone	#N/A	Blast Hole Cuttings	Z1030-06	#N/A	0.663	#N/A	#N/A	#N/A	#N/A	0.15
594	Z1030-07	SE Zone	#N/A	Blast Hole Cuttings	Z1030-07	#N/A	0.756	#N/A	#N/A	#N/A	#N/A	0.08
595	Z1030-07	SE Zone	#N/A	Blast Hole Cuttings	Z1030-07	#N/A	1.7	#N/A	#N/A	#N/A	#N/A	0.11

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
510	79461	38	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
511	79463	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
512	79464	65	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
513	79408	21	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
514	79455	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
515	79161	39	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
516	79162	28	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
517	79163	67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
518	79409	35	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
519	79410	27	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
520	79157	21	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
521	M79201	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
522	M 79469	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
523	M79212	59	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
524	M79213	27	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
525	M79420	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
526	M79421	70	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
527	M79419	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
528	M79418	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
529	M79210	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
530	M79209	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
531	79457	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
532	79456	39	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
533	M 82338	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
534	M 82339	138	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
535	M82481	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
536	M82480	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
537	M79168	34	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
538	M79167	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
539	M79166	28	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
540	M79220	36	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
541	M79219	61	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
542	M79215	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
543	M79214	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
544	M 82677	45	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
545	82316	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
546	82317	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
547	M82303	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
548	M82304	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
549	M82301	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
550	M82302	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
551	M82496	31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
552	M82497	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
553	M82478	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
554	82501	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
555	82502	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
556	82503	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
557	M82323	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
558	M82322	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
559	M82321	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
560	M 82516	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
561	M 82517	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
562	M 82514	36	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
563	M 82515	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
564	M 82513	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
565	M 82512	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
566	M82318	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
567	M 82530	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
568	M 82676	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
569	M 82529	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
570	1065-1	60	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
571	1084-2	53	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
572	1111-1	88	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
573	1526-2	80	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
574	1639-1	69	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
575	320198	62	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
576	320302	104	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
577	320380	105	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
578	320447	72	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
579	320534	64	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
580	320735	80	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
581	320855	50	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
582	320880	95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
583	215305	68	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
584	215401	60	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
585	265862	63	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
586	265988	87	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
587	400129	81	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
588	400251	55	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
589	320856	95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
590	320881	50	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
591	Z1030-04	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
592	Z1030-05	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
593	Z1030-06	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
594	Z1030-07	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
595	Z1030-07	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
596	Z1030-08	SE Zone	#N/A	Blast Hole Cuttings	Z1030-08	#N/A	0.685	#N/A	#N/A	#N/A	#N/A	0.19
597	Z1030-08	SE Zone	#N/A	Blast Hole Cuttings	Z1030-08	#N/A	0.767	#N/A	#N/A	#N/A	#N/A	0.09
598	Z1030-09	SE Zone	#N/A	Blast Hole Cuttings	Z1030-09	#N/A	0.471	#N/A	#N/A	#N/A	#N/A	0.25
599	Z1030-09	SE Zone	#N/A	Blast Hole Cuttings	Z1030-09	#N/A	0.689	#N/A	#N/A	#N/A	#N/A	0.13
600	Z1030-10	SE Zone	#N/A	Blast Hole Cuttings	Z1030-10	#N/A	0.928	#N/A	#N/A	#N/A	#N/A	0.21
601	Z1040-01	SE Zone	#N/A	Blast Hole Cuttings	Z1040-01	#N/A	0.185	#N/A	#N/A	#N/A	#N/A	0.03
602	Z1040-04	SE Zone	#N/A	Blast Hole Cuttings	Z1040-04	#N/A	0.754	#N/A	#N/A	#N/A	#N/A	0.05
603	Z1040-05	SE Zone	#N/A	Blast Hole Cuttings	Z1040-05	#N/A	0.819	#N/A	#N/A	#N/A	#N/A	0.07
604	Z1040-06	SE Zone	#N/A	Blast Hole Cuttings	Z1040-06	#N/A	1.52	#N/A	#N/A	#N/A	#N/A	0.10
605	Z1040-07	SE Zone	#N/A	Blast Hole Cuttings	Z1040-07	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.07
606	Z1040-08	SE Zone	#N/A	Blast Hole Cuttings	Z1040-08	#N/A	0.55	#N/A	#N/A	#N/A	#N/A	0.03
607	Z1040-09	SE Zone	#N/A	Blast Hole Cuttings	Z1040-09	#N/A	0.94	#N/A	#N/A	#N/A	#N/A	0.11
608	Z1040-10	SE Zone	#N/A	Blast Hole Cuttings	Z1040-10	#N/A	0.482	#N/A	#N/A	#N/A	#N/A	0.11
609	Z1040-11	SE Zone	#N/A	Blast Hole Cuttings	Z1040-11	#N/A	0.729	#N/A	#N/A	#N/A	#N/A	0.06
610	Z1040-12	SE Zone	#N/A	Blast Hole Cuttings	Z1040-12	#N/A	0.315	#N/A	#N/A	#N/A	#N/A	0.08
611	Z1040-13	SE Zone	#N/A	Blast Hole Cuttings	Z1040-13	#N/A	0.583	#N/A	#N/A	#N/A	#N/A	0.23
612	Z1040-14	SE Zone	#N/A	Blast Hole Cuttings	Z1040-14	#N/A	0.898	#N/A	#N/A	#N/A	#N/A	0.14
613	Z1040-15	SE Zone	#N/A	Blast Hole Cuttings	Z1040-15	#N/A	0.798	#N/A	#N/A	#N/A	#N/A	0.16
614	Z1050-02	SE Zone	#N/A	Blast Hole Cuttings	Z1050-02	#N/A	0.323	#N/A	#N/A	#N/A	#N/A	0.04
615	Z1050-03	SE Zone	#N/A	Blast Hole Cuttings	Z1050-03	#N/A	0.478	#N/A	#N/A	#N/A	#N/A	0.02
616	Z1050-04	SE Zone	#N/A	Blast Hole Cuttings	Z1050-04	#N/A	0.679	#N/A	#N/A	#N/A	#N/A	0.11
617	Z1050-05	SE Zone	#N/A	Blast Hole Cuttings	Z1050-05	#N/A	0.91	#N/A	#N/A	#N/A	#N/A	0.09
618	Z1050-06	SE Zone	#N/A	Blast Hole Cuttings	Z1050-06	#N/A	0.886	#N/A	#N/A	#N/A	#N/A	0.09
619	Z1050-07	SE Zone	#N/A	Blast Hole Cuttings	Z1050-07	#N/A	0.708	#N/A	#N/A	#N/A	#N/A	0.18
620	Z1050-09	SE Zone	#N/A	Blast Hole Cuttings	Z1050-09	#N/A	0.427	#N/A	#N/A	#N/A	#N/A	0.08
621	Z1050-10	SE Zone	#N/A	Blast Hole Cuttings	Z1050-10	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.21
622	Z1060-05	SE Zone	#N/A	Blast Hole Cuttings	Z1060-05	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	0.13
623	Z1060-09	SE Zone	#N/A	Blast Hole Cuttings	Z1060-09	#N/A	0.472	#N/A	#N/A	#N/A	#N/A	0.09
624	106257	SE Zone	#N/A	Blast Hole Cuttings	106257	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.97
625	106276	SE Zone	#N/A	Blast Hole Cuttings	106276	#N/A	0.091	#N/A	#N/A	#N/A	#N/A	0.43
626	106585	SE Zone	#N/A	Blast Hole Cuttings	106585	#N/A	0.105	#N/A	#N/A	#N/A	#N/A	0.23
627	106740	SE Zone	#N/A	Blast Hole Cuttings	106740	#N/A	0.218	#N/A	#N/A	#N/A	#N/A	0.31
628	106838	SE Zone	#N/A	Blast Hole Cuttings	106838	#N/A	0.148	#N/A	#N/A	#N/A	#N/A	0.40
629	106933	SE Zone	#N/A	Blast Hole Cuttings	106933	#N/A	2.49	#N/A	#N/A	#N/A	#N/A	0.54
630	107035	SE Zone	#N/A	Blast Hole Cuttings	107035	#N/A	0.168	#N/A	#N/A	#N/A	#N/A	0.31
631	107291	SE Zone	#N/A	Blast Hole Cuttings	107291	#N/A	0.226	#N/A	#N/A	#N/A	#N/A	0.10
632	109016	SE Zone	#N/A	Blast Hole Cuttings	109016	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.67
633	109054	SE Zone	#N/A	Blast Hole Cuttings	109054	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.30
634	109323	SE Zone	#N/A	Blast Hole Cuttings	109323	#N/A	1.7	#N/A	#N/A	#N/A	#N/A	0.23
635	109434	SE Zone	#N/A	Blast Hole Cuttings	109434	#N/A	0.074	#N/A	#N/A	#N/A	#N/A	0.15
636	109445	SE Zone	#N/A	Blast Hole Cuttings	109445	#N/A	1.47	#N/A	#N/A	#N/A	#N/A	0.10
637	111916	SE Zone	#N/A	Blast Hole Cuttings	111916	#N/A	0.16	#N/A	#N/A	#N/A	#N/A	0.23
638	23048	SE Zone	#N/A	Blast Hole Cuttings	23048	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.22
639	23617	SE Zone	#N/A	Blast Hole Cuttings	23617	#N/A	0.713	#N/A	#N/A	#N/A	#N/A	0.19
640	23892	SE Zone	#N/A	Blast Hole Cuttings	23892	#N/A	0.049	#N/A	#N/A	#N/A	#N/A	0.11
641	30964	SE Zone	#N/A	Blast Hole Cuttings	30964	#N/A	0.624	#N/A	#N/A	#N/A	#N/A	0.57
642	90607	SE Zone	#N/A	Blast Hole Cuttings	90607	#N/A	1.89	#N/A	#N/A	#N/A	#N/A	0.45
643	106606	SE Zone	#N/A	Blast Hole Cuttings	106606	#N/A	0.026	#N/A	#N/A	#N/A	#N/A	0.22
644	106622	SE Zone	#N/A	Blast Hole Cuttings	106622	#N/A	0.061	#N/A	#N/A	#N/A	#N/A	0.12
645	106718	SE Zone	#N/A	Blast Hole Cuttings	106718	#N/A	0.189	#N/A	#N/A	#N/A	#N/A	0.46
646	106854	SE Zone	#N/A	Blast Hole Cuttings	106854	#N/A	0.172	#N/A	#N/A	#N/A	#N/A	0.14
647	106867	SE Zone	#N/A	Blast Hole Cuttings	106867	#N/A	0.315	#N/A	#N/A	#N/A	#N/A	0.31
648	107253	SE Zone	#N/A	Blast Hole Cuttings	107253	#N/A	0.085	#N/A	#N/A	#N/A	#N/A	0.35
649	109028	SE Zone	#N/A	Blast Hole Cuttings	109028	#N/A	0.397	#N/A	#N/A	#N/A	#N/A	0.81
650	109463	SE Zone	#N/A	Blast Hole Cuttings	109463	#N/A	0.543	#N/A	#N/A	#N/A	#N/A	0.48
651	111998	SE Zone	#N/A	Blast Hole Cuttings	111998	#N/A	0.101	#N/A	#N/A	#N/A	#N/A	0.30
652	121049	SE Zone	#N/A	Blast Hole Cuttings	121049	#N/A	0.487	#N/A	#N/A	#N/A	#N/A	0.84
653	121071	SE Zone	#N/A	Blast Hole Cuttings	121071	#N/A	0.547	#N/A	#N/A	#N/A	#N/A	0.26
654	121157	SE Zone	#N/A	Blast Hole Cuttings	121157	#N/A	0.84	#N/A	#N/A	#N/A	#N/A	0.27
655	30768	SE Zone	#N/A	Blast Hole Cuttings	30768	#N/A	0.662	#N/A	#N/A	#N/A	#N/A	0.28
656	30977	SE Zone	#N/A	Blast Hole Cuttings	30977	#N/A	0.399	#N/A	#N/A	#N/A	#N/A	0.68
657	30988	SE Zone	#N/A	Blast Hole Cuttings	30988	#N/A	0.235	#N/A	#N/A	#N/A	#N/A	0.59
658	1520	SE Zone	#N/A	Blast Hole Cuttings	1520	#N/A	0.428	#N/A	#N/A	#N/A	#N/A	0.03
659	1922	SE Zone	#N/A	Blast Hole Cuttings	1922	#N/A	0.296	#N/A	#N/A	#N/A	#N/A	0.05
660	1926	SE Zone	#N/A	Blast Hole Cuttings	1926	#N/A	0.013	#N/A	#N/A	#N/A	#N/A	0.02
661	2324	SE Zone	#N/A	Blast Hole Cuttings	2324	#N/A	0.161	#N/A	#N/A	#N/A	#N/A	0.05
662	2328	SE Zone	#N/A	Blast Hole Cuttings	2328	#N/A	0.107	#N/A	#N/A	#N/A	#N/A	0.05
663	2726	SE Zone	#N/A	Blast Hole Cuttings	2726	#N/A	0.218	#N/A	#N/A	#N/A	#N/A	0.05
664	2730	SE Zone	#N/A	Blast Hole Cuttings	2730	#N/A	0.054	#N/A	#N/A	#N/A	#N/A	0.27
665	3124	SE Zone	#N/A	Blast Hole Cuttings	3124	#N/A	0.533	#N/A	#N/A	#N/A	#N/A	0.19
666	3128	SE Zone	#N/A	Blast Hole Cuttings	3128	#N/A	0.038	#N/A	#N/A	#N/A	#N/A	0.04
667	3132	SE Zone	#N/A	Blast Hole Cuttings	3132	#N/A	0.07	#N/A	#N/A	#N/A	#N/A	0.03
668	2013	SE Zone	#N/A	Blast Hole Cuttings	2013	#N/A	0.173	#N/A	#N/A	#N/A	#N/A	0.12
669	2106	SE Zone	#N/A	Blast Hole Cuttings	2106	#N/A	0.608	#N/A	#N/A	#N/A	#N/A	0.08
670	2114	SE Zone	#N/A	Blast Hole Cuttings	2114	#N/A	0.466	#N/A	#N/A	#N/A	#N/A	0.16
671	2007	SE Zone	#N/A	Blast Hole Cuttings	2007	#N/A	0.502	#N/A	#N/A	#N/A	#N/A	0.07
672	2218	SE Zone	#N/A	Blast Hole Cuttings	2218	#N/A	0.546	#N/A	#N/A	#N/A	#N/A	0.13
673	2244	SE Zone	#N/A	Blast Hole Cuttings	2244	#N/A	0.265	#N/A	#N/A	#N/A	#N/A	0.21
674	2248	SE Zone	#N/A	Blast Hole Cuttings	2248	#N/A	1.14	#N/A	#N/A	#N/A	#N/A	0.09
675	2203	SE Zone	#N/A	Blast Hole Cuttings	2203	#N/A	0.396	#N/A	#N/A	#N/A	#N/A	0.10
676	5005	SE Zone	#N/A	Blast Hole Cuttings	5005	#N/A	0.944	#N/A	#N/A	#N/A	#N/A	0.24
677	5064	SE Zone	#N/A	Blast Hole Cuttings	5064	#N/A	0.506	#N/A	#N/A	#N/A	#N/A	0.34
678	5500	SE Zone	#N/A	Blast Hole Cuttings	5500	#N/A	1.36	#N/A	#N/A	#N/A	#N/A	0.26
679	5508	SE Zone	#N/A	Blast Hole Cuttings	5508	#N/A	1.77	#N/A	#N/A	#N/A	#N/A	0.19
680	5512	SE Zone	#N/A	Blast Hole Cuttings	5512	#N/A	0.492	#N/A	#N/A	#N/A	#N/A	0.23
681	5527	SE Zone	#N/A	Blast Hole Cuttings	5527	#N/A	0.646	#N/A	#N/A	#N/A	#N/A	0.18
682	5529	SE Zone	#N/A	Blast Hole Cuttings	5529	#N/A	0.961	#N/A	#N/A	#N/A	#N/A	0.19
683	5544	SE Zone	#N/A	Blast Hole Cuttings	5544	#N/A	1.88	#N/A	#N/A	#N/A	#N/A	0.23

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
596	Z1030-08	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
597	Z1030-08	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
598	Z1030-09	21	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
599	Z1030-09	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
600	Z1030-10	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
601	Z1040-01	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
602	Z1040-04	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
603	Z1040-05	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
604	Z1040-06	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
605	Z1040-07	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
606	Z1040-08	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
607	Z1040-09	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
608	Z1040-10	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
609	Z1040-11	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
610	Z1040-12	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
611	Z1040-13	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
612	Z1040-14	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
613	Z1040-15	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
614	Z1050-02	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
615	Z1050-03	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
616	Z1050-04	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
617	Z1050-05	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
618	Z1050-06	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
619	Z1050-07	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
620	Z1050-09	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
621	Z1050-10	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
622	Z1060-05	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
623	Z1060-09	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
624	106257	81	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
625	106276	35	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
626	106585	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
627	106740	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
628	106838	33	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
629	106933	45	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
630	107035	26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
631	107291	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
632	109016	56	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
633	109054	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
634	109323	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
635	109434	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
636	109445	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
637	111916	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
638	23048	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
639	23617	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
640	23892	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
641	30964	47	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
642	90607	38	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
643	106606	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
644	106622	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
645	106718	38	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
646	106854	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
647	106867	26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
648	107253	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
649	109028	67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
650	109463	40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
651	111998	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
652	121049	70	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
653	121071	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
654	121157	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
655	30768	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
656	30977	56	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
657	30988	49	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
658	1520	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
659	1922	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
660	1926	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
661	2324	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
662	2328	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
663	2726	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
664	2730	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
665	3124	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
666	3128	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
667	3132	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
668	2013	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
669	2106	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
670	2114	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
671	2007	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
672	2218	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
673	2244	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
674	2248	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
675	2203	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
676	5005	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
677	5064	28	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
678	5500	21	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
679	5508	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
680	5512	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
681	5527	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
682	5529	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
683	5544	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
684	6511	SE Zone	#N/A	Blast Hole Cuttings	6511	#N/A	0.538	#N/A	#N/A	#N/A	#N/A	0.19
685	6516	SE Zone	#N/A	Blast Hole Cuttings	6516	#N/A	0.389	#N/A	#N/A	#N/A	#N/A	0.21
686	6570	SE Zone	#N/A	Blast Hole Cuttings	6570	#N/A	2.63	#N/A	#N/A	#N/A	#N/A	0.30
687	6580	SE Zone	#N/A	Blast Hole Cuttings	6580	#N/A	1.43	#N/A	#N/A	#N/A	#N/A	0.24
688	Z10006	SE Zone	#N/A	Blast Hole Cuttings	Z10006	#N/A	1.16	#N/A	#N/A	#N/A	#N/A	0.10
689	Z10009	SE Zone	#N/A	Blast Hole Cuttings	Z10009	#N/A	1.51	#N/A	#N/A	#N/A	#N/A	0.07
690	Z10019	SE Zone	#N/A	Blast Hole Cuttings	Z10019	#N/A	0.823	#N/A	#N/A	#N/A	#N/A	0.06
691	Z10042	SE Zone	#N/A	Blast Hole Cuttings	Z10042	#N/A	0.662	#N/A	#N/A	#N/A	#N/A	0.19
692	Z10045	SE Zone	#N/A	Blast Hole Cuttings	Z10045	#N/A	1.55	#N/A	#N/A	#N/A	#N/A	0.04
693	5212	SE Zone	Z1080-05	Blast Hole Cuttings	5212	#N/A	1.56	#N/A	#N/A	#N/A	#N/A	0.04
694	7283	SE Zone	Z1080-05	Blast Hole Cuttings	7283	#N/A	2.17	#N/A	#N/A	#N/A	#N/A	0.06
695	5092	SE Zone	Z1080-05	Blast Hole Cuttings	5092	#N/A	1.16	#N/A	#N/A	#N/A	#N/A	0.06
696	5203	SE Zone	Z1080-05	Blast Hole Cuttings	5203	#N/A	1.01	#N/A	#N/A	#N/A	#N/A	0.05
697	5267	SE Zone	Z1080-05	Blast Hole Cuttings	5267	#N/A	0.411	#N/A	#N/A	#N/A	#N/A	0.03
698	5246	SE Zone	Z1080-05	Blast Hole Cuttings	5246	#N/A	0.866	#N/A	#N/A	#N/A	#N/A	0.05
699	7273	SE Zone	Z1080-05	Blast Hole Cuttings	7273	#N/A	1.96	#N/A	#N/A	#N/A	#N/A	0.13
700	7315	SE Zone	Z1080-05	Blast Hole Cuttings	7315	#N/A	0.362	#N/A	#N/A	#N/A	#N/A	0.03
701	7263	SE Zone	Z1080-05	Blast Hole Cuttings	7263	#N/A	0.445	#N/A	#N/A	#N/A	#N/A	0.07
702	7202	SE Zone	Z1080-05	Blast Hole Cuttings	7202	#N/A	0.168	#N/A	#N/A	#N/A	#N/A	0.03
703	7297	SE Zone	Z1080-05	Blast Hole Cuttings	7297	#N/A	0.77	#N/A	#N/A	#N/A	#N/A	0.14
704	7319	SE Zone	Z1080-05	Blast Hole Cuttings	7319	#N/A	0.422	#N/A	#N/A	#N/A	#N/A	0.38
705	7182	SE Zone	Z1080-05	Blast Hole Cuttings	7182	#N/A	0.547	#N/A	#N/A	#N/A	#N/A	0.69
706	7001	SE Zone	Z1070-07	Blast Hole Cuttings	7001	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	0.32
707	11019	SE Zone	Z1060-11	Blast Hole Cuttings	11019	#N/A	1.03	#N/A	#N/A	#N/A	#N/A	0.22
708	11024	SE Zone	Z1060-11	Blast Hole Cuttings	11024	#N/A	1.8	#N/A	#N/A	#N/A	#N/A	0.23
709	11035	SE Zone	Z1060-11	Blast Hole Cuttings	11035	#N/A	1.1	#N/A	#N/A	#N/A	#N/A	0.14
710	11043	SE Zone	Z1060-11	Blast Hole Cuttings	11043	#N/A	0.624	#N/A	#N/A	#N/A	#N/A	0.11
711	11057	SE Zone	Z1060-11	Blast Hole Cuttings	11057	#N/A	2.6	#N/A	#N/A	#N/A	#N/A	0.11
712	11255	SE Zone	Z1060-11	Blast Hole Cuttings	11255	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.22
713	11314	SE Zone	Z1060-11	Blast Hole Cuttings	11314	#N/A	1.98	#N/A	#N/A	#N/A	#N/A	0.12
714	11443	SE Zone	Z1060-11	Blast Hole Cuttings	11443	#N/A	0.226	#N/A	#N/A	#N/A	#N/A	0.27
715	11512	SE Zone	Z1060-11	Blast Hole Cuttings	11512	#N/A	1.9	#N/A	#N/A	#N/A	#N/A	0.09
716	11608	SE Zone	Z1060-11	Blast Hole Cuttings	11608	#N/A	1.43	#N/A	#N/A	#N/A	#N/A	0.07
717	11216	SE Zone	Z1060-11	Blast Hole Cuttings	11216	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.02
718	11222	SE Zone	Z1060-11	Blast Hole Cuttings	11222	#N/A	0.848	#N/A	#N/A	#N/A	#N/A	0.09
719	11211	SE Zone	Z1060-11	Blast Hole Cuttings	11211	#N/A	0.007	#N/A	#N/A	#N/A	#N/A	0.28
720	11325	SE Zone	Z1060-11	Blast Hole Cuttings	11325	#N/A	0.265	#N/A	#N/A	#N/A	#N/A	0.21
721	11405	SE Zone	Z1060-11	Blast Hole Cuttings	11405	#N/A	0.004	#N/A	#N/A	#N/A	#N/A	0.04
722	11809	SE Zone	Z1060-11	Blast Hole Cuttings	11809	#N/A	0.103	#N/A	#N/A	#N/A	#N/A	0.64
723	P1060-01	Pond Zone	Pond Pit. Holes: 1154, 1017, 1020, 1104, 1043, 1049	Blast Hole Cuttings	P1060-01	#N/A	0.548	#N/A	#N/A	#N/A	#N/A	1.74
724	P1070-01	Pond Zone	Pond Pit. Holes: 1149, 1090, 1027, 1032, 1092, 1069	Blast Hole Cuttings	P1070-01	#N/A	0.291	#N/A	#N/A	#N/A	#N/A	0.07
725	P1070-01	Pond Zone	Pond Pit. Holes: 1053, 1056, 1017, 1021, 1024, 1086	Blast Hole Cuttings	P1070-01	#N/A	0.688	#N/A	#N/A	#N/A	#N/A	0.15
726	P1070-01	Pond Zone	Pond Pit. Holes: 1051, 1108, 1111, 1136, 1154, 1147	Blast Hole Cuttings	P1070-01	#N/A	0.224	#N/A	#N/A	#N/A	#N/A	0.17
727	P1070-02	Pond Zone	Pond Pit. Holes: 2006, 2057, 2112, 2052	Blast Hole Cuttings	P1070-02	#N/A	0.024	#N/A	#N/A	#N/A	#N/A	0.01
728	P1080-01	Pond Zone	Pond Pit. Holes: 1270, 1075, 1078, 1241	Blast Hole Cuttings	P1080-01	#N/A	0.127	#N/A	#N/A	#N/A	#N/A	0.11
729	P1080-01	Pond Zone	Pond Pit. Holes: 1069, 1219, 1061, 1237	Blast Hole Cuttings	P1080-01	#N/A	0.124	#N/A	#N/A	#N/A	#N/A	0.04
730	1104	Pond Zone	Pond. 1040	Blast Hole Cuttings	1104	#N/A	0.349	#N/A	#N/A	#N/A	#N/A	0.21
731	1062	Pond Zone	Pond. 1040	Blast Hole Cuttings	1062	#N/A	0.043	#N/A	#N/A	#N/A	#N/A	0.02
732	1086	Pond Zone	Pond. 1040	Blast Hole Cuttings	1086	#N/A	0.058	#N/A	#N/A	#N/A	#N/A	0.02
733	1018	Pond Zone	Pond. 1040	Blast Hole Cuttings	1018	#N/A	0.037	#N/A	#N/A	#N/A	#N/A	0.04
734	1032	Pond Zone	Pond. 1040	Blast Hole Cuttings	1032	#N/A	0.066	#N/A	#N/A	#N/A	#N/A	1.45
735	1035	Pond Zone	Pond. 1040	Blast Hole Cuttings	1035	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.41
736	1038	Pond Zone	Pond. 1040	Blast Hole Cuttings	1038	#N/A	0.044	#N/A	#N/A	#N/A	#N/A	0.53
737	1053	Pond Zone	Pond. 1040	Blast Hole Cuttings	1053	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.26
738	1056	Pond Zone	Pond. 1040	Blast Hole Cuttings	1056	#N/A	0.037	#N/A	#N/A	#N/A	#N/A	0.18
739	1059	Pond Zone	Pond. 1040	Blast Hole Cuttings	1059	#N/A	0.06	#N/A	#N/A	#N/A	#N/A	0.32
740	1077	Pond Zone	Pond. 1040	Blast Hole Cuttings	1077	#N/A	0.345	#N/A	#N/A	#N/A	#N/A	0.26
741	1080	Pond Zone	Pond. 1040	Blast Hole Cuttings	1080	#N/A	0.066	#N/A	#N/A	#N/A	#N/A	0.35
742	1083	Pond Zone	Pond. 1040	Blast Hole Cuttings	1083	#N/A	0.153	#N/A	#N/A	#N/A	#N/A	0.49
743	1101	Pond Zone	Pond. 1040	Blast Hole Cuttings	1101	#N/A	0.03	#N/A	#N/A	#N/A	#N/A	0.24
744	1108	Pond Zone	Pond. 1040	Blast Hole Cuttings	1108	#N/A	0.198	#N/A	#N/A	#N/A	#N/A	0.19
745	1111	Pond Zone	Pond. 1040	Blast Hole Cuttings	1111	#N/A	0.379	#N/A	#N/A	#N/A	#N/A	0.30
746	1123	Pond Zone	Pond. 1040	Blast Hole Cuttings	1123	#N/A	0.294	#N/A	#N/A	#N/A	#N/A	0.22
747	1126	Pond Zone	Pond. 1040	Blast Hole Cuttings	1126	#N/A	0.343	#N/A	#N/A	#N/A	#N/A	0.30
748	1129	Pond Zone	Pond. 1040	Blast Hole Cuttings	1129	#N/A	0.08	#N/A	#N/A	#N/A	#N/A	0.36
749	1141	Pond Zone	Pond. 1040	Blast Hole Cuttings	1141	#N/A	0.065	#N/A	#N/A	#N/A	#N/A	0.15
750	1144	Pond Zone	Pond. 1040	Blast Hole Cuttings	1144	#N/A	0.294	#N/A	#N/A	#N/A	#N/A	0.22
751	1158	Pond Zone	Pond. 1040	Blast Hole Cuttings	1158	#N/A	0.467	#N/A	#N/A	#N/A	#N/A	0.26
752	2002	Pond Zone	Pond. 1040	Blast Hole Cuttings	2002	#N/A	0.682	#N/A	#N/A	#N/A	#N/A	0.19
753	2006	Pond Zone	Pond. 1040	Blast Hole Cuttings	2006	#N/A	1.39	#N/A	#N/A	#N/A	#N/A	0.21
754	2016	Pond Zone	Pond. 1040	Blast Hole Cuttings	2016	#N/A	0.46	#N/A	#N/A	#N/A	#N/A	0.28
755	2031	Pond Zone	Pond. 1040	Blast Hole Cuttings	2031	#N/A	0.094	#N/A	#N/A	#N/A	#N/A	0.60
756	2040	Pond Zone	Pond. 1040	Blast Hole Cuttings	2040	#N/A	0.511	#N/A	#N/A	#N/A	#N/A	0.08
757	2042	Pond Zone	Pond. 1040	Blast Hole Cuttings	2042	#N/A	0.87	#N/A	#N/A	#N/A	#N/A	0.26
758	2061	Pond Zone	Pond. 1040	Blast Hole Cuttings	2061	#N/A	1.43	#N/A	#N/A	#N/A	#N/A	0.89
759	2104	Pond Zone	Pond. 1040	Blast Hole Cuttings	2104	#N/A	2.39	#N/A	#N/A	#N/A	#N/A	0.36
760	2111	Pond Zone	Pond. 1040	Blast Hole Cuttings	2111	#N/A	0.8	#N/A	#N/A	#N/A	#N/A	0.22
761	2113	Pond Zone	Pond. 1040	Blast Hole Cuttings	2113	#N/A	0.301	#N/A	#N/A	#N/A	#N/A	0.17
762	2123	Pond Zone	Pond. 1040	Blast Hole Cuttings	2123	#N/A	0.282	#N/A	#N/A	#N/A	#N/A	0.09
763	2019	Pond Zone	Pond. 1040	Blast Hole Cuttings	2019	#N/A	0.176	#N/A	#N/A	#N/A	#N/A	0.03
764	2045	Pond Zone	Pond. 1040	Blast Hole Cuttings	2045	#N/A	0.09	#N/A	#N/A	#N/A	#N/A	0.03
765	2073	Pond Zone	Pond. 1040	Blast Hole Cuttings	2073	#N/A	0.084	#N/A	#N/A	#N/A	#N/A	0.01
766	2076	Pond Zone	Pond. 1040	Blast Hole Cuttings	2076	#N/A	0.309	#N/A	#N/A	#N/A	#N/A	0.37

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
684	6511	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
685	6516	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
686	6570	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
687	6580	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
688	Z10006	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
689	Z10009	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
690	Z10019	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
691	Z10042	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
692	Z10045	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
693	5212	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
694	7283	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
695	5092	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
696	5203	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
697	5267	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
698	5246	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
699	7273	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
700	7315	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
701	7263	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
702	7202	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
703	7297	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
704	7319	31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
705	7182	58	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
706	7001	27	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
707	11019	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
708	11024	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
709	11035	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
710	11043	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
711	11057	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
712	11255	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
713	11314	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
714	11443	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
715	11512	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
716	11608	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
717	11216	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
718	11222	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
719	11211	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
720	11325	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
721	11405	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
722	11809	53	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
723	P1060-01	145	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
724	P1070-01	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
725	P1070-01	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
726	P1070-01	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
727	P1070-02	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
728	P1080-01	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
729	P1080-01	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
730	1104	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
731	1062	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
732	1086	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
733	1018	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
734	1032	121	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
735	1035	34	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
736	1038	44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
737	1053	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
738	1056	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
739	1059	27	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
740	1077	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
741	1080	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
742	1083	40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
743	1101	20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
744	1108	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
745	1111	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
746	1123	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
747	1126	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
748	1129	30	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
749	1141	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
750	1144	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
751	1158	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
752	2002	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
753	2006	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
754	2016	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
755	2031	50	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
756	2040	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
757	2042	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
758	2061	75	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
759	2104	30	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
760	2111	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
761	2113	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
762	2123	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
763	2019	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
764	2045	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
765	2073	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
766	2076	31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
767	5102	Pond Zone	Pond. 1040	Blast Hole Cuttings	5102	#N/A	0.731	#N/A	#N/A	#N/A	#N/A	1.27
768	5105	Pond Zone	Pond. 1040	Blast Hole Cuttings	5105	#N/A	1.14	#N/A	#N/A	#N/A	#N/A	1.03
769	5108	Pond Zone	Pond. 1040	Blast Hole Cuttings	5108	#N/A	1.52	#N/A	#N/A	#N/A	#N/A	0.54
770	5111	Pond Zone	Pond. 1040	Blast Hole Cuttings	5111	#N/A	2.41	#N/A	#N/A	#N/A	#N/A	0.98
771	5114	Pond Zone	Pond. 1040	Blast Hole Cuttings	5114	#N/A	1.88	#N/A	#N/A	#N/A	#N/A	0.11
772	5117	Pond Zone	Pond. 1040	Blast Hole Cuttings	5117	#N/A	0.221	#N/A	#N/A	#N/A	#N/A	0.05
773	5305	Pond Zone	Pond. 1040	Blast Hole Cuttings	5305	#N/A	2.34	#N/A	#N/A	#N/A	#N/A	0.26
774	5308	Pond Zone	Pond. 1040	Blast Hole Cuttings	5308	#N/A	2.58	#N/A	#N/A	#N/A	#N/A	0.29
775	5311	Pond Zone	Pond. 1040	Blast Hole Cuttings	5311	#N/A	2.48	#N/A	#N/A	#N/A	#N/A	0.08
776	5314	Pond Zone	Pond. 1040	Blast Hole Cuttings	5314	#N/A	0.797	#N/A	#N/A	#N/A	#N/A	0.11
777	5317	Pond Zone	Pond. 1040	Blast Hole Cuttings	5317	#N/A	0.647	#N/A	#N/A	#N/A	#N/A	0.22
778	1005	Pond Zone	Pond. 1050	Blast Hole Cuttings	1005	#N/A	0.115	#N/A	#N/A	#N/A	#N/A	0.17
779	1016	Pond Zone	Pond. 1050	Blast Hole Cuttings	1016	#N/A	0.023	#N/A	#N/A	#N/A	#N/A	0.17
780	1029	Pond Zone	Pond. 1050	Blast Hole Cuttings	1029	#N/A	0.14	#N/A	#N/A	#N/A	#N/A	0.16
781	1032	Pond Zone	Pond. 1050	Blast Hole Cuttings	1032	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.16
782	1035	Pond Zone	Pond. 1050	Blast Hole Cuttings	1035	#N/A	0.316	#N/A	#N/A	#N/A	#N/A	0.58
783	1038	Pond Zone	Pond. 1050	Blast Hole Cuttings	1038	#N/A	0.093	#N/A	#N/A	#N/A	#N/A	0.66
784	1057	Pond Zone	Pond. 1050	Blast Hole Cuttings	1057	#N/A	0.039	#N/A	#N/A	#N/A	#N/A	0.16
785	1060	Pond Zone	Pond. 1050	Blast Hole Cuttings	1060	#N/A	0.182	#N/A	#N/A	#N/A	#N/A	0.16
786	1063	Pond Zone	Pond. 1050	Blast Hole Cuttings	1063	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.52
787	1066	Pond Zone	Pond. 1050	Blast Hole Cuttings	1066	#N/A	0.053	#N/A	#N/A	#N/A	#N/A	0.19
788	1069	Pond Zone	Pond. 1050	Blast Hole Cuttings	1069	#N/A	0.264	#N/A	#N/A	#N/A	#N/A	0.17
789	1073	Pond Zone	Pond. 1050	Blast Hole Cuttings	1073	#N/A	0.062	#N/A	#N/A	#N/A	#N/A	0.18
790	1096	Pond Zone	Pond. 1050	Blast Hole Cuttings	1096	#N/A	0.082	#N/A	#N/A	#N/A	#N/A	0.18
791	1099	Pond Zone	Pond. 1050	Blast Hole Cuttings	1099	#N/A	0.197	#N/A	#N/A	#N/A	#N/A	0.35
792	1103	Pond Zone	Pond. 1050	Blast Hole Cuttings	1103	#N/A	0.069	#N/A	#N/A	#N/A	#N/A	0.17
793	1106	Pond Zone	Pond. 1050	Blast Hole Cuttings	1106	#N/A	1.2	#N/A	#N/A	#N/A	#N/A	0.16
794	1110	Pond Zone	Pond. 1050	Blast Hole Cuttings	1110	#N/A	2.95	#N/A	#N/A	#N/A	#N/A	0.30
795	1113	Pond Zone	Pond. 1050	Blast Hole Cuttings	1113	#N/A	0.184	#N/A	#N/A	#N/A	#N/A	0.16
796	1134	Pond Zone	Pond. 1050	Blast Hole Cuttings	1134	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.14
797	1139	Pond Zone	Pond. 1050	Blast Hole Cuttings	1139	#N/A	0.193	#N/A	#N/A	#N/A	#N/A	0.21
798	1142	Pond Zone	Pond. 1050	Blast Hole Cuttings	1142	#N/A	2.96	#N/A	#N/A	#N/A	#N/A	0.35
799	1145	Pond Zone	Pond. 1050	Blast Hole Cuttings	1145	#N/A	0.608	#N/A	#N/A	#N/A	#N/A	0.21
800	1149	Pond Zone	Pond. 1050	Blast Hole Cuttings	1149	#N/A	0.207	#N/A	#N/A	#N/A	#N/A	0.65
801	1152	Pond Zone	Pond. 1050	Blast Hole Cuttings	1152	#N/A	0.082	#N/A	#N/A	#N/A	#N/A	0.16
802	1502	Pond Zone	Pond. 1050	Blast Hole Cuttings	1502	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	0.21
803	2037	Pond Zone	Pond. 1050	Blast Hole Cuttings	2037	#N/A	1.13	#N/A	#N/A	#N/A	#N/A	0.31
804	2040	Pond Zone	Pond. 1050	Blast Hole Cuttings	2040	#N/A	1.27	#N/A	#N/A	#N/A	#N/A	0.12
805	2112	Pond Zone	Pond. 1050	Blast Hole Cuttings	2112	#N/A	3.81	#N/A	#N/A	#N/A	#N/A	1.47
806	2118	Pond Zone	Pond. 1050	Blast Hole Cuttings	2118	#N/A	2.38	#N/A	#N/A	#N/A	#N/A	1.33
807	2122	Pond Zone	Pond. 1050	Blast Hole Cuttings	2122	#N/A	2.34	#N/A	#N/A	#N/A	#N/A	2.12
808	2115	Pond Zone	Pond. 1050	Blast Hole Cuttings	2115	#N/A	1.9	#N/A	#N/A	#N/A	#N/A	6.33
809	2125	Pond Zone	Pond. 1050	Blast Hole Cuttings	2125	#N/A	1.21	#N/A	#N/A	#N/A	#N/A	0.44
810	2104	Pond Zone	Pond. 1050	Blast Hole Cuttings	2104	#N/A	0.425	#N/A	#N/A	#N/A	#N/A	6.88
811	2025	Pond Zone	Pond. 1050	Blast Hole Cuttings	2025	#N/A	0.523	#N/A	#N/A	#N/A	#N/A	0.04
812	2028	Pond Zone	Pond. 1050	Blast Hole Cuttings	2028	#N/A	0.087	#N/A	#N/A	#N/A	#N/A	0.02
813	2030	Pond Zone	Pond. 1050	Blast Hole Cuttings	2030	#N/A	0.177	#N/A	#N/A	#N/A	#N/A	0.15
814	2052	Pond Zone	Pond. 1050	Blast Hole Cuttings	2052	#N/A	0.292	#N/A	#N/A	#N/A	#N/A	0.02
815	2054	Pond Zone	Pond. 1050	Blast Hole Cuttings	2054	#N/A	0.049	#N/A	#N/A	#N/A	#N/A	0.02
816	2056	Pond Zone	Pond. 1050	Blast Hole Cuttings	2056	#N/A	0.035	#N/A	#N/A	#N/A	#N/A	1.04
817	2078	Pond Zone	Pond. 1050	Blast Hole Cuttings	2078	#N/A	0.18	#N/A	#N/A	#N/A	#N/A	0.04
818	2081	Pond Zone	Pond. 1050	Blast Hole Cuttings	2081	#N/A	0.046	#N/A	#N/A	#N/A	#N/A	0.35
819	2094	Pond Zone	Pond. 1050	Blast Hole Cuttings	2094	#N/A	0.072	#N/A	#N/A	#N/A	#N/A	0.51
820	2099	Pond Zone	Pond. 1050	Blast Hole Cuttings	2099	#N/A	0.563	#N/A	#N/A	#N/A	#N/A	0.61
821	2043	Pond Zone	Pond. 1050	Blast Hole Cuttings	2043	#N/A	2.81	#N/A	#N/A	#N/A	#N/A	0.12
822	2046	Pond Zone	Pond. 1050	Blast Hole Cuttings	2046	#N/A	1.41	#N/A	#N/A	#N/A	#N/A	0.15
823	2129	Pond Zone	Pond. 1050	Blast Hole Cuttings	2129	#N/A	1.62	#N/A	#N/A	#N/A	#N/A	0.13
824	2134	Pond Zone	Pond. 1050	Blast Hole Cuttings	2134	#N/A	1.57	#N/A	#N/A	#N/A	#N/A	0.68
825	2139	Pond Zone	Pond. 1050	Blast Hole Cuttings	2139	#N/A	2.2	#N/A	#N/A	#N/A	#N/A	0.08
826	2144	Pond Zone	Pond. 1050	Blast Hole Cuttings	2144	#N/A	0.181	#N/A	#N/A	#N/A	#N/A	0.23
827	P3025	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3025	#N/A	0.027	#N/A	#N/A	#N/A	#N/A	0.07
828	P3034	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3034	#N/A	0.016	#N/A	#N/A	#N/A	#N/A	0.04
829	P3043	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3043	#N/A	0.022	#N/A	#N/A	#N/A	#N/A	0.01
830	P3052	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3052	#N/A	0.547	#N/A	#N/A	#N/A	#N/A	0.02
831	P3061	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3061	#N/A	0.255	#N/A	#N/A	#N/A	#N/A	0.01
832	P3070	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3070	#N/A	0.017	#N/A	#N/A	#N/A	#N/A	0.11
833	P3076	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3076	#N/A	0.02	#N/A	#N/A	#N/A	#N/A	0.01
834	P3082	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3082	#N/A	0.073	#N/A	#N/A	#N/A	#N/A	0.01
835	P3088	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3088	#N/A	0.18	#N/A	#N/A	#N/A	#N/A	0.03
836	P3095	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3095	#N/A	0.017	#N/A	#N/A	#N/A	#N/A	0.02
837	P3099	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3099	#N/A	0.308	#N/A	#N/A	#N/A	#N/A	0.01
838	P3105	Pond Zone	Pond. 1050	Blast Hole Cuttings	P3105	#N/A	0.079	#N/A	#N/A	#N/A	#N/A	0.01
839	5134	Pond Zone	Pond. 1050	Blast Hole Cuttings	5134	#N/A	1.56	#N/A	#N/A	#N/A	#N/A	0.87
840	5146	Pond Zone	Pond. 1050	Blast Hole Cuttings	5146	#N/A	1.48	#N/A	#N/A	#N/A	#N/A	0.26
841	5158	Pond Zone	Pond. 1050	Blast Hole Cuttings	5158	#N/A	1.23	#N/A	#N/A	#N/A	#N/A	0.28
842	5167	Pond Zone	Pond. 1050	Blast Hole Cuttings	5167	#N/A	1.85	#N/A	#N/A	#N/A	#N/A	0.19

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
767	5102	106	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
768	5105	86	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
769	5108	45	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
770	5111	81	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
771	5114	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
772	5117	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
773	5305	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
774	5308	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
775	5311	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
776	5314	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
777	5317	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
778	1005	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
779	1016	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
780	1029	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
781	1032	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
782	1035	48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
783	1038	55	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
784	1057	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
785	1060	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
786	1063	44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
787	1066	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
788	1069	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
789	1073	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
790	1096	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
791	1099	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
792	1103	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
793	1106	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
794	1110	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
795	1113	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
796	1134	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
797	1139	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
798	1142	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
799	1145	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
800	1149	54	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
801	1152	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
802	1502	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
803	2037	25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
804	2040	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
805	2112	123	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
806	2118	111	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
807	2122	177	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
808	2115	528	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
809	2125	37	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
810	2104	573	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
811	2025	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
812	2028	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
813	2030	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
814	2052	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
815	2054	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
816	2056	87	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
817	2078	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
818	2081	29	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
819	2094	42	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
820	2099	51	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
821	2043	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
822	2046	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
823	2129	11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
824	2134	57	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
825	2139	7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
826	2144	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
827	P3025	6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
828	P3034	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
829	P3043	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
830	P3052	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
831	P3061	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
832	P3070	9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
833	P3076	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
834	P3082	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
835	P3088	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
836	P3095	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
837	P3099	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
838	P3105	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
839	5134	73	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
840	5146	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
841	5158	23	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
842	5167	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Index	Sample ID	Source	Location	Sample Type	Sample ID	Rock Type	Total S	Sulphate S	Paste pH	Rinse pH	Total Carbonate	Total C
											%C	%C
843	5219	Pond Zone	Pond. 1050	Blast Hole Cuttings	5219	#N/A	1.99	#N/A	#N/A	#N/A	#N/A	2.22
844	5223	Pond Zone	Pond. 1050	Blast Hole Cuttings	5223	#N/A	2.98	#N/A	#N/A	#N/A	#N/A	0.38
845	5227	Pond Zone	Pond. 1050	Blast Hole Cuttings	5227	#N/A	2.08	#N/A	#N/A	#N/A	#N/A	0.26
846	5233	Pond Zone	Pond. 1050	Blast Hole Cuttings	5233	#N/A	0.401	#N/A	#N/A	#N/A	#N/A	0.18
847	5223	Pond Zone	Pond. 1050	Blast Hole Cuttings	5223	#N/A	2.98	#N/A	#N/A	#N/A	#N/A	0.38
848	5227	Pond Zone	Pond. 1050	Blast Hole Cuttings	5227	#N/A	2.08	#N/A	#N/A	#N/A	#N/A	0.26
849	5233	Pond Zone	Pond. 1050	Blast Hole Cuttings	5233	#N/A	0.401	#N/A	#N/A	#N/A	#N/A	0.18
850	5103	Pond Zone	Pond. 1050	Blast Hole Cuttings	5103	#N/A	0.505	#N/A	#N/A	#N/A	#N/A	0.06
851	5112	Pond Zone	Pond. 1050	Blast Hole Cuttings	5112	#N/A	0.214	#N/A	#N/A	#N/A	#N/A	0.06
852	5120	Pond Zone	Pond. 1050	Blast Hole Cuttings	5120	#N/A	0.281	#N/A	#N/A	#N/A	#N/A	0.07
853	5208	Pond Zone	Pond. 1050	Blast Hole Cuttings	5208	#N/A	0.304	#N/A	#N/A	#N/A	#N/A	0.06
854	5212	Pond Zone	Pond. 1050	Blast Hole Cuttings	5212	#N/A	0.111	#N/A	#N/A	#N/A	#N/A	0.06
855	5216	Pond Zone	Pond. 1050	Blast Hole Cuttings	5216	#N/A	0.324	#N/A	#N/A	#N/A	#N/A	1.56
856	P1060-1009	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1009	#N/A	0.043	#N/A	#N/A	#N/A	#N/A	0.05
857	P1060-1020	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1020	#N/A	0.34	#N/A	#N/A	#N/A	#N/A	0.03
858	P1060-1034	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1034	#N/A	0.114	#N/A	#N/A	#N/A	#N/A	0.01
859	P1060-1131	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1131	#N/A	0.039	#N/A	#N/A	#N/A	#N/A	0.00
860	P1060-1176	Pond Zone	Pond. 1060	Blast Hole Cuttings	P1060-1176	#N/A	0.058	#N/A	#N/A	#N/A	#N/A	0.16
861	P2010	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2010	#N/A	0.163	#N/A	#N/A	#N/A	#N/A	0.12
862	P2013	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2013	#N/A	0.011	#N/A	#N/A	#N/A	#N/A	0.02
863	P2016	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2016	#N/A	0.011	#N/A	#N/A	#N/A	#N/A	0.03
864	P2019	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2019	#N/A	0.117	#N/A	#N/A	#N/A	#N/A	0.03
865	P2022	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2022	#N/A	0.161	#N/A	#N/A	#N/A	#N/A	0.05
866	P2025	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2025	#N/A	0.58	#N/A	#N/A	#N/A	#N/A	0.28
867	P2028	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2028	#N/A	0.255	#N/A	#N/A	#N/A	#N/A	0.06
868	P2031	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2031	#N/A	0.136	#N/A	#N/A	#N/A	#N/A	0.05
869	P2034	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2034	#N/A	0.148	#N/A	#N/A	#N/A	#N/A	0.02
870	P2037	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2037	#N/A	0.199	#N/A	#N/A	#N/A	#N/A	0.04
871	P2074	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2074	#N/A	0.012	#N/A	#N/A	#N/A	#N/A	0.05
872	P2076	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2076	#N/A	0.055	#N/A	#N/A	#N/A	#N/A	0.06
873	P2078	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2078	#N/A	0.065	#N/A	#N/A	#N/A	#N/A	0.06
874	P2080	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2080	#N/A	0.552	#N/A	#N/A	#N/A	#N/A	0.04
875	P2082	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2082	#N/A	0.179	#N/A	#N/A	#N/A	#N/A	0.04
876	P2086	Pond Zone	Pond. 1060	Blast Hole Cuttings	P2086	#N/A	0.425	#N/A	#N/A	#N/A	#N/A	0.03
877	3008	Pond Zone	Pond. 1060	Blast Hole Cuttings	3008	#N/A	0.291	#N/A	#N/A	#N/A	#N/A	0.12
878	3017	Pond Zone	Pond. 1060	Blast Hole Cuttings	3017	#N/A	0.659	#N/A	#N/A	#N/A	#N/A	0.64
879	3026	Pond Zone	Pond. 1060	Blast Hole Cuttings	3026	#N/A	1.44	#N/A	#N/A	#N/A	#N/A	0.50
880	3035	Pond Zone	Pond. 1060	Blast Hole Cuttings	3035	#N/A	1.6	#N/A	#N/A	#N/A	#N/A	0.18
881	3044	Pond Zone	Pond. 1060	Blast Hole Cuttings	3044	#N/A	0.408	#N/A	#N/A	#N/A	#N/A	0.16
882	3071	Pond Zone	Pond. 1060	Blast Hole Cuttings	3071	#N/A	0.273	#N/A	#N/A	#N/A	#N/A	0.12
883	3075	Pond Zone	Pond. 1060	Blast Hole Cuttings	3075	#N/A	0.14	#N/A	#N/A	#N/A	#N/A	0.57
884	3078	Pond Zone	Pond. 1060	Blast Hole Cuttings	3078	#N/A	1.19	#N/A	#N/A	#N/A	#N/A	1.86
885	3082	Pond Zone	Pond. 1060	Blast Hole Cuttings	3082	#N/A	0.539	#N/A	#N/A	#N/A	#N/A	0.15
886	3087	Pond Zone	Pond. 1060	Blast Hole Cuttings	3087	#N/A	0.834	#N/A	#N/A	#N/A	#N/A	0.19
887	3092	Pond Zone	Pond. 1060	Blast Hole Cuttings	3092	#N/A	0.202	#N/A	#N/A	#N/A	#N/A	0.12
888	5005	Pond Zone	Pond. 1060	Blast Hole Cuttings	5005	#N/A	0.734	#N/A	#N/A	#N/A	#N/A	0.23
889	5011	Pond Zone	Pond. 1060	Blast Hole Cuttings	5011	#N/A	1.74	#N/A	#N/A	#N/A	#N/A	0.20
890	5020	Pond Zone	Pond. 1060	Blast Hole Cuttings	5020	#N/A	3.45	#N/A	#N/A	#N/A	#N/A	0.34
891	5052	Pond Zone	Pond. 1060	Blast Hole Cuttings	5052	#N/A	0.471	#N/A	#N/A	#N/A	#N/A	0.17
892	5058	Pond Zone	Pond. 1060	Blast Hole Cuttings	5058	#N/A	2.86	#N/A	#N/A	#N/A	#N/A	0.20
893	5060	Pond Zone	Pond. 1060	Blast Hole Cuttings	5060	#N/A	1	#N/A	#N/A	#N/A	#N/A	0.19
894	5068	Pond Zone	Pond. 1060	Blast Hole Cuttings	5068	#N/A	0.192	#N/A	#N/A	#N/A	#N/A	0.29
895	5070	Pond Zone	Pond. 1060	Blast Hole Cuttings	5070	#N/A	0.246	#N/A	#N/A	#N/A	#N/A	0.22
896	5078	Pond Zone	Pond. 1060	Blast Hole Cuttings	5078	#N/A	0.96	#N/A	#N/A	#N/A	#N/A	0.25

Index	Sample ID	NP	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Non- Sulphide Cu	Fe	Hg	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sr	Ti	V	W	Zn
			ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	ppb	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm
843	5219	185	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
844	5223	32	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
845	5227	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
846	5233	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
847	5223	32	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
848	5227	22	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
849	5233	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
850	5103	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
851	5112	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
852	5120	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
853	5208	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
854	5212	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
855	5216	130	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
856	P1060-1009	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
857	P1060-1020	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
858	P1060-1034	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
859	P1060-1131	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
860	P1060-1176	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
861	P2010	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
862	P2013	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
863	P2016	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
864	P2019	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
865	P2022	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
866	P2025	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
867	P2028	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
868	P2031	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
869	P2034	2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
870	P2037	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
871	P2074	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
872	P2076	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
873	P2078	5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
874	P2080	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
875	P2082	4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
876	P2086	3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
877	3008	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
878	3017	54	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
879	3026	42	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
880	3035	15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
881	3044	13	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
882	3071	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
883	3075	48	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
884	3078	155	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
885	3082	12	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
886	3087	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
887	3092	10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
888	5005	19	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
889	5011	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
890	5020	28	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
891	5052	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
892	5058	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
893	5060	16	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
894	5068	24	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
895	5070	18	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
896	5078	21	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Appendix D – Evaluation of Delay to Onset of Acidification

SRK Consulting
Engineers and Scientists

SRK Consulting (Canada) Inc.
Suite 2200 – 1066 West Hastings Street
Vancouver, B.C. V6E 3X2
Canada

vancouver@srk.com
www.srk.com

Tel: 604.681.4196
Fax: 604.687.5532

Memo

To:	Ron Martel, Mount Polley	**Date:**	August 27, 2010
cc:		**From:**	Stephen Day
Subject:	Delay to Onset of Acidic Conditions for Springer Zone PAG Waste Rock DRAFT	**Project #:**	1CI008.000

1 Background

The proposed expansion of mining in Mount Polley Mine's Springer Pit will result in generation of PAG rock. A number of options are under consideration for management of this rock one of which would involve placement in a temporary stockpile prior to re-handling and permanent subaqueous disposal in the Springer Pit following completion of mining. It is important that the PAG waste rock is placed underwater before it becomes acidic so that ARD from the stockpile does not need to be managed, and the Springer Pit lake is not affected by acidic salts in the PAG waste rock as it becomes inundated.

This memorandum describes calculation of the delay to onset of acidic conditions for Springer Zone PAG waste rock.

2 Method

The delay to onset depends on two factors:

- The amount of acid neutralizing minerals; and
- The rate at which the acid neutralizing minerals are consumed.

The latter is dependent on the rate of acid generation from sulphide oxidation is proportional to the sulphide content. The ratio of consumption of acid neutralizing minerals compared to sulphate generation is also the critical NPR (NPR_{crit}).

These concepts can be brought together in the following equation:

$$t_{onset} = \frac{NPR_{rock}}{k.NPR_{crit}}$$

where k is the slope of the line (in $week^{-1}$) relating sulphide content (in mgS/kg) to oxidation rate (in mgS/kg/week).

3 Results

3.1 Calculation of NPR_{crit}

Site-specific values of NPR_{crit} have previously developed using humidity cell data. Earlier estimates were hampered by a lack of testing on samples oxidizing fast enough to indicate the effect of acid

generation. Figure 1 shows the average ratio of release of calcium and magnesium (reflecting carbonate dissolution) to sulphate release (reflecting sulphide oxidation) compared to sulphate release for each test. The pattern of decreasing ratio as oxidation rate increases reflects the increasing influence of acid generation on carbonate dissolution. At lower oxidation rates, carbonate dissolution occurs by simple dissolution due to the high water volumes applied to humidity cells. The theoretical range of ratios is 1 to 2 which the trend approaches and is crossed for the Springer Zone sample with the highest oxidation rate.

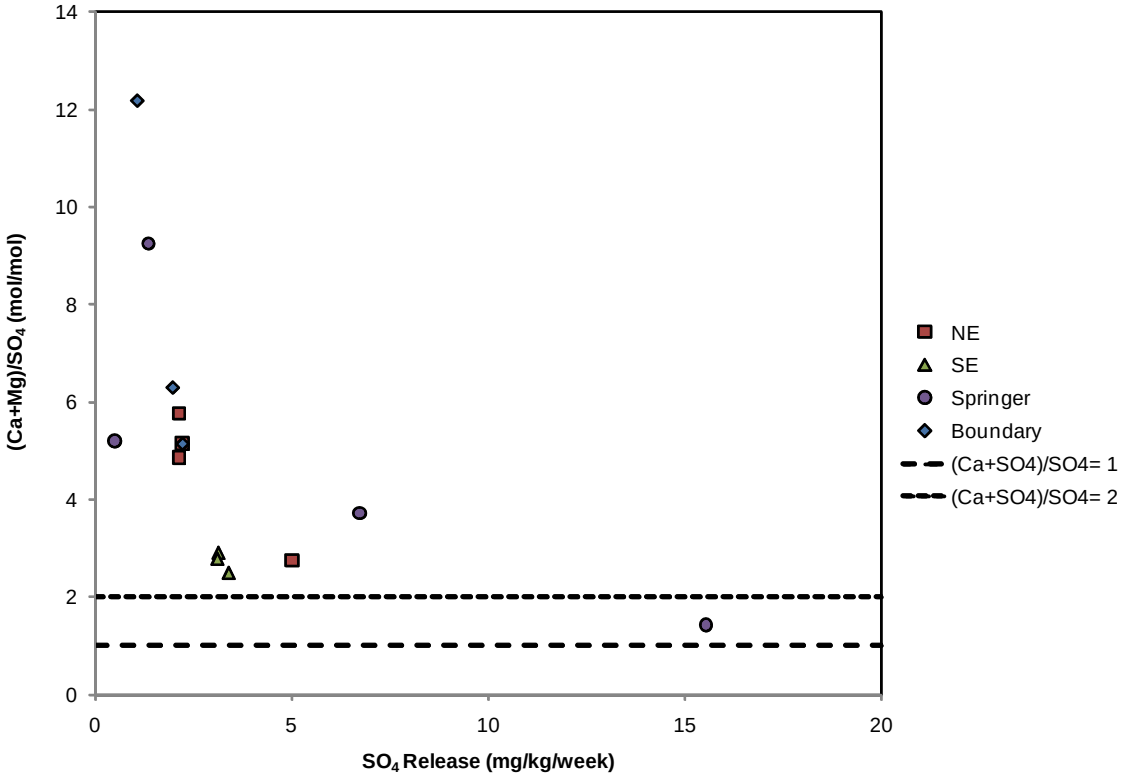


Figure 1. Estimation of NP_{crit} Values from Mount Polley Humidity Cells

This evaluation supports the permit-specified value of NPR_{crit} of 2 which is the upper end of the theoretical range. This value was adopted for subsequent calculations. Note that in the t_{onset} calculation, higher values of NPR_{crit} result in more rapid onset due to higher relative rates of NP consumption.

3.2 Calculation of k

The value of k is estimated from the average rates of sulphide oxidation indicated by the humidity cells compared to sulphide content (Figure 2). Overall data from Mount Polley show a strong positive correlation (r=0.85). The regression equation for the best fit is:

$$R_{SO_4} = 0.00016 \cdot S + 0.16$$

The intercept is non-negative but the 95% confidence limit for the intercept includes 0 mg/kg/week indicating the expected condition that when sulphur content is zero, the rate is also zero. The additional dashed lines indicate the 95% confidence limits on the regression slope of 0.00016 $week^{-1}$ which is 0.000096 to 0.00023 $week^{-1}$.

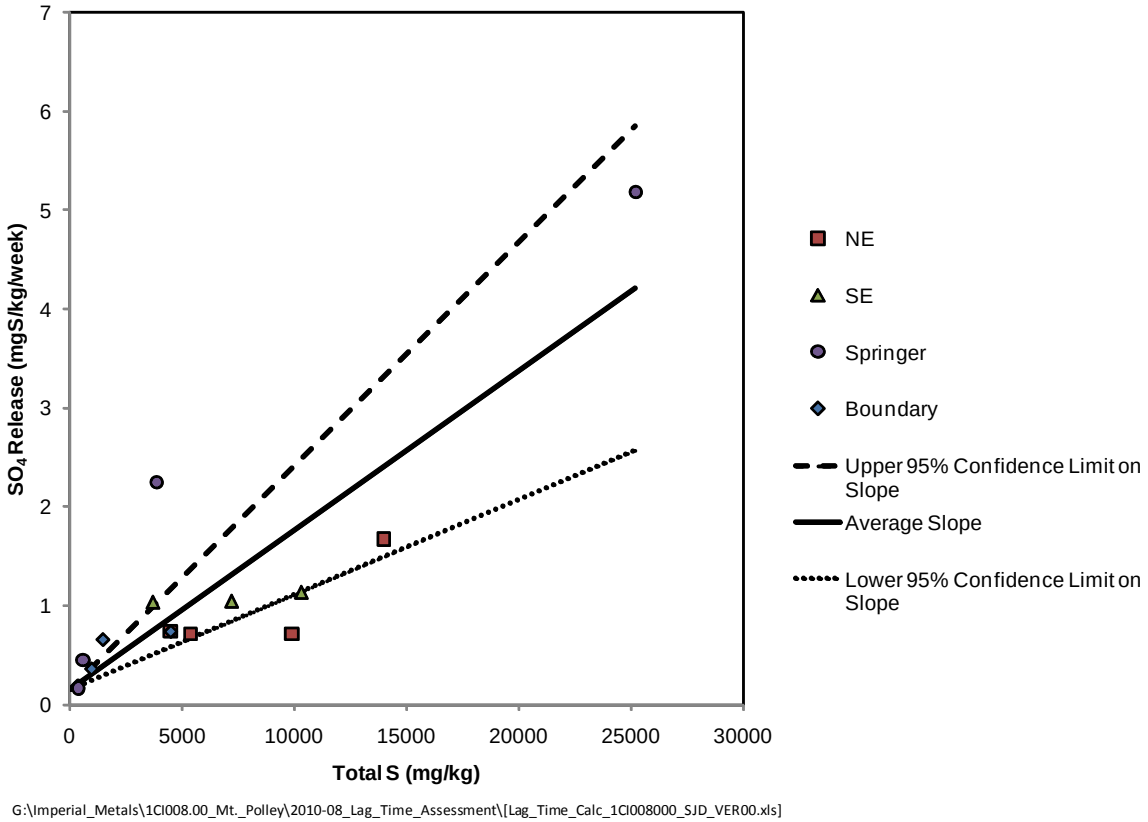
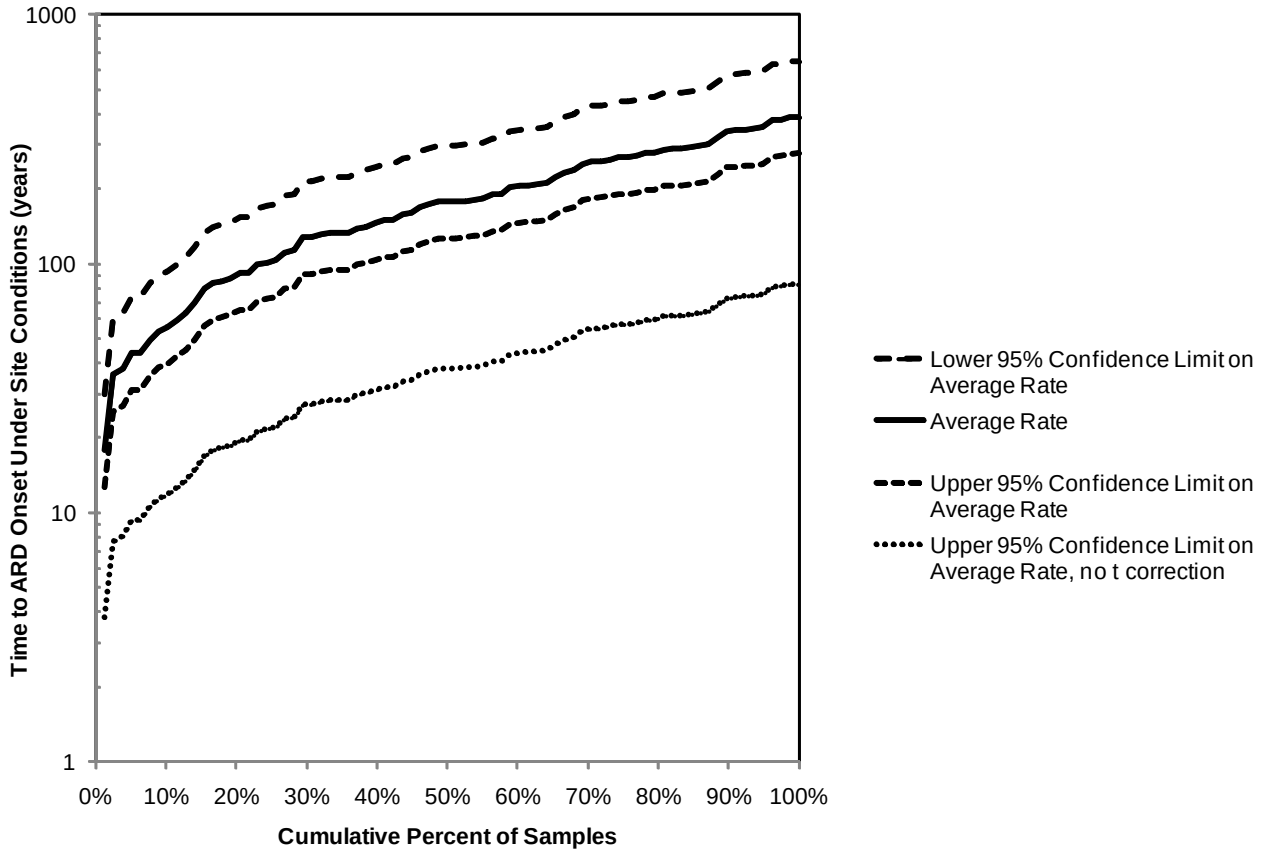


Figure 2. Sulphur Content Compared to Oxidation Rate.

4 Calculation of t_{onset}

The range of NPR indicated by blast hole and drill hole samples in the Springer Pit was used to estimate the distribution of t_{onset} for PAG waste (Figure 3). The calculation is based on an NPR_{crit} value of 3, the range of k values indicated above and a temperature correction of 0.3 to reflect slow reaction rates under cooler site conditions. For reference, the distribution at room temperature with the highest value is also shown. This line indicates the delay to onset for humidity cell tests.



G:\Imperial_Metals\1CI008.00_Mt._Polley\2010-08_Lag_Time_Assessment\[Lag_Time_Calc_1CI008000_SJD_VER00.xls]

Figure 3. Distribution of t_{onset} for PAG Waste Rock in Springer Pit

The distribution for faster-reacting components represented by the lower dashed line indicates that about 2% of the rock might become acidic in 20 years, and 10% after 40 years. The majority of the rock with higher NPR might take over 100 years to become acidic. A number of factors complicate the actual estimate for higher NPR materials. Increasing acidification along with heating would result in accelerated oxidation and NP depletion though decreasing oxidation rates due to sulphide depletion and formation of secondary mineral coatings would result in lower oxidation rates and greater time to onset of acidic conditions.

5 Conclusion

This calculation indicates that PAG rock placed in stockpiles for a few years is not likely to become significantly acidic due to buffering provided by carbonate minerals.

Appendix E – Waste Rock Seepage Chemistry Database

Location Type	Sample Point	Original Date As Is	Recoded Date	Location	Source Term Group	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Q (m3/s)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Alkalinity (CaCO3) (mg/L)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Total Nitrogen (mg/L)
							µs/cm	su	m3/s	C	ntu	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	Boundary Dump Seep 1	4/6/2013	4/6/2013	Boundary	Boundary	Wet spot at dump toe. Full suite sample taken at puddle ~3m d/s. Shallow, leaf littler, may be TSS in sample.	352	7.1	0	7.9	#N/A	320	161	7.46	211	16.3	2.28	57.7	0.0195	-0.5	0.045	0.286	0.286	-0.001	0.0211	0.038	0.15	99	1.1
Bi-annual Seep Sampling	Boundary Dump Seep 2	4/6/2013	4/6/2013	Boundary	Boundary	Full suite sample taken at puddle where flowing out of sump. Maybe some alage in samples. Addditional pooling at dump toe near seep.	1020	7.9	0.003	2	#N/A	998	526	7.9	728	-3	0.54	142	0.0168	-5	0.3	0.877	0.877	-0.01	0.0201	0.0283	0.0554	438	1.04
Bi-annual Seep Sampling	Boundary Dump Seep 2	10/12/2013	10/12/2013	Boundary	Boundary	Sample Taken	1358	7.498	#N/A	0.2	#N/A	1320	793	7.71	1090	-3	29.5	213	0.273	-5	0.26	0.112	0.112	-0.01	0.161	0.195	0.225	600	0.639
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2013 15:26	10/23/2013	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1330	812	7.8	999	-3	1.01	186	0.15	-5	-0.2	0.173	0.173	-0.01	0.0803	0.0908	0.202	642	0.591
Bi-annual Seep Sampling	Boundary Dump Seep 2	14-11-2013 10:35	11/14/2013	Boundary	Boundary	sample taken	1092	7.757	#N/A	1	1.2	1300	793	8.06	1050	-3	3.77	181	0.0959	-5	-0.2	0.118	0.131	0.013	0.0766	0.0889	0.15	609	0.468
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-01-2014 11:10	1/16/2014	Boundary	Boundary	Ash like substance flowting around, Sulfer smell, Sample taken	378	8.601	#N/A	0	108.9	1160	654	7.61	912	26.9	95.6	175	0.213	-5	-0.2	-0.05	-0.051	-0.01	0.162	0.256	2.03	513	2.55
Bi-annual Seep Sampling	Boundary Dump Seep 2	18-02-2014 10:11	2/18/2014	Boundary	Boundary	Broke threw ice and stirred it up a bit had to wait sample taken	1184	7.667	#N/A	0	3.84	1200	748	7.79	983	4.4	10.5	223	0.412	-5	-0.2	-0.05	-0.051	-0.01	0.183	0.172	0.247	521	0.681
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/7/2014	3/7/2014	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1310	809	8.06	1120	5.4	1.1	146	0.0288	-5	0.2	0.395	0.395	-0.01	0.0341	0.0401	0.048	659	0.618
Bi-annual Seep Sampling	Boundary Dump Seep 2	15-05-2014 9:15	5/15/2014	Boundary	Boundary	pH taken with pen	667	7.8	#N/A	3.6	#N/A	675	372	8.02	494	-3	0.27	107	0.0065	-0.5	0.145	0.985	0.987	0.0022	0.016	0.0198	0.021	244	1.13
Bi-annual Seep Sampling	Boundary Dump Seep 2	6/8/2014	6/8/2014	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1170	711	7.97	982	-3	0.27	148	0.0094	-5	0.28	0.539	0.539	-0.01	0.0252	0.0299	0.024	555	0.726
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-06-2014 11:53	6/16/2014	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1250	795	8.02	1010	-3	0.26	131	0.0177	-5	-0.2	0.677	0.677	-0.01	0.0249	0.0315	0.0366	612	0.848
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/9/2014	8/9/2014	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1260	715	7.91	968	5.4	0.81	176	0.0217	-5	0.29	0.323	0.323	-0.01	0.0314	0.0434	0.0514	589	0.515
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/12/2014	8/12/2014	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1300	746	8.11	1040	-3	0.4	142	0.096	-5	-0.2	0.35	0.35	-0.01	0.0616	0.0722	0.0831	630	0.563
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2014 9:42	10/23/2014	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1260	737	7.97	981	-3	0.28	178	0.0172	-5	-0.2	0.172	0.172	-0.01	0.0607	0.0679	0.0648	591	0.39
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/11/2014	11/11/2014	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1130	620	8.14	875	-3	0.29	168	0.0294	-5	-0.2	0.906	0.93	0.023	0.0422	0.0465	0.0476	502	1.04
Bi-annual Seep Sampling	Boundary Dump Seep 2	1/7/2015	1/7/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	974	556	7.83	703	61.7	8.53	183	0.0129	-1	0.155	-0.01	-0.01	-0.002	0.0247	0.0368	0.282	368	0.858
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/6/2015	2/6/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	936	483	8.36	682	5.9	1.47	181	0.0189	-1	0.123	0.181	0.184	0.0025	0.0181	0.0236	0.0522	325	0.411
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/9/2015	2/9/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	976	582	7.55	766	-3	0.92	207	0.0799	-2.5	0.14	0.094	0.094	-0.005	0.0908	0.084	0.119	351	0.443
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/2/2015	3/2/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	853	510	8.12	656	-3	0.2	167	0.0156	-1	0.148	0.473	0.473	-0.002	0.0386	0.0421	0.046	318	0.573
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/3/2015	3/3/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	916	514	7.95	725	-3	0.17	147	0.0055	-1	0.167	0.564	0.564	-0.002	0.0317	0.0374	0.0349	383	0.712
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/4/2015	7/4/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	908	511	7.97	663	-3	0.18	136	0.0078	-1	0.145	0.989	0.992	0.0028	0.0216	0.0257	0.0233	371	1.09
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/5/2015	7/5/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	784	435	8.32	582	-3	0.24	156	0.0057	-1	0.112	0.63	0.63	-0.002	0.0285	0.0323	0.0335	276	0.727
Bi-annual Seep Sampling	Boundary Dump Seep 2	29-10-2015 11:29	10/29/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1110	620	7.88	884	-3	4.24	200	0.229	-2.5	0.18	-0.025	-0.025	-0.005	0.167	0.181	0.261	456	0.554
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/8/2015	11/8/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1060	589	8.19	814	3.5	0.77	199	0.0926	-2.5	0.19	0.074	0.074	-0.005	0.0839	0.0923	0.129	412	0.417
Bi-annual Seep Sampling	Boundary Dump Seep 2	30-11-2015 11:50	11/30/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1170	707	7.57	903	26.6	6.87	200	0.125	-2.5	0.13	0.1	0.114	0.0139	0.081	0.0923	0.324	475	0.883
Bi-annual Seep Sampling	Boundary Dump Seep 2	12/1/2015	12/1/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	1060	632	7.93	815	-3	0.23	177	0.0498	2.5	0.15	0.349	0.357	0.0076	0.0456	0.0559	0.0626	441	0.53
Bi-annual Seep Sampling	Boundary Dump Seep 3	19-05-2015 13:49	5/19/2015	Boundary	Boundary		#N/A	#N/A	#N/A	#N/A	#N/A	748	413	8.28	570	5.7	0.57	179	0.0137	-0.5	0.1	0.359	0.361	0.0018	0.0198	0.0231	0.0423	223	0.578
Bi-annual Seep Sampling	East Dump Seep 1	9/5/2013	9/5/2013	Wight	Wight	Sample taken from pond collecting water from 2 seeps (combined outflow).	526	6.85	0.003	1.7	#N/A	971	514	7.2	784	-3	0.32	29.5	-0.005	-5	0.22	2.49	2.49	-0.01	-0.001	0.0058	0.0089	505	2.56
Bi-annual Seep Sampling	East Dump Seep 1	23-10-2014 14:15	10/23/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	995	549	7.86	814	-3	0.72	60.8	-0.005	-5	-0.2	0.169	0.169	-0.01	-0.001	0.0025	0.004	499	0.31
Bi-annual Seep Sampling	East Dump Seep 1	28-05-2015 10:46	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1070	572	8.04	863	4.1	0.46	56	-0.005	-2.5	-0.1	0.227	0.235	0.008	0.0016	0.0025	0.0095	519	0.388
Bi-annual Seep Sampling	East Dump Seep 1	26-11-2015 12:46	11/26/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1020	554	7.41	731	35.6	18.1	57	0.0051	-2.5	-0.1	0.32	0.32	-0.005	-0.001	0.0035	0.195	501	0.587
Bi-annual Seep Sampling	East Dump Seep 2	9/5/2013	9/5/2013	Wight	Wight	Still some snow - come back and sample. Full suite sample taken June 20th.	394	#N/A	0.002	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 2	20-06-2013 13:24	6/20/2013	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	842	430	7.41	646	-3	0.53	24.9	-0.005	-5	-0.2	1.76	1.76	-0.01	0.0045	0.0093	0.0117	431	1.79
Bi-annual Seep Sampling	East Dump Seep 3	9/5/2013	9/5/2013	Wight	Wight	Still some snow - come back and sample. Full suite sample taken June 20th.	519	#N/A	0.002	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 3	20-06-2013 13:36	6/20/2013	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	936	495	7.48	737	5.7	0.91	22.7	0.0072	-5	0.37	1.72	1.73	0.011	0.001	0.0058	0.0123	496	1.7
Bi-annual Seep Sampling	East Dump Seep 4	9/5/2013	9/5/2013	Wight	Wight	Still some snow - come back and sample. Full suite sample taken June 20th.	633	#N/A	0.005	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 4	20-06-2013 13:55	6/20/2013	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1280	732	7.59	1060	-3	0.22	33.6	-0.005	-5	-0.2	3.66	3.66	-0.01	0.0089	0.0128	0.0137	708	3.67
Bi-annual Seep Sampling	East Dump Seep 4	26-11-2015 13:16	11/26/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	884	465	7.83	658	6.4	1.27	60.8	-0.005	-2.5	-0.1	3.31	3.31	-0.005	-0.001	-0.002	0.0754	406	3.3
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/7/2013	2/7/2013	Wight	Wight	Full suite sample taken. Photo taken.	2010	8.1	0.2	2.6	#N/A	1860	1160	7.83	1700	-3	1.01	56.5	-0.005	-10	-0.4	15.3	15.3	-0.02	0.0033	0.0053	0.0064	1090	14.5
Bi-annual Seep Sampling	NEZ Dump Seep 1	10/12/2013	10/12/2013	Wight	Wight	Sample Taken	1799	8.03	#N/A	0.1	#N/A	1700	1040	7.86	1520	-3	0.29	78.3	-0.005	-10	0.5	7.16	7.16	-0.02	0.0067	0.0107	0.0115	1000	6.77
Bi-annual Seep Sampling	NEZ Dump Seep 1	23-10-2013 13:55	10/23/2013	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1670	981	7.9	1450	-3	0.14	78.9	-0.005	12	-0.4	8.12	8.12	-0.02	0.0063	0.0091	0.0097	948	7.47
Bi-annual Seep Sampling	NEZ Dump Seep 1	26-11-2013 9:14	11/26/2013	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1700	1040	7.95	1480	-3	0.18	73.7	0.0085	-10	-0.4	7.19	7.19	-0.02	0.0061	0.0101	0.0097	964	7.24
Bi-annual Seep Sampling	NEZ Dump Seep 1	16-01-2014 10:15	1/16/2014	Wight	Wight	Seep was totally exposed Sample taken	1850	8.761	#N/A	1.4	0.22	1800	1050	7.84	1650	-3	0.34	76.2	0.0166	-10	-0.4	6.59	6.59	-0.02	0.0081	0.0102	0.0121	1070	6.36
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-02-2014 13:08	2/18/2014	Wight	Wight	Sample Taken	1902	7.924	#N/A	0.2	0.13	1800	1140	7.85	1660	-3	0.26	76.3	-0.005	-10	-0.4	6.46	6.46	-0.02	0.0085	0.0109	0.0127	1110	6.19
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/6/2014	3/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1750	1050	7.88	1560	4.9	2.18	54.8	-0.005	8	0.47	5.12	5.12	-0.01	0.0014	0.0022	0.0058	1000	5.04
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/7/2014	3/7/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1830	1160	7.86	1670	-3	0.43	62.4	-0.005	-10	0.45	5.29	5.29	-0.02	0.0029	0.0048	0.0064	1130	4.98
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-05-2014 11:45	5/13/2014	Wight	Wight	Sample taken, grey/blue precipitate observed (pH taken with pen-1)	1763	7.39	#N/A	2.7	#N/A	1720	1050	7.59	1560	10	7.93	34.3	0.0071	5.2	0.7	5.16	5.16	-0.01	-0.001	-0.002	-0.002	1030	5.16
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/8/2014	6/8/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1730	1090	7.85	1540	-3	0.32	60	-0.005	-10	0.78	5.92	5.92	-0.02	0.0025	0.004	0.0041	1030	5.44
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/4/2014	8/4/2014	Wight	Wight		1390	8.059	#N/A	1.8	0.19	1350	768	8.05	1140	4.3	0.39	99.3	-0.005	21.3	0.33	3.34	3.34	-0.01	0.008	0.0123	0.0148	659	3.03
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/9/2014	8/9/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1790	1120	7.87	1580	-3	0.22	68.5	-0.005	-10	-0.4	5.34	#N/A	-0.02	0.0035	0.0052	0.006	1070	4.69
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/12/2014	8/12/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1860	1110	7.85	1520	-3	0.46	64.7	-0.005	-10	0.56	5.49	5.49	-0.02	-0.001	0.0037	0.0045	1130	4.94
Bi-annual Seep Sampling	NEZ Dump Seep 1	27-10-2014 11:23	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1540	905	8.03	1340	-3	0.85	64.9	-0.005	10	0.39	5.86	5.86	-0.01	0.0041	0.0055	0.0049	801	5.86
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/3/2014	11/3/2014	Wight	Wight	Broke through ice, but no disturbance	1957	7.64	#N/A	0.1	0.1	1860	1170	7.89	1670	-3	0.17	83.2	-0.005	-10	0.43	6.37	6.37	-0.02	0.0075	0.0112	0.0109	1130	6.2
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2014	11/11/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1550	909	7.87	1250	-3	1.26	65.8	-0.005	11.6	0.51	6.66	6.66	-0.01	0.0026	0.0047	0.005	834	6.18
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-01-2015 10:28	1/13/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1890	1190	7.79	1690	-3	0.28	61	-0.005	9.9	0.58	5.38	5.38	-0.01	0.0019	0.005	0.0048	1140	5.06
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/9/2015	2/9/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1780	1150	7.66	1610	-3	0.5	67.9	-0.005	-5	0.47	3.94	3.94	-0.01	0.0023	0.0053	0.0048	1060	3.91
Bi-annual Seep Sampling	NEZ Dump Seep 1	4/6/2015	4/6/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1720	1110	7.84	1590	-3	0.26	63.8	-0.005	4.7	0.56	4.67	4.67	-0.005	0.0012	0.0035	0.0032	1040	4.63
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/2/2015	5/2/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1790	1070	7.87	1600	3.4	1.27	57.9	-0.005	6.4	0.72	5.08	5.08	-0.01	0.0014	0.0026	0.0046	1050	4.84
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/3/2015	5/3/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1760	1150	7.54	1590	-3	2.81	55.5	-0.005	7.6	0.79	4.77	4.77	-0.01	0.0015	0.0037	0.0056	1060	4.82
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/5/2015	6/5/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1830	1080	7.98	1570	-3	2.4	58.9	-0.005	5.3	0.6	5	5	-0.01	-0.001	0.0021	0.0059	1080	4.75
Bi-annual Seep Sampling	NEZ Dump Seep 1	7/7/2015	7/7/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1900	1170	7.86	1640	-3	0.7	63.2	-0.005	-5	0.54	4.23	4.23	-0.01	0.0019	0.0042	0.0044	1100	4.31
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-08-2015 13:28	8/18/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1840	1070	7.73	1710	-3	0.36	66.9	-0.005	5	0.56	4.26	4.26	-0.01	0.0032	0.0047	0.0041	1110	3.88
Bi-annual Seep Sampling	NEZ Dump Seep 1	9/4/2015	9/4/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1610	1010	7.83	1360	6.2	6.35	50.7	-0.005	7	0.73	5.67	5.67	-0.01	-0.001	0.0021	0.0043	991	5.26
Bi-annual Seep Sampling	NEZ Dump Seep 1	29-10-2015 10:44	10/29/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1790	1080	7.89	1570	-3	0.32	76.7	-0.005	5.7	0.47	3.7	3.7	-0.01	0.0037	0.0056	0.0045	1020	3.64
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2015	11/11/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1660	956	7.95	1420	-3	0.54	75.3	-0.005	6.8	0.51	3.93	3.93	-0.01	0.0031	0.0052	0.0048	895	3.97
Bi-annual Seep Sampling	NEZ Dump Seep 10	4/7/2013	4/7/2013	Wight	Wight	Full suite sample taken.	1433	8.3	0.0085	5.1	#N/A	1380	835	8.08	1170	-3	0.52	165	-0.005	-5	-0.2	1.21	1.21	-0.01	0.0102	0.0118	0.0133	681	1.25
Bi-annual Seep Sampling	NEZ Dump Seep 10	27-10-2014 13:57	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1390	809	8.26	1190	-3	0.56	148	-0.005	-5	-0.2	0.793	0.793	-0.01	0.0099	0.0132	0.0137	681	0.88
Bi-annual Seep Sampling	NEZ Dump Seep 10	8/6/2015	8/6/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1310	813	8.27	1070	-3	0.72	182	0.0055	-2.5	0.14	0.732	0.732	-0.005	0.0087	0.0126	0.0112	645	0.857
Bi-annual Seep Sampling	NEZ Dump Seep 11	4/7/2013	4/7/2013	Wight	Wight	Full suite sample taken.	1479	8.2	0.002	7.2	#N/A	1440	878	8.11	1240	42.7	11.6	245	-0.005	-5	-0.2	1.11	1.11	-0.01	0.0021	0.0044	0.0674	656	1.3
Bi-annual Seep Sampling	NEZ Dump Seep 11	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1340	807	8.23	1150	6.1	0.33	238	-0.005	-5	-0.2	0.826	0.826	-0.01	0.0022	0.0026	0.0183	592	1.02
Bi-annual Seep Sampling	NEZ Dump Seep 11	27-10-2014 14:28	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1450	845	8.28	1240	3	0.44	202	-0.005	-5	-0.2	1.44	1.44	-0.01	0.0051	0.0049	0.0045	670	1.5
Bi-annual Seep Sampling	NEZ Dump Seep 11	28-05-2015 13:17	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1390	820	8.37	1150	14	3.7	216	-0.005	-5	-0.2	0.529	0.529	-0.01	0.0022	0.0042	0.0396	615	0.724
Bi-annual Seep Sampling	NEZ Dump Seep 12	4/7/2013	4/7/2013	Wight	Wight	Full suite sample taken.	1338	8.3	0.0035	6.4	#N/A	1260	757	8.09	1080	6.7	2.16	159	0.0051	-5	0.26	1.01	1.01	-0.01	0.0075	0.0102	0.0184	602	1.07
Bi-annual Seep Sampling	NEZ Dump Seep 12	27-10-2014 15:29	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1370	808	8.23	1120	-3	0.5	136	-0.005	-5	0.26	0.72	0.72	-0.01	0.0025	0.0038	0.0045	689	0.8
Bi-annual Seep Sampling	NEZ Dump Seep 12	28-05-2015 12:53	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1230	709	8.28	1000	3.8	0.56	131	-0.005	-2.5	0.22	0.721	0.721	-0.005	0.0024	0.0044	0.0052	583	0.805
Bi-annual Seep Sampling	NEZ Dump Seep 13	4/7/2013	4/7/2013	Wight	Wight	Full suite sample taken.	1453	8.1	0.0025	6.5	#N/A	1370	831	8.02	1180	-3	1.73	203	-0.005	-5	0.26	1.44	1.44	-0.01	0.0031	0.0045	0.0084	633	1.47
Bi-annual Seep Sampling	NEZ Dump Seep 13	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1290	759	8.16	1090	4.1	0.39	156	-0.005	-5	0.34	1.96	1.96	-0.01	0.0024	0.0024	0.0125	617	2.13
Bi-annual Seep Sampling	NEZ Dump Seep 13	27-10-2014 15:47	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1390	821	8.23	1160	5.7	1.26	140	-0.005	-5	0.27	1.21	1.21	-0.01	0.0022	0.0032	0.0035	696	1.22
Bi-annual Seep Sampling	NEZ Dump Seep 13	28-05-2015 12:37	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1420	838	8.33	1200	8.2	3.21	225	0.0055	-5	0.23	1.15	1.15	-0.01	0.0022	0.0037	0.0107	633	1.22
Bi-annual Seep Sampling	NEZ Dump Seep 14	4/7/2013	4/7/2013	Wight	Wight	Full suite sample taken. High flow.	661	7.9	0.004	4.8	#N/A	616	318	7.8	469	-3	0.22	67.3	-0.005	-0.5	0.048	0.551	0.551	-0.001	0.0012	0.0027	0.0036	247	0.606
Bi-annual Seep Sampling	NEZ Dump Seep 14	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	464	232	8.05	336	3.4	0.15	72.8	-0.005	-0.5	0.052	0.308	0.308	-0.001	-0.001	-0.002	0.0039	166	0.41
Bi-annual Seep Sampling	NEZ Dump Seep 14	27-10-2014 15:26	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	889	511	7.92	710	-3	0.19	146	-0.005	-5	-0.2	0.203	0.203	-0.01	-0.001	-0.002	0.0022	357	0.26
Bi-annual Seep Sampling	NEZ Dump Seep 14	28-05-2015 12:16	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	629	316	8.02	458	-3	0.68	71.1	-0.005	-1	0.051	0.329	0.329	-0.002	0.0011	0.0025	0.0022	254	0.391
Bi-annual Seep Sampling	NEZ Dump Seep 15	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1170	687	8.28	894	3.2	0.13	151	-0.005	-5	0.22	0.518	0.518	-0.01	0.0045	0.0051	0.0086	560	0.591
Bi-annual Seep Sampling	NEZ Dump Seep 15	28-05-2015 11:55	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1310	759	8.26	1090	6.6	0.5	134	-0.005	-2.5	0.18	0.917	0.917	-0.005	0.0048	0.0072	0.0106	636	0.933
Bi-annual Seep Sampling	NEZ Dump Seep 16	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1070	614	8.32	862	-3	0.19	161	-0.005	-5	-0.2	1.23	1.23	-0.01	0.0024	0.0032	0.0083	481	1.25
Bi-annual Seep Sampling	NEZ Dump Seep 2	2/7/2013	2/7/2013	Wight	Wight	Full suite sample taken. Photo taken.	2200	8	0.2	3.4	#N/A	2080	1350	7.84	2010	-3	0.46	57.8	-0.005	-10	0.44	13.8	13.8	-0.02	0.0059	0.0074	0.0092	1280	13.4
Bi-annual Seep Sampling	NEZ Dump Seep 2	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1930	1190	7.88	1820	5	1.03	66	-0.005	-10	0.52	5.47	5.47	-0.02	0.0045	0.0055	0.0088	1230	5.19
Bi-annual Seep Sampling	NEZ Dump Seep 2	27-10-2014 11:45	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1640	980	8.02	1440	-3	0.35	65.7	-0.005	6.2	0.44	4.61	4.61	-0.01	0.0057	0.0072	0.0059	892	4.6
Bi-annual Seep Sampling	NEZ Dump Seep 2	25-05-2015 14:26	5/25/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1860	1150	7.94	1690	-3	0.84	78.1	-0.005	-5	0.38	3.5	3.5	-0.01	0.0059	0.0092	0.0088	1070	3.62
Bi-annual Seep Sampling	NEZ Dump Seep 2	11/11/2015	11/11/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1800	1050	8.04	1550	-3	0.15	88.1	-0.005	-5	0.34	2.55	2.55	-0.01	0.0085	0.0103	0.0087	954	2.74
Bi-annual Seep Sampling	NEZ Dump Seep 3	2/7/2013	2/7/2013	Wight	Wight	Full suite sample taken. Photo taken.	2240	8	0.02	6.2	#N/A	2190	1400	7.83	2130	3.3	0.3	58.5	-0.005	-10	-0.4	11.1	11.1	-0.02	0.0118	0.014	0.0169	1400	12.2
Bi-annual Seep Sampling	NEZ Dump Seep 3	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	2000	1250	7.89	1900	4.7	0.57	66.9	-0.005	-10	-0.4	5.57	5.57	-0.02	0.0119	0.0131	0.0174	1240	5.53
Bi-annual Seep Sampling	NEZ Dump Seep 3	27-10-2014 12:08	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	2040	1250	8.01	1900	3.2	0.69	76.4	-0.005	-10	-0.4	4.08	4.08	-0.02	0.0123	0.0136	0.0201	1270	4.02
Bi-annual Seep Sampling	NEZ Dump Seep 3	25-05-2015 14:30	5/25/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	2120	1300	8.03	1920	-3	0.22	62.7	-0.005	-10	-0.4	4.36	4.36	-0.02	0.0102	0.0127	0.0118	1340	4.05
Bi-annual Seep Sampling	NEZ Dump Seep 3	11/11/2015	11/11/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	2030	1200	7.77	1750	10.9	2.42	86.6	0.0051	-5	-0.2	2.76	2.76	-0.01	0.008	0.0102	0.0086	1170	2.81
Bi-annual Seep Sampling	NEZ Dump Seep 4	2/7/2013	2/7/2013	Wight	Wight	Full suite sample taken. Photo taken.	2090	7.9	0.02	5.9	#N/A	1980	1240	7.89	1800	-3	0.25	86	-0.005	-10	0.41	5.42	5.42	-0.02	0.0132	0.0149	0.0181	1220	4.3
Bi-annual Seep Sampling	NEZ Dump Seep 4	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1670	1010	7.91	1520	-3	0.34	78.2	-0.005	-5	0.34	2.42	2.42	-0.01	0.0131	0.0138	0.0157	960	2.6
Bi-annual Seep Sampling	NEZ Dump Seep 4	27-10-2014 12:20	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1720	1010	8.07	1540	-3	0.58	103	-0.005	-10	-0.4	1.61	1.61	-0.02	0.0152	0.0178	0.0225	998	1.58
Bi-annual Seep Sampling	NEZ Dump Seep 4	25-05-2015 14:14	5/25/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1990	1200	8.07	1790	4.6	0.64	84	-0.005	-5	0.32	1.64	1.64	-0.01	0.0162	0.0202	0.0185	1160	1.69
Bi-annual Seep Sampling	NEZ Dump Seep 4	11/11/2015	11/11/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1740	991	8.03	1450	22.8	9.46	110	-0.005	-5	0.29	0.847	0.847	-0.01	0.0132	0.0156	0.0238	947	0.978
Bi-annual Seep Sampling	NEZ Dump Seep 5	2/7/2013	2/7/2013	Wight	Wight	Full suite sample taken. Photo taken. Adjacent seep with same conductivity (~2L/min).	334	8.1	0.006	6.8	#N/A	311	154	8.11	215	6	2.06	83.7	-0.005	-0.5	0.2	0.23	0.23	-0.001	0.0054	0.0071	0.0243	70.9	0.295
Bi-annual Seep Sampling	NEZ Dump Seep 5	27-10-2014 14:55	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1150	635	8.03	926	11.7	2.17	99.5	-0.005	-5	0.47	2.62	2.62	-0.01	0.0032	0.0044	0.0061	547	2.49
Bi-annual Seep Sampling	NEZ Dump Seep 5	28-05-2015 14:09	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1030	549	8.19	809	4.8	0.88	77.5	-0.005	-2.5	0.37	1.55	1.55	-0.005	0.0041	0.0098	0.0225	456	1.52

Location Type	Sample Point	Original Date As Is	Recoded Date	Dissolved Organic Carbon (mg/L)	Aluminum (Al)-Total (mg/L)	Antimony (Sb)-Total (mg/L)	Arsenic (As)-Total (mg/L)	Barium (Ba)-Total (mg/L)	Beryllium (Be)-Total (mg/L)	Bismuth (Bi)-Total (mg/L)	Boron (B)-Total (mg/L)	Cadmium (Cd)-Total (mg/L) (mg/L)	Calcium (Ca)-Total (mg/L)	Chromium (Cr)-Total (mg/L)	Cobalt (Co)-Total (mg/L)	Copper (Cu)-Total (mg/L)	Iron (Fe)-Total (mg/L) (mg/L)	Lead (Pb)-Total (mg/L)	Lithium (Li)-Total (mg/L)	Magnesium (Mg)-Total (mg/L)	Manganese (Mn)-Total (mg/L)	Molybdenum (Mo)-Total (mg/L)	Nickel (Ni)-Total (mg/L)	Potassium (K)-Total (mg/L)	Selenium (Se)-Total (mg/L)	Silicon (Si)-Total (mg/L)	Silver (Ag)-Total (mg/L)	Sodium (Na)-Total (mg/L)	Strontium (Sr)-Total (mg/L)	Thallium (Tl)-Total (mg/L)	Tin (Sn)-Total (mg/L)	Titanium (Ti)-Total (mg/L)	Uranium (U)-Total (mg/L)	Vanadium (V)-Total (mg/L)	Zinc (Zn)-Total (mg/L)	Aluminum (Al)-Dissolved (mg/L)	Antimony (Sb)-Dissolved (mg/L)	Arsenic (As)-Dissolved (mg/L)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	Boundary Dump Seep 1	4/6/2013	4/6/2013	6.84	0.0298	-0.0001	0.00024	0.0197	-0.0001	-0.0005	0.053	-0.00001	55.1	-0.0005	-0.0001	0.00309	0.052	-0.00005	-0.0005	4.93	0.0255	0.00371	-0.0005	0.314	0.001	5.26	-0.00001	2.28	0.165	-0.00001	-0.0001	-0.01	0.000024	-0.001	-0.003	0.0055	-0.0001	0.0002
Bi-annual Seep Sampling	Boundary Dump Seep 2	4/6/2013	4/6/2013	5.75	0.0081	0.00018	0.00087	0.0369	-0.0001	-0.0005	0.054	0.000057	190	-0.0005	0.00019	0.0113	0.046	7.8E-05	0.00179	23.6	0.0341	0.0319	-0.0005	1.51	0.00479	6.02	-0.00001	6.03	1.85	-0.00001	-0.0001	0.011	0.00111	-0.001	-0.003	0.0032	0.0002	0.00067
Bi-annual Seep Sampling	Boundary Dump Seep 2	10/12/2013	10/12/2013	8.53	0.0104	0.00017	0.00237	0.0559	-0.0001	-0.0005	0.057	0.000018	273	-0.0005	0.00035	0.00404	0.192	0.00027	0.002	36.6	0.292	0.0237	-0.0005	1.95	0.00201	7.61	-0.00001	7.81	2.9	-0.00001	-0.0001	0.02	0.000801	-0.001	-0.003	-0.003	0.00015	0.00202
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2013 15:26	10/23/2013	7.06	0.0065	0.00017	0.00218	0.054	-0.0001	-0.0005	0.057	0.000035	254	-0.0005	0.00045	0.00435	0.281	0.00021	0.0027	36.9	0.312	0.0256	-0.0005	1.95	0.00195	6.65	-0.00001	8.18	2.99	-0.00001	-0.0001	-0.01	0.000983	0.0011	-0.003	0.0045	0.00012	0.00184
Bi-annual Seep Sampling	Boundary Dump Seep 2	14-11-2013 10:35	11/14/2013	6.59	0.0063	0.00026	0.00255	0.0524	-0.0001	-0.0005	0.061	0.000039	260	-0.0005	0.00069	0.00517	0.347	0.00017	0.00266	37.1	0.34	0.0245	0.00073	1.94	0.0023	6.39	-0.00001	7.97	2.99	-0.00001	-0.0001	0.025	0.000883	0.0019	-0.003	0.0033	0.00018	0.00171
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-01-2014 11:10	1/16/2014	8.04	0.0352	0.00016	0.00316	0.0527	-0.0001	-0.0005	0.059	-0.0001	215	-0.0005	0.00105	0.0194	1.74	0.00071	0.00194	27.5	0.411	0.0209	-0.0005	1.76	0.00339	6.27	-0.00001	5.92	2.21	-0.00001	-0.0001	0.015	0.000635	0.0014	0.0043	0.0031	0.00012	0.0029
Bi-annual Seep Sampling	Boundary Dump Seep 2	18-02-2014 10:11	2/18/2014	8.25	0.0088	0.00012	0.00154	0.0484	-0.0001	-0.0005	0.055	0.000022	248	-0.0005	0.00027	0.0048	0.214	0.00019	0.0016	32.4	0.408	0.0145	-0.0005	1.77	0.00155	7.59	-0.00001	6.88	2.18	-0.00001	-0.0001	0.012	0.000654	-0.001	-0.003	0.0038	0.00011	0.00149
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/7/2014	3/7/2014	5.8	0.0136	0.00022	0.00083	0.0443	-0.0001	-0.0005	0.054	-0.0001	261	-0.0005	0.00031	0.0113	0.103	0.00016	0.00235	42.1	0.0778	0.0508	-0.0005	1.68	0.00517	5.69	-0.00001	8.67	3.25	-0.00001	-0.0001	0.017	0.00152	-0.001	0.0033	-0.003	0.00021	0.00073
Bi-annual Seep Sampling	Boundary Dump Seep 2	15-05-2014 9:15	5/15/2014	5.86	0.0166	0.00016	0.00061	0.0261	-0.0001	-0.0005	0.059	0.000053	127	-0.0005	0.00023	0.012	0.042	0.00018	0.00129	15.3	0.0281	0.0215	-0.0005	1.23	0.0034	5.35	-0.00001	4.38	1.02	-0.00001	-0.0001	0.015	0.000582	-0.001	0.0048	0.0069	0.00014	0.00055
Bi-annual Seep Sampling	Boundary Dump Seep 2	6/8/2014	6/8/2014	4.83	0.0061	0.00018	0.00075	0.0399	-0.0001	-0.0005	0.058	0.000044	238	-0.0005	0.0002	0.0107	0.042	9.5E-05	0.00245	32.6	0.0307	0.0349	-0.0005	1.46	0.00405	6.11	-0.00001	7.59	2.29	-0.00001	-0.0001	0.013	0.00117	-0.001	-0.003	0.0031	0.00018	0.00069
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-06-2014 11:53	6/16/2014	5.54	0.0053	0.00021	0.00066	0.0418	-0.0001	-0.0005	0.05	-0.00007	238	-0.0005	0.00018	0.00861	0.034	9.3E-05	0.00281	38.1	0.0319	0.0547	-0.0005	1.62	0.00679	5.49	-0.00001	7.97	3.07	-0.00001	-0.0001	0.013	0.00135	-0.001	-0.003	0.0033	0.00021	0.00063
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/9/2014	8/9/2014	6.29	0.0087	0.00027	0.00097	0.0429	-0.0001	-0.0005	0.056	0.000092	244	-0.0005	0.00043	0.0131	0.077	0.00029	0.00293	37.3	0.0726	0.0351	-0.0005	1.55	0.00297	5.89	-0.00001	7.76	3	-0.00001	-0.0001	0.02	0.00147	-0.001	0.0032	0.0099	0.00019	0.00079
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/12/2014	8/12/2014	7.06	0.0053	0.00012	0.0012	0.0458	-0.0001	-0.0005	0.051	0.000027	245	-0.0005	0.00032	0.00695	0.124	0.00022	0.00207	33.9	0.0959	0.0258	-0.0005	1.78	0.00206	6.13	-0.00001	7.95	2.66	-0.00001	-0.0001	0.014	0.000755	-0.001	-0.003	0.0036	0.00012	0.0012
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2014 9:42	10/23/2014	6.88	0.0047	0.00019	0.00107	0.0409	-0.0001	-0.0005	0.046	0.000064	247	-0.0005	0.00043	0.0122	0.075	0.00018	0.00227	37.8	0.0866	0.0306	-0.0005	1.61	0.00219	6.09	-0.00001	7.81	3.12	-0.00001	-0.0001	0.02	0.00105	-0.001	0.0031	-0.003	0.00017	0.00105
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/11/2014	11/11/2014	6.85	0.0052	0.00017	0.00097	0.0411	-0.0001	-0.0005	0.064	0.000039	208	-0.0005	0.00026	0.00726	0.07	0.00015	0.00213	25.9	0.0482	0.0328	-0.0005	1.51	0.00354	5.94	-0.00001	6.62	1.83	-0.00001	-0.0001	0.016	0.000947	-0.001	-0.003	0.0294	0.00024	0.001
Bi-annual Seep Sampling	Boundary Dump Seep 2	1/7/2015	1/7/2015	6.07	0.0446	0.00018	0.00173	0.0371	-0.0001	-0.00005	0.053	0.000221	180	-0.0005	0.001	0.0373	0.323	0.0007	0.0017	22.4	0.174	0.0213	0.00065	1.69	0.00247	6.02	1.1E-05	6.32	1.59	-0.00001	-0.0001	-0.01	0.00091	0.00089	0.0064	-0.003	0.00017	0.00087
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/6/2015	2/6/2015	5.37	0.0147	0.00017	0.00088	0.0351	-0.0001	-0.00005	0.059	0.0000782	170	-0.0005	0.00049	0.0155	0.081	0.00028	0.0015	19.4	0.0854	0.0188	-0.0005	1.2	0.00161	5.91	1.8E-05	5.44	1.42	-0.00001	-0.0001	-0.01	0.000768	0.00062	-0.003	-0.003	0.00012	0.00073
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/9/2015	2/9/2015	6.94	0.0128	0.00019	0.00209	0.0466	-0.0001	-0.00005	0.062	0.0000433	205	-0.0005	0.0019	0.0096	0.402	0.00024	0.0026	25	0.53	0.0168	-0.0005	1.34	0.00143	6.95	-0.00001	6.22	2.02	-0.00001	-0.0001	-0.01	0.00098	0.00132	-0.003	0.008	0.00016	0.00154
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/2/2015	3/2/2015	5.58	0.0045	0.00013	0.00081	0.0316	-0.0001	-0.0005	0.063	0.00002	174	-0.0005	0.0002	0.00745	0.041	0.00013	0.00165	22.4	0.0316	0.0294	-0.0005	1.24	0.00237	6.08	-0.00001	5.74	1.61	-0.00001	-0.0001	0.013	0.000657	-0.001	-0.003	-0.003	0.00013	0.00079
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/3/2015	3/3/2015	5.73	0.0035	0.00016	0.00076	0.0325	-0.0001	-0.0005	0.061	0.000039	178	-0.0005	0.00015	0.00803	-0.03	8.8E-05	0.00167	23.5	0.0173	0.0343	-0.0005	1.21	0.0032	6.08	-0.00001	5.79	1.76	-0.00001	-0.0001	0.015	0.000725	-0.001	-0.003	-0.003	0.00014	0.00065
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/4/2015	7/4/2015	6.07	0.0039	0.00017	0.00057	0.0316	-0.0001	-0.00005	0.06	0.0000387	173	-0.0005	0.00011	0.00864	-0.03	6.5E-05	0.0017	22.1	0.0139	0.0332	-0.0005	1.28	0.00417	5.91	-0.00001	5.96	1.67	-0.00001	-0.0001	0.013	0.000639	0.00051	-0.003	0.0031	0.00015	0.00055
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/5/2015	7/5/2015	5.25	0.0041	0.00015	0.00059	0.0294	-0.0001	-0.00005	0.069	0.000018	150	-0.0005	-0.0001	0.00936	-0.03	-0.00005	0.002	17.2	0.00989	0.0223	-0.0005	1.06	0.00216	6.27	-0.00001	4.99	1.3	-0.00001	-0.0001	-0.01	0.000625	0.00052	-0.003	-0.003	0.00013	0.00054
Bi-annual Seep Sampling	Boundary Dump Seep 2	29-10-2015 11:29	10/29/2015	6.82	0.0139	0.00017	0.00162	0.043	-0.0001	-0.00005	0.06	0.0000404	192	-0.0005	0.00094	0.00964	0.378	0.00012	0.0025	26.2	0.747	0.021	-0.0005	1.4	0.00162	7.22	-0.00001	6.64	2.31	-0.00001	-0.0001	-0.01	0.000912	0.00079	-0.003	0.0054	0.00013	0.00147
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/8/2015	11/8/2015	6.81	0.0104	0.00019	0.00137	0.0394	-0.0001	-0.00005	0.058	0.0000484	193	-0.0005	0.00156	0.00848	0.287	0.0002	0.0027	25.8	0.53	0.0249	-0.0005	1.31	0.00174	6.39	-0.00001	6.23	2.24	-0.00001	-0.0001	-0.01	0.000944	0.00069	-0.003	0.0039	0.00017	0.00115
Bi-annual Seep Sampling	Boundary Dump Seep 2	30-11-2015 11:50	11/30/2015	6.6	0.0957	0.00014	0.00346	0.0544	-0.0001	-0.00005	0.055	0.0000743	229	-0.0005	0.00183	0.0351	1.73	0.00112	0.0018	27.6	0.575	0.0196	-0.0005	1.57	0.00215	6.74	2.2E-05	6.73	2.1	-0.00001	-0.0001	0.01	0.00066	0.00154	0.0035	-0.003	0.0001	0.00138
Bi-annual Seep Sampling	Boundary Dump Seep 2	12/1/2015	12/1/2015	6.27	0.0042	0.00014	0.00111	0.0372	-0.0001	-0.0005	0.06	0.000018	210	-0.0005	0.00027	0.00846	0.079	0.00022	0.0015	28.3	0.0547	0.0251	-0.0005	1.46	0.00174	6.47	-0.00001	6.68	2.05	-0.00001	-0.0001	0.018	0.000732	-0.001	-0.003	-0.003	0.00012	0.00103
Bi-annual Seep Sampling	Boundary Dump Seep 3	19-05-2015 13:49	5/19/2015	5.14	0.0465	0.00013	0.00072	0.0335	-0.0001	-0.00005	0.072	0.0000332	139	-0.0005	0.00017	0.0112	0.106	0.00013	0.0014	13	0.0623	0.00878	-0.0005	1	0.000993	6.27	-0.00001	4.27	0.817	-0.00001	-0.0001	-0.01	0.000542	0.00078	-0.003	0.0035	0.0001	0.00068
Bi-annual Seep Sampling	East Dump Seep 1	9/5/2013	9/5/2013	4.07	0.0288	0.00018	0.0003	0.0306	-0.0001	-0.0005	0.064	-0.00015	157	-0.0005	-0.0001	0.00324	-0.03	-0.00005	-0.0005	31.1	0.0239	0.202	-0.0005	2.41	0.0625	3.88	-0.00001	15.1	3.12	-0.00001	-0.0001	-0.01	0.00003	-0.001	0.0169	0.009	0.00015	0.00019
Bi-annual Seep Sampling	East Dump Seep 1	23-10-2014 14:15	10/23/2014	7.74	0.0628	-0.0001	0.00033	0.0494	-0.0001	-0.0005	0.043	0.000247	162	-0.0005	0.00155	0.00739	0.07	5.6E-05	-0.0005	32.8	0.515	0.0945	0.0016	2.32	0.017	3.7	1.1E-05	13.3	3.01	-0.00001	-0.0001	0.018	0.000035	-0.001	0.0214	0.0173	-0.0001	0.00025
Bi-annual Seep Sampling	East Dump Seep 1	28-05-2015 10:46	5/28/2015	7.23	0.0676	0.0001	0.00035	0.0576	-0.0001	-0.00005	0.053	0.000213	172	-0.0005	0.00117	0.00696	0.08	-0.00005	-0.001	34.6	0.646	0.115	0.00112	2.1	0.0268	3.93	-0.00001	14.4	3.19	-0.00001	-0.0001	0.016	0.000045	0.00065	0.0171	0.0152	-0.0001	0.00028
Bi-annual Seep Sampling	East Dump Seep 1	26-11-2015 12:46	11/26/2015	5.42	1.46	-0.0001	0.00112	0.0548	-0.0001	-0.00005	0.046	0.000269	161	0.00157	0.00502	0.0296	1.96	0.00067	0.0014	33.8	1.14	0.0494	0.00276	2.14	0.00835	6.7	3.1E-05	13.6	2.7	-0.00001	-0.0001	0.104	0.000068	0.00558	0.0327	0.011	-0.0001	0.00017
Bi-annual Seep Sampling	East Dump Seep 2	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 2	20-06-2013 13:24	6/20/2013	3.35	0.0147	0.00015	0.00024	0.0237	-0.0001	-0.0005	0.057	-0.0005	128	-0.0005	0.0016	0.00442	-0.03	-0.00005	-0.0005	27.6	0.251	0.32	0.00078	2.36	0.0736	3.31	-0.00001	14.2	3.36	-0.00001	-0.0001	0.011	0.000019	-0.001	0.0167	0.0118	0.00015	0.00023
Bi-annual Seep Sampling	East Dump Seep 3	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 3	20-06-2013 13:36	6/20/2013	2.88	0.186	0.00019	0.00023	0.0336	-0.0001	-0.0005	0.064	-0.001	142	-0.0005	0.00719	0.00686	0.184	9.4E-05	0.00126	34.8	1.2	0.403	0.00357	2.33	0.0397	4.4	-0.00001	18.3	4.28	-0.00001	-0.0001	0.017	0.000082	-0.001	0.0747	0.027	0.00017	0.00011
Bi-annual Seep Sampling	East Dump Seep 4	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 4	20-06-2013 13:55	6/20/2013	4.25	0.0102	0.0001	0.00035	0.0446	-0.0001	-0.0005	0.041	0.000296	231	-0.0005	-0.0001	0.00516	-0.03	-0.00005	-0.0005	36.4	0.00526	0.108	0.00096	2.62	0.0479	5.06	-0.00001	17.3	2.75	-0.00001	-0.0001	0.014	0.000087	-0.001	0.0544	0.0077	-0.0001	0.00034
Bi-annual Seep Sampling	East Dump Seep 4	26-11-2015 13:16	11/26/2015	3.11	0.146	-0.0001	0.00024	0.0623	-0.0001	-0.00005	0.035	0.00123	146	-0.0005	0.00013	0.0111	0.149	0.00011	0.0013	22.6	0.00635	0.115	0.00087	1.33	0.028	5.66	-0.00001	9.74	1.84	-0.00001	-0.0001	0.018	0.000296	0.00068	0.151	-0.003	-0.0001	0.00013
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/7/2013	2/7/2013	2.91	0.0575	0.00074	0.00029	0.0509	-0.0002	-0.001	0.109	-0.0003	358	-0.0005	0.00077	0.0758	-0.03	-0.0001	0.0013	63.4	0.0939	0.321	0.0016	2.2	0.247	5.15	-0.00002	22.1	3.35	-0.00002	-0.0002	0.014	0.00158	-0.002	0.012	0.025	0.00068	0.00032
Bi-annual Seep Sampling	NEZ Dump Seep 1	10/12/2013	10/12/2013	4.46	0.0223	0.00037	0.00033	0.0607	-0.0002	-0.001	0.086	-0.0001	324	-0.0005	-0.0002	0.0217	-0.03	-0.0001	0.0012	57.5	0.0224	0.2	-0.001	2.21	0.127	5.46	-0.00002	19.7	4.14	-0.00002	-0.0002	0.021	0.00135	-0.002	-0.006	0.008	0.00037	0.00025
Bi-annual Seep Sampling	NEZ Dump Seep 1	23-10-2013 13:55	10/23/2013	3.91	0.0148	0.00054	0.00038	0.0515	-0.0002	-0.001	0.092	-0.00013	291	-0.0005	-0.0002	0.0238	0.082	0.00013	0.0022	54.3	0.0177	0.189	-0.001	2.18	0.13	5.56	-0.00002	19.5	3.37	-0.00002	-0.0002	-0.01	0.00135	-0.002	0.0073	0.007	0.00052	0.00033
Bi-annual Seep Sampling	NEZ Dump Seep 1	26-11-2013 9:14	11/26/2013	4.57	0.0121	0.00043	0.00038	0.0575	-0.0002	-0.001	0.094	-0.00012	310	-0.0005	-0.0002	0.0189	-0.03	-0.0001	0.0021	56.2	0.0138	0.194	-0.001	2.15	0.136	5.35	-0.00002	20	3.99	-0.00002	-0.0002	0.019	0.00133	-0.002	-0.006	0.008	0.0004	0.00031
Bi-annual Seep Sampling	NEZ Dump Seep 1	16-01-2014 10:15	1/16/2014	4.57	0.0389	0.0004	0.00036	0.065	-0.0002	-0.001	0.097	-0.0002	330	-0.0005	-0.0002	0.0226	0.031	-0.0001	0.0027	58.5	0.0277	0.226	-0.001	2.35	0.133	5.05	-0.00002	20.8	4.62	-0.00002	-0.0002	0.016	0.00148	-0.002	0.0077	0.0084	0.00037	0.00028
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-02-2014 13:08	2/18/2014	4.39	0.0256	0.00036	0.00032	0.0682	-0.0002	-0.001	0.1	-0.00012	349	-0.0005	-0.0002	0.0173	-0.03	-0.0001	0.0021	64	0.017	0.266	-0.001	2.26	0.134	5.31	-0.00002	21.2	5.3	-0.00002	-0.0002	0.012	0.00158	-0.002	-0.006	0.006	0.00033	0.00028
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/6/2014	3/6/2014	3.26	0.453	0.00045	0.00022	0.0447	-0.0002	-0.001	0.074	-0.0004	318	-0.0005	0.00328	0.29	-0.03	-0.0001	0.0029	60.8	0.313	0.243	0.005	2.19	0.176	5.26	-0.00002	20.2	3.28	-0.00002	-0.0002	-0.01	0.00114	-0.002	0.027	0.0556	0.00045	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/7/2014	3/7/2014	3.65	0.0854	0.00047	0.00026	0.0486	-0.0002	-0.001	0.094	-0.0004	362	-0.0005	0.00185	0.138	-0.03	-0.0001	0.0028	67.8	0.21	0.294	0.0034	2.32	0.191	5.25	-0.00002	22.3	4.17	-0.00002	-0.0002	0.017	0.00131	-0.002	0.0194	0.0364	0.00047	0.00027
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-05-2014 11:45	5/13/2014	2.74	1.93	0.00043	0.00029	0.0503	0.00024	-0.001	0.076	-0.0009	315	-0.0005	0.0169	1.28	0.045	-0.0001	0.0054	65	1.08	0.254	0.0147	2.18	0.158	5.9	-0.00002	18.8	3.58	-0.00002	-0.0002	0.017	0.00099	-0.002	0.0848	0.0405	0.00041	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/8/2014	6/8/2014	3.04	0.0478	0.00048	0.00026	0.0423	-0.0002	-0.001	0.082	0.000182	334	-0.0005	0.00141	0.0927	-0.03	-0.0001	0.0026	58.8	0.162	0.192	0.0024	2.1	0.153	5.03	-0.00002	19.9	3.12	-0.00002	-0.0002	0.016	0.00106	-0.002	0.0141	0.0153	0.0005	0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/4/2014	8/4/2014	3.88	0.0385	0.00056	0.00037	0.0362	-0.0001	-0.0005	0.06	-0.00012	231	-0.0005	0.0003	0.034	0.035	-0.00005	0.00173	39	0.055	0.165	0.00066	1.78	0.0987	5.04	-0.00001	16.7	2.24	-0.00001	-0.0001	0.019	0.00137	-0.001	0.0041	0.0082	0.00056	0.00035
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/9/2014	8/9/2014	3.47	0.0308	0.00049	0.00028	0.0463	-0.0002	-0.001	0.087	-0.0002	342	-0.0005	0.0012	0.0821	-0.03	-0.0001	0.0029	64.5	0.143	0.224	0.0023	2.33	0.18	5.4	-0.00002	20.1	3.37	-0.00002	-0.0002	0.024	0.00131	-0.002	0.0144	0.0154	0.00046	0.00021
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/12/2014	8/12/2014	11.3	0.0906	0.00044	0.00022	0.045	-0.0002	-0.001	0.08	0.000169	343	-0.0005	0.00186	0.174	-0.03	-0.0001	0.0027	65.3	0.188	0.222	0.0037	2.28	0.175	5.57	-0.00002	20.8	3.39	-0.00002	-0.0002	0.016	0.00119	-0.002	0.0222	0.036	0.00044	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	27-10-2014 11:23	10/27/2014	3.88	0.0882	0.00054	0.00031	0.0355	-0.0001	-0.0005	0.074	0.000111	277	-0.0005	0.00092	0.0797	-0.03	-0.00005	0.00301	47.1	0.124	0.207	0.00135	2.02	0.126	4.68	-0.00001	17.4	3.18	-0.00001	-0.0001	0.022	0.00135	-0.001	0.009	0.0124	0.00054	0.00024
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/3/2014	11/3/2014	4.38	0.0098	0.00029	0.00027	0.0709	-0.0002	-0.001	0.105	-0.00014	360	-0.0005	-0.0002	0.0153	-0.03	-0.0001	0.0019	64.6	0.00883	0.216	-0.001	2.34	0.132	5.17	-0.00002	22.3	4.63	-0.00002	-0.0002	0.017	0.0014	-0.002	-0.006	0.005	0.0003	0.00029
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2014	11/11/2014	4.4	0.22	0.00039	0.0003	0.0384	-0.0001	-0.0005	0.061	0.000166	282	-0.0005	0.00279	0.175	-0.03	-0.00005	0.00244	49.6	0.252	0.155	0.00327	2.2	0.124	5.18	-0.00001	18.5	2.56	-0.00001	-0.0001	0.021	0.000913	-0.001	0.0172	0.0611	0.00053	0.00022
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-01-2015 10:28	1/13/2015	3.87	0.118	0.00048	0.00025	0.0478	-0.0002	-0.001	0.088	0.000247	369	-0.0005	0.00215	0.209	-0.03	-0.0001	0.0025	69.6	0.213	0.251	0.0039	2.44	0.21	5.55	-0.00002	21.2	3.65	-0.00002	-0.0002	0.019	0.0013	-0.002	0.0255	0.0366	0.00049	0.00024
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/9/2015	2/9/2015	3.8	0.0993	0.00054	0.00038	0.0444	-0.0002	-0.0001	0.092	0.000226	359	-0.0005	0.00173	0.172	-0.03	-0.0001	0.0031	64.3	0.207	0.178	0.0031	2.29	0.178	5.49	-0.00002	21	3.12	-0.00002	-0.0002	-0.01	0.00135	-0.001	0.0219	0.0227	0.00052	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	4/6/2015	4/6/2015	3.79	0.19	0.00043	-0.0002	0.043	-0.0002	-0.0001	0.079	0.000297	346	-0.0005	0.00235	0.257	-0.03	-0.0001	0.0039	64.5	0.268	0.225	0.0042	2.32	0.2	5.56	-0.00002	21.1	3.38	-0.00002	-0.0002	-0.01	0.00123	-0.001	0.0602	0.0458	0.00041	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/2/2015	5/2/2015	3.82	0.257	0.0005	0.00026	0.0434	-0.0002	-0.001	0.082	0.000262	321	-0.0005	0.00314	0.319	-0.03	-0.0001	0.0036	64.3	0.282	0.252	0.0045	2.27	0.178	5.37	-0.00002	21.2	3.55	-0.00002	-0.0002	0.016	0.00112	-0.002	0.031	0.0632	0.00047	0.00022
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/3/2015	5/3/2015	3.62	0.567	0.00055	0.00027	0.0431	-0.0002	-0.001	0.08	0.000238	335	-0.0005	0.00342	0.412	-0.03	-0.0001	0.0042	60.2	0.31	0.299	0.0044	2.3	0.192	5.34	-0.00002	21	3.73	-0.00002	-0.0002	0.013	0.00133	-0.002	0.0304	0.0603	0.00047	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/5/2015	6/5/2015	3.54	0.564	0.00042	0.00032	0.0432	-0.0002	-0.0001	0.076	0.000315	325	-0.0005	0.00326	0.409	-0.03	-0.0001	0.0036	65.1	0.353	0.222	0.0052	2.35	0.208	5.61	-0.00002	20.3	3.21	-0.00002	-0.0002	-0.01	0.00103	-0.001	0.0323	0.0587	0.0004	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	7/7/2015	7/7/2015	3.25	0.138	0.00053	0.00024	0.0448	-0.0002	-0.0001	0.09	0.00019	371	-0.0005	0.00184	0.206	-0.03	-0.0001	-0.002	63.3	0.228	0.201	0.0037	2.5	0.189	5.11	-0.00002	22	3.15	-0.00002	-0.0002	-0.01	0.00123	-0.001	0.0267	0.0336	0.0005	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-08-2015 13:28	8/18/2015	3.4	0.0788	0.00051	-0.0002	0.0427	-0.0002	-0.0001	0.091	0.000217	334	-0.0005	0.00172	0.168	-0.03	-0.0001	0.0026	61.3	0.21	0.175	0.003	2.3	0.162	5.43	-0.00002	20.5	3.02	-0.00002	-0.0002	-0.01	0.00127	-0.001	0.0225	0.0203	0.00048	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	9/4/2015	9/4/2015	3.46	1.35	0.00044	0.00023	0.0404	0.00017	-0.00005	0.082	0.000348	302	-0.0005	0.00505	0.719	-0.03	-0.00005	0.0047	57.2	0.475	0.192	0.00708	2.29	0.164	5.97	-0.00001	19.6	2.98	-0.00001	-0.0001	0.02	0.00087	-0.0005	0.0449	0.0555	0.00039	0.00011
Bi-annual Seep Sampling	NEZ Dump Seep 1	29-10-2015 10:44	10/29/2015	3.51	0.0532	0.00043	0.00023	0.0432	-0.0002	-0.0001	0.086	0.000191	343	-0.0005	0.00142	0.156	-0.03	-0.0001	0.003	63.1	0.183	0.178	0.0029	2.39	0.151	5.86	-0.00002	20.7	3.11	-0.00002	-0.0002	-0.01	0.00126	-0.001	0.0216	0.0218	0.0004	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2015	11/11/2015	3.74	0.116	0.00052	0.00022	0.0378	-0.0001	-0.00005	0.078	0.000195	290	-0.0005	0.00218	0.177	-0.03	-0.00005	0.0031	53.8	0.226	0.17	0.00312	2.12	0.144	5.22	-0.00001	17.9	3.04	-0.00001	-0.0001	0.014	0.00118	-0.0005	0.0215	0.024	0.00049	0.00018
Bi-annual Seep Sampling	NEZ Dump Seep 10	4/7/2013	4/7/2013	4.85	0.0196	0.00019	0.00041	0.0326	-0.0001	-0.0005	0.061	-0.00002	251	-0.0005	-0.0001	0.00534	-0.03	-0.00005	0.00174	45.7	0.00683	0.0495	-0.0005	2.28	0.00802	5.12	-0.00001	13.8	2.79	-0.00001	-0.0001	0.014	0.00195	-0.001	-0.003	-0.003	0.00017	0.00036
Bi-annual Seep Sampling	NEZ Dump Seep 10	27-10-2014 13:57	10/27/2014	5.67	0.0479	0.00014	0.00045	0.0304	-0.0001	-0.0005	0.056	0.000011	249	-0.0005	0.00011	0.00688	0.053	-0.00005	0.00167	47.9	0.0116	0.0463	-0.0005	2.25	0.00926	5.19	-0.00001	12.9	2.35	-0.00001	-0.0001	0.025	0.00161	-0.001	-0.003	-0.003	0.00014	0.00045
Bi-annual Seep Sampling	NEZ Dump Seep 10	8/6/2015	8/6/2015	6.37	0.0377	0.00014	0.00036	0.0302	-0.0001	-0.00005	0.059	0.0000114	246	-0.0005	0.00012	0.00626	0.042	-0.00005	0.0019	47.2	0.0374	0.0294	-0.0005	2.25	0.00825	5.6	-0.00001	13.6	2.55	-0.00001	-0.0001	-0.01	0.00154	-0.0005	-0.003	0.0032	0.00015	0.00036
Bi-annual Seep Sampling	NEZ Dump Seep 11	4/7/2013	4/7/2013	5.2	0.552	0.00014	0.00091	0.0407	-0.0001	-0.0005	0.051	0.000141	275	0.00072	0.00189	0.0922	0.656	0.00034	0.0023	48	0.592	0.0338	0.00145	1.95	0.00368	6.68	9.2E-05	13.4	2.58	-0.00001	-0.0001	0.034	0.00268	0.0027	0.0045	-0.003	-0.0001	0.00037
Bi-annual Seep Sampling	NEZ Dump Seep 11	5/6/2014	5/6/2014	4.71	0.0927	0.00014	0.00058	0.0253	-0.0001	-0.0005	0.047	-0.00005	255	-0.0005	0.00025	0.0188	0.797	7.5E-05	0.00186	46.1	0.0635	0.0482	-0.0005	1.89	0.00444	5.62	-0.00001	12.9	2.52	-0.00001	-0.0001	0.012	0.00265	-0.001	-0.003	-0.003	0.00013	0.00044
Bi-annual Seep Sampling	NEZ Dump Seep 11	27-10-2014 14:28	10/27/2014	5.46	0.0057	0.00011	0.00039	0.0248	-0.0001	-0.0005	0.048	0.000015	254	-0.0005	-0.0001	0.00776	-0.03	-0.00005	0.00176	47.9	0.00678	0.0479	-0.0005	2.08	0.00664	5.81	-0.00001	13	2.35	-0.00001	-0.0001	0.022	0.00205	-0.001	-0.003	-0.003	0.00013	0.0004
Bi-annual Seep Sampling	NEZ Dump Seep 11	28-05-2015 13:17	5/28/2015	6.05	0.3	0.00014	0.0006	0.0295	-0.0001	-0.00005	0.045	0.0000635	247	-0.0005	0.0007	0.0412	0.403	0.00017	0.002	45.5	0.167	0.0344	0.00071	1.78	0.00257	6.44	1.4E-05	11.2	2.15	-0.00001	-0.0001	0.026	0.002	0.00148	-0.003	-0.003	0.00014	0.00044
Bi-annual Seep Sampling	NEZ Dump Seep 12	4/7/2013	4/7/2013	3.22	0.0578	0.00032	0.0008	0.0272	-0.0001	-0.0005	0.05	-0.00007	234	-0.0005	-0.0001	0.00589	0.055	-0.00005	0.00219	44.5	0.00933	0.165	-0.0005	1.43	0.00623	5.14	-0.00001	13.3	2.79	-0.00001	-0.0001	0.015	0.00509	-0.001	-0.003	-0.003	0.00032	0.00065
Bi-annual Seep Sampling	NEZ Dump Seep 12	27-10-2014 15:29	10/27/2014	2.99	0.0343	0.00032	0.00061	0.0304	-0.0001	-0.0005	0.057	0.000076	244	-0.0005	-0.0001	0.0094	0.042	-0.00005	0.00366	46.6	0.014	0.167	-0.0005	1.5	0.0108	5.25	-0.00001	12.7	2.81	-0.00001	-0.0001	0.022	0.00471	-0.001	0.0032	-0.003	0.00029	0.0005
Bi-annual Seep Sampling	NEZ Dump Seep 12	28-05-2015 12:53	5/28/2015	3.41	0.022	0.00027	0.00064	0.0237	-0.0001	-0.00005	0.049	0.0000673	216	-0.0005	-0.0001	0.0127	0.032	-0.00005	0.0023	42.5	0.0177	0.126	-0.0005	1.28	0.00764	5.12	-0.00001	12.2	2.26	-0.00001	-0.0001	0.013	0.00402	0.00057	-0.003	-0.003	0.00024	0.00061
Bi-annual Seep Sampling	NEZ Dump Seep 13	4/7/2013	4/7/2013	3.57	0.0784	0.00026	0.00035	0.0154	-0.0001	-0.0005	0.048	-0.00006	263	-0.0005	0.00013	0.00589	0.125	0.00034	0.00213	41.5	0.11	0.116	-0.0005	1.32	0.00706	5.75	-0.00001	12.8	2.59	-0.00001	0.00236	0.016	0.00412	-0.001	-0.003	-0.003	0.00024	0.00019
Bi-annual Seep Sampling	NEZ Dump Seep 13	5/6/2014	5/6/2014	2.86	0.19	0.00042	0.00178	0.0338	-0.0001	-0.0005	0.057	0.000391	239	-0.0005	0.00046	0.0276	0.83	0.00021	0.00207	41.7	0.681	0.228	0.00056	1.25	0.00832	5.26	-0.00001	13	2.53	-0.00001	-0.0001	0.014	0.0052	0.0022	0.0051	-0.003	0.00036	0.0006
Bi-annual Seep Sampling	NEZ Dump Seep 13	27-10-2014 15:47	10/27/2014	2.96	0.0269	0.00035	0.00093	0.0295	-0.0001	-0.0005	0.058	0.000058	253	-0.0005	-0.0001	0.00753	0.14	-0.00005	0.00275	44.2	0.0547	0.234	-0.0005	1.4	0.0102	4.85	-0.00001	12.5	2.64	-0.00001	-0.0001	0.023	0.00441	-0.001	-0.003	-0.003	0.00033	0.00069
Bi-annual Seep Sampling	NEZ Dump Seep 13	28-05-2015 12:37	5/28/2015	3.72	0.0823	0.00027	0.0003	0.0166	-0.0001	-0.00005	0.045	0.0000302	276	-0.0005	0.00015	0.00436	0.212	-0.00005	0.0026	43.9	0.141	0.14	-0.0005	1.37	0.00661	6.48	-0.00001	12.4	2.56	-0.00001	-0.0001	0.016	0.00343	0.00051	-0.003	0.0045	0.00023	0.00018
Bi-annual Seep Sampling	NEZ Dump Seep 14	4/7/2013	4/7/2013	3.97	0.0171	-0.0001	0.00021	0.0146	-0.0001	-0.0005	0.035	-0.00005	100	-0.0005	0.00012	0.00825	0.033	0.00034	-0.0005	16.8	0.0182	0.0117	-0.0005	0.89	0.0162	4.82	-0.00001	6.9	0.397	-0.00001	0.00352	-0.01	0.000194	-0.001	0.0041	-0.003	-0.0001	0.00016
Bi-annual Seep Sampling	NEZ Dump Seep 14	5/6/2014	5/6/2014	3.89	0.0142	-0.0001	0.00016	0.0104	-0.0001	-0.0005	0.028	0.000045	73.9	-0.0005	0.00015	0.00745	-0.03	-0.00005	0.00092	12.9	0.0257	0.011	-0.0005	0.715	0.0167	5.22	-0.00001	5.03	0.301	-0.00001	-0.0001	-0.01	0.000153	-0.001	0.0039	0.0047	-0.0001	0.00011
Bi-annual Seep Sampling	NEZ Dump Seep 14	27-10-2014 15:26	10/27/2014	3.54	0.0079	-0.0001	0.0002	0.0282	-0.0001	-0.0005	0.04	0.000278	161	-0.0005	0.00094	0.0108	-0.03	-0.00005	0.00179	25.5	0.183	0.012	0.0005	1.32	0.00973	7	-0.00001	8.72	0.816	0.000013	-0.0001	0.016	0.000468	-0.001	0.0146	0.0062	-0.0001	0.00016
Bi-annual Seep Sampling	NEZ Dump Seep 14	28-05-2015 12:16	5/28/2015	3.79	0.0104	-0.0001	0.00015	0.0173	-0.0001	-0.00005	0.031	0.000076	101	-0.0005	0.00028	0.00735	-0.03	-0.00005	-0.001	16.1	0.0402	0.0134	-0.0005	0.948	0.0177	5.06	-0.00001	6.27	0.509	-0.00001	-0.0001	-0.01	0.000153	-0.0005	0.0045	0.0048	-0.0001	0.00011
Bi-annual Seep Sampling	NEZ Dump Seep 15	5/6/2014	5/6/2014	2.83	0.0045	0.00021	0.00039	0.0173	-0.0001	-0.0005	0.053	-0.00003	225	-0.0005	-0.0001	0.00246	-0.03	-0.00005	0.00145	36.1	0.0164	0.109	-0.0005	1.23	0.00813	5.7	-0.00001	11.4	1.57	-0.00001	-0.0001	-0.01	0.00313	-0.001	-0.003	-0.003	0.00019	0.00033
Bi-annual Seep Sampling	NEZ Dump Seep 15	28-05-2015 11:55	5/28/2015	3.03	0.0832	0.00023	0.00043	0.0228	-0.0001	-0.00005	0.053	0.0000252	238	-0.0005	0.00016	0.00509	0.124	-0.00005	0.0016	37	0.144	0.0885	-0.0005	1.22	0.00998	5.56	-0.00001	11	1.48	-0.00001	-0.0001	0.016	0.0024	0.00077	-0.003	-0.003	0.00021	0.00036
Bi-annual Seep Sampling	NEZ Dump Seep 16	5/6/2014	5/6/2014	2.34	0.003	0.00021	0.00042	0.0231	-0.0001	-0.0005	0.063	-0.0001	209	-0.0005	-0.0001	0.00235	-0.03	-0.00005	0.00136	26.6	0.00904	0.14	-0.0005	1.05	0.0194	5.98	-0.00001	11.5	1.21	-0.00001	-0.0001	-0.01	0.0025	-0.001	-0.003	-0.003	0.0002	0.00035
Bi-annual Seep Sampling	NEZ Dump Seep 2	2/7/2013	2/7/2013	2.93	0.0736	0.00068	0.00034	0.0506	-0.0002	-0.001	0.132	-0.0003	410	-0.0005	0.00053	0.0538	-0.03	-0.0001	0.0041	76.8	0.0668	0.563	0.0013	2.5	0.201	4.69	-0.00002	28.6	6.52	-0.00002	-0.0002	0.014	0.00249	-0.002	0.0113	0.0228	0.00061	0.00027
Bi-annual Seep Sampling	NEZ Dump Seep 2	5/6/2014	5/6/2014	3.28	0.189	0.00045	0.00032	0.0479	-0.0002	-0.001	0.099	-0.00026	371	-0.0005	0.00069	0.107	-0.03	-0.0001	0.0047	75.1	0.0921	0.321	0.0025	2.49	0.126	4.68	-0.00002	25.9	6.47	-0.00002	-0.0002	-0.01	0.00195	-0.002	0.0146	0.0501	0.0004	0.00024
Bi-annual Seep Sampling	NEZ Dump Seep 2	27-10-2014 11:45	10/27/2014	3.64	0.0482	0.00049	0.00035	0.0377	-0.0001	-0.0005	0.091	0.000105	305	-0.0005	0.00028	0.0343	-0.03	-0.00005	0.00479	58.3	0.0464	0.287	0.00089	2.16	0.109	4.46	-0.00001	20	5.31	-0.00001	-0.0001	0.024	0.00189	-0.001	0.0068	0.0096	0.00045	0.00031
Bi-annual Seep Sampling	NEZ Dump Seep 2	25-05-2015 14:26	5/25/2015	4.54	0.0939	0.00039	0.00031	0.0478	-0.0002	-0.0001	0.096	0.000127	345	-0.0005	-0.0002	0.0573	-0.03	-0.0001	0.0048	69.2	0.0467	0.265	0.0011	2.45	0.0802	4.61	-0.00002	23.7	5.92	-0.00002	-0.0002	-0.01	0.0019	-0.001	0.0099	0.0116	0.00033	0.00027
Bi-annual Seep Sampling	NEZ Dump Seep 2	11/11/2015	11/11/2015	4.04	0.0149	0.00039	0.00032	0.0473	-0.0002	-0.0001	0.102	-0.00011	319	-0.0005	-0.0002	0.0265	-0.03	-0.0001	0.0044	63	0.0467	0.246	-0.001	2.31	0.0698	4.79	-0.00002	22.4	6.06	-0.00002	-0.0002	0.014	0.00177	-0.001	0.0071	0.0099	0.00032	0.00025
Bi-annual Seep Sampling	NEZ Dump Seep 3	2/7/2013	2/7/2013	4.16	0.154	-0.0002	0.00032	0.0829	-0.0002	-0.001	0.127	-0.0002	404	-0.0005	0.00032	0.0155	0.146	-0.0001	0.0012	96	0.0514	0.0852	0.0012	3.79	0.0404	5.62	-0.00002	30.7	7.16	-0.00002	-0.0002	0.019	0.000388	-0.002	0.0074	0.0043	-0.0002	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 3	5/6/2014	5/6/2014	4.33	0.573	-0.0002	0.00047	0.0782	-0.0002	-0.001	0.104	-0.00018	372	0.00063	0.00073	0.0302	0.532	0.00029	0.0016	94.7	0.141	0.0984	0.0018	3.79	0.04	6.61	-0.00002	28.3	6.61	-0.00002	-0.0002	0.032	0.000392	-0.002	0.0112	0.0062	-0.0002	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 3	27-10-2014 12:08	10/27/2014	5.08	0.0413	-0.0002	0.00029	0.0635	-0.0002	-0.001	0.108	0.000049	352	-0.0005	-0.0002	0.0061	0.038	-0.0001	0.0018	85.6	0.00824	0.107	-0.001	3.6	0.0161	4.99	2.4E-05	26.9	6.27	-0.00002	-0.0002	0.026	0.000523	-0.002	-0.006	0.0047	-0.0002	0.00025
Bi-annual Seep Sampling	NEZ Dump Seep 3	25-05-2015 14:30	5/25/2015	5.44	0.0101	-0.0002	0.00022	0.0674	-0.0002	-0.0001	0.103	0.000068	379	-0.0005	-0.0002	0.0043	-0.03	-0.0001	-0.002	91.6	0.00108	0.0928	-0.001	3.7	0.0226	5.13	-0.00002	26.4	6.22	-0.00002	-0.0002	-0.01	0.000337	-0.001	-0.006	0.0055	-0.0002	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 3	11/11/2015	11/11/2015	5.62	0.0185	-0.0002	0.00022	0.0591	-0.0002	-0.0001	0.078	0.000057	335	-0.0005	-0.0002	0.0033	-0.03	-0.0001	-0.002	84.1	0.00476	0.0806	-0.001	3.2	0.0117	4.77	-0.00002	25.5	5.58	-0.00002	-0.0002	0.014	0.000518	-0.001	-0.006	-0.003	-0.0002	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 4	2/7/2013	2/7/2013	4.1	0.0661	0.00037	0.00031	0.0543	-0.0002	-0.001	0.155	-0.0005	361	-0.0005	-0.0002	0.0223	-0.03	-0.0001	0.0029	72.8	0.00519	0.325	-0.001	2.67	0.0423	4.7	-0.00002	26.4	7.63	-0.00002	-0.0002	0.014	0.00188	-0.002	-0.006	0.0087	0.00033	0.00028
Bi-annual Seep Sampling	NEZ Dump Seep 4	5/6/2014	5/6/2014	4.12	0.0352	0.00028	0.00029	0.0411	-0.0002	-0.001	0.078	-0.00012	310	-0.0005	-0.0002	0.0186	-0.03	-0.0001	0.003	66.8	0.00236	0.22	-0.001	2.45	0.0671	4.69	-0.00002	21.1	5.93	-0.00002	-0.0002	-0.01	0.00138	-0.002	-0.006	0.0087	0.00027	0.00026
Bi-annual Seep Sampling	NEZ Dump Seep 4	27-10-2014 12:20	10/27/2014	5.59	0.104	0.00022	0.00041	0.0451	-0.0001	-0.0005	0.106	0.000078	292	-0.0005	0.00033	0.0456	0.053	5.1E-05	0.00289	63.2	0.0713	0.17	0.0007	2.71	0.0277	4.44	-0.00001	21.3	5.75	-0.00001	-0.0001	0.024	0.00186	-0.001	0.0043	0.0091	0.0002	0.0003
Bi-annual Seep Sampling	NEZ Dump Seep 4	25-05-2015 14:14	5/25/2015	6.35	0.0426	0.00021	0.00033	0.047	-0.0002	-0.0001	0.087	0.000069	356	-0.0005	-0.0002	0.0209	-0.03	-0.0001	0.0033	74.6	0.0123	0.169	-0.001	2.79	0.0244	4.46	-0.00002	22.9	6.38	-0.00002	-0.0002	-0.01	0.00169	-0.001	-0.006	0.0086	-0.0002	0.00031
Bi-annual Seep Sampling	NEZ Dump Seep 4	11/11/2015	11/11/2015	5.57	0.573	0.00021	0.00046	0.0427	-0.0001	-0.00005	0.081	0.0000684	281	-0.0005	0.00044	0.0779	0.209	0.00012	0.0026	60.7	0.0793	0.117	0.00102	2.59	0.0173	4.6	7.9E-05	19.2	5.32	-0.00001	-0.0001	0.019	0.00154	0.00105	0.0058	0.0167	0.00015	0.00029
Bi-annual Seep Sampling	NEZ Dump Seep 5	2/7/2013	2/7/2013	3.24	0.217	0.00022	0.00074	0.0226	-0.0001	-0.0005	0.054	0.000023	51.9	-0.0005	0.00016	0.0205	0.207	9.2E-05	0.00072	7.01	0.017	0.0371	-0.0005	0.594	0.00945	6.8	-0.00001	4.11	0.665	-0.00001	-0.0001	0.017	0.000403	0.002	-0.003	0.0084	0.00017	0.00061
Bi-annual Seep Sampling	NEZ Dump Seep 5	27-10-2014 14:55	10/27/2014	3.27	0.027	0.00047	0.00031	0.056	-0.0001	-0.0005	0.32	0.000024	205	-0.0005	-0.0001	0.00451	-0.03	-0.00005	0.00353	26.8	0.00224	0.111	-0.0005	1.5	0.017	7.03	-0.00001	23.5	4.73	-0.00001	-0.0001	0.02	0.00127	-0.001	-0.003	-0.003	0.00045	0.00029
Bi-annual Seep Sampling	NEZ Dump Seep 5	28-05-2015 14:09	5/28/2015	1.89	0.0666	0.0004	0.00067	0.0499	-0.0001	-0.00005	0.163	0.0000283	183	-0.0005	-0.0001	0.0087	0.075	-0.00005	0.0038	24.5	0.00764	0.116	-0.0005	1.29	0.0418	6.6	-0.00001	15.3	3.08	-0.00001	-0.0001	0.016	0.00208	0.00128	-0.003	-0.003	0.00039	0.0006

Location Type	Sample Point	Original Date As Is	Recoded Date	Barium (Ba)-Dissolved (mg/L)	Beryllium (Be)-Dissolved (mg/L)	Bismuth (Bi)-Dissolved (mg/L)	Boron (B)-Dissolved (mg/L)	Cadmium (Cd)-Dissolved (mg/L)	Calcium (Ca)-Dissolved (mg/L)	Chromium (Cr)-Dissolved (mg/L)	Cobalt (Co)-Dissolved (mg/L)	Copper (Cu)-Dissolved (mg/L)	Iron (Fe)-Dissolved (mg/L)	Lead (Pb)-Dissolved (mg/L)	Lithium (Li)-Dissolved (mg/L)	Magnesium (Mg)-Dissolved (mg/L)	Manganese (Mn)-Dissolved (mg/L)	Molybdenum (Mo)-Dissolved (mg/L)	Nickel (Ni)-Dissolved (mg/L)	Potassium (K)-Dissolved (mg/L)	Selenium (Se)-Dissolved (mg/L)	Silicon (Si)-Dissolved (mg/L)	Silver (Ag)-Dissolved (mg/L)	Sodium (Na)-Dissolved (mg/L)	Strontium (Sr)-Dissolved (mg/L)	Thallium (Tl)-Dissolved (mg/L)	Tin (Sn)-Dissolved (mg/L)	Titanium (Ti)-Dissolved (mg/L)	Uranium (U)-Dissolved (mg/L)	Vanadium (V)-Dissolved (mg/L)	Zinc (Zn)-Dissolved (mg/L)		Julian Date	EC-Field
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L			µs/cm
Bi-annual Seep Sampling	Boundary Dump Seep 1	4/6/2013	4/6/2013	0.0205	-0.0001	-0.0005	0.051	-0.00001	56.2	-0.0005	-0.0001	0.00213	0.038	-0.00005	-0.0005	5.04	0.000591	0.00513	-0.0005	0.494	0.00079	4.58	-0.00001	2.34	0.194	-0.00001	-0.0001	-0.01	0.000037	-0.001	-0.003		2013.26	352
Bi-annual Seep Sampling	Boundary Dump Seep 2	4/6/2013	4/6/2013	0.0336	-0.0001	-0.0005	0.061	0.000052	176	-0.0005	0.00015	0.00868	-0.03	-0.00005	0.00186	21	0.0222	0.0328	-0.0005	1.35	0.00456	5.88	-0.00001	5.44	1.8	-0.00001	-0.0001	0.011	0.0012	-0.001	-0.003		2013.26	1020
Bi-annual Seep Sampling	Boundary Dump Seep 2	10/12/2013	10/12/2013	0.0503	-0.0001	-0.0005	0.049	0.00001	261	-0.0005	-0.0001	0.00196	0.038	-0.00005	0.00165	34.5	0.0354	0.0225	-0.0005	1.78	0.00249	7.16	-0.00001	7.1	2.76	-0.00001	-0.0001	0.02	0.000757	-0.001	-0.003		2013.78	1358
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2013 15:26	10/23/2013	0.0556	-0.0001	-0.0005	0.048	0.000013	260	-0.0005	0.00041	0.00099	0.249	0.000063	0.00226	39.6	0.316	0.0215	-0.0005	1.99	0.00205	6.62	-0.00001	8.08	2.98	-0.00001	-0.0001	-0.01	0.000874	-0.001	-0.003		2013.81	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	14-11-2013 10:35	11/14/2013	0.0511	-0.0001	-0.0005	0.057	0.00003	258	-0.0005	0.00028	0.00287	0.055	-0.00005	0.00231	36.1	0.166	0.0231	0.00068	1.89	0.00242	6.32	-0.00001	7.79	2.91	-0.00001	-0.0001	0.024	0.000867	-0.001	-0.003		2013.87	1092
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-01-2014 11:10	1/16/2014	0.0523	-0.0001	-0.0005	0.058	-0.00002	217	-0.0005	0.00048	-0.0005	0.326	-0.00005	0.00198	27.2	0.397	0.0151	-0.0005	1.82	0.00296	6.33	-0.00001	6.23	2.24	-0.00001	-0.0001	0.015	0.000558	-0.001	-0.003		2014.04	378
Bi-annual Seep Sampling	Boundary Dump Seep 2	18-02-2014 10:11	2/18/2014	0.0502	-0.0001	-0.0005	0.052	-0.00001	248	-0.0005	0.00019	0.00112	0.124	0.000055	0.00136	31.3	0.405	0.0128	-0.0005	1.76	0.00169	7.59	-0.00001	6.59	2.07	-0.00001	-0.0001	0.011	0.00062	-0.001	-0.003		2014.13	1184
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/7/2014	3/7/2014	0.044	-0.0001	-0.0005	0.052	-0.0001	257	-0.0005	-0.0001	0.00736	-0.03	-0.00005	0.00252	40.5	0.00383	0.0543	-0.0005	1.69	0.00495	5.59	-0.00001	8.79	3.55	-0.00001	-0.0001	0.017	0.00154	-0.001	-0.003		2014.18	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	15-05-2014 9:15	5/15/2014	0.025	-0.0001	-0.0005	0.052	0.000047	124	-0.0005	0.00015	0.00951	-0.03	-0.00005	0.00133	14.9	0.0211	0.0218	-0.0005	1.21	0.0033	5.14	-0.00001	4.14	0.969	-0.00001	-0.0001	0.014	0.000567	-0.001	-0.003		2014.37	667
Bi-annual Seep Sampling	Boundary Dump Seep 2	6/8/2014	6/8/2014	0.0412	-0.0001	-0.0005	0.057	0.000045	232	-0.0005	0.00022	0.00604	0.04	0.000073	0.00203	32.3	0.0344	0.0371	-0.0005	1.49	0.00412	5.8	-0.00001	7.42	2.39	-0.00001	-0.0001	0.013	0.00125	-0.001	-0.003		2014.43	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-06-2014 11:53	6/16/2014	0.0431	-0.0001	-0.0005	0.047	-0.00007	252	-0.0005	0.00017	0.00393	-0.03	0.000065	0.00284	39.9	0.0332	0.0517	-0.0005	1.67	0.00687	5.52	-0.00001	8.28	3.06	-0.00001	-0.0001	0.014	0.00137	-0.001	-0.003		2014.45	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/9/2014	8/9/2014	0.0441	-0.0001	-0.0005	0.057	0.000015	233	-0.0005	0.00034	0.0035	0.057	-0.00005	0.0024	32.4	0.0594	0.0253	-0.0005	1.45	0.00241	6.24	-0.00001	6.84	2.35	-0.00001	-0.0001	0.019	0.0013	-0.001	0.004		2014.6	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/12/2014	8/12/2014	0.0452	-0.0001	-0.0005	0.048	0.000031	243	-0.0005	0.00031	0.00433	0.097	0.000168	0.00188	34.1	0.0976	0.0245	-0.0005	1.75	0.00257	6.07	-0.00001	7.99	2.6	-0.00001	-0.0001	0.015	0.000722	-0.001	-0.003		2014.61	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2014 9:42	10/23/2014	0.0396	-0.0001	-0.0005	0.044	0.000028	238	-0.0005	0.00052	0.00356	0.075	0.000052	0.00205	34.4	0.105	0.0292	-0.0005	1.55	0.00299	6.18	-0.00001	7.35	2.83	-0.00001	-0.0001	0.018	0.00104	-0.001	-0.003		2014.81	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/11/2014	11/11/2014	0.0408	0.00019	-0.0005	0.066	0.000055	206	-0.0005	0.00023	0.00594	-0.03	0.000164	0.0025	25.8	0.0259	0.0348	-0.0005	1.48	0.00435	5.89	-0.00001	6.75	1.98	0.00002	-0.0001	0.015	0.000999	0.0015	0.004		2014.86	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	1/7/2015	1/7/2015	0.0342	-0.0001	-0.00005	0.059	0.0000715	184	-0.0005	-0.0001	0.00675	-0.03	-0.00005	0.0019	23.4	0.0207	0.0246	-0.0005	1.29	0.00225	5.48	-0.00001	6.35	1.91	-0.00001	-0.0001	-0.01	0.00107	-0.0005	0.003		2015.02	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/6/2015	2/6/2015	0.0342	-0.0001	-0.00005	0.062	0.000074	164	-0.0005	0.00016	0.00905	-0.03	-0.00005	0.0013	17.9	0.0393	0.0173	-0.0005	1.18	0.00154	6.13	-0.00001	5.23	1.27	-0.00001	-0.0001	-0.01	0.000783	-0.0005	-0.003		2015.1	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/9/2015	2/9/2015	0.0453	-0.0001	-0.00005	0.066	0.0000211	195	-0.0005	0.00155	0.00317	0.185	0.000096	0.002	23	0.498	0.0173	-0.0005	1.32	0.00156	6.67	-0.00001	6.02	1.87	-0.00001	-0.0001	-0.01	0.00103	0.00069	-0.003		2015.11	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/2/2015	3/2/2015	0.0315	-0.0001	-0.0005	0.062	0.000021	169	-0.0005	-0.0001	0.00616	-0.03	-0.00005	0.00193	21.2	0.0205	0.028	-0.0005	1.18	0.00258	5.91	-0.00001	5.65	1.57	-0.00001	-0.0001	0.012	0.000645	-0.001	-0.003		2015.16	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/3/2015	3/3/2015	0.0312	-0.0001	-0.0005	0.056	0.000036	169	-0.0005	0.00012	0.00654	-0.03	-0.00005	0.00157	22.5	0.0134	0.0342	-0.0005	1.13	0.00352	5.73	-0.00001	5.54	1.73	-0.00001	-0.0001	0.015	0.000738	-0.001	-0.003		2015.17	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/4/2015	7/4/2015	0.0315	-0.0001	-0.00005	0.059	0.0000306	169	-0.0005	0.00011	0.00571	-0.03	-0.00005	0.0017	21.7	0.0138	0.0324	-0.0005	1.31	0.00389	5.68	-0.00001	5.94	1.66	-0.00001	-0.0001	0.013	0.000604	-0.0005	-0.003		2015.5	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/5/2015	7/5/2015	0.0294	-0.0001	-0.00005	0.067	0.000027	147	-0.0005	-0.0001	0.00716	-0.03	-0.00005	0.002	16.5	0.00726	0.0208	-0.0005	1.03	0.00204	6.14	-0.00001	4.68	1.22	-0.00001	-0.0001	-0.01	0.0006	-0.0005	-0.003		2015.51	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	29-10-2015 11:29	10/29/2015	0.047	-0.0001	-0.00005	0.038	0.0000114	200	-0.0005	0.0011	0.00168	0.157	-0.00005	-0.001	29.1	0.00398	0.0158	-0.0005	1.68	0.00161	6.76	0.00001	7.06	2.75	-0.00001	-0.0001	-0.01	0.00076	0.00075	-0.003		2015.82	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/8/2015	11/8/2015	0.04	-0.0001	-0.00005	0.06	0.00004	195	-0.0005	0.00115	0.00537	0.103	0.000061	0.0029	24.6	0.419	0.0243	-0.0005	1.29	0.00208	6.45	-0.00001	6.18	2.13	-0.00001	-0.0001	-0.01	0.00107	0.00056	-0.003		2015.85	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	30-11-2015 11:50	11/30/2015	0.0453	-0.0001	-0.00005	0.056	0.0000353	237	-0.0005	0.00019	0.00332	0.034	-0.00005	0.0017	28.1	0.116	0.0183	-0.0005	1.58	0.00177	6.5	-0.00001	6.97	2.16	-0.00001	-0.0001	-0.01	0.000665	0.0005	-0.003		2015.91	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 2	12/1/2015	12/1/2015	0.0363	-0.0001	-0.0005	0.057	0.000013	209	-0.0005	0.00025	0.00111	0.063	-0.00005	0.00129	26.7	0.0491	0.0226	-0.0005	1.41	0.00187	6.48	-0.00001	6.38	1.92	-0.00001	-0.0001	0.018	0.00069	-0.001	-0.003		2015.91	#N/A
Bi-annual Seep Sampling	Boundary Dump Seep 3	19-05-2015 13:49	5/19/2015	0.0331	-0.0001	-0.00005	0.069	0.0000227	144	-0.0005	0.00013	0.00634	0.04	-0.00005	0.0013	13.2	0.0509	0.0089	-0.0005	0.972	0.00106	6.3	-0.00001	4.24	0.815	-0.00001	-0.0001	-0.01	0.000551	0.00055	-0.003		2015.38	#N/A
Bi-annual Seep Sampling	East Dump Seep 1	9/5/2013	9/5/2013	0.0301	-0.0001	-0.0005	0.057	-0.00015	156	-0.0005	-0.0001	0.00226	-0.03	-0.00005	-0.0005	30.5	0.0195	0.195	-0.0005	2.29	0.0612	3.77	-0.00001	14.4	3.05	-0.00001	-0.0001	-0.01	0.000022	-0.001	0.0147		2013.68	526
Bi-annual Seep Sampling	East Dump Seep 1	23-10-2014 14:15	10/23/2014	0.0492	-0.0001	-0.0005	0.039	0.000237	166	-0.0005	0.00179	0.00561	-0.03	-0.00005	-0.0005	32.9	0.594	0.0926	0.0017	2.3	0.017	3.71	-0.00001	12.9	2.92	-0.00001	-0.0001	0.016	0.000031	-0.001	0.0212		2014.81	#N/A
Bi-annual Seep Sampling	East Dump Seep 1	28-05-2015 10:46	5/28/2015	0.0586	-0.0001	-0.00005	0.045	0.000226	171	-0.0005	0.0011	0.00571	-0.03	-0.00005	-0.001	35	0.646	0.102	0.00107	2.16	0.0257	3.76	-0.00001	14.5	2.81	-0.00001	-0.0001	0.011	0.000037	-0.0005	0.0176		2015.4	#N/A
Bi-annual Seep Sampling	East Dump Seep 1	26-11-2015 12:46	11/26/2015	0.0383	-0.0001	-0.00005	0.045	0.000159	167	-0.0005	0.00015	0.00342	-0.03	-0.00005	-0.001	33.4	0.217	0.0392	0.00138	1.94	0.00789	3.9	-0.00001	13.6	2.74	-0.00001	-0.0001	0.013	0.000017	-0.0005	0.0175		2015.9	#N/A
Bi-annual Seep Sampling	East Dump Seep 2	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.68	394
Bi-annual Seep Sampling	East Dump Seep 2	20-06-2013 13:24	6/20/2013	0.0233	-0.0001	-0.0005	0.051	-0.0005	128	-0.0005	0.00154	0.00321	-0.03	-0.00005	-0.0005	26.8	0.244	0.312	0.00078	2.3	0.0726	3.25	-0.00001	13.8	3.26	-0.00001	-0.0001	0.011	0.000016	-0.001	0.0135		2013.47	#N/A
Bi-annual Seep Sampling	East Dump Seep 3	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.68	519
Bi-annual Seep Sampling	East Dump Seep 3	20-06-2013 13:36	6/20/2013	0.0312	-0.0001	-0.0005	0.062	-0.001	141	-0.0005	0.00659	0.00477	-0.03	-0.00005	0.00109	34.5	1.11	0.393	0.00333	2.19	0.0399	4.1	-0.00001	17.3	4.2	-0.00001	-0.0001	0.011	0.000068	-0.001	0.0695		2013.47	#N/A
Bi-annual Seep Sampling	East Dump Seep 4	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.68	633
Bi-annual Seep Sampling	East Dump Seep 4	20-06-2013 13:55	6/20/2013	0.0441	-0.0001	-0.0005	0.039	0.000309	232	-0.0005	-0.0001	0.00479	-0.03	-0.00005	-0.0005	37.2	0.00473	0.107	0.00093	2.6	0.0491	5.04	-0.00001	17.1	2.73	-0.00001	-0.0001	0.013	0.000086	-0.001	0.0546		2013.47	#N/A
Bi-annual Seep Sampling	East Dump Seep 4	26-11-2015 13:16	11/26/2015	0.0622	-0.0001	-0.00005	0.035	0.00123	148	-0.0005	-0.0001	0.00397	-0.03	-0.00005	0.0012	22.8	0.00051	0.117	0.00078	1.32	0.0282	5.5	-0.00001	9.86	1.84	-0.00001	-0.0001	0.013	0.000287	-0.0005	0.14		2015.9	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/7/2013	2/7/2013	0.0504	-0.0002	-0.001	0.105	-0.0003	359	-0.0005	0.00076	0.0652	-0.03	-0.0001	-0.001	63	0.0938	0.313	0.0016	2.23	0.242	5.14	-0.00002	22.5	3.22	-0.00002	-0.0002	0.013	0.00147	-0.002	0.0117		2013.1	2010
Bi-annual Seep Sampling	NEZ Dump Seep 1	10/12/2013	10/12/2013	0.0607	-0.0002	-0.001	0.082	-0.0001	322	-0.0005	-0.0002	0.0168	-0.03	-0.0001	-0.001	56.2	0.0117	0.195	-0.001	2.14	0.125	5.35	-0.00002	19.1	4.1	-0.00002	-0.0002	0.02	0.00133	-0.002	0.005		2013.78	1799
Bi-annual Seep Sampling	NEZ Dump Seep 1	23-10-2013 13:55	10/23/2013	0.0527	-0.0002	-0.001	0.09	-0.00012	301	-0.0005	-0.0002	0.0198	-0.03	-0.0001	0.0023	55.6	0.0181	0.188	-0.001	2.27	0.133	5.68	-0.00002	19.6	3.44	-0.00002	-0.0002	-0.01	0.00136	-0.002	0.0053		2013.81	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	26-11-2013 9:14	11/26/2013	0.056	-0.0002	-0.001	0.089	-0.00012	327	-0.0005	-0.0002	0.0173	-0.03	-0.0001	0.0019	54.4	0.0134	0.184	-0.001	2.21	0.132	5.31	-0.00002	19.9	3.78	-0.00002	-0.0002	0.019	0.00133	-0.002	0.005		2013.9	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	16-01-2014 10:15	1/16/2014	0.0613	-0.0002	-0.001	0.095	-0.0002	325	-0.0005	-0.0002	0.0164	-0.03	-0.0001	0.0025	57.9	0.0114	0.227	-0.001	2.21	0.132	4.9	-0.00002	19.7	4.57	-0.00002	-0.0002	0.015	0.00148	-0.002	0.0061		2014.04	1850
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-02-2014 13:08	2/18/2014	0.0677	-0.0002	-0.001	0.095	-0.00012	353	-0.0005	-0.0002	0.0145	-0.03	-0.0001	0.0019	63.4	0.011	0.256	-0.001	2.31	0.136	5.15	-0.00002	21.6	5.26	-0.00002	-0.0002	0.012	0.00153	-0.002	0.0052		2014.13	1902
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/6/2014	3/6/2014	0.0462	-0.0002	-0.001	0.071	-0.0004	320	-0.0005	0.00327	0.17	-0.03	-0.0001	0.0028	60.5	0.315	0.245	0.0051	2.21	0.174	5.16	-0.00002	19.8	3.2	-0.00002	-0.0002	-0.01	0.00106	-0.002	0.0241		2014.17	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/7/2014	3/7/2014	0.0472	-0.0002	-0.001	0.089	-0.0004	355	-0.0005	0.00175	0.112	-0.03	-0.0001	0.0024	67.1	0.202	0.272	0.0032	2.22	0.182	5.15	-0.00002	21	3.92	-0.00002	-0.0002	0.017	0.00129	-0.002	0.018		2014.18	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-05-2014 11:45	5/13/2014	0.0495	-0.0002	-0.001	0.076	-0.0009	314	-0.0005	0.0167	0.516	-0.03	-0.0001	0.0051	64.9	1.05	0.252	0.0145	2.16	0.156	5.45	-0.00002	18.5	3.53	-0.00002	-0.0002	0.016	0.000707	-0.002	0.0733		2014.36	1763
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/8/2014	6/8/2014	0.0432	-0.0002	-0.001	0.089	0.000168	339	-0.0005	0.00142	0.0817	-0.03	-0.0001	0.003	60	0.169	0.203	0.0025	2.15	0.156	5.17	-0.00002	20.2	3.22	-0.00002	-0.0002	0.016	0.00108	-0.002	0.0141		2014.43	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/4/2014	8/4/2014	0.0359	-0.0001	-0.0005	0.06	-0.00013	241	-0.0005	0.00019	0.0217	-0.03	-0.00005	0.00146	40.5	0.0296	0.178	0.00061	1.77	0.101	5.22	-0.00001	17.4	2.28	-0.00001	-0.0001	0.017	0.00137	-0.001	0.0037		2014.59	1390
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/9/2014	8/9/2014	0.0449	-0.0002	-0.001	0.084	-0.0002	344	-0.0005	0.00118	0.0732	-0.03	-0.0001	0.0026	63.6	0.141	0.22	0.0023	2.28	0.178	5.44	-0.00002	20	3.31	-0.00002	-0.0002	0.024	0.00129	-0.002	0.0136		2014.6	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/12/2014	8/12/2014	0.0459	-0.0002	-0.001	0.075	0.000192	342	-0.0005	0.00193	0.143	-0.03	-0.0001	0.0028	62.2	0.194	0.216	0.0034	2.39	0.177	5.53	-0.00002	20.8	3.29	-0.00002	-0.0002	0.015	0.00116	-0.002	0.0212		2014.61	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	27-10-2014 11:23	10/27/2014	0.0379	-0.0001	-0.0005	0.075	0.000105	283	-0.0005	0.00089	0.0616	-0.03	-0.00005	0.00276	48.2	0.126	0.195	0.00134	2.06	0.125	4.79	-0.00001	17.6	3.13	-0.00001	-0.0001	0.023	0.00128	-0.001	0.0081		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/3/2014	11/3/2014	0.0708	-0.0002	-0.001	0.096	-0.00014	361	-0.0005	-0.0002	0.0139	-0.03	-0.0001	0.0016	64.5	0.00791	0.232	-0.001	2.3	0.136	5.23	-0.00002	21.3	5.03	-0.00002	-0.0002	0.019	0.00145	-0.002	0.0051		2014.84	1957
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2014	11/11/2014	0.0384	-0.0001	-0.0005	0.072	0.000196	283	-0.0005	0.00268	0.116	-0.03	-0.00005	0.00292	49.1	0.238	0.186	0.0032	2.11	0.115	5.16	-0.00001	17.2	3.01	-0.00001	-0.0001	0.021	0.00109	-0.001	0.0165		2014.86	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-01-2015 10:28	1/13/2015	0.0448	-0.0002	-0.001	0.079	0.00023	364	-0.0005	0.00202	0.153	-0.03	-0.0001	0.0029	67.4	0.203	0.245	0.0036	2.26	0.197	5.47	-0.00002	19.8	3.16	0.000035	-0.0002	0.02	0.00123	-0.002	0.0242		2015.03	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/9/2015	2/9/2015	0.0457	-0.0002	-0.0001	0.085	0.000198	357	-0.0005	0.00169	0.132	-0.03	-0.0001	0.003	63.5	0.204	0.182	0.003	2.32	0.176	5.38	-0.00002	20.5	3.19	-0.00002	-0.0002	-0.01	0.00134	-0.001	0.0209		2015.11	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	4/6/2015	4/6/2015	0.0434	-0.0002	-0.0001	0.081	0.000247	342	-0.0005	0.0022	0.179	-0.03	-0.0001	0.0032	61.8	0.267	0.219	0.0039	2.32	0.205	5.32	-0.00002	20.3	3.33	-0.00002	-0.0002	-0.01	0.00116	-0.001	0.0249		2015.26	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/2/2015	5/2/2015	0.0506	-0.0002	-0.001	0.079	0.000249	326	-0.0005	0.00352	0.234	-0.03	-0.0001	0.0034	62.8	0.318	0.249	0.0051	2.59	0.174	5.28	-0.00002	24.1	3.55	-0.00002	-0.0002	0.016	0.0011	-0.002	0.0316		2015.33	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/3/2015	5/3/2015	0.0424	-0.0002	-0.001	0.083	0.000255	355	-0.0005	0.00324	0.198	-0.03	-0.0001	0.0048	64.9	0.299	0.284	0.0045	2.24	0.184	5.42	-0.00002	19.8	3.6	-0.00002	-0.0002	0.026	0.00122	-0.002	0.0248		2015.33	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/5/2015	6/5/2015	0.0433	-0.0002	-0.0001	0.074	0.000287	327	-0.0005	0.00324	0.213	-0.03	-0.0001	0.0035	63.4	0.345	0.218	0.0049	2.27	0.207	5.43	-0.00002	19.8	3.17	-0.00002	-0.0002	-0.01	0.000991	-0.001	0.0278		2015.42	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	7/7/2015	7/7/2015	0.0467	-0.0002	-0.0001	0.1	-0.0002	367	-0.0005	0.00175	0.153	-0.03	-0.0001	0.0034	60.5	0.211	0.196	0.0035	2.33	0.18	5	-0.00002	20.1	3.03	-0.00002	-0.0002	-0.01	0.00117	-0.001	0.0246		2015.51	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-08-2015 13:28	8/18/2015	0.043	-0.0002	-0.0001	0.089	0.000189	330	-0.0005	0.00166	0.135	-0.03	-0.0001	0.0022	60.5	0.206	0.172	0.003	2.22	0.156	5.32	-0.00002	19.7	2.94	-0.00002	-0.0002	-0.01	0.00121	-0.001	0.022		2015.63	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	9/4/2015	9/4/2015	0.0424	-0.0001	-0.00005	0.082	0.000347	308	-0.0005	0.00494	0.266	-0.03	-0.00005	0.0049	58	0.467	0.187	0.007	2.31	0.16	5.65	-0.00001	19.5	2.94	-0.00001	-0.0001	0.02	0.000742	-0.0005	0.0347		2015.67	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	29-10-2015 10:44	10/29/2015	0.0415	-0.0002	-0.0001	0.081	0.000179	336	-0.0005	0.0014	0.131	-0.03	-0.0001	0.0027	59	0.18	0.174	0.0027	2.3	0.142	5.61	-0.00002	20.1	3.03	-0.00002	-0.0002	-0.01	0.00124	-0.001	0.0204		2015.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2015	11/11/2015	0.0389	-0.0001	-0.00005	0.071	0.000191	293	-0.0005	0.00213	0.137	-0.03	-0.00005	0.0032	54.4	0.223	0.164	0.003	2.08	0.141	5.19	-0.00001	17.4	3	-0.00001	-0.0001	0.014	0.0012	-0.0005	0.0196		2015.86	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 10	4/7/2013	4/7/2013	0.0319	-0.0001	-0.0005	0.058	-0.00002	257	-0.0005	-0.0001	0.00439	-0.03	-0.00005	0.00169	47.1	0.00345	0.0499	-0.0005	2.23	0.00816	5.12	-0.00001	14.2	2.81	-0.00001	-0.0001	0.013	0.00193	-0.001	-0.003		2013.26	1433
Bi-annual Seep Sampling	NEZ Dump Seep 10	27-10-2014 13:57	10/27/2014	0.0314	-0.0001	-0.0005	0.052	-0.00001	243	-0.0005	-0.0001	0.00549	-0.03	-0.00005	0.00149	48.8	0.00519	0.0434	-0.0005	2.3	0.0101	5.09	-0.00001	13.1	2.35	-0.00001	-0.0001	0.021	0.0016	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 10	8/6/2015	8/6/2015	0.03	-0.0001	-0.00005	0.056	0.0000085	249	-0.0005	-0.0001	0.00419	-0.03	-0.00005	0.0018	46.7	0.0019	0.0283	-0.0005	2.2	0.00863	5.63	-0.00001	13.4	2.48	-0.00001	-0.0001	-0.01	0.00154	-0.0005	-0.003		2015.59	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 11	4/7/2013	4/7/2013	0.0269	-0.0001	-0.0005	0.042	0.000021	271	-0.0005	-0.0001	0.00706	-0.03	-0.00005	0.00087	48.5	0.00169	0.0342	-0.0005	1.82	0.00328	5.58	-0.00001	13.7	2.57	-0.00001	-0.0001	0.013	0.00255	-0.001	-0.003		2013.26	1479
Bi-annual Seep Sampling	NEZ Dump Seep 11	5/6/2014	5/6/2014	0.0239	-0.0001	-0.0005	0.047	-0.00005	248	-0.0005	-0.0001	0.00609	-0.03	-0.00005	0.00169	45.4	0.000515	0.0474	-0.0005	1.89	0.00423	5.27	-0.00001	12.5	2.54	-0.00001	-0.0001	-0.01	0.00266	-0.001	-0.003		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 11	27-10-2014 14:28	10/27/2014	0.0249	-0.0001	-0.0005	0.043	0.000014	260	-0.0005	-0.0001	0.00698	-0.03	-0.00005	0.0017	47.3	0.00456	0.044	-0.0005	2.03	0.00688	5.74	-0.00001	12.6	2.33	-0.00001	-0.0001	0.021	0.00194	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 11	28-05-2015 13:17	5/28/2015	0.0267	-0.0001	-0.00005	0.048	0.0000133	251	-0.0005	-0.0001	0.00894	-0.03	-0.00005	0.0017	47.1	0.00083	0.0368	-0.0005	2.01	0.00273	6.1	-0.00001	12.6	2.27	-0.00001	-0.0001	0.014	0.00223	-0.0005	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 12	4/7/2013	4/7/2013	0.024	-0.0001	-0.0005	0.053	-0.00007	231	-0.0005	-0.0001	0.00353	-0.03	-0.00005	0.00222	43.7	0.000961	0.154	-0.0005	1.27	0.00597	5.13	-0.00001	12.5	2.63	-0.00001	0.00011	0.013	0.00476	-0.001	-0.003		2013.26	1338
Bi-annual Seep Sampling	NEZ Dump Seep 12	27-10-2014 15:29	10/27/2014	0.0284	-0.0001	-0.0005	0.05	0.000063	247	-0.0005	-0.0001	0.00428	-0.03	-0.00005	0.00329	46.6	0.00343	0.154	-0.0005	1.38	0.0109	5.16	-0.00001	11.9	2.69	-0.00001	-0.0001	0.021	0.0044	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 12	28-05-2015 12:53	5/28/2015	0.0231	-0.0001	-0.00005	0.044	0.00004	215	-0.0005	-0.0001	0.0039	-0.03	-0.00005	0.0021	41.6	0.00257	0.119	-0.0005	1.29	0.00744	5.03	-0.00001	12.5	2.1	-0.00001	-0.0001	0.013	0.00388	-0.0005	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 13	4/7/2013	4/7/2013	0.0139	-0.0001	-0.0005	0.046	-0.00005	263	-0.0005	-0.0001	0.00307	-0.03	-0.00005	0.00096	42.3	0.0541	0.117	-0.0005	1.3	0.00686	5.65	-0.00001	12.4	2.67	-0.00001	-0.0001	0.013	0.00412	-0.001	-0.003		2013.26	1453
Bi-annual Seep Sampling	NEZ Dump Seep 13	5/6/2014	5/6/2014	0.023	-0.0001	-0.0005	0.056	-0.00008	237	-0.0005	-0.0001	0.00322	-0.03	-0.00005	0.00184	40.5	0.028	0.235	-0.0005	1.18	0.00795	4.76	-0.00001	12.5	2.46	-0.00001	-0.0001	-0.01	0.00501	-0.001	-0.003		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 13	27-10-2014 15:47	10/27/2014	0.028	-0.0001	-0.0005	0.052	0.000038	257	-0.0005	-0.0001	0.00501	-0.03	-0.00005	0.00258	43.4	0.0369	0.218	-0.0005	1.34	0.011	4.74	-0.00001	12.1	2.52	-0.00001	-0.0001	0.021	0.00418	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 13	28-05-2015 12:37	5/28/2015	0.0154	-0.0001	-0.00005	0.042	0.0000185	265	-0.0005	-0.0001	0.00217	-0.03	-0.00005	0.0023	42.5	0.0969	0.13	-0.0005	1.3	0.00643	6.14	-0.00001	12.1	2.51	-0.00001	-0.0001	0.013	0.00336	-0.0005	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 14	4/7/2013	4/7/2013	0.014	-0.0001	-0.0005	0.033	-0.00005	99.9	-0.0005	-0.0001	0.00589	-0.03	-0.00005	-0.0005	16.6	0.00416	0.0112	-0.0005	0.859	0.0154	4.78	-0.00001	6.53	0.392	-0.00001	0.00025	-0.01	0.000189	-0.001	0.0031		2013.26	661
Bi-annual Seep Sampling	NEZ Dump Seep 14	5/6/2014	5/6/2014	0.00977	-0.0001	-0.0005	0.021	0.000031	72	-0.0005	-0.0001	0.00598	-0.03	-0.00005	0.00082	12.6	0.00485	0.0103	-0.0005	0.684	0.0158	5.08	-0.00001	4.88	0.291	-0.00001	-0.0001	-0.01	0.000144	-0.001	0.0043		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 14	27-10-2014 15:26	10/27/2014	0.0275	-0.0001	-0.0005	0.034	0.000265	162	-0.0005	0.00088	0.0102	-0.03	-0.00005	0.00155	26	0.174	0.0108	-0.0005	1.25	0.0104	7.12	-0.00001	8.25	0.778	-0.00001	-0.0001	0.016	0.000429	-0.001	0.0137		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 14	28-05-2015 12:16	5/28/2015	0.0165	-0.0001	-0.00005	0.029	0.0000554	100	-0.0005	-0.0001	0.00573	-0.03	-0.00005	-0.001	15.9	0.0116	0.0124	-0.0005	0.931	0.0171	5.01	-0.00001	6.07	0.476	-0.00001	-0.0001	-0.01	0.000148	-0.0005	0.0039		2015.4	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 15	5/6/2014	5/6/2014	0.0165	-0.0001	-0.0005	0.048	-0.00003	218	-0.0005	-0.0001	0.00206	-0.03	-0.00005	0.00112	34.4	0.00933	0.102	-0.0005	1.17	0.00748	5.58	-0.00001	10.4	1.51	-0.00001	-0.0001	-0.01	0.00291	-0.001	-0.003		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 15	28-05-2015 11:55	5/28/2015	0.0212	-0.0001	-0.00005	0.053	0.0000067	242	-0.0005	-0.0001	0.0019	-0.03	-0.00005	0.0014	37.7	0.00052	0.0922	-0.0005	1.23	0.0102	5.53	-0.00001	11	1.54	-0.00001	-0.0001	0.013	0.00251	-0.0005	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 16	5/6/2014	5/6/2014	0.022	-0.0001	-0.0005	0.06	-0.00005	203	-0.0005	-0.0001	0.0018	-0.03	-0.00005	0.0013	26	0.00668	0.136	-0.0005	0.98	0.0191	5.81	-0.00001	10.8	1.17	-0.00001	-0.0001	-0.01	0.00241	-0.001	-0.003		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 2	2/7/2013	2/7/2013	0.0497	-0.0002	-0.001	0.12	-0.0003	411	-0.0005	0.0005	0.042	-0.03	-0.0001	0.0035	77.7	0.0641	0.537	0.0013	2.43	0.193	4.6	-0.00002	27.5	6.29	-0.00002	-0.0002	0.013	0.00231	-0.002	0.0097		2013.1	2200
Bi-annual Seep Sampling	NEZ Dump Seep 2	5/6/2014	5/6/2014	0.0459	-0.0002	-0.001	0.093	-0.00026	355	-0.0005	0.00065	0.0712	-0.03	-0.0001	0.0043	73.2	0.084	0.303	0.0024	2.41	0.118	4.44	-0.00002	24.5	6.12	-0.00002	-0.0002	-0.01	0.00183	-0.002	0.0135		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 2	27-10-2014 11:45	10/27/2014	0.0371	-0.0001	-0.0005	0.081	0.000097	301	-0.0005	0.00026	0.0274	-0.03	-0.00005	0.0044	55.2	0.0432	0.265	0.00083	2.05	0.108	4.34	-0.00001	19.5	5.01	-0.00001	-0.0001	0.023	0.00171	-0.001	0.0057		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 2	25-05-2015 14:26	5/25/2015	0.0477	-0.0002	-0.0001	0.091	0.000114	346	-0.0005	-0.0002	0.0412	-0.03	-0.0001	0.0048	68.8	0.0441	0.263	0.0011	2.43	0.079	4.49	-0.00002	23.7	5.9	-0.00002	-0.0002	-0.01	0.0019	-0.001	0.0097		2015.39	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 2	11/11/2015	11/11/2015	0.046	-0.0002	-0.0001	0.093	-0.0001	320	-0.0005	-0.0002	0.0251	-0.03	-0.0001	0.0034	62	0.0452	0.24	-0.001	2.24	0.0684	4.74	-0.00002	21.7	5.95	-0.00002	-0.0002	0.014	0.00171	-0.001	0.0061		2015.86	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 3	2/7/2013	2/7/2013	0.0804	-0.0002	-0.001	0.122	-0.0002	402	-0.0005	-0.0002	0.00389	-0.03	-0.0001	-0.001	95.7	0.00122	0.0837	-0.001	3.76	0.04	5.23	-0.00002	30.3	6.98	-0.00002	-0.0002	0.013	0.000369	-0.002	0.0048		2013.1	2240
Bi-annual Seep Sampling	NEZ Dump Seep 3	5/6/2014	5/6/2014	0.0649	-0.0002	-0.001	0.097	-0.00009	354	-0.0005	-0.0002	0.00387	-0.03	-0.0001	0.0011	89.2	0.00179	0.0897	-0.001	3.5	0.0365	5.19	-0.00002	26.7	6.1	-0.00002	-0.0002	-0.01	0.000372	-0.002	0.0042		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 3	27-10-2014 12:08	10/27/2014	0.0622	-0.0002	-0.001	0.097	0.00005	355	-0.0005	-0.0002	0.00395	-0.03	-0.0001	0.0015	87.8	0.00015	0.0999	-0.001	3.46	0.0163	5.1	-0.00002	25.2	6.13	-0.00002	-0.0002	0.025	0.000501	-0.002	0.0033		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 3	25-05-2015 14:30	5/25/2015	0.066	-0.0002	-0.0001	0.098	0.000054	374	-0.0005	-0.0002	0.00387	-0.03	-0.0001	-0.002	89.3	0.00035	0.0925	-0.001	3.61	0.0224	4.95	-0.00002	25.7	6.19	-0.00002	-0.0002	-0.01	0.000334	-0.001	0.0045		2015.39	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 3	11/11/2015	11/11/2015	0.058	-0.0002	-0.0001	0.074	0.00005	340	-0.0005	-0.0002	0.00298	-0.03	-0.0001	-0.002	84.1	0.0075	0.0829	-0.001	3.08	0.0119	4.89	-0.00002	23.8	5.71	-0.00002	-0.0002	0.014	0.000482	-0.001	-0.003		2015.86	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 4	2/7/2013	2/7/2013	0.0541	-0.0002	-0.001	0.148	-0.0005	373	-0.0005	-0.0002	0.0156	-0.03	-0.0001	0.0025	74.6	0.00349	0.324	-0.001	2.65	0.042	4.79	-0.00002	26.1	7.49	-0.00002	-0.0002	0.013	0.00191	-0.002	0.0042		2013.1	2090
Bi-annual Seep Sampling	NEZ Dump Seep 4	5/6/2014	5/6/2014	0.0393	-0.0002	-0.001	0.075	-0.00012	299	-0.0005	-0.0002	0.0144	-0.03	-0.0001	0.0028	63.9	0.00067	0.209	-0.001	2.28	0.0636	4.45	-0.00002	19.4	5.48	-0.00002	-0.0002	-0.01	0.00126	-0.002	0.0034		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 4	27-10-2014 12:20	10/27/2014	0.0437	-0.0001	-0.0005	0.092	0.000065	300	-0.0005	-0.0001	0.017	-0.03	-0.00005	0.00254	63.9	0.000898	0.154	0.00052	2.63	0.028	4.4	-0.00001	20.1	5.36	-0.00001	-0.0001	0.024	0.00171	-0.001	0.0043		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 4	25-05-2015 14:14	5/25/2015	0.0469	-0.0002	-0.0001	0.079	0.000061	357	-0.0005	-0.0002	0.0151	-0.03	-0.0001	0.0031	74.8	0.00172	0.162	-0.001	2.72	0.0241	4.41	-0.00002	22.4	6.04	-0.00002	-0.0002	-0.01	0.0016	-0.001	0.0033		2015.39	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 4	11/11/2015	11/11/2015	0.0419	-0.0001	-0.00005	0.073	0.0000522	293	-0.0005	-0.0001	0.0169	-0.03	-0.00005	0.0023	63.1	0.00138	0.115	0.00059	2.67	0.0168	4.35	-0.00001	19.3	5.35	-0.00001	-0.0001	0.014	0.00153	-0.0005	0.0037		2015.86	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 5	2/7/2013	2/7/2013	0.0188	-0.0001	-0.0005	0.052	0.00002	50.6	-0.0005	-0.0001	0.011	-0.03	-0.00005	-0.0005	6.67	0.00719	0.0348	-0.0005	0.531	0.00912	6.18	-0.00001	4.08	0.634	-0.00001	-0.0001	-0.01	0.00038	0.0013	-0.003		2013.1	334
Bi-annual Seep Sampling	NEZ Dump Seep 5	27-10-2014 14:55	10/27/2014	0.0551	-0.0001	-0.0005	0.294	0.000029	210	-0.0005	-0.0001	0.00339	-0.03	-0.00005	0.0032	26.8	0.00118	0.106	-0.0005	1.45	0.0177	7.11	-0.00001	22.7	4.87	-0.00001	-0.0001	0.019	0.00121	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 5	28-05-2015 14:09	5/28/2015	0.049	-0.0001	-0.00005	0.159	0.0000293	180	-0.0005	-0.0001	0.00499	-0.03	-0.00005	0.0036	24.2	0.00347	0.113	-0.0005	1.28	0.0406	6.37	-0.00001	14.9	2.97	-0.00001	-0.0001	0.011	0.00203	0.00098	-0.003		2015.4	#N/A

Location Type	Sample Point	Original Date As Is	Recoded Date	pH-field	Q	T	Turbidity-Field	EC	Hardness	pH	TDS	TSS	Turbidity	Alkalinity	NH3	Cl	F	NO3	NO3+NO2	NO2	PO4	P-D	P-T	SO4	N-T
					m3/s	C	NTU	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	Boundary Dump Seep 1	4/6/2013	4/6/2013	7.1	0	7.9	#N/A	320	161	7.46	211	16.3	2.28	57.7	0.0195	0.25	0.045	0.286	0.286	0.0005	0.0211	0.038	0.15	99	1.1
Bi-annual Seep Sampling	Boundary Dump Seep 2	4/6/2013	4/6/2013	7.9	0.003	2	#N/A	998	526	7.9	728	1.5	0.54	142	0.0168	2.5	0.3	0.877	0.877	0.005	0.0201	0.0283	0.0554	438	1.04
Bi-annual Seep Sampling	Boundary Dump Seep 2	10/12/2013	10/12/2013	7.498	#N/A	0.2	#N/A	1320	793	7.71	1090	1.5	29.5	213	0.273	2.5	0.26	0.112	0.112	0.005	0.161	0.195	0.225	600	0.639
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2013 15:26	10/23/2013	#N/A	#N/A	#N/A	#N/A	1330	812	7.8	999	1.5	1.01	186	0.15	2.5	0.1	0.173	0.173	0.005	0.0803	0.0908	0.202	642	0.591
Bi-annual Seep Sampling	Boundary Dump Seep 2	14-11-2013 10:35	11/14/2013	7.757	#N/A	1	1.2	1300	793	8.06	1050	1.5	3.77	181	0.0959	2.5	0.1	0.118	0.131	0.013	0.0766	0.0889	0.15	609	0.468
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-01-2014 11:10	1/16/2014	8.601	#N/A	0	108.9	1160	654	7.61	912	26.9	95.6	175	0.213	2.5	0.1	0.025	0.0255	0.005	0.162	0.256	2.03	513	2.55
Bi-annual Seep Sampling	Boundary Dump Seep 2	18-02-2014 10:11	2/18/2014	7.667	#N/A	0	3.84	1200	748	7.79	983	4.4	10.5	223	0.412	2.5	0.1	0.025	0.0255	0.005	0.183	0.172	0.247	521	0.681
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/7/2014	3/7/2014	#N/A	#N/A	#N/A	#N/A	1310	809	8.06	1120	5.4	1.1	146	0.0288	2.5	0.2	0.395	0.395	0.005	0.0341	0.0401	0.048	659	0.618
Bi-annual Seep Sampling	Boundary Dump Seep 2	15-05-2014 9:15	5/15/2014	7.8	#N/A	3.6	#N/A	675	372	8.02	494	1.5	0.27	107	0.0065	0.25	0.145	0.985	0.987	0.0022	0.016	0.0198	0.021	244	1.13
Bi-annual Seep Sampling	Boundary Dump Seep 2	6/8/2014	6/8/2014	#N/A	#N/A	#N/A	#N/A	1170	711	7.97	982	1.5	0.27	148	0.0094	2.5	0.28	0.539	0.539	0.005	0.0252	0.0299	0.024	555	0.726
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-06-2014 11:53	6/16/2014	#N/A	#N/A	#N/A	#N/A	1250	795	8.02	1010	1.5	0.26	131	0.0177	2.5	0.1	0.677	0.677	0.005	0.0249	0.0315	0.0366	612	0.848
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/9/2014	8/9/2014	#N/A	#N/A	#N/A	#N/A	1260	715	7.91	968	5.4	0.81	176	0.0217	2.5	0.29	0.323	0.323	0.005	0.0314	0.0434	0.0514	589	0.515
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/12/2014	8/12/2014	#N/A	#N/A	#N/A	#N/A	1300	746	8.11	1040	1.5	0.4	142	0.096	2.5	0.1	0.35	0.35	0.005	0.0616	0.0722	0.0831	630	0.563
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2014 9:42	10/23/2014	#N/A	#N/A	#N/A	#N/A	1260	737	7.97	981	1.5	0.28	178	0.0172	2.5	0.1	0.172	0.172	0.005	0.0607	0.0679	0.0648	591	0.39
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/11/2014	11/11/2014	#N/A	#N/A	#N/A	#N/A	1130	620	8.14	875	1.5	0.29	168	0.0294	2.5	0.1	0.906	0.93	0.023	0.0422	0.0465	0.0476	502	1.04
Bi-annual Seep Sampling	Boundary Dump Seep 2	1/7/2015	1/7/2015	#N/A	#N/A	#N/A	#N/A	974	556	7.83	703	61.7	8.53	183	0.0129	0.5	0.155	0.005	0.005	0.001	0.0247	0.0368	0.282	368	0.858
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/6/2015	2/6/2015	#N/A	#N/A	#N/A	#N/A	936	483	8.36	682	5.9	1.47	181	0.0189	0.5	0.123	0.181	0.184	0.0025	0.0181	0.0236	0.0522	325	0.411
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/9/2015	2/9/2015	#N/A	#N/A	#N/A	#N/A	976	582	7.55	766	1.5	0.92	207	0.0799	1.25	0.14	0.094	0.094	0.0025	0.0908	0.084	0.119	351	0.443
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/2/2015	3/2/2015	#N/A	#N/A	#N/A	#N/A	853	510	8.12	656	1.5	0.2	167	0.0156	0.5	0.148	0.473	0.473	0.001	0.0386	0.0421	0.046	318	0.573
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/3/2015	3/3/2015	#N/A	#N/A	#N/A	#N/A	916	514	7.95	725	1.5	0.17	147	0.0055	0.5	0.167	0.564	0.564	0.001	0.0317	0.0374	0.0349	383	0.712
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/4/2015	7/4/2015	#N/A	#N/A	#N/A	#N/A	908	511	7.97	663	1.5	0.18	136	0.0078	0.5	0.145	0.989	0.992	0.0028	0.0216	0.0257	0.0233	371	1.09
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/5/2015	7/5/2015	#N/A	#N/A	#N/A	#N/A	784	435	8.32	582	1.5	0.24	156	0.0057	0.5	0.112	0.63	0.63	0.001	0.0285	0.0323	0.0335	276	0.727
Bi-annual Seep Sampling	Boundary Dump Seep 2	29-10-2015 11:29	10/29/2015	#N/A	#N/A	#N/A	#N/A	1110	620	7.88	884	1.5	4.24	200	0.229	1.25	0.18	0.0125	0.0125	0.0025	0.167	0.181	0.261	456	0.554
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/8/2015	11/8/2015	#N/A	#N/A	#N/A	#N/A	1060	589	8.19	814	3.5	0.77	199	0.0926	1.25	0.19	0.074	0.074	0.0025	0.0839	0.0923	0.129	412	0.417
Bi-annual Seep Sampling	Boundary Dump Seep 2	30-11-2015 11:50	11/30/2015	#N/A	#N/A	#N/A	#N/A	1170	707	7.57	903	26.6	6.87	200	0.125	1.25	0.13	0.1	0.114	0.0139	0.081	0.0923	0.324	475	0.883
Bi-annual Seep Sampling	Boundary Dump Seep 2	12/1/2015	12/1/2015	#N/A	#N/A	#N/A	#N/A	1060	632	7.93	815	1.5	0.23	177	0.0498	2.5	0.15	0.349	0.357	0.0076	0.0456	0.0559	0.0626	441	0.53
Bi-annual Seep Sampling	Boundary Dump Seep 3	19-05-2015 13:49	5/19/2015	#N/A	#N/A	#N/A	#N/A	748	413	8.28	570	5.7	0.57	179	0.0137	0.25	0.1	0.359	0.361	0.0018	0.0198	0.0231	0.0423	223	0.578
Bi-annual Seep Sampling	East Dump Seep 1	9/5/2013	9/5/2013	6.85	0.003	1.7	#N/A	971	514	7.2	784	1.5	0.32	29.5	0.0025	2.5	0.22	2.49	2.49	0.005	0.0005	0.0058	0.0089	505	2.56
Bi-annual Seep Sampling	East Dump Seep 1	23-10-2014 14:15	10/23/2014	#N/A	#N/A	#N/A	#N/A	995	549	7.86	814	1.5	0.72	60.8	0.0025	2.5	0.1	0.169	0.169	0.005	0.0005	0.0025	0.004	499	0.31
Bi-annual Seep Sampling	East Dump Seep 1	28-05-2015 10:46	5/28/2015	#N/A	#N/A	#N/A	#N/A	1070	572	8.04	863	4.1	0.46	56	0.0025	1.25	0.05	0.227	0.235	0.008	0.0016	0.0025	0.0095	519	0.388
Bi-annual Seep Sampling	East Dump Seep 1	26-11-2015 12:46	11/26/2015	#N/A	#N/A	#N/A	#N/A	1020	554	7.41	731	35.6	18.1	57	0.0051	1.25	0.05	0.32	0.32	0.0025	0.0005	0.0035	0.195	501	0.587
Bi-annual Seep Sampling	East Dump Seep 2	9/5/2013	9/5/2013	#N/A	0.002	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 2	20-06-2013 13:24	6/20/2013	#N/A	#N/A	#N/A	#N/A	842	430	7.41	646	1.5	0.53	24.9	0.0025	2.5	0.1	1.76	1.76	0.005	0.0045	0.0093	0.0117	431	1.79
Bi-annual Seep Sampling	East Dump Seep 3	9/5/2013	9/5/2013	#N/A	0.002	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 3	20-06-2013 13:36	6/20/2013	#N/A	#N/A	#N/A	#N/A	936	495	7.48	737	5.7	0.91	22.7	0.0072	2.5	0.37	1.72	1.73	0.011	0.001	0.0058	0.0123	496	1.7
Bi-annual Seep Sampling	East Dump Seep 4	9/5/2013	9/5/2013	#N/A	0.005	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	East Dump Seep 4	20-06-2013 13:55	6/20/2013	#N/A	#N/A	#N/A	#N/A	1280	732	7.59	1060	1.5	0.22	33.6	0.0025	2.5	0.1	3.66	3.66	0.005	0.0089	0.0128	0.0137	708	3.67
Bi-annual Seep Sampling	East Dump Seep 4	26-11-2015 13:16	11/26/2015	#N/A	#N/A	#N/A	#N/A	884	465	7.83	658	6.4	1.27	60.8	0.0025	1.25	0.05	3.31	3.31	0.0025	0.0005	0.001	0.0754	406	3.3
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/7/2013	2/7/2013	8.1	0.2	2.6	#N/A	1860	1160	7.83	1700	1.5	1.01	56.5	0.0025	5	0.2	15.3	15.3	0.01	0.0033	0.0053	0.0064	1090	14.5
Bi-annual Seep Sampling	NEZ Dump Seep 1	10/12/2013	10/12/2013	8.03	#N/A	0.1	#N/A	1700	1040	7.86	1520	1.5	0.29	78.3	0.0025	5	0.5	7.16	7.16	0.01	0.0067	0.0107	0.0115	1000	6.77
Bi-annual Seep Sampling	NEZ Dump Seep 1	23-10-2013 13:55	10/23/2013	#N/A	#N/A	#N/A	#N/A	1670	981	7.9	1450	1.5	0.14	78.9	0.0025	12	0.2	8.12	8.12	0.01	0.0063	0.0091	0.0097	948	7.47
Bi-annual Seep Sampling	NEZ Dump Seep 1	26-11-2013 9:14	11/26/2013	#N/A	#N/A	#N/A	#N/A	1700	1040	7.95	1480	1.5	0.18	73.7	0.0085	5	0.2	7.19	7.19	0.01	0.0061	0.0101	0.0097	964	7.24
Bi-annual Seep Sampling	NEZ Dump Seep 1	16-01-2014 10:15	1/16/2014	8.761	#N/A	1.4	0.22	1800	1050	7.84	1650	1.5	0.34	76.2	0.0166	5	0.2	6.59	6.59	0.01	0.0081	0.0102	0.0121	1070	6.36
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-02-2014 13:08	2/18/2014	7.924	#N/A	0.2	0.13	1800	1140	7.85	1660	1.5	0.26	76.3	0.0025	5	0.2	6.46	6.46	0.01	0.0085	0.0109	0.0127	1110	6.19
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	1750	1050	7.88	1560	4.9	2.18	54.8	0.0025	8	0.47	5.12	5.12	0.005	0.0014	0.0022	0.0058	1000	5.04
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/7/2014	3/7/2014	#N/A	#N/A	#N/A	#N/A	1830	1160	7.86	1670	1.5	0.43	62.4	0.0025	5	0.45	5.29	5.29	0.01	0.0029	0.0048	0.0064	1130	4.98
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-05-2014 11:45	5/13/2014	7.39	#N/A	2.7	#N/A	1720	1050	7.59	1560	10	7.93	34.3	0.0071	5.2	0.7	5.16	5.16	0.005	0.0005	0.001	0.001	1030	5.16
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/8/2014	6/8/2014	#N/A	#N/A	#N/A	#N/A	1730	1090	7.85	1540	1.5	0.32	60	0.0025	5	0.78	5.92	5.92	0.01	0.0025	0.004	0.0041	1030	5.44
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/4/2014	8/4/2014	8.059	#N/A	1.8	0.19	1350	768	8.05	1140	4.3	0.39	99.3	0.0025	21.3	0.33	3.34	3.34	0.005	0.008	0.0123	0.0148	659	3.03
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/9/2014	8/9/2014	#N/A	#N/A	#N/A	#N/A	1790	1120	7.87	1580	1.5	0.22	68.5	0.0025	5	0.2	5.34	#N/A	0.01	0.0035	0.0052	0.006	1070	4.69
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/12/2014	8/12/2014	#N/A	#N/A	#N/A	#N/A	1860	1110	7.85	1520	1.5	0.46	64.7	0.0025	5	0.56	5.49	5.49	0.01	0.0005	0.0037	0.0045	1130	4.94
Bi-annual Seep Sampling	NEZ Dump Seep 1	27-10-2014 11:23	10/27/2014	#N/A	#N/A	#N/A	#N/A	1540	905	8.03	1340	1.5	0.85	64.9	0.0025	10	0.39	5.86	5.86	0.005	0.0041	0.0055	0.0049	801	5.86
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/3/2014	11/3/2014	7.64	#N/A	0.1	0.1	1860	1170	7.89	1670	1.5	0.17	83.2	0.0025	5	0.43	6.37	6.37	0.01	0.0075	0.0112	0.0109	1130	6.2
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2014	11/11/2014	#N/A	#N/A	#N/A	#N/A	1550	909	7.87	1250	1.5	1.26	65.8	0.0025	11.6	0.51	6.66	6.66	0.005	0.0026	0.0047	0.005	834	6.18
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-01-2015 10:28	1/13/2015	#N/A	#N/A	#N/A	#N/A	1890	1190	7.79	1690	1.5	0.28	61	0.0025	9.9	0.58	5.38	5.38	0.005	0.0019	0.005	0.0048	1140	5.06
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/9/2015	2/9/2015	#N/A	#N/A	#N/A	#N/A	1780	1150	7.66	1610	1.5	0.5	67.9	0.0025	2.5	0.47	3.94	3.94	0.005	0.0023	0.0053	0.0048	1060	3.91
Bi-annual Seep Sampling	NEZ Dump Seep 1	4/6/2015	4/6/2015	#N/A	#N/A	#N/A	#N/A	1720	1110	7.84	1590	1.5	0.26	63.8	0.0025	4.7	0.56	4.67	4.67	0.0025	0.0012	0.0035	0.0032	1040	4.63
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/2/2015	5/2/2015	#N/A	#N/A	#N/A	#N/A	1790	1070	7.87	1600	3.4	1.27	57.9	0.0025	6.4	0.72	5.08	5.08	0.005	0.0014	0.0026	0.0046	1050	4.84
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/3/2015	5/3/2015	#N/A	#N/A	#N/A	#N/A	1760	1150	7.54	1590	1.5	2.81	55.5	0.0025	7.6	0.79	4.77	4.77	0.005	0.0015	0.0037	0.0056	1060	4.82
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/5/2015	6/5/2015	#N/A	#N/A	#N/A	#N/A	1830	1080	7.98	1570	1.5	2.4	58.9	0.0025	5.3	0.6	5	5	0.005	0.0005	0.0021	0.0059	1080	4.75
Bi-annual Seep Sampling	NEZ Dump Seep 1	7/7/2015	7/7/2015	#N/A	#N/A	#N/A	#N/A	1900	1170	7.86	1640	1.5	0.7	63.2	0.0025	2.5	0.54	4.23	4.23	0.005	0.0019	0.0042	0.0044	1100	4.31
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-08-2015 13:28	8/18/2015	#N/A	#N/A	#N/A	#N/A	1840	1070	7.73	1710	1.5	0.36	66.9	0.0025	5	0.56	4.26	4.26	0.005	0.0032	0.0047	0.0041	1110	3.88
Bi-annual Seep Sampling	NEZ Dump Seep 1	9/4/2015	9/4/2015	#N/A	#N/A	#N/A	#N/A	1610	1010	7.83	1360	6.2	6.35	50.7	0.0025	7	0.73	5.67	5.67	0.005	0.0005	0.0021	0.0043	991	5.26
Bi-annual Seep Sampling	NEZ Dump Seep 1	29-10-2015 10:44	10/29/2015	#N/A	#N/A	#N/A	#N/A	1790	1080	7.89	1570	1.5	0.32	76.7	0.0025	5.7	0.47	3.7	3.7	0.005	0.0037	0.0056	0.0045	1020	3.64
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2015	11/11/2015	#N/A	#N/A	#N/A	#N/A	1660	956	7.95	1420	1.5	0.54	75.3	0.0025	6.8	0.51	3.93	3.93	0.005	0.0031	0.0052	0.0048	895	3.97
Bi-annual Seep Sampling	NEZ Dump Seep 10	4/7/2013	4/7/2013	8.3	0.0085	5.1	#N/A	1380	835	8.08	1170	1.5	0.52	165	0.0025	2.5	0.1	1.21	1.21	0.005	0.0102	0.0118	0.0133	681	1.25
Bi-annual Seep Sampling	NEZ Dump Seep 10	27-10-2014 13:57	10/27/2014	#N/A	#N/A	#N/A	#N/A	1390	809	8.26	1190	1.5	0.56	148	0.0025	2.5	0.1	0.793	0.793	0.005	0.0099	0.0132	0.0137	681	0.88
Bi-annual Seep Sampling	NEZ Dump Seep 10	8/6/2015	8/6/2015	#N/A	#N/A	#N/A	#N/A	1310	813	8.27	1070	1.5	0.72	182	0.0055	1.25	0.14	0.732	0.732	0.0025	0.0087	0.0126	0.0112	645	0.857
Bi-annual Seep Sampling	NEZ Dump Seep 11	4/7/2013	4/7/2013	8.2	0.002	7.2	#N/A	1440	878	8.11	1240	42.7	11.6	245	0.0025	2.5	0.1	1.11	1.11	0.005	0.0021	0.0044	0.0674	656	1.3
Bi-annual Seep Sampling	NEZ Dump Seep 11	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1340	807	8.23	1150	6.1	0.33	238	0.0025	2.5	0.1	0.826	0.826	0.005	0.0022	0.0026	0.0183	592	1.02
Bi-annual Seep Sampling	NEZ Dump Seep 11	27-10-2014 14:28	10/27/2014	#N/A	#N/A	#N/A	#N/A	1450	845	8.28	1240	3	0.44	202	0.0025	2.5	0.1	1.44	1.44	0.005	0.0051	0.0049	0.0045	670	1.5
Bi-annual Seep Sampling	NEZ Dump Seep 11	28-05-2015 13:17	5/28/2015	#N/A	#N/A	#N/A	#N/A	1390	820	8.37	1150	14	3.7	216	0.0025	2.5	0.1	0.529	0.529	0.005	0.0022	0.0042	0.0396	615	0.724
Bi-annual Seep Sampling	NEZ Dump Seep 12	4/7/2013	4/7/2013	8.3	0.0035	6.4	#N/A	1260	757	8.09	1080	6.7	2.16	159	0.0051	2.5	0.26	1.01	1.01	0.005	0.0075	0.0102	0.0184	602	1.07
Bi-annual Seep Sampling	NEZ Dump Seep 12	27-10-2014 15:29	10/27/2014	#N/A	#N/A	#N/A	#N/A	1370	808	8.23	1120	1.5	0.5	136	0.0025	2.5	0.26	0.72	0.72	0.005	0.0025	0.0038	0.0045	689	0.8
Bi-annual Seep Sampling	NEZ Dump Seep 12	28-05-2015 12:53	5/28/2015	#N/A	#N/A	#N/A	#N/A	1230	709	8.28	1000	3.8	0.56	131	0.0025	1.25	0.22	0.721	0.721	0.0025	0.0024	0.0044	0.0052	583	0.805
Bi-annual Seep Sampling	NEZ Dump Seep 13	4/7/2013	4/7/2013	8.1	0.0025	6.5	#N/A	1370	831	8.02	1180	1.5	1.73	203	0.0025	2.5	0.26	1.44	1.44	0.005	0.0031	0.0045	0.0084	633	1.47
Bi-annual Seep Sampling	NEZ Dump Seep 13	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1290	759	8.16	1090	4.1	0.39	156	0.0025	2.5	0.34	1.96	1.96	0.005	0.0024	0.0024	0.0125	617	2.13
Bi-annual Seep Sampling	NEZ Dump Seep 13	27-10-2014 15:47	10/27/2014	#N/A	#N/A	#N/A	#N/A	1390	821	8.23	1160	5.7	1.26	140	0.0025	2.5	0.27	1.21	1.21	0.005	0.0022	0.0032	0.0035	696	1.22
Bi-annual Seep Sampling	NEZ Dump Seep 13	28-05-2015 12:37	5/28/2015	#N/A	#N/A	#N/A	#N/A	1420	838	8.33	1200	8.2	3.21	225	0.0055	2.5	0.23	1.15	1.15	0.005	0.0022	0.0037	0.0107	633	1.22
Bi-annual Seep Sampling	NEZ Dump Seep 14	4/7/2013	4/7/2013	7.9	0.004	4.8	#N/A	616	318	7.8	469	1.5	0.22	67.3	0.0025	0.25	0.048	0.551	0.551	0.0005	0.0012	0.0027	0.0036	247	0.606
Bi-annual Seep Sampling	NEZ Dump Seep 14	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	464	232	8.05	336	3.4	0.15	72.8	0.0025	0.25	0.052	0.308	0.308	0.0005	0.0005	0.001	0.0039	166	0.41
Bi-annual Seep Sampling	NEZ Dump Seep 14	27-10-2014 15:26	10/27/2014	#N/A	#N/A	#N/A	#N/A	889	511	7.92	710	1.5	0.19	146	0.0025	2.5	0.1	0.203	0.203	0.005	0.0005	0.001	0.0022	357	0.26
Bi-annual Seep Sampling	NEZ Dump Seep 14	28-05-2015 12:16	5/28/2015	#N/A	#N/A	#N/A	#N/A	629	316	8.02	458	1.5	0.68	71.1	0.0025	0.5	0.051	0.329	0.329	0.001	0.0011	0.0025	0.0022	254	0.391
Bi-annual Seep Sampling	NEZ Dump Seep 15	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1170	687	8.28	894	3.2	0.13	151	0.0025	2.5	0.22	0.518	0.518	0.005	0.0045	0.0051	0.0086	560	0.591
Bi-annual Seep Sampling	NEZ Dump Seep 15	28-05-2015 11:55	5/28/2015	#N/A	#N/A	#N/A	#N/A	1310	759	8.26	1090	6.6	0.5	134	0.0025	1.25	0.18	0.917	0.917	0.0025	0.0048	0.0072	0.0106	636	0.933
Bi-annual Seep Sampling	NEZ Dump Seep 16	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1070	614	8.32	862	1.5	0.19	161	0.0025	2.5	0.1	1.23	1.23	0.005	0.0024	0.0032	0.0083	481	1.25
Bi-annual Seep Sampling	NEZ Dump Seep 2	2/7/2013	2/7/2013	8	0.2	3.4	#N/A	2080	1350	7.84	2010	1.5	0.46	57.8	0.0025	5	0.44	13.8	13.8	0.01	0.0059	0.0074	0.0092	1280	13.4
Bi-annual Seep Sampling	NEZ Dump Seep 2	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1930	1190	7.88	1820	5	1.03	66	0.0025	5	0.52	5.47	5.47	0.01	0.0045	0.0055	0.0088	1230	5.19
Bi-annual Seep Sampling	NEZ Dump Seep 2	27-10-2014 11:45	10/27/2014	#N/A	#N/A	#N/A	#N/A	1640	980	8.02	1440	1.5	0.35	65.7	0.0025	6.2	0.44	4.61	4.61	0.005	0.0057	0.0072	0.0059	892	4.6
Bi-annual Seep Sampling	NEZ Dump Seep 2	25-05-2015 14:26	5/25/2015	#N/A	#N/A	#N/A	#N/A	1860	1150	7.94	1690	1.5	0.84	78.1	0.0025	2.5	0.38	3.5	3.5	0.005	0.0059	0.0092	0.0088	1070	3.62
Bi-annual Seep Sampling	NEZ Dump Seep 2	11/11/2015	11/11/2015	#N/A	#N/A	#N/A	#N/A	1800	1050	8.04	1550	1.5	0.15	88.1	0.0025	2.5	0.34	2.55	2.55	0.005	0.0085	0.0103	0.0087	954	2.74
Bi-annual Seep Sampling	NEZ Dump Seep 3	2/7/2013	2/7/2013	8	0.02	6.2	#N/A	2190	1400	7.83	2130	3.3	0.3	58.5	0.0025	5	0.2	11.1	11.1	0.01	0.0118	0.014	0.0169	1400	12.2
Bi-annual Seep Sampling	NEZ Dump Seep 3	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	2000	1250	7.89	1900	4.7	0.57	66.9	0.0025	5	0.2	5.57	5.57	0.01	0.0119	0.0131	0.0174	1240	5.53
Bi-annual Seep Sampling	NEZ Dump Seep 3	27-10-2014 12:08	10/27/2014	#N/A	#N/A	#N/A	#N/A	2040	1250	8.01	1900	3.2	0.69	76.4	0.0025	5	0.2	4.08	4.08	0.01	0.0123	0.0136	0.0201	1270	4.02
Bi-annual Seep Sampling	NEZ Dump Seep 3	25-05-2015 14:30	5/25/2015	#N/A	#N/A	#N/A	#N/A	2120	1300	8.03	1920	1.5	0.22	62.7	0.0025	5	0.2	4.36	4.36	0.01	0.0102	0.0127	0.0118	1340	4.05
Bi-annual Seep Sampling	NEZ Dump Seep 3	11/11/2015	11/11/2015	#N/A	#N/A	#N/A	#N/A	2030	1200	7.77	1750	10.9	2.42	86.6	0.0051	2.5	0.1	2.76	2.76	0.005	0.008	0.0102	0.0086	1170	2.81
Bi-annual Seep Sampling	NEZ Dump Seep 4	2/7/2013	2/7/2013	7.9	0.02	5.9	#N/A	1980	1240	7.89	1800	1.5	0.25	86	0.0025	5	0.41	5.42	5.42	0.01	0.0132	0.0149	0.0181	1220	4.3
Bi-annual Seep Sampling	NEZ Dump Seep 4	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1670	1010	7.91	1520	1.5	0.34	78.2	0.0025	2.5	0.34	2.42	2.42	0.005	0.0131	0.0138	0.0157	960	2.6
Bi-annual Seep Sampling	NEZ Dump Seep 4	27-10-2014 12:20	10/27/2014	#N/A	#N/A	#N/A	#N/A	1720	1010	8.07	1540	1.5	0.58	103	0.0025	5	0.2	1.61	1.61	0.01	0.0152	0.0178	0.0225	998	1.58
Bi-annual Seep Sampling	NEZ Dump Seep 4	25-05-2015 14:14	5/25/2015	#N/A	#N/A	#N/A	#N/A	1990	1200	8.07	1790	4.6	0.64	84	0.0025	2.5	0.32	1.64	1.64	0.005	0.0162	0.0202	0.0185	1160	1.69
Bi-annual Seep Sampling	NEZ Dump Seep 4	11/11/2015	11/11/2015	#N/A	#N/A	#N/A	#N/A	1740	991	8.03	1450	22.8	9.46	110	0.0025	2.5	0.29	0.847	0.847	0.005	0.0132	0.0156	0.0238	947	0.978
Bi-annual Seep Sampling	NEZ Dump Seep 5	2/7/2013	2/7/2013	8.1	0.006	6.8	#N/A	311	154	8.11	215	6	2.06	83.7	0.0025	0.25	0.2	0.23	0.23	0.0005	0.0054	0.0071	0.0243	70.9	0.295
Bi-annual Seep Sampling	NEZ Dump Seep 5	27-10-2014 14:55	10/27/2014	#N/A	#N/A	#N/A	#N/A	1150	635	8.03	926	11.7	2.17	99.5	0.0025	2.5	0.47	2.62	2.62	0.005	0.0032	0.0044	0.0061	547	2.49
Bi-annual Seep Sampling	NEZ Dump Seep 5	28-05-2015 14:09	5/28/2015	#N/A	#N/A	#N/A	#N/A	1030	549	8.19	809	4.8	0.88	77.5	0.0025	1.25	0.37	1.55	1.55	0.0025	0.0041	0.0098	0.0225	456	1.52

Location Type	Sample Point	Original Date As Is	Recoded Date	DOC	Al-D	Sb-D	As-D	Ba-D	Be-D	Bi-D	B-D	Cd-D	Ca-D	Cr-D	Co-D	Cu-D	Fe-D	Pb-D	Li-D	Mg-D	Mn-D	Mo-D	Ni-D	K-D	Se-D	Si-D	Ag-D	Na-D	Sr-D	Tl-D	Sn-D	Ti-D	U-D	V-D	Zn-D		Se/SO4	Ca	Mg+K+Na	(Mg+K+Na)/Ca	Zn/Cd		Year
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/mgS	meq/L	meq/L	meq/meq			Year
Bi-annual Seep Sampling	Boundary Dump Seep 1	4/6/2013	4/6/2013	6.84	0.0055	0.00005	0.0002	0.0205	0.00005	0.00025	0.051	5E-06	56.2	0.00025	0.00005	0.00213	0.038	2.5E-05	0.00025	5.04	0.00059	0.00513	0.00025	0.494	0.00079	4.58	5E-06	2.34	0.194	5E-06	0.00005	0.005	3.7E-05	0.0005	0.0015		2.39394E-05	2.81	0.40828	0.145296565	300		2013
Bi-annual Seep Sampling	Boundary Dump Seep 2	4/6/2013	4/6/2013	5.75	0.0032	0.0002	0.00067	0.0336	0.00005	0.00025	0.061	5.2E-05	176	0.00025	0.00015	0.00868	0.015	2.5E-05	0.00186	21	0.0222	0.0328	0.00025	1.35	0.00456	5.88	5E-06	5.44	1.8	5E-06	0.00005	0.011	0.0012	0.0005	0.0015		3.12329E-05	8.8	1.49563	0.169957605	28.8462		2013
Bi-annual Seep Sampling	Boundary Dump Seep 2	10/12/2013	10/12/2013	8.53	0.0015	0.00015	0.00202	0.0503	0.00005	0.00025	0.049	0.00001	261	0.00025	0.00005	0.00196	0.038	2.5E-05	0.00165	34.5	0.0354	0.0225	0.00025	1.78	0.00249	7.16	5E-06	7.1	2.76	5E-06	0.00005	0.02	0.00076	0.0005	0.0015		0.00001245	13.05	2.366	0.181302566	150		2013
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2013 15:26	10/23/2013	7.06	0.0045	0.00012	0.00184	0.0556	0.00005	0.00025	0.048	1.3E-05	260	0.00025	0.00041	0.00099	0.249	6.3E-05	0.00226	39.6	0.316	0.0215	0.00025	1.99	0.00205	6.62	5E-06	8.08	2.98	5E-06	0.00005	0.005	0.00087	0.0005	0.0015		9.57944E-06	13	2.71137	0.208566761	115.385		2013
Bi-annual Seep Sampling	Boundary Dump Seep 2	14-11-2013 10:35	11/14/2013	6.59	0.0033	0.00018	0.00171	0.0511	0.00005	0.00025	0.057	0.00003	258	0.00025	0.00028	0.00287	0.055	2.5E-05	0.00231	36.1	0.166	0.0231	0.00068	1.89	0.00242	6.32	5E-06	7.79	2.91	5E-06	0.00005	0.024	0.00087	0.0005	0.0015		1.19212E-05	12.9	2.49211	0.19318709	50		2013
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-01-2014 11:10	1/16/2014	8.04	0.0031	0.00012	0.0029	0.0523	0.00005	0.00025	0.058	0.00001	217	0.00025	0.00048	0.00025	0.326	2.5E-05	0.00198	27.2	0.397	0.0151	0.00025	1.82	0.00296	6.33	5E-06	6.23	2.24	5E-06	0.00005	0.015	0.00056	0.0005	0.0015		1.73099E-05	10.85	1.90354	0.175441665	150		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	18-02-2014 10:11	2/18/2014	8.25	0.0038	0.00011	0.00149	0.0502	0.00005	0.00025	0.052	5E-06	248	0.00025	0.00019	0.00112	0.124	5.5E-05	0.00136	31.3	0.405	0.0128	0.00025	1.76	0.00169	7.59	5E-06	6.59	2.07	5E-06	0.00005	0.011	0.00062	0.0005	0.0015		9.73129E-06	12.4	2.15672	0.173929261	300		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/7/2014	3/7/2014	5.8	0.0015	0.00021	0.00073	0.044	0.00005	0.00025	0.052	0.00005	257	0.00025	0.00005	0.00736	0.015	2.5E-05	0.00252	40.5	0.00383	0.0543	0.00025	1.69	0.00495	5.59	5E-06	8.79	3.55	5E-06	0.00005	0.017	0.00154	0.0005	0.0015		2.25341E-05	12.85	2.78702	0.216888971	30		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	15-05-2014 9:15	5/15/2014	5.86	0.0069	0.00014	0.00055	0.025	0.00005	0.00025	0.052	4.7E-05	124	0.00025	0.00015	0.00951	0.015	2.5E-05	0.00133	14.9	0.0211	0.0218	0.00025	1.21	0.0033	5.14	5E-06	4.14	0.969	5E-06	0.00005	0.014	0.00057	0.0005	0.0015		4.05738E-05	6.2	1.07983	0.174166178	31.9149		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	6/8/2014	6/8/2014	4.83	0.0031	0.00018	0.00069	0.0412	0.00005	0.00025	0.057	4.5E-05	232	0.00025	0.00022	0.00604	0.04	7.3E-05	0.00203	32.3	0.0344	0.0371	0.00025	1.49	0.00412	5.8	5E-06	7.42	2.39	5E-06	0.00005	0.013	0.00125	0.0005	0.0015		2.22703E-05	11.6	2.2442	0.193465151	33.3333		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	16-06-2014 11:53	6/16/2014	5.54	0.0033	0.00021	0.00063	0.0431	0.00005	0.00025	0.047	3.5E-05	252	0.00025	0.00017	0.00393	0.015	6.5E-05	0.00284	39.9	0.0332	0.0517	0.00025	1.67	0.00687	5.52	5E-06	8.28	3.06	5E-06	0.00005	0.014	0.00137	0.0005	0.0015		3.36765E-05	12.6	2.72935	0.216615169	42.8571		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/9/2014	8/9/2014	6.29	0.0099	0.00019	0.00079	0.0441	0.00005	0.00025	0.057	1.5E-05	233	0.00025	0.00034	0.0035	0.057	2.5E-05	0.0024	32.4	0.0594	0.0253	0.00025	1.45	0.00241	6.24	5E-06	6.84	2.35	5E-06	0.00005	0.019	0.0013	0.0005	0.004		1.2275E-05	11.65	2.22378	0.190882714	266.667		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	8/12/2014	8/12/2014	7.06	0.0036	0.00012	0.0012	0.0452	0.00005	0.00025	0.048	3.1E-05	243	0.00025	0.00031	0.00433	0.097	0.00017	0.00188	34.1	0.0976	0.0245	0.00025	1.75	0.00257	6.07	5E-06	7.99	2.6	5E-06	0.00005	0.015	0.00072	0.0005	0.0015		1.22381E-05	12.15	2.3806	0.195934263	48.3871		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	23-10-2014 9:42	10/23/2014	6.88	0.0015	0.00017	0.00105	0.0396	0.00005	0.00025	0.044	2.8E-05	238	0.00025	0.00052	0.00356	0.075	5.2E-05	0.00205	34.4	0.105	0.0292	0.00025	1.55	0.00299	6.18	5E-06	7.35	2.83	5E-06	0.00005	0.018	0.00104	0.0005	0.0015		1.51777E-05	11.9	2.36514	0.198751236	53.5714		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/11/2014	11/11/2014	6.85	0.0294	0.00024	0.001	0.0408	0.00019	0.00025	0.066	5.5E-05	206	0.00025	0.00023	0.00594	0.015	0.00016	0.0025	25.8	0.0259	0.0348	0.00025	1.48	0.00435	5.89	5E-06	6.75	1.98	0.00002	0.00005	0.015	0.001	0.0015	0.004		2.5996E-05	10.3	1.8358	0.178233025	72.7273		2014
Bi-annual Seep Sampling	Boundary Dump Seep 2	1/7/2015	1/7/2015	6.07	0.0015	0.00017	0.00087	0.0342	0.00005	2.5E-05	0.059	7.2E-05	184	0.00025	0.00005	0.00675	0.015	2.5E-05	0.0019	23.4	0.0207	0.0246	0.00025	1.29	0.00225	5.48	5E-06	6.35	1.91	5E-06	0.00005	0.005	0.00107	0.00025	0.003		1.83424E-05	9.2	1.6736	0.18191254	41.958		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/6/2015	2/6/2015	5.37	0.0015	0.00012	0.00073	0.0342	0.00005	2.5E-05	0.062	7.4E-05	164	0.00025	0.00016	0.00905	0.015	2.5E-05	0.0013	17.9	0.0393	0.0173	0.00025	1.18	0.00154	6.13	5E-06	5.23	1.27	5E-06	0.00005	0.005	0.00078	0.00025	0.0015		1.42154E-05	8.2	1.30138	0.158704816	20.2703		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	2/9/2015	2/9/2015	6.94	0.008	0.00016	0.00154	0.0453	0.00005	2.5E-05	0.066	2.1E-05	195	0.00025	0.00155	0.00317	0.185	9.6E-05	0.002	23	0.498	0.0173	0.00025	1.32	0.00156	6.67	5E-06	6.02	1.87	5E-06	0.00005	0.005	0.00103	0.00069	0.0015		1.33333E-05	9.75	1.63669	0.167865965	71.09		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/2/2015	3/2/2015	5.58	0.0015	0.00013	0.00079	0.0315	0.00005	0.00025	0.062	2.1E-05	169	0.00025	0.00005	0.00616	0.015	2.5E-05	0.00193	21.2	0.0205	0.028	0.00025	1.18	0.00258	5.91	5E-06	5.65	1.57	5E-06	0.00005	0.012	0.00065	0.0005	0.0015		2.43396E-05	8.45	1.51206	0.178942034	71.4286		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	3/3/2015	3/3/2015	5.73	0.0015	0.00014	0.00065	0.0312	0.00005	0.00025	0.056	3.6E-05	169	0.00025	0.00012	0.00654	0.015	2.5E-05	0.00157	22.5	0.0134	0.0342	0.00025	1.13	0.00352	5.73	5E-06	5.54	1.73	5E-06	0.00005	0.015	0.00074	0.0005	0.0015		2.75718E-05	8.45	1.5818	0.187194944	41.6667		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/4/2015	7/4/2015	6.07	0.0031	0.00015	0.00055	0.0315	0.00005	2.5E-05	0.059	3.1E-05	169	0.00025	0.00011	0.00571	0.015	2.5E-05	0.0017	21.7	0.0138	0.0324	0.00025	1.31	0.00389	5.68	5E-06	5.94	1.66	5E-06	0.00005	0.013	0.0006	0.00025	0.0015		3.14555E-05	8.45	1.55716	0.184278904	49.0196		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	7/5/2015	7/5/2015	5.25	0.0015	0.00013	0.00054	0.0294	0.00005	2.5E-05	0.067	2.7E-05	147	0.00025	0.00005	0.00716	0.015	2.5E-05	0.002	16.5	0.00726	0.0208	0.00025	1.03	0.00204	6.14	5E-06	4.68	1.22	5E-06	0.00005	0.005	0.0006	0.00025	0.0015		2.21739E-05	7.35	1.19199	0.162175189	55.5556		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	29-10-2015 11:29	10/29/2015	6.82	0.0054	0.00013	0.00147	0.047	0.00005	2.5E-05	0.038	1.1E-05	200	0.00025	0.0011	0.00168	0.157	2.5E-05	0.0005	29.1	0.00398	0.0158	0.00025	1.68	0.00161	6.76	0.00001	7.06	2.75	5E-06	0.00005	0.005	0.00076	0.00075	0.0015		1.05921E-05	10	2.04683	0.204682645	131.579		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	11/8/2015	11/8/2015	6.81	0.0039	0.00017	0.00115	0.04	0.00005	2.5E-05	0.06	0.00004	195	0.00025	0.00115	0.00537	0.103	6.1E-05	0.0029	24.6	0.419	0.0243	0.00025	1.29	0.00208	6.45	5E-06	6.18	2.13	5E-06	0.00005	0.005	0.00107	0.00056	0.0015		1.51456E-05	9.75	1.73617	0.178069221	37.5		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	30-11-2015 11:50	11/30/2015	6.6	0.0015	0.0001	0.00138	0.0453	0.00005	2.5E-05	0.056	3.5E-05	237	0.00025	0.00019	0.00332	0.034	2.5E-05	0.0017	28.1	0.116	0.0183	0.00025	1.58	0.00177	6.5	5E-06	6.97	2.16	5E-06	0.00005	0.005	0.00067	0.0005	0.0015		1.11789E-05	11.85	1.98204	0.167260782	42.4929		2015
Bi-annual Seep Sampling	Boundary Dump Seep 2	12/1/2015	12/1/2015	6.27	0.0015	0.00012	0.00103	0.0363	0.00005	0.00025	0.057	1.3E-05	209	0.00025	0.00025	0.00111	0.063	2.5E-05	0.00129	26.7	0.0491	0.0226	0.00025	1.41	0.00187	6.48	5E-06	6.38	1.92	5E-06	0.00005	0.018	0.00069	0.0005	0.0015		1.27211E-05	10.45	1.8704	0.178985307	115.385		2015
Bi-annual Seep Sampling	Boundary Dump Seep 3	19-05-2015 13:49	5/19/2015	5.14	0.0035	0.0001	0.00068	0.0331	0.00005	2.5E-05	0.069	2.3E-05	144	0.00025	0.00013	0.00634	0.04	2.5E-05	0.0013	13.2	0.0509	0.0089	0.00025	0.972	0.00106	6.3	5E-06	4.24	0.815	5E-06	0.00005	0.005	0.00055	0.00055	0.0015		1.42601E-05	7.2	0.97895	0.135965306	66.0793		2015
Bi-annual Seep Sampling	East Dump Seep 1	9/5/2013	9/5/2013	4.07	0.009	0.00015	0.00019	0.0301	0.00005	0.00025	0.057	7.5E-05	156	0.00025	0.00005	0.00226	0.015	2.5E-05	0.00025	30.5	0.0195	0.195	0.00025	2.29	0.0612	3.77	5E-06	14.4	3.05	5E-06	0.00005	0.005	2.2E-05	0.0005	0.0147		0.000363564	7.8	2.46323	0.31579879	196		2013
Bi-annual Seep Sampling	East Dump Seep 1	23-10-2014 14:15	10/23/2014	7.74	0.0173	0.00005	0.00025	0.0492	0.00005	0.00025	0.039	0.00024	166	0.00025	0.00179	0.00561	0.015	2.5E-05	0.00025	32.9	0.594	0.0926	0.0017	2.3	0.017	3.71	5E-06	12.9	2.92	5E-06	0.00005	0.016	3.1E-05	0.0005	0.0212		0.000102204	8.3	2.53821	0.305808587	89.4515		2014
Bi-annual Seep Sampling	East Dump Seep 1	28-05-2015 10:46	5/28/2015	7.23	0.0152	0.00005	0.00028	0.0586	0.00005	2.5E-05	0.045	0.00023	171	0.00025	0.0011	0.00571	0.015	2.5E-05	0.0005	35	0.646	0.102	0.00107	2.16	0.0257	3.76	5E-06	14.5	2.81	5E-06	0.00005	0.011	3.7E-05	0.00025	0.0176		0.000148555	8.55	2.72664	0.318904763	77.8761		2015
Bi-annual Seep Sampling	East Dump Seep 1	26-11-2015 12:46	11/26/2015	5.42	0.011	0.00005	0.00017	0.0383	0.00005	2.5E-05	0.045	0.00016	167	0.00025	0.00015	0.00342	0.015	2.5E-05	0.0005	33.4	0.217	0.0392	0.00138	1.94	0.00789	3.9	5E-06	13.6	2.74	5E-06	0.00005	0.013	1.7E-05	0.00025	0.0175		4.72455E-05	8.35	2.58857	0.31000836	110.063		2015
Bi-annual Seep Sampling	East Dump Seep 2	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	East Dump Seep 2	20-06-2013 13:24	6/20/2013	3.35	0.0118	0.00015	0.00023	0.0233	0.00005	0.00025	0.051	0.00025	128	0.00025	0.00154	0.00321	0.015	2.5E-05	0.00025	26.8	0.244	0.312	0.00078	2.3	0.0726	3.25	5E-06	13.8	3.26	5E-06	0.00005	0.011	1.6E-05	0.0005	0.0135		0.000505336	6.4	2.22166	0.34713384	54		2013
Bi-annual Seep Sampling	East Dump Seep 3	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	East Dump Seep 3	20-06-2013 13:36	6/20/2013	2.88	0.027	0.00017	0.00011	0.0312	0.00005	0.00025	0.062	0.0005	141	0.00025	0.00659	0.00477	0.015	2.5E-05	0.00109	34.5	1.11	0.393	0.00333	2.19	0.0399	4.1	5E-06	17.3	4.2	5E-06	0.00005	0.011	6.8E-05	0.0005	0.0695		0.000241331	7.05	2.81999	0.39999852	139		2013
Bi-annual Seep Sampling	East Dump Seep 4	9/5/2013	9/5/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	East Dump Seep 4	20-06-2013 13:55	6/20/2013	4.25	0.0077	0.00005	0.00034	0.0441	0.00005	0.00025	0.039	0.00031	232	0.00025	0.00005	0.00479	0.015	2.5E-05	0.00025	37.2	0.00473	0.107	0.00093	2.6	0.0491	5.04	5E-06	17.1	2.73	5E-06	0.00005	0.013	8.6E-05	0.0005	0.0546		0.000208051	11.6	2.97924	0.256831133	176.699		2013
Bi-annual Seep Sampling	East Dump Seep 4	26-11-2015 13:16	11/26/2015	3.11	0.0015	0.00005	0.00013	0.0622	0.00005	2.5E-05	0.035	0.00123	148	0.00025	0.00005	0.00397	0.015	2.5E-05	0.0012	22.8	0.00051	0.117	0.00078	1.32	0.0282	5.5	5E-06	9.86	1.84	5E-06	0.00005	0.013	0.00029	0.00025	0.14		0.000208374	7.4	1.79199	0.242160523	113.821		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/7/2013	2/7/2013	2.91	0.025	0.00068	0.00032	0.0504	0.0001	0.0005	0.105	0.00015	359	0.00025	0.00076	0.0652	0.015	0.00005	0.0005	63	0.0938	0.313	0.0016	2.23	0.242	5.14	0.00001	22.5	3.22	0.00001	0.0001	0.013	0.00147	0.001	0.0117		0.000666055	17.95	4.70891	0.262334805	78		2013
Bi-annual Seep Sampling	NEZ Dump Seep 1	10/12/2013	10/12/2013	4.46	0.008	0.00037	0.00025	0.0607	0.0001	0.0005	0.082	0.00005	322	0.00025	0.0001	0.0168	0.015	0.00005	0.0005	56.2	0.0117	0.195	0.0005	2.14	0.125	5.35	0.00001	19.1	4.1	0.00001	0.0001	0.02	0.00133	0.001	0.005		0.000375	16.1	4.16227	0.258526367	100		2013
Bi-annual Seep Sampling	NEZ Dump Seep 1	23-10-2013 13:55	10/23/2013	3.91	0.007	0.00052	0.00033	0.0527	0.0001	0.0005	0.09	0.00006	301	0.00025	0.0001	0.0198	0.015	0.00005	0.0023	55.6	0.0181	0.188	0.0005	2.27	0.133	5.68	0.00001	19.6	3.44	0.00001	0.0001	0.005	0.00136	0.001	0.0053		0.000420886	15.05	4.15236	0.275904422	88.3333		2013
Bi-annual Seep Sampling	NEZ Dump Seep 1	26-11-2013 9:14	11/26/2013	4.57	0.008	0.0004	0.00031	0.056	0.0001	0.0005	0.089	0.00006	327	0.00025	0.0001	0.0173	0.015	0.00005	0.0019	54.4	0.0134	0.184	0.0005	2.21	0.132	5.31	0.00001	19.9	3.78	0.00001	0.0001	0.019	0.00133	0.001	0.005		0.000410788	16.35	4.0939	0.250391176	83.3333		2013
Bi-annual Seep Sampling	NEZ Dump Seep 1	16-01-2014 10:15	1/16/2014	4.57	0.0084	0.00037	0.00028	0.0613	0.0001	0.0005	0.095	0.0001	325	0.00025	0.0001	0.0164	0.015	0.00005	0.0025	57.9	0.0114	0.227	0.0005	2.21	0.132	4.9	0.00001	19.7	4.57	0.00001	0.0001	0.015	0.00148	0.001	0.0061		0.000370093	16.25	4.28928	0.263955797	61		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-02-2014 13:08	2/18/2014	4.39	0.006	0.00033	0.00028	0.0677	0.0001	0.0005	0.095	0.00006	353	0.00025	0.0001	0.0145	0.015	0.00005	0.0019	63.4	0.011	0.256	0.0005	2.31	0.136	5.15	0.00001	21.6	5.26	0.00001	0.0001	0.012	0.00153	0.001	0.0052		0.000367568	17.65	4.69515	0.266014403	86.6667		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/6/2014	3/6/2014	3.26	0.0556	0.00045	0.0001	0.0462	0.0001	0.0005	0.071	0.0002	320	0.00025	0.00327	0.17	0.015	0.00005	0.0028	60.5	0.315	0.245	0.0051	2.21	0.174	5.16	0.00001	19.8	3.2	0.00001	0.0001	0.005	0.00106	0.001	0.0241		0.000522	16	4.44523	0.277827064	120.5		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	3/7/2014	3/7/2014	3.65	0.0364	0.00047	0.00027	0.0472	0.0001	0.0005	0.089	0.0002	355	0.00025	0.00175	0.112	0.015	0.00005	0.0024	67.1	0.202	0.272	0.0032	2.22	0.182	5.15	0.00001	21	3.92	0.00001	0.0001	0.017	0.00129	0.001	0.018		0.000483186	17.75	4.8825	0.275070591	90		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-05-2014 11:45	5/13/2014	2.74	0.0405	0.00041	0.0001	0.0495	0.0001	0.0005	0.076	0.00045	314	0.00025	0.0167	0.516	0.015	0.00005	0.0051	64.9	1.05	0.252	0.0145	2.16	0.156	5.45	0.00001	18.5	3.53	0.00001	0.0001	0.016	0.00071	0.001	0.0733		0.000454369	15.7	4.64399	0.295795478	162.889		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/8/2014	6/8/2014	3.04	0.0153	0.0005	0.0002	0.0432	0.0001	0.0005	0.089	0.00017	339	0.00025	0.00142	0.0817	0.015	0.00005	0.003	60	0.169	0.203	0.0025	2.15	0.156	5.17	0.00001	20.2	3.22	0.00001	0.0001	0.016	0.00108	0.001	0.0141		0.000454369	16.95	4.43193	0.261470876	83.9286		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/4/2014	8/4/2014	3.88	0.0082	0.00056	0.00035	0.0359	0.00005	0.00025	0.06	6.5E-05	241	0.00025	0.00019	0.0217	0.015	2.5E-05	0.00146	40.5	0.0296	0.178	0.00061	1.77	0.101	5.22	5E-06	17.4	2.28	5E-06	0.00005	0.017	0.00137	0.0005	0.0037		0.000459788	12.05	3.16342	0.26252468	56.9231		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/9/2014	8/9/2014	3.47	0.0154	0.00046	0.00021	0.0449	0.0001	0.0005	0.084	0.0001	344	0.00025	0.00118	0.0732	0.015	0.00005	0.0026	63.6	0.141	0.22	0.0023	2.28	0.178	5.44	0.00001	20	3.31	0.00001	0.0001	0.024	0.00129	0.001	0.0136		0.000499065	17.2	4.63648	0.269562882	136		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	8/12/2014	8/12/2014	11.3	0.036	0.00044	0.0001	0.0459	0.0001	0.0005	0.075	0.00019	342	0.00025	0.00193	0.143	0.015	0.00005	0.0028	62.2	0.194	0.216	0.0034	2.39	0.177	5.53	0.00001	20.8	3.29	0.00001	0.0001	0.015	0.00116	0.001	0.0212		0.000469912	17.1	4.59245	0.268564446	110.417		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	27-10-2014 11:23	10/27/2014	3.88	0.0124	0.00054	0.00024	0.0379	0.00005	0.00025	0.075	0.00011	283	0.00025	0.00089	0.0616	0.015	2.5E-05	0.00276	48.2	0.126	0.195	0.00134	2.06	0.125	4.79	5E-06	17.6	3.13	5E-06	0.00005	0.023	0.00128	0.0005	0.0081		0.000468165	14.15	3.62853	0.256433465	77.1429		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/3/2014	11/3/2014	4.38	0.005	0.0003	0.00029	0.0708	0.0001	0.0005	0.096	0.00007	361	0.00025	0.0001	0.0139	0.015	0.00005	0.0016	64.5	0.00791	0.232	0.0005	2.3	0.136	5.23	0.00001	21.3	5.03	0.00001	0.0001	0.019	0.00145	0.001	0.0051		0.000361062	18.05	4.74599	0.26293597	72.8571		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2014	11/11/2014	4.4	0.0611	0.00053	0.00022	0.0384	0.00005	0.00025	0.072	0.0002	283	0.00025	0.00268	0.116	0.015	2.5E-05	0.00292	49.1	0.238	0.186	0.0032	2.11	0.115	5.16	5E-06	17.2	3.01	5E-06	0.00005	0.021	0.00109	0.0005	0.0165		0.000413669	14.15	3.6649	0.259003704	84.1837		2014
Bi-annual Seep Sampling	NEZ Dump Seep 1	13-01-2015 10:28	1/13/2015	3.87	0.0366	0.00049	0.00024	0.0448	0.0001	0.0005	0.079	0.00023	364	0.00025	0.00202	0.153	0.015	0.00005	0.0029	67.4	0.203	0.245	0.0036	2.26	0.197	5.47	0.00001	19.8	3.16	3.5E-05	0.0001	0.02	0.00123	0.001	0.0242		0.000518421	18.2	4.84885	0.266420189	105.217		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	2/9/2015	2/9/2015	3.8	0.0227	0.00052	0.0001	0.0457	0.0001	0.00005	0.085	0.0002	357	0.00025	0.00169	0.132	0.015	0.00005	0.003	63.5	0.204	0.182	0.003	2.32	0.176	5.38	0.00001	20.5	3.19	0.00001	0.0001	0.005	0.00134	0.0005	0.0209		0.000498113	17.85	4.65342	0.260695543	105.556		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	4/6/2015	4/6/2015	3.79	0.0458	0.00041	0.0001	0.0434	0.0001	0.00005	0.081	0.00025	342	0.00025	0.0022	0.179	0.015	0.00005	0.0032	61.8	0.267	0.219	0.0039	2.32	0.205	5.32	0.00001	20.3	3.33	0.00001	0.0001	0.005	0.00116	0.0005	0.0249		0.000591346	17.1	4.54559	0.265824235	100.81		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/2/2015	5/2/2015	3.82	0.0632	0.00047	0.00022	0.0506	0.0001	0.0005	0.079	0.00025	326	0.00025	0.00352	0.234	0.015	0.00005	0.0034	62.8	0.318	0.249	0.0051	2.59	0.174	5.28	0.00001	24.1	3.55	0.00001	0.0001	0.016	0.0011	0.001	0.0316		0.000497143	16.3	4.77604	0.29300883	126.908		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	5/3/2015	5/3/2015	3.62	0.0603	0.00047	0.0001	0.0424	0.0001	0.0005	0.083	0.00026	355	0.00025	0.00324	0.198	0.015	0.00005	0.0048	64.9	0.299	0.284	0.0045	2.24	0.184	5.42	0.00001	19.8	3.6	0.00001	0.0001	0.026	0.00122	0.001	0.0248		0.000520755	17.75	4.70256	0.264933072	97.2549		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	6/5/2015	6/5/2015	3.54	0.0587	0.0004	0.0001	0.0433	0.0001	0.00005	0.074	0.00029	327	0.00025	0.00324	0.213	0.015	0.00005	0.0035	63.4	0.345	0.218	0.0049	2.27	0.207	5.43	0.00001	19.8	3.17	0.00001	0.0001	0.005	0.00099	0.0005	0.0278		0.000575	16.35	4.61587	0.282316067	96.8641		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	7/7/2015	7/7/2015	3.25	0.0336	0.0005	0.0001	0.0467	0.0001	0.00005	0.1	0.0001	367	0.00025	0.00175	0.153	0.015	0.00005	0.0034	60.5	0.211	0.196	0.0035	2.33	0.18	5	0.00001	20.1	3.03	0.00001	0.0001	0.005	0.00117	0.0005	0.0246		0.000490909	18.35	4.46135	0.243125527	246		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	18-08-2015 13:28	8/18/2015	3.4	0.0203	0.00048	0.0001	0.043	0.0001	0.00005	0.089	0.00019	330	0.00025	0.00166	0.135	0.015	0.00005	0.0022	60.5	0.206	0.172	0.003	2.22	0.156	5.32	0.00001	19.7	2.94	0.00001	0.0001	0.005	0.00121	0.0005	0.022		0.000421622	16.5	4.44114	0.269160098	116.402		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	9/4/2015	9/4/2015	3.46	0.0555	0.00039	0.00011	0.0424	0.00005	2.5E-05	0.082	0.00035	308	0.00025	0.00494	0.266	0.015	2.5E-05	0.0049	58	0.467	0.187	0.007	2.31	0.16	5.65	5E-06	19.5	2.94	5E-06	0.00005	0.02	0.00074	0.00025	0.0347		0.000484359	15.4	4.28898	0.278505263	100		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	29-10-2015 10:44	10/29/2015	3.51	0.0218	0.0004	0.0001	0.0415	0.0001	0.00005	0.081	0.00018	336	0.00025	0.0014	0.131	0.015	0.00005	0.0027	59	0.18	0.174	0.0027	2.3	0.142	5.61	0.00001	20.1	3.03	0.00001	0.0001	0.005	0.00124	0.0005	0.0204		0.000417647	16.8	4.37312	0.2603048	113.966		2015
Bi-annual Seep Sampling	NEZ Dump Seep 1	11/11/2015	11/11/2015	3.74	0.024	0.00049	0.00018	0.0389	0.00005	2.5E-05	0.071	0.00019	293	0.00025	0.00213	0.137	0.015	2.5E-05	0.0032	54.4	0.223	0.164	0.003	2.08	0.141	5.19	5E-06	17.4	3	5E-06	0.00005	0.014	0.0012	0.00025	0.0196		0.000472626	14.65	3.98187	0.271799777	102.618		2015
Bi-annual Seep Sampling	NEZ Dump Seep 10	4/7/2013	4/7/2013	4.85	0.0015	0.00017	0.00036	0.0319	0.00005	0.00025	0.058	0.00001	257	0.00025	0.00005	0.00439	0.015	2.5E-05	0.00169	47.1	0.00345	0.0499	0.00025	2.23	0.00816	5.12	5E-06	14.2	2.81	5E-06	0.00005	0.013	0.00193	0.0005	0.0015		3.59471E-05	12.85	3.42093	0.266219959	150		2013
Bi-annual Seep Sampling	NEZ Dump Seep 10	27-10-2014 13:57	10/27/2014	5.67	0.0015	0.00014	0.00045	0.0314	0.00005	0.00025	0.052	5E-06	243	0.00025	0.00005	0.00549	0.015	2.5E-05	0.00149	48.8	0.00519	0.0434	0.00025	2.3	0.0101	5.09	5E-06	13.1	2.35	5E-06	0.00005	0.021	0.0016	0.0005	0.0015		4.44934E-05	12.15	3.47402	0.285927624	300		2014
Bi-annual Seep Sampling	NEZ Dump Seep 10	8/6/2015	8/6/2015	6.37	0.0032	0.00015	0.00036	0.03	0.00005	2.5E-05	0.056	8.5E-06	249	0.00025	0.00005	0.00419	0.015	2.5E-05	0.0018	46.7	0.0019	0.0283	0.00025	2.2	0.00863	5.63	5E-06	13.4	2.48	5E-06	0.00005	0.005	0.00154	0.00025	0.0015		4.01395E-05	12.45	3.36205	0.270044259	176.471		2015
Bi-annual Seep Sampling	NEZ Dump Seep 11	4/7/2013	4/7/2013	5.2	0.0015	0.00005	0.00037	0.0269	0.00005	0.00025	0.042	2.1E-05	271	0.00025	0.00005	0.00706	0.015	2.5E-05	0.00087	48.5	0.00169	0.0342	0.00025	1.82	0.00328	5.58	5E-06	13.7	2.57	5E-06	0.00005	0.013	0.00255	0.0005	0.0015		0.000015	13.55	3.47031	0.256111231	71.4286		2013
Bi-annual Seep Sampling	NEZ Dump Seep 11	5/6/2014	5/6/2014	4.71	0.0015	0.00013	0.00044	0.0239	0.00005	0.00025	0.047	2.5E-05	248	0.00025	0.00005	0.00609	0.015	2.5E-05	0.00169	45.4	0.00052	0.0474	0.00025	1.89	0.00423	5.27	5E-06	12.5	2.54	5E-06	0.00005	0.005	0.00266	0.0005	0.0015		2.14358E-05	12.4	3.23917	0.261223397	60		2014
Bi-annual Seep Sampling	NEZ Dump Seep 11	27-10-2014 14:28	10/27/2014	5.46	0.0015	0.00013	0.0004	0.0249	0.00005	0.00025	0.043	1.4E-05	260	0.00025	0.00005	0.00698	0.015	2.5E-05	0.0017	47.3	0.00456	0.044	0.00025	2.03	0.00688	5.74	5E-06	12.6	2.33	5E-06	0.00005	0.021	0.00194	0.0005	0.0015		3.0806E-05	13	3.35789	0.258299605	107.143		2014
Bi-annual Seep Sampling	NEZ Dump Seep 11	28-05-2015 13:17	5/28/2015	6.05	0.0015	0.00014	0.00044	0.0267	0.00005	2.5E-05	0.048	1.3E-05	251	0.00025	0.00005	0.00894	0.015	2.5E-05	0.0017	47.1	0.00083	0.0368	0.00025	2.01	0.00273	6.1	5E-06	12.6	2.27	5E-06	0.00005	0.014	0.00223	0.00025	0.0015		1.33171E-05	12.55	3.34572	0.266591254	112.782		2015
Bi-annual Seep Sampling	NEZ Dump Seep 12	4/7/2013	4/7/2013	3.22	0.0015	0.00032	0.00065	0.024	0.00005	0.00025	0.053	3.5E-05	231	0.00025	0.00005	0.00353	0.015	2.5E-05	0.00222	43.7	0.00096	0.154	0.00025	1.27	0.00597	5.13	5E-06	12.5	2.63	5E-06	0.00011	0.013	0.00476	0.0005	0.0015		2.97508E-05	11.55	3.12415	0.270488945	42.8571		2013
Bi-annual Seep Sampling	NEZ Dump Seep 12	27-10-2014 15:29	10/27/2014	2.99	0.0015	0.00029	0.0005	0.0284	0.00005	0.00025	0.05	6.3E-05	247	0.00025	0.00005	0.00428	0.015	2.5E-05	0.00329	46.6	0.00343	0.154	0.00025	1.38	0.0109	5.16	5E-06	11.9	2.69	5E-06	0.00005	0.021	0.0044	0.0005	0.0015		4.74601E-05	12.35	3.26998	0.264775473	23.8095		2014
Bi-annual Seep Sampling	NEZ Dump Seep 12	28-05-2015 12:53	5/28/2015	3.41	0.0015	0.00024	0.00061	0.0231	0.00005	2.5E-05	0.044	0.00004	215	0.00025	0.00005	0.0039	0.015	2.5E-05	0.0021	41.6	0.00257	0.119	0.00025	1.29	0.00744	5.03	5E-06	12.5	2.1	5E-06	0.00005	0.013	0.00388	0.00025	0.0015		3.82847E-05	10.75	3.00221	0.279275457	37.5		2015
Bi-annual Seep Sampling	NEZ Dump Seep 13	4/7/2013	4/7/2013	3.57	0.0015	0.00024	0.00019	0.0139	0.00005	0.00025	0.046	2.5E-05	263	0.00025	0.00005	0.00307	0.015	2.5E-05	0.00096	42.3	0.0541	0.117	0.00025	1.3	0.00686	5.65	5E-06	12.4	2.67	5E-06	0.00005	0.013	0.00412	0.0005	0.0015		3.25118E-05	13.15	3.03894	0.2310978	60		2013
Bi-annual Seep Sampling	NEZ Dump Seep 13	5/6/2014	5/6/2014	2.86	0.0015	0.00036	0.0006	0.023	0.00005	0.00025	0.056	0.00004	237	0.00025	0.00005	0.00322	0.015	2.5E-05	0.00184	40.5	0.028	0.235	0.00025	1.18	0.00795	4.76	5E-06	12.5	2.46	5E-06	0.00005	0.005	0.00501	0.0005	0.0015		3.86548E-05	11.85	2.93525	0.247700482	37.5		2014
Bi-annual Seep Sampling	NEZ Dump Seep 13	27-10-2014 15:47	10/27/2014	2.96	0.0015	0.00033	0.00069	0.028	0.00005	0.00025	0.052	3.8E-05	257	0.00025	0.00005	0.00501	0.015	2.5E-05	0.00258	43.4	0.0369	0.218	0.00025	1.34	0.011	4.74	5E-06	12.1	2.52	5E-06	0.00005	0.021	0.00418	0.0005	0.0015		4.74138E-05	12.85	3.09106	0.240549274	39.4737		2014
Bi-annual Seep Sampling	NEZ Dump Seep 13	28-05-2015 12:37	5/28/2015	3.72	0.0045	0.00023	0.00018	0.0154	0.00005	2.5E-05	0.042	1.9E-05	265	0.00025	0.00005	0.00217	0.015	2.5E-05	0.0023	42.5	0.0969	0.13	0.00025	1.3	0.00643	6.14	5E-06	12.1	2.51	5E-06	0.00005	0.013	0.00336	0.00025	0.0015		3.04739E-05	13.25	3.03755	0.229249389	81.0811		2015
Bi-annual Seep Sampling	NEZ Dump Seep 14	4/7/2013	4/7/2013	3.97	0.0015	0.00005	0.00016	0.014	0.00005	0.00025	0.033	2.5E-05	99.9	0.00025	0.00005	0.00589	0.015	2.5E-05	0.00025	16.6	0.00416	0.0112	0.00025	0.859	0.0154	4.78	5E-06	6.53	0.392	5E-06	0.00025	0.005	0.00019	0.0005	0.0031		0.000187045	4.995	1.27387	0.255028772	124		2013
Bi-annual Seep Sampling	NEZ Dump Seep 14	5/6/2014	5/6/2014	3.89	0.0047	0.00005	0.00011	0.00977	0.00005	0.00025	0.021	3.1E-05	72	0.00025	0.00005	0.00598	0.015	2.5E-05	0.00082	12.6	0.00485	0.0103	0.00025	0.684	0.0158	5.08	5E-06	4.88	0.291	5E-06	0.00005	0.005	0.00014	0.0005	0.0043		0.000285542	3.6	0.96441	0.267890626	138.71		2014
Bi-annual Seep Sampling	NEZ Dump Seep 14	27-10-2014 15:26	10/27/2014	3.54	0.0062	0.00005	0.00016	0.0275	0.00005	0.00025	0.034	0.00027	162	0.00025	0.00088	0.0102	0.015	2.5E-05	0.00155	26	0.174	0.0108	0.00025	1.25	0.0104	7.12	5E-06	8.25	0.778	5E-06	0.00005	0.016	0.00043	0.0005	0.0137		8.7395E-05	8.1	1.90678	0.235405175	51.6981		2014
Bi-annual Seep Sampling	NEZ Dump Seep 14	28-05-2015 12:16	5/28/2015	3.79	0.0048	0.00005	0.00011	0.0165	0.00005	2.5E-05	0.029	5.5E-05	100	0.00025	0.00005	0.00573	0.015	2.5E-05	0.0005	15.9	0.0116	0.0124	0.00025	0.931	0.0171	5.01	5E-06	6.07	0.476	5E-06	0.00005	0.005	0.00015	0.00025	0.0039		0.000201969	5	1.2149	0.242979708	70.3971		2015
Bi-annual Seep Sampling	NEZ Dump Seep 15	5/6/2014	5/6/2014	2.83	0.0015	0.00019	0.00033	0.0165	0.00005	0.00025	0.048	1.5E-05	218	0.00025	0.00005	0.00206	0.015	2.5E-05	0.00112	34.4	0.00933	0.102	0.00025	1.17	0.00748	5.58	5E-06	10.4	1.51	5E-06	0.00005	0.005	0.00291	0.0005	0.0015		4.00714E-05	10.9	2.488	0.228257323	100		2014
Bi-annual Seep Sampling	NEZ Dump Seep 15	28-05-2015 11:55	5/28/2015	3.03	0.0015	0.00021	0.00036	0.0212	0.00005	2.5E-05	0.053	6.7E-06	242	0.00025	0.00005	0.0019	0.015	2.5E-05	0.0014	37.7	0.00052	0.0922	0.00025	1.23	0.0102	5.53	5E-06	11	1.54	5E-06	0.00005	0.013	0.00251	0.00025	0.0015		4.81132E-05	12.1	2.70805	0.22380579	223.881		2015
Bi-annual Seep Sampling	NEZ Dump Seep 16	5/6/2014	5/6/2014	2.34	0.0015	0.0002	0.00035	0.022	0.00005	0.00025	0.06	2.5E-05	203	0.00025	0.00005	0.0018	0.015	2.5E-05	0.0013	26	0.00668	0.136	0.00025	0.98	0.0191	5.81	5E-06	10.8	1.17	5E-06	0.00005	0.005	0.00241	0.0005	0.0015		0.000119127	10.15	2.01073	0.198101321	60		2014
Bi-annual Seep Sampling	NEZ Dump Seep 2	2/7/2013	2/7/2013	2.93	0.0228	0.00061	0.00027	0.0497	0.0001	0.0005	0.12	0.00015	411	0.00025	0.0005	0.042	0.015	0.00005	0.0035	77.7	0.0641	0.537	0.0013	2.43	0.193	4.6	0.00001	27.5	6.29	0.00001	0.0001	0.013	0.00231	0.001	0.0097		0.000452344	20.55	5.78857	0.281682341	64.6667		2013
Bi-annual Seep Sampling	NEZ Dump Seep 2	5/6/2014	5/6/2014	3.28	0.0501	0.0004	0.00024	0.0459	0.0001	0.0005	0.093	0.00013	355	0.00025	0.00065	0.0712	0.015	0.00005	0.0043	73.2	0.084	0.303	0.0024	2.41	0.118	4.44	0.00001	24.5	6.12	0.00001	0.0001	0.005	0.00183	0.001	0.0135		0.000287805	17.75	5.39523	0.303956836	103.846		2014
Bi-annual Seep Sampling	NEZ Dump Seep 2	27-10-2014 11:45	10/27/2014	3.64	0.0096	0.00045	0.00031	0.0371	0.00005	0.00025	0.081	9.7E-05	301	0.00025	0.00026	0.0274	0.015	2.5E-05	0.0044	55.2	0.0432	0.265	0.00083	2.05	0.108	4.34	5E-06	19.5	5.01	5E-06	0.00005	0.023	0.00171	0.0005	0.0057		0.000363229	15.05	4.11905	0.273690969	58.7629		2014
Bi-annual Seep Sampling	NEZ Dump Seep 2	25-05-2015 14:26	5/25/2015	4.54	0.0116	0.00033	0.00027	0.0477	0.0001	0.00005	0.091	0.00011	346	0.00025	0.0001	0.0412	0.015	0.00005	0.0048	68.8	0.0441	0.263	0.0011	2.43	0.079	4.49	0.00001	23.7	5.9	0.00001	0.0001	0.005	0.0019	0.0005	0.0097		0.000221495	17.3	5.1044	0.295052271	85.0877		2015
Bi-annual Seep Sampling	NEZ Dump Seep 2	11/11/2015	11/11/2015	4.04	0.0099	0.00032	0.00025	0.046	0.0001	0.00005	0.093	0.00005	320	0.00025	0.0001	0.0251	0.015	0.00005	0.0034	62	0.0452	0.24	0.0005	2.24	0.0684	4.74	0.00001	21.7	5.95	0.00001	0.0001	0.014	0.00171	0.0005	0.0061		0.000215094	16	4.61607	0.288504657	122		2015
Bi-annual Seep Sampling	NEZ Dump Seep 3	2/7/2013	2/7/2013	4.16	0.0043	0.0001	0.0001	0.0804	0.0001	0.0005	0.122	0.0001	402	0.00025	0.0001	0.00389	0.015	0.00005	0.0005	95.7	0.00122	0.0837	0.0005	3.76	0.04	5.23	0.00001	30.3	6.98	0.00001	0.0001	0.013	0.00037	0.001	0.0048		8.57143E-05	20.1	6.99398	0.347959029	48		2013
Bi-annual Seep Sampling	NEZ Dump Seep 3	5/6/2014	5/6/2014	4.33	0.0062	0.0001	0.0001	0.0649	0.0001	0.0005	0.097	4.5E-05	354	0.00025	0.0001	0.00387	0.015	0.00005	0.0011	89.2	0.00179	0.0897	0.0005	3.5	0.0365	5.19	0.00001	26.7	6.1	0.00001	0.0001	0.005	0.00037	0.001	0.0042		8.83065E-05	17.7	6.45178	0.364507307	93.3333		2014
Bi-annual Seep Sampling	NEZ Dump Seep 3	27-10-2014 12:08	10/27/2014	5.08	0.0047	0.0001	0.00025	0.0622	0.0001	0.0005	0.097	0.00005	355	0.00025	0.0001	0.00395	0.015	0.00005	0.0015	87.8	0.00015	0.0999	0.0005	3.46	0.0163	5.1	0.00001	25.2	6.13	0.00001	0.0001	0.025	0.0005	0.001	0.0033		3.85039E-05	17.75	6.3039	0.355149501	66		2014
Bi-annual Seep Sampling	NEZ Dump Seep 3	25-05-2015 14:30	5/25/2015	5.44	0.0055	0.0001	0.0001	0.066	0.0001	0.00005	0.098	5.4E-05	374	0.00025	0.0001	0.00387	0.015	0.00005	0.001	89.3	0.00035	0.0925	0.0005	3.61	0.0224	4.95	0.00001	25.7	6.19	0.00001	0.0001	0.005	0.00033	0.0005	0.0045		5.01493E-05	18.7	6.41695	0.34315254	83.3333		2015
Bi-annual Seep Sampling	NEZ Dump Seep 3	11/11/2015	11/11/2015	5.62	0.0015	0.0001	0.0001	0.058	0.0001	0.00005	0.074	0.00005	340	0.00025	0.0001	0.00298	0.015	0.00005	0.001	84.1	0.0075	0.0829	0.0005	3.08	0.0119	4.89	0.00001	23.8	5.71	0.00001	0.0001	0.014	0.00048	0.0005	0.0015		3.05128E-05	17	6.01755	0.353973356	30		2015
Bi-annual Seep Sampling	NEZ Dump Seep 4	2/7/2013	2/7/2013	4.1	0.0087	0.00033	0.00028	0.0541	0.0001	0.0005	0.148	0.00025	373	0.00025	0.0001	0.0156	0.015	0.00005	0.0025	74.6	0.00349	0.324	0.0005	2.65	0.042	4.79	0.00001	26.1	7.49	0.00001	0.0001	0.013	0.00191	0.001	0.0042		0.000103279	18.65	5.55259	0.297725767	16.8		2013
Bi-annual Seep Sampling	NEZ Dump Seep 4	5/6/2014	5/6/2014	4.12	0.0087	0.00027	0.00026	0.0393	0.0001	0.0005	0.075	0.00006	299	0.00025	0.0001	0.0144	0.015	0.00005	0.0028	63.9	0.00067	0.209	0.0005	2.28	0.0636	4.45	0.00001	19.4	5.48	0.00001	0.0001	0.005	0.00126	0.001	0.0034		0.00019875	14.95	4.62789	0.30955768	56.6667		2014
Bi-annual Seep Sampling	NEZ Dump Seep 4	27-10-2014 12:20	10/27/2014	5.59	0.0091	0.0002	0.0003	0.0437	0.00005	0.00025	0.092	6.5E-05	300	0.00025	0.00005	0.017	0.015	2.5E-05	0.00254	63.9	0.0009	0.154	0.00052	2.63	0.028	4.4	5E-06	20.1	5.36	5E-06	0.00005	0.024	0.00171	0.0005	0.0043		8.41683E-05	15	4.6673	0.311153098	66.1538		2014
Bi-annual Seep Sampling	NEZ Dump Seep 4	25-05-2015 14:14	5/25/2015	6.35	0.0086	0.0001	0.00031	0.0469	0.0001	0.00005	0.079	6.1E-05	357	0.00025	0.0001	0.0151	0.015	0.00005	0.0031	74.8	0.00172	0.162	0.0005	2.72	0.0241	4.41	0.00001	22.4	6.04	0.00001	0.0001	0.005	0.0016	0.0005	0.0033		6.23276E-05	17.85	5.40517	0.302810794	54.0984		2015
Bi-annual Seep Sampling	NEZ Dump Seep 4	11/11/2015	11/11/2015	5.57	0.0167	0.00015	0.00029	0.0419	0.00005	2.5E-05	0.073	5.2E-05	293	0.00025	0.00005	0.0169	0.015	2.5E-05	0.0023	63.1	0.00138	0.115	0.00059	2.67	0.0168	4.35	5E-06	19.3	5.35	5E-06	0.00005	0.014	0.00153	0.00025	0.0037		5.32207E-05	14.65	4.58689	0.313098448	70.8812		2015
Bi-annual Seep Sampling	NEZ Dump Seep 5	2/7/2013	2/7/2013	3.24	0.0084	0.00017	0.00061	0.0188	0.00005	0.00025	0.052	0.00002	50.6	0.00025	0.00005	0.011	0.015	2.5E-05	0.00025	6.67	0.00719	0.0348	0.00025	0.531	0.00912	6.18	5E-06	4.08	0.634	5E-06	0.00005	0.005	0.00038	0.0013	0.0015		0.000385896	2.53	0.57993	0.229220542	75		2013
Bi-annual Seep Sampling	NEZ Dump Seep 5	27-10-2014 14:55	10/27/2014	3.27	0.0015	0.00045	0.00029	0.0551	0.00005	0.00025	0.294	2.9E-05	210	0.00025	0.00005	0.00339	0.015	2.5E-05	0.0032	26.8	0.00118	0.106	0.00025	1.45	0.0177	7.11	5E-06	22.7	4.87	5E-06	0.00005	0.019	0.00121	0.0005	0.0015		9.7075E-05	10.5	2.58682	0.24636364	51.7241		2014
Bi-annual Seep Sampling	NEZ Dump Seep 5	28-05-2015 14:09	5/28/2015	1.89	0.0015	0.00039	0.0006	0.049	0.00005	2.5E-05	0.159	2.9E-05	180	0.00025	0.00005	0.00499	0.015	2.5E-05	0.0036	24.2	0.00347	0.113	0.00025	1.28	0.0406	6.37	5E-06	14.9	2.97	5E-06	0.00005	0.011	0.00203	0.00098	0.0015		0.000267105	9	2.09173	0.232413924	51.1945		2015

Location Type	Sample Point	Original Date As Is	Recoded Date	Location	Source Term Group	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Q (m3/s)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Alkalinity (CaCO3) (mg/L)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Total Nitrogen (mg/L)
							µs/cm	su	m3/s	C	ntu	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	NEZ Dump Seep 6	2/7/2013	2/7/2013	Wight	Wight	Water trickles through rock (and goes to ground?) - difficult to tell in slash. Unable to sample.	531	8.1	0.002	6.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 6	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1390	790	8.28	1190	6.8	1.27	148	-0.005	-5	0.77	6.49	6.49	-0.01	0.0079	0.0097	0.0115	685	6.55
Bi-annual Seep Sampling	NEZ Dump Seep 6	27-10-2014 14:22	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1200	663	8.02	943	3.3	1.22	127	-0.005	-5	0.36	2.11	2.11	-0.01	0.0019	0.0033	0.0046	571	2.04
Bi-annual Seep Sampling	NEZ Dump Seep 7	2/7/2013	2/7/2013	Wight	Wight	Full suite sample taken. Photo Taken.	5.4	8.3	0.002	7.1	#N/A	468	242	8.17	333	20	1.54	99.6	-0.005	-0.5	0.178	0.638	0.638	-0.001	0.0059	0.0072	0.0329	137	0.687
Bi-annual Seep Sampling	NEZ Dump Seep 7	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	859	464	8.2	665	3.2	0.39	112	-0.005	-2.5	0.31	2.52	2.52	-0.005	0.0047	0.0048	0.0071	361	2.66
Bi-annual Seep Sampling	NEZ Dump Seep 7	27-10-2014 13:52	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1020	571	8.02	819	-3	1.92	86.3	-0.005	-5	0.31	1.52	1.52	-0.01	0.0061	0.0066	0.0093	501	1.48
Bi-annual Seep Sampling	NEZ Dump Seep 7	28-05-2015 14:25	5/28/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	812	423	8.24	609	25.9	5.31	111	-0.005	-1	0.245	1.09	1.09	-0.002	0.0038	0.0055	0.135	322	1.1
Bi-annual Seep Sampling	NEZ Dump Seep 8	4/7/2013	4/7/2013	Wight	Wight	Full suite sample taken.	1452	7.9	0.0025	5.8	#N/A	1430	850	7.65	1240	68.7	20	87.3	-0.005	-5	-0.2	1.58	1.58	-0.01	0.006	0.0078	0.129	647	2.31
Bi-annual Seep Sampling	NEZ Dump Seep 8	8/6/2015	8/6/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1100	639	7.93	876	14.3	2.82	106	0.0057	-2.5	-0.1	0.959	0.959	-0.005	0.0062	0.0093	0.0224	543	1.09
Bi-annual Seep Sampling	NEZ Dump Seep 9	4/7/2013	4/7/2013	Wight	Wight	Full suite sample taken.	1984	7.9	0.01	5.3	#N/A	1970	1240	7.79	1850	-3	0.37	58.3	-0.005	-10	-0.4	4.7	4.7	-0.02	0.0068	0.0085	0.0102	1180	4.56
Bi-annual Seep Sampling	NEZ Dump Seep 9	23-10-2013 13:21	10/23/2013	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1690	1020	7.92	1500	-3	0.46	71.8	-0.005	-10	-0.4	2.71	2.71	-0.02	0.0042	0.0079	0.0082	1020	2.61
Bi-annual Seep Sampling	NEZ Dump Seep 9	5/6/2014	5/6/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1480	879	7.84	1230	3.5	0.43	56.2	-0.005	-5	0.23	2.09	2.09	-0.01	0.0052	0.0064	0.0211	852	2.2
Bi-annual Seep Sampling	NEZ Dump Seep 9	27-10-2014 13:31	10/27/2014	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1420	814	7.99	1220	7.8	10.9	62.3	-0.005	-5	0.21	1.55	1.55	-0.01	0.0038	0.0069	0.0189	779	1.6
Bi-annual Seep Sampling	NEZ Dump Seep 9	8/6/2015	8/6/2015	Wight	Wight		#N/A	#N/A	#N/A	#N/A	#N/A	1540	963	7.91	1360	-3	0.28	67	-0.005	-5	-0.2	1.45	1.45	-0.01	0.0047	0.0062	0.0048	918	1.53
Bi-annual Seep Sampling	North Bell Dump Seep 1	30-05-2013 9:43	5/30/2013	Bell	All Non-PAG	No sample taken. Photo taken. In a wet depressional area. A tiny bit of snow in area.	478	8.6	0	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	North Bell Dump Seep 1	14-10-2015 13:57	10/14/2015	Bell	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	562	295	7.11	411	11.6	4.41	127	0.233	0.92	0.064	1.64	4.14	2.5	0.0162	0.0312	0.445	162	6.04
Bi-annual Seep Sampling	North Bell Dump Seep 2	4/6/2013	4/6/2013	Bell	All Non-PAG	Full suite sample. Will have some TSS (shallow pond). Puddle from dump toe goes to ground.	801	8.2	0	0.4	#N/A	712	369	7.91	498	106	108	95	0.0409	-2.5	0.27	9.53	9.57	0.0364	0.0951	0.124	0.333	246	9.57
Bi-annual Seep Sampling	North Bell Dump Seep 3	4/6/2013	4/6/2013	Bell	All Non-PAG	Full suite sample. Will have some TSS/algae (shallow pond). Puddle from dump toe goes to ground.	1083	7.8	0	4.4	#N/A	883	498	7.36	658	26.3	1.71	44.2	0.0077	-5	0.23	0.86	0.86	-0.01	-0.001	0.0061	0.0694	444	1.56
Bi-annual Seep Sampling	North Bell Dump Seep 4	2/7/2013	2/7/2013	Bell	All Non-PAG	Stagnant pond starting ~10-15m d/s of dump toe. No sample taken. Photo taken.	588	6.8	0	15.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 1	30-05-2013 9:42	5/30/2013	PAG Ex-Pit	All PAG - Pre-Acid	Full suite. Sampled water flowing into pool ~3m d/s of dump toe. Filled bottles w/ DOC 120mL amber.	736	7.23	0.005	4.36	#N/A	1220	650	8.01	996	6.8	0.99	139	0.0336	7.8	0.28	31.8	31.9	0.066	0.0536	0.0666	0.0739	428	30.7
Bi-annual Seep Sampling	PAG Dump Seep 10	29-05-2014 9:48	5/29/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	842	455	8.08	606	9	3.54	172	0.0087	-5	-0.2	6.12	6.69	0.562	-0.001	0.0105	0.0331	273	6.76
Bi-annual Seep Sampling	PAG Dump Seep 10	23-10-2014 12:28	10/23/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1360	793	7.99	1100	-3	0.37	251	0.0393	5.6	-0.2	8.01	8.01	-0.01	0.0073	0.0146	0.0175	540	7.8
Bi-annual Seep Sampling	PAG Dump Seep 10	20-05-2015 13:03	5/20/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1310	741	7.82	1070	-3	0.25	173	0.0087	3.3	-0.1	13.4	13.5	0.0103	0.0124	0.0169	0.0176	533	13.8
Bi-annual Seep Sampling	PAG Dump Seep 10	24-11-2015 13:22	11/24/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1570	914	7.78	1250	-3	0.32	181	-0.005	3.6	-0.1	13.8	13.8	0.0057	0.0154	0.0208	0.0181	670	13.6
Bi-annual Seep Sampling	PAG Dump Seep 12	29-05-2014 10:04	5/29/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	645	333	8	501	6.5	3.49	116	0.0075	3.4	0.14	3.67	3.95	0.278	-0.001	0.018	0.0561	210	4.39
Bi-annual Seep Sampling	PAG Dump Seep 13	23-10-2014 10:49	10/23/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	295	149	8.15	144	30.7	8.32	151	0.0232	0.79	0.115	0.0916	0.109	0.0173	0.0059	0.0061	0.0354	9.91	0.38
Bi-annual Seep Sampling	PAG Dump Seep 13	20-05-2015 13:36	5/20/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	307	151	8.25	214	-3	0.66	112	0.0176	0.57	0.119	0.808	0.809	0.002	0.0288	0.0283	0.037	26.8	0.964
Bi-annual Seep Sampling	PAG Dump Seep 14	23-10-2014 11:13	10/23/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1050	591	8.17	838	3.5	3.71	261	0.0577	-5	-0.2	5.95	6.12	0.166	-0.001	0.007	0.0177	328	5.94
Bi-annual Seep Sampling	PAG Dump Seep 14	20-05-2015 13:16	5/20/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1470	854	8.09	1210	-3	0.35	196	0.0077	-5	-0.2	16.4	16.4	0.026	0.0092	0.0111	0.0155	647	15.2
Bi-annual Seep Sampling	PAG Dump Seep 14	24-11-2015 14:48	11/24/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1670	975	8.14	1340	-3	0.46	210	0.0098	4.1	-0.1	13.7	13.7	-0.005	0.0178	0.0213	0.0247	736	13.2
Bi-annual Seep Sampling	PAG Dump Seep 15	9/12/2014	9/12/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1260	679	7.96	959	103	23.9	120	0.236	5.6	-0.2	21.2	22.3	1.03	-0.001	0.0043	0.196	533	21.2
Bi-annual Seep Sampling	PAG Dump Seep 15	23-10-2014 11:56	10/23/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1230	712	7.89	972	87.8	18.9	325	0.144	6.4	-0.2	1.04	1.55	0.516	0.0022	0.0323	0.391	390	3
Bi-annual Seep Sampling	PAG Dump Seep 15	1/9/2015	1/9/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1730	1030	7.57	1480	9.1	7.38	187	0.0641	-5	-0.2	18.1	18.5	0.338	0.0029	0.0051	0.0517	805	18.3
Bi-annual Seep Sampling	PAG Dump Seep 15	2/2/2015	2/2/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1770	977	7.81	1520	45.2	28.9	161	0.2	8	-0.2	34.7	36.7	2.07	0.002	0.0134	0.0997	771	35.9
Bi-annual Seep Sampling	PAG Dump Seep 15	2/6/2015	2/6/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1720	968	8.25	1450	6.8	7.16	186	0.0805	5.4	-0.2	21	21.5	0.453	-0.001	-0.002	0.0376	761	20.5
Bi-annual Seep Sampling	PAG Dump Seep 15	3/3/2015	3/3/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1820	1050	7.92	1560	17.1	9.49	148	0.156	10	0.29	37.1	38.4	1.33	0.0015	0.0073	0.0515	834	38.7
Bi-annual Seep Sampling	PAG Dump Seep 15	5/5/2015	5/5/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1630	906	8.06	1330	9.8	6.6	201	0.0806	5.8	-0.2	23.8	24.5	0.722	-0.001	0.0081	0.0365	703	22.7
Bi-annual Seep Sampling	PAG Dump Seep 15	6/1/2015	6/1/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1640	926	7.76	1330	157	97.1	190	0.348	10	-0.2	27	28.9	1.92	0.0015	0.0092	0.27	682	29.1
Bi-annual Seep Sampling	PAG Dump Seep 15	6/8/2015	6/8/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1780	1040	7.86	1660	15.2	9.18	180	0.0935	-5	-0.2	20	20.4	0.374	0.0029	-0.002	0.0502	822	22.1
Bi-annual Seep Sampling	PAG Dump Seep 15	7/7/2015	7/7/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1690	986	8.07	1480	9.9	5.8	196	0.0573	-5	-0.2	17.7	18.1	0.413	0.0019	0.0059	0.0417	754	17.6
Bi-annual Seep Sampling	PAG Dump Seep 15	8/4/2015	8/4/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1840	1090	8.03	1600	7.5	6.25	150	0.0905	6.3	-0.1	33.8	34.7	0.914	-0.001	0.0041	0.0244	863	33.5
Bi-annual Seep Sampling	PAG Dump Seep 15	29-10-2015 12:55	10/29/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1650	952	8	1370	5.2	6.19	238	0.0507	5.1	-0.2	14.9	15.4	0.554	0.0018	-0.002	0.0555	707	15.7
Bi-annual Seep Sampling	PAG Dump Seep 15	24-11-2015 13:05	11/24/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1840	1090	8.05	1550	-3	1.24	183	0.0146	5.3	-0.2	20.9	21	0.09	0.0148	0.0196	0.031	830	20.5
Bi-annual Seep Sampling	PAG Dump Seep 2	30-05-2013 9:56	5/30/2013	PAG Ex-Pit	All PAG - Pre-Acid	Full suite. Sampled flow just below dump toe. Filled bottles w/ DOC 120mL amber.	996	6.41	0.005	1.3	#N/A	2040	1190	7.57	1670	51.3	37.5	289	0.694	17	0.54	26.7	49.6	22.9	0.0052	0.0342	0.236	819	45.4
Bi-annual Seep Sampling	PAG Dump Seep 3	30-05-2013 10:08	5/30/2013	PAG Ex-Pit	All PAG - Pre-Acid	Full suite. Sampled shallow trickle out of till berm" ~20m below dump toe. Filled bottles w/ DOC 120mL amber (may have picked up some TSS)."	690	6.79	0.003	9.4	#N/A	1060	599	7.87	841	24.7	7.21	127	0.538	7.6	0.2	2.67	2.68	0.016	0.0021	0.0067	0.048	469	3.17
Bi-annual Seep Sampling	PAG Dump Seep 3	29-05-2014 10:52	5/29/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1200	678	7.81	995	24.1	5.02	48.8	-0.005	-5	-0.2	18.8	18.9	0.018	-0.001	0.0041	0.0475	570	17.7
Bi-annual Seep Sampling	PAG Dump Seep 4	30-05-2013 11:03	5/30/2013	PAG Ex-Pit	All PAG - Pre-Acid	Full suite. Sample taken from flow into roadside ditch. Appears till was packed against toe to prevent seep flow. Filled bottles w/ DOC 120mL ambers.	899	7.88	0.003	4.4	#N/A	1470	829	8.09	1100	47.3	27.1	210	0.0651	19.2	0.23	34.5	34.9	0.336	0.007	0.0088	0.0907	509	32.8
Bi-annual Seep Sampling	PAG Dump Seep 4	29-05-2014 11:11	5/29/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	2230	1360	8.13	1940	5.2	1.16	151	0.0542	14	-0.4	49.9	50	0.136	0.0079	0.0158	0.0219	1140	45.1
Bi-annual Seep Sampling	PAG Dump Seep 4	14-05-2015 13:57	5/14/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	2180	1260	7.97	1850	3.2	0.24	146	-0.005	10.6	-0.2	48.6	48.6	-0.01	0.0116	0.0161	0.0193	959	51.3
Bi-annual Seep Sampling	PAG Dump Seep 5	29-05-2014 10:40	5/29/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1950	1110	8.02	1710	5.1	3.27	137	0.337	11	-0.4	52.4	56	3.55	0.0022	0.008	0.0468	907	51.2
Bi-annual Seep Sampling	PAG Dump Seep 5	23-10-2014 10:50	10/23/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1810	1070	8.07	1530	12.3	4.73	171	0.288	11	-0.4	35.9	36.8	0.95	-0.001	0.0041	0.054	797	34
Bi-annual Seep Sampling	PAG Dump Seep 5	14-05-2015 14:22	5/14/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	2400	1360	8.08	2140	3.3	1.18	169	0.0475	11.5	-0.2	54.4	54.4	0.049	0.0018	0.0083	0.0067	1100	53.3
Bi-annual Seep Sampling	PAG Dump Seep 5	24-11-2015 12:38	11/24/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	2290	1390	7.86	1980	-3	2.41	256	0.0299	9	-0.2	34.1	34.2	0.017	-0.001	-0.002	-0.002	1060	34.3
Bi-annual Seep Sampling	PAG Dump Seep 7	29-05-2014 9:01	5/29/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	376	213	7.47	340	180	235	193	0.18	2.15	0.086	-0.005	-0.0051	-0.001	0.0267	0.0492	0.584	20.8	1.33
Bi-annual Seep Sampling	PAG Dump Seep 7	23-10-2014 11:16	10/23/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1050	587	7.42	849	33.7	33.2	355	1.2	6.1	-0.2	-0.05	-0.051	-0.01	0.0257	0.0601	1.05	199	8.2
Bi-annual Seep Sampling	PAG Dump Seep 7	20-05-2015 12:27	5/20/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1110	619	7.63	913	69.9	80.7	300	0.869	3.2	-0.1	-0.025	-0.025	-0.005	0.0105	0.0234	0.454	353	2.16
Bi-annual Seep Sampling	PAG Dump Seep 7	24-11-2015 12:48	11/24/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1260	727	7.34	927	57.6	142	379	1.63	3	-0.1	-0.025	-0.025	-0.005	0.0018	0.0092	0.859	374	2.3
Bi-annual Seep Sampling	PAG Dump Seep 8	29-05-2014 9:20	5/29/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	873	397	7.88	659	6.9	3.32	109	0.141	-5	0.31	38.6	42.5	3.85	-0.001	0.0113	0.0456	186	40.8
Bi-annual Seep Sampling	PAG Dump Seep 8	23-10-2014 12:15	10/23/2014	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	776	381	7.87	548	11.7	11.4	227	0.0461	4.2	0.17	0.646	2.17	1.53	0.0025	0.0199	0.182	196	3.27
Bi-annual Seep Sampling	PAG Dump Seep 8	20-05-2015 12:44	5/20/2015	PAG Ex-Pit	All PAG - Pre-Acid		#N/A	#N/A	#N/A	#N/A	#N/A	1030	538	7.69	803	6	5.9	279	0.858	2.8	-0.1	2.23	2.43	0.201	0.0053	0.0131	0.036	301	3.58
Bi-annual Seep Sampling	SERDS Seep 1	6/6/2013	6/6/2013	South East	All Non-PAG	No sample taken (no flow).	702	7.6	0	15.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 10	6/6/2013	6/6/2013	South East	All Non-PAG	No sample taken. Bullrushes observed. No flow, but ground saturated.	690	8.6	0	9.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 11	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken. Lots of algae (some rust coloured). Seep flows out in a few braids - area saturated.	880	6.7	0.005	12	#N/A	1060	541	7.59	843	148	159	91.4	0.39	-5	-0.2	-0.05	-0.051	-0.01	0.0167	0.0331	0.272	522	1.32
Bi-annual Seep Sampling	SERDS Seep 11	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2530	1500	8.05	2370	-3	0.42	98.4	0.0469	-10	0.55	61.9	62.2	0.223	0.0078	0.0148	0.0226	1360	58.9
Bi-annual Seep Sampling	SERDS Seep 11	25-05-2015 12:41	5/25/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2780	1630	7.81	2770	73.1	22.7	87	0.0184	-10	-0.4	76.3	76.3	0.056	0.0131	0.0177	0.1	1500	70.7
Bi-annual Seep Sampling	SERDS Seep 12	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken at lower stream (collects multiple flow points out of dump toe from same source).	2040	8.3	0.01	15.9	#N/A	2130	1210	7.98	1840	44.2	16.4	102	0.0185	-10	0.42	38.4	38.6	0.216	0.0016	0.0104	0.0493	1170	37
Bi-annual Seep Sampling	SERDS Seep 12	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1590	912	8.17	1380	-3	0.39	139	-0.005	5.2	0.4	25.7	25.7	0.02	0.0104	0.0133	0.0145	738	24.6
Bi-annual Seep Sampling	SERDS Seep 13	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken. Video taken.	1572	8.1	0.6	2.9	#N/A	1460	824	8.06	1170	3.4	0.78	111	-0.005	-5	0.29	18.9	18.9	-0.01	0.0067	0.0123	0.0184	718	18
Bi-annual Seep Sampling	SERDS Seep 13	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1600	912	8.12	1390	-3	0.49	126	-0.005	5.1	0.34	27.2	27.2	0.013	0.01	0.012	0.0139	758	26.5
Bi-annual Seep Sampling	SERDS Seep 13	27-10-2014 10:42	10/27/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1560	905	8.16	1370	-3	0.75	133	-0.005	5.3	0.36	25.9	25.9	-0.01	0.0119	0.0136	0.0172	716	25.3
Bi-annual Seep Sampling	SERDS Seep 13	13-01-2015 10:51	1/13/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1670	1010	8.06	1450	-3	0.16	141	-0.005	-5	0.38	26.3	26.3	-0.01	0.011	0.0163	0.0147	824	24.5
Bi-annual Seep Sampling	SERDS Seep 13	2/9/2015	2/9/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1580	974	7.9	1350	3.4	0.38	142	-0.005	-5	0.33	22.2	22.2	-0.01	0.0111	0.0144	0.0119	745	21.9
Bi-annual Seep Sampling	SERDS Seep 13	4/6/2015	4/6/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1590	987	8.12	1450	6.4	0.37	145	-0.005	3.8	0.37	22.8	22.8	-0.005	0.0088	0.0139	0.0125	774	23
Bi-annual Seep Sampling	SERDS Seep 13	5/2/2015	5/2/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1710	1010	8.12	1490	-3	0.23	143	-0.005	-5	0.44	25.2	25.2	-0.01	0.0129	0.0152	0.0155	819	23.9
Bi-annual Seep Sampling	SERDS Seep 13	5/3/2015	5/3/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1700	1020	8	1490	-3	0.25	152	-0.005	-5	0.45	24.7	24.7	-0.01	0.0126	0.0165	0.0152	826	24.5
Bi-annual Seep Sampling	SERDS Seep 13	6/5/2015	6/5/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1720	1040	8.29	1440	-3	0.37	146	-0.005	-5	0.33	24.4	24.4	-0.01	0.0095	0.0136	0.0143	815	23.3
Bi-annual Seep Sampling	SERDS Seep 13	7/7/2015	7/7/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1650	969	8.15	1420	-3	0.17	151	-0.005	-5	0.35	21.8	21.8	-0.01	0.0086	0.0118	0.0126	763	21.9
Bi-annual Seep Sampling	SERDS Seep 13	18-08-2015 13:01	8/18/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1640	927	7.89	1380	-3	0.48	143	-0.005	-5	0.36	22.3	22.3	-0.01	0.0099	0.0141	0.0117	761	20.5
Bi-annual Seep Sampling	SERDS Seep 13	9/4/2015	9/4/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1640	1020	8.15	1430	-3	0.6	151	-0.005	-5	0.35	25.5	25.5	-0.01	0.0094	0.0144	0.013	849	23.5
Bi-annual Seep Sampling	SERDS Seep 13	29-10-2015 10:30	10/29/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1600	934	8.09	1370	-3	0.19	136	-0.005	-5	0.32	23.9	23.9	-0.01	0.0105	0.0136	0.0114	724	24.2
Bi-annual Seep Sampling	SERDS Seep 13	11/11/2015	11/11/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1630	894	8.16	1340	3.2	0.24	135	-0.005	-5	0.35	23.3	23.3	-0.01	0.0113	0.0118	0.0106	716	24
Bi-annual Seep Sampling	SERDS Seep 14	6/6/2013	6/6/2013	South East	All Non-PAG	No sample taken. Water chemistry expected to be similar to seep 13.	1644	8.1	0.005	6.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 14	25-05-2015 14:01	5/25/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1910	1170	7.72	1720	5.4	0.3	70.2	0.0513	-10	-0.4	0.62	0.62	-0.02	0.004	0.0092	0.025	1170	0.863
Bi-annual Seep Sampling	SERDS Seep 15	6/6/2013	6/6/2013	South East	All Non-PAG	No sample taken. Wet at dump toe, pooling below. No surface flow, but ground saturated	2210	7.9	0	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 16	6/6/2013	6/6/2013	South East	All Non-PAG	No sample taken. No flow - puddle at dump toe. No flow, but ground saturated	755	7.3	0	14.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 17	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken.	1362	7.8	0.01	5.6	#N/A	1310	729	7.97	1030	5	1.39	68.9	-0.005	6.4	-0.2	6.93	6.93	-0.01	0.0092	0.0168	0.0229	691	6.68
Bi-annual Seep Sampling	SERDS Seep 17	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1320	729	8	1100	15.2	4.39	68.8	-0.005	6.5	-0.2	3.98	3.98	-0.01	0.009	0.0129	0.0445	690	4.05
Bi-annual Seep Sampling	SERDS Seep 18	27-10-2014 10:12	10/27/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1260	687	8.13	1050	-3	0.79	90.7	-0.005	-5	0.32	23.3	23.3	-0.01	0.0257	0.0276	0.0238	548	22.4
Bi-annual Seep Sampling	SERDS Seep 18	25-05-2015 12:23	5/25/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2170	1280	8.07	2030	6.6	0.7	64.5	0.0074	-10	-0.4	71.5	71.5	-0.02	0.0176	0.0239	0.0347	1050	67
Bi-annual Seep Sampling	SERDS Seep 19	27-10-2014 10:35	10/27/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1540	848	7.92	1330	3.6	1.64	87.4	0.117	5.8	-0.2	42.5	42.6	0.07	0.0036	0.0068	0.0163	646	42.6
Bi-annual Seep Sampling	SERDS Seep 19	25-05-2015 12:38	5/25/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2860	1720	7.79	2800	11	1.31	62.9	0.024	-10	-0.4	129	129	0.062	0.0141	0.0156	0.0356	1340	119
Bi-annual Seep Sampling	SERDS Seep 19	11/11/2015	11/11/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2850	1630	7.84	2520	15.8	4.89	89.3	0.0105	-10	-0.4	130	130	0.036	0.0147	0.0187	0.305	1170	132
Bi-annual Seep Sampling	SERDS Seep 2	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken (will have TSS due to shallow samping enviro).	1622	8	0.002	7.7	#N/A	1570	945	8.05	1410	525	168	160	0.115	-5	0.34	2.87	3	0.131	0.0948	0.167	0.821	823	3.93
Bi-annual Seep Sampling	SERDS Seep 2	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1660	945	7.92	1460	11.3	4.64	72.1	0.156	5.6	0.27	49	49.3	0.335	0.0114	0.0162	0.039	757	47.6
Bi-annual Seep Sampling	SERDS Seep 20	25-05-2015 13:10	5/25/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2870	1660	7.82	2710	9.9	1.78	73.6	0.184	-10	-0.4	135	135	0.197	0.0062	0.0058	0.0353	1230	125
Bi-annual Seep Sampling	SERDS Seep 21	25-05-2015 13:04	5/25/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2480	1420	7.87	2410	7.3	4.1	104	0.214	-10	-0.4	104	104	0.346	0.0258	0.0376	0.057	1090	95.1

Location Type	Sample Point	Original Date As Is	Recoded Date	Dissolved Organic Carbon (mg/L)	Aluminum (Al)-Total (mg/L)	Antimony (Sb)-Total (mg/L)	Arsenic (As)-Total (mg/L)	Barium (Ba)-Total (mg/L)	Beryllium (Be)-Total (mg/L)	Bismuth (Bi)-Total (mg/L)	Boron (B)-Total (mg/L)	Cadmium (Cd)-Total (mg/L) (mg/L)	Calcium (Ca)-Total (mg/L)	Chromium (Cr)-Total (mg/L)	Cobalt (Co)-Total (mg/L)	Copper (Cu)-Total (mg/L)	Iron (Fe)-Total (mg/L) (mg/L)	Lead (Pb)-Total (mg/L)	Lithium (Li)-Total (mg/L)	Magnesium (Mg)-Total (mg/L)	Manganese (Mn)-Total (mg/L)	Molybdenum (Mo)-Total (mg/L)	Nickel (Ni)-Total (mg/L)	Potassium (K)-Total (mg/L)	Selenium (Se)-Total (mg/L)	Silicon (Si)-Total (mg/L)	Silver (Ag)-Total (mg/L)	Sodium (Na)-Total (mg/L)	Strontium (Sr)-Total (mg/L)	Thallium (Tl)-Total (mg/L)	Tin (Sn)-Total (mg/L)	Titanium (Ti)-Total (mg/L)	Uranium (U)-Total (mg/L)	Vanadium (V)-Total (mg/L)	Zinc (Zn)-Total (mg/L)	Aluminum (Al)-Dissolved (mg/L)	Antimony (Sb)-Dissolved (mg/L)	Arsenic (As)-Dissolved (mg/L)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	NEZ Dump Seep 6	2/7/2013	2/7/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 6	5/6/2014	5/6/2014	1.67	0.083	0.00097	0.00114	0.0739	-0.0001	-0.0005	0.422	-0.0002	262	-0.0005	-0.0001	0.00872	0.073	-0.00005	0.00695	35.4	0.0231	0.192	-0.0005	1.98	0.0149	7.85	-0.00001	30.2	7	-0.00001	-0.0001	0.011	0.00491	0.0017	-0.003	-0.003	0.00091	0.00105
Bi-annual Seep Sampling	NEZ Dump Seep 6	27-10-2014 14:22	10/27/2014	4.15	0.356	0.00032	0.00039	0.0645	-0.0001	-0.0005	0.309	0.000038	213	0.00071	0.00021	0.00841	0.36	0.00011	0.00359	28.3	0.0156	0.0685	0.00095	1.23	0.0123	7.64	1.3E-05	22.9	5.42	-0.00001	-0.0001	0.031	0.00106	0.0015	-0.003	0.0049	0.00032	0.00027
Bi-annual Seep Sampling	NEZ Dump Seep 7	2/7/2013	2/7/2013	3.13	0.853	0.00018	0.00095	0.0369	-0.0001	-0.0005	0.07	0.000031	80.3	0.00128	0.0006	0.0246	0.847	0.00036	0.00135	11	0.0403	0.0258	0.00109	0.773	0.00428	8.49	1.2E-05	5.52	0.742	-0.00001	-0.0001	0.05	0.00053	0.0039	0.0038	0.0075	0.00013	0.00047
Bi-annual Seep Sampling	NEZ Dump Seep 7	5/6/2014	5/6/2014	2.16	0.098	0.00031	0.00066	0.0467	-0.0001	-0.0005	0.154	-0.00005	154	-0.0005	-0.0001	0.00925	0.098	6.9E-05	0.00235	21.7	0.00518	0.0767	-0.0005	0.986	0.00938	6.8	-0.00001	13.1	2.27	-0.00001	-0.0001	0.011	0.00176	0.0017	-0.003	0.0036	0.0003	0.00054
Bi-annual Seep Sampling	NEZ Dump Seep 7	27-10-2014 13:52	10/27/2014	2.91	0.108	0.00034	0.00066	0.0516	-0.0001	-0.0005	0.102	0.000032	184	-0.0005	0.0001	0.0108	0.123	5.1E-05	0.00229	24.7	0.00755	0.0825	-0.0005	1.26	0.0192	6.27	-0.00001	12.4	2.07	-0.00001	-0.0001	0.022	0.00138	0.0017	-0.003	0.0035	0.00031	0.00057
Bi-annual Seep Sampling	NEZ Dump Seep 7	28-05-2015 14:25	5/28/2015	2.38	1.54	0.00023	0.00225	0.061	0.00015	-0.00005	0.139	0.0000535	146	0.00172	0.00145	0.0523	2.24	0.00126	0.0037	18.2	0.122	0.0393	0.00179	0.948	0.011	9.45	2.1E-05	9.66	1.52	-0.00001	-0.0001	0.061	0.00107	0.00978	0.0079	-0.003	0.00023	0.00045
Bi-annual Seep Sampling	NEZ Dump Seep 8	4/7/2013	4/7/2013	4.27	0.827	-0.0001	0.00089	0.1	-0.0001	-0.0005	0.069	-0.0005	244	0.00134	0.00227	0.0398	1.19	0.00057	-0.0005	52.7	1.28	0.103	0.00606	3.18	0.0107	5.82	0.00005	13.4	2.93	0.000015	-0.0001	0.036	0.000269	0.004	0.0071	0.0037	-0.0001	0.00018
Bi-annual Seep Sampling	NEZ Dump Seep 8	8/6/2015	8/6/2015	3.9	0.183	-0.0001	0.00039	0.0517	-0.0001	-0.00005	0.045	0.0000659	187	0.0005	0.00048	0.0114	0.325	0.00017	-0.001	38.6	0.234	0.076	0.00129	2.38	0.00492	5.07	1.6E-05	10.1	1.93	-0.00001	-0.0001	0.011	0.000343	0.00119	-0.003	0.0036	-0.0001	0.00021
Bi-annual Seep Sampling	NEZ Dump Seep 9	4/7/2013	4/7/2013	3.85	0.0354	0.00027	0.00034	0.038	-0.0002	-0.001	0.093	-0.0004	380	-0.0005	0.00063	0.059	-0.03	-0.0001	0.0041	67.9	0.134	0.432	0.0021	2.41	0.043	4.18	-0.00002	22.6	5.5	-0.00002	-0.0002	0.014	0.00268	-0.002	0.0239	0.0158	0.00025	0.00026
Bi-annual Seep Sampling	NEZ Dump Seep 9	23-10-2013 13:21	10/23/2013	4.4	0.0369	0.00021	0.00027	0.0331	-0.0002	-0.001	0.079	0.00032	303	-0.0005	0.00069	0.0747	-0.03	-0.0001	0.0036	60.8	0.185	0.152	0.0024	2.55	0.0509	5.11	-0.00002	18.1	3.57	-0.00002	-0.0002	-0.01	0.00141	-0.002	0.0319	0.0096	-0.0002	-0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 9	5/6/2014	5/6/2014	4.07	0.0532	0.00015	0.00023	0.0288	-0.0001	-0.0005	0.058	-0.00025	269	-0.0005	0.00051	0.0535	0.032	-0.00005	0.00227	54.7	0.119	0.154	0.00211	2.39	0.0739	4.75	-0.00001	16.2	3.35	-0.00001	-0.0001	-0.01	0.00107	-0.001	0.0189	0.013	0.00014	0.0002
Bi-annual Seep Sampling	NEZ Dump Seep 9	27-10-2014 13:31	10/27/2014	4.78	0.575	0.00015	0.0005	0.0334	-0.0001	-0.0005	0.068	0.000193	243	0.00056	0.00084	0.0808	0.554	0.00021	0.00304	47	0.134	0.158	0.00202	2.31	0.0435	5.58	1.7E-05	14.8	2.58	-0.00001	-0.0001	0.05	0.00107	0.0019	0.0178	0.0086	0.00015	0.00025
Bi-annual Seep Sampling	NEZ Dump Seep 9	8/6/2015	8/6/2015	5.34	0.0175	0.00016	0.00026	0.0309	-0.0001	-0.00005	0.066	0.000118	300	-0.0005	0.00027	0.0432	-0.03	-0.00005	0.0024	52.9	0.0952	0.145	0.0014	2.61	0.0581	4.76	1.5E-05	17.6	3.35	-0.00001	-0.0001	-0.01	0.00113	-0.0005	0.0157	0.0184	0.00012	0.0002
Bi-annual Seep Sampling	North Bell Dump Seep 1	30-05-2013 9:43	5/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	North Bell Dump Seep 1	14-10-2015 13:57	10/14/2015	6.6	0.0245	0.00031	0.00063	0.0577	-0.0001	-0.00005	0.026	0.0000578	99.3	-0.0005	0.00042	0.0178	0.303	-0.00005	0.0047	11.8	0.633	0.0316	-0.0005	1.07	0.0307	7.63	-0.00001	4.6	0.359	-0.00001	-0.0001	-0.01	0.000452	0.00079	0.0045	-0.003	0.00029	0.00047
Bi-annual Seep Sampling	North Bell Dump Seep 2	4/6/2013	4/6/2013	4.86	2.7	0.00027	0.00258	0.0696	-0.0001	-0.0005	0.043	0.000143	114	0.00245	0.00234	0.134	3.19	0.00143	0.00591	22.6	0.197	0.0385	0.00235	1.72	0.0683	11.7	4.4E-05	8.84	0.375	0.000011	-0.0001	0.165	0.0016	0.0106	0.018	0.0087	0.00024	0.00114
Bi-annual Seep Sampling	North Bell Dump Seep 3	4/6/2013	4/6/2013	5.85	0.0734	0.00021	0.00045	0.0674	-0.0001	-0.0005	0.024	0.000015	151	-0.0005	-0.0001	0.00912	0.051	-0.00005	0.00051	21.4	0.00655	0.0139	-0.0005	1.77	0.0064	4.23	-0.00001	6.74	1.03	-0.00001	-0.0001	0.014	0.000097	-0.001	-0.003	0.0229	0.00022	0.00033
Bi-annual Seep Sampling	North Bell Dump Seep 4	2/7/2013	2/7/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 1	30-05-2013 9:42	5/30/2013	9.05	0.174	0.00042	0.00093	0.107	-0.0001	-0.0005	0.046	0.000039	183	-0.0005	0.00026	0.0163	0.464	0.00011	0.00249	34.3	0.151	0.051	-0.0005	4.39	0.143	7.97	1.5E-05	15.9	0.733	-0.00001	-0.0001	0.012	0.000801	0.0015	0.0038	0.0053	0.00046	0.00068
Bi-annual Seep Sampling	PAG Dump Seep 10	29-05-2014 9:48	5/29/2014	12.4	0.239	0.00021	0.00083	0.0937	-0.0001	-0.0005	0.04	-0.0002	146	-0.0005	0.00162	0.0343	0.298	0.00012	0.00109	23.6	0.885	0.0258	0.00078	3.21	0.018	8.55	3.9E-05	10.1	0.667	-0.00001	0.00016	0.019	0.000873	0.0014	0.005	0.0117	0.00018	0.00063
Bi-annual Seep Sampling	PAG Dump Seep 10	23-10-2014 12:28	10/23/2014	12.6	0.0398	0.00014	0.00049	0.131	-0.0001	-0.0005	0.034	0.000032	243	-0.0005	0.00028	0.0149	0.043	-0.00005	-0.0005	43.8	0.238	0.02	0.00062	4.21	0.0172	7.3	1.5E-05	16	1.07	-0.00001	-0.0001	0.021	0.0018	-0.001	-0.003	0.0135	0.00012	0.00045
Bi-annual Seep Sampling	PAG Dump Seep 10	20-05-2015 13:03	5/20/2015	8.12	0.0813	0.00023	0.0004	0.111	-0.0001	-0.00005	0.036	0.0000349	235	-0.0005	0.00024	0.0103	0.08	-0.00005	0.001	39.2	0.0675	0.0438	-0.0005	2.92	0.0321	7.72	-0.00001	15.4	0.96	-0.00001	-0.0001	0.012	0.00118	0.00084	-0.003	0.0093	0.00021	0.00034
Bi-annual Seep Sampling	PAG Dump Seep 10	24-11-2015 13:22	11/24/2015	7.3	0.0193	0.00022	0.0004	0.111	-0.0001	-0.00005	0.038	0.0000108	284	-0.0005	0.00011	0.00719	-0.03	-0.00005	-0.001	49.2	0.017	0.0586	-0.0005	3.01	0.0332	7.35	-0.00001	17.7	0.982	-0.00001	-0.0001	0.021	0.00172	0.0006	-0.003	0.0062	0.00021	0.00038
Bi-annual Seep Sampling	PAG Dump Seep 12	29-05-2014 10:04	5/29/2014	20.5	0.177	0.00018	0.00113	0.0875	-0.0001	-0.0005	0.051	0.000125	103	0.00056	0.00271	0.0358	0.23	8.1E-05	0.00101	19.7	1.14	0.011	0.00087	2.68	0.016	7.04	0.00008	8.16	0.572	-0.00001	-0.0001	0.012	0.000818	0.0014	0.0055	0.022	0.00016	0.00093
Bi-annual Seep Sampling	PAG Dump Seep 13	23-10-2014 10:49	10/23/2014	4.87	0.0513	0.0004	0.00208	0.0156	-0.0001	-0.0005	0.157	-0.00001	46	-0.0005	0.00101	0.00403	0.363	-0.00005	0.00188	8.83	0.934	0.018	-0.0005	0.693	0.00112	9.84	-0.00001	6.47	0.211	-0.00001	-0.0001	-0.01	0.000472	0.0034	-0.003	0.0092	0.00043	0.00176
Bi-annual Seep Sampling	PAG Dump Seep 13	20-05-2015 13:36	5/20/2015	3.87	0.0348	0.00046	0.0026	0.0129	-0.0001	-0.00005	0.169	0.0000149	47.9	-0.0005	0.00034	0.00498	0.075	-0.00005	0.002	9.2	0.509	0.0359	-0.0005	0.72	0.00371	9.56	-0.00001	7.09	0.218	-0.00001	-0.0001	-0.01	0.000582	0.00405	-0.003	0.005	0.00043	0.00243
Bi-annual Seep Sampling	PAG Dump Seep 14	23-10-2014 11:13	10/23/2014	14.7	0.114	0.00012	0.00069	0.0975	-0.0001	-0.0005	0.065	0.00005	174	-0.0005	0.00141	0.0202	0.495	-0.00005	-0.0005	34.7	3.23	0.0201	0.00093	2.74	0.0138	7.94	1.3E-05	11.5	0.844	-0.00001	-0.0001	0.02	0.00163	0.0014	-0.003	0.014	0.00011	0.00055
Bi-annual Seep Sampling	PAG Dump Seep 14	20-05-2015 13:16	5/20/2015	9.04	0.0101	0.00017	0.00048	0.103	-0.0001	-0.00005	0.072	0.0000079	267	-0.0005	0.00031	0.00785	0.047	-0.00005	0.0011	49.3	0.54	0.03	-0.0005	3.03	0.0425	7.2	-0.00001	17.3	1.26	-0.00001	-0.0001	-0.01	0.00271	0.00061	-0.003	0.0043	0.00015	0.00041
Bi-annual Seep Sampling	PAG Dump Seep 14	24-11-2015 14:48	11/24/2015	7.57	0.0113	0.00014	0.00056	0.115	-0.0001	-0.00005	0.066	-0.000005	312	-0.0005	0.00011	0.00587	0.072	-0.00005	-0.001	60.7	0.264	0.05	-0.0005	3.09	0.0404	7.85	6.2E-05	18.6	1.24	-0.00001	-0.0001	0.021	0.00285	0.00065	-0.003	0.0034	0.00012	0.00049
Bi-annual Seep Sampling	PAG Dump Seep 15	9/12/2014	9/12/2014	14.6	2.68	0.0004	0.00211	0.127	-0.0001	-0.0005	0.04	0.000147	202	0.00273	0.00725	0.0812	3.84	0.00105	0.00377	39.2	2.16	0.077	0.00254	4.27	0.0678	10.5	3.7E-05	15.6	1.01	0.000012	-0.0001	0.17	0.000958	0.0093	0.0139	0.016	0.00034	0.00057
Bi-annual Seep Sampling	PAG Dump Seep 15	23-10-2014 11:56	10/23/2014	67.9	2.64	0.00037	0.00277	0.168	-0.0001	-0.0005	0.047	0.000118	207	0.00291	0.0186	0.0783	6.27	0.00107	0.00284	44	7.98	0.029	0.00344	7.29	0.0234	12.4	6.9E-05	14.2	1.2	0.000015	-0.0001	0.156	0.00163	0.0105	0.0159	0.0307	0.00028	0.00106
Bi-annual Seep Sampling	PAG Dump Seep 15	1/9/2015	1/9/2015	15.3	0.192	0.00035	0.00077	0.102	-0.0001	-0.00005	0.054	0.0000675	314	-0.0005	0.00553	0.0146	1.06	8.2E-05	0.0028	55.5	1.76	0.122	0.00082	4.76	0.0822	7.26	1.7E-05	24.8	1.43	-0.00001	-0.0001	0.014	0.00166	0.00139	0.0036	0.0147	0.00033	0.00054
Bi-annual Seep Sampling	PAG Dump Seep 15	2/2/2015	2/2/2015	18.9	1.05	0.00034	0.00123	0.14	-0.0002	-0.001	0.047	0.000165	304	0.00122	0.00772	0.0337	2.47	0.00047	0.0025	55.6	2.64	0.0856	0.0019	5.05	0.12	9.08	-0.00002	22.6	1.38	-0.00002	-0.0002	0.078	0.000991	0.0044	0.0107	0.0093	0.0003	0.00053
Bi-annual Seep Sampling	PAG Dump Seep 15	2/6/2015	2/6/2015	14.8	0.167	0.00037	0.00073	0.106	-0.0001	-0.00005	0.056	0.000073	302	-0.0005	0.00564	0.0154	1.19	7.4E-05	0.0022	53.3	2.22	0.107	0.00104	4.89	0.0914	7.85	1.5E-05	23.4	1.32	-0.00001	-0.0001	0.014	0.00162	0.0014	0.0032	0.0062	0.00033	0.0005
Bi-annual Seep Sampling	PAG Dump Seep 15	3/3/2015	3/3/2015	15	0.32	0.00031	0.0008	0.131	-0.0002	-0.001	0.046	0.000139	323	-0.0005	0.00627	0.0206	1.16	0.00015	0.0026	57.7	2.18	0.104	0.0012	5.03	0.128	7.48	-0.00002	26.4	1.43	-0.00002	-0.0002	0.036	0.000994	-0.002	0.0067	0.0061	0.0003	0.00044
Bi-annual Seep Sampling	PAG Dump Seep 15	5/5/2015	5/5/2015	19.3	0.131	0.00037	0.00081	0.112	-0.0001	-0.00005	0.06	0.0000827	287	-0.0005	0.00719	0.0156	1.6	0.00006	0.0026	52.8	2.78	0.0961	0.00112	5.1	0.0953	8.39	1.5E-05	24.8	1.22	-0.00001	-0.0001	0.014	0.00128	0.00134	0.0038	0.0103	0.00035	0.00056
Bi-annual Seep Sampling	PAG Dump Seep 15	6/1/2015	6/1/2015	24.6	5.27	0.0004	0.00348	0.188	0.00015	-0.0005	0.052	0.000188	284	0.00541	0.0135	0.11	7.33	0.00212	0.00604	54.1	3.92	0.0705	0.00508	6.05	0.0972	17.4	6.3E-05	23.6	1.29	0.000025	0.00013	0.338	0.00104	0.0181	0.0236	0.0104	0.00031	0.00065
Bi-annual Seep Sampling	PAG Dump Seep 15	6/8/2015	6/8/2015	14.6	0.374	0.00043	0.00092	0.108	-0.0002	-0.0001	0.051	0.000074	326	-0.0005	0.00711	0.0191	1.17	0.00017	0.003	56.5	1.96	0.111	0.0012	4.89	0.0987	7.86	-0.00002	25.4	1.46	-0.00002	-0.0002	0.026	0.00168	0.0021	-0.006	0.0095	0.00036	0.0005
Bi-annual Seep Sampling	PAG Dump Seep 15	7/7/2015	7/7/2015	14	0.264	0.00036	0.0018	0.117	-0.0002	-0.0001	0.054	0.000072	311	0.00057	0.00571	0.0175	0.944	0.00021	-0.002	53.3	2.17	0.104	0.0028	5.27	0.0781	7.67	-0.00002	25	1.34	0.000042	-0.0002	0.019	0.00156	0.0016	-0.006	0.0166	0.00035	0.00061
Bi-annual Seep Sampling	PAG Dump Seep 15	8/4/2015	8/4/2015	14.1	0.152	0.00034	0.00069	0.118	-0.0002	-0.0001	0.054	0.000076	332	-0.0005	0.00511	0.0153	1.06	-0.0001	0.003	58.5	1.87	0.116	-0.001	4.7	0.122	7.48	2.6E-05	26.5	1.36	-0.00002	-0.0002	0.03	0.00101	0.0012	-0.006	0.0071	0.00033	0.00048
Bi-annual Seep Sampling	PAG Dump Seep 15	29-10-2015 12:55	10/29/2015	18.9	0.11	0.00034	0.00074	0.0891	-0.0001	-0.00005	0.059	0.0000375	298	-0.0005	0.00499	0.0146	1.08	6.5E-05	0.0023	52	1.97	0.108	0.00064	4.93	0.0576	7.96	1.6E-05	25.5	1.31	-0.00001	-0.0001	0.017	0.00164	0.00124	0.0031	0.0097	0.00033	0.00053
Bi-annual Seep Sampling	PAG Dump Seep 15	24-11-2015 13:05	11/24/2015	8.93	0.0209	0.00038	0.00058	0.0819	-0.0001	-0.00005	0.054	0.0000067	346	-0.0005	0.00079	0.0105	0.147	-0.00005	0.0028	61.7	0.294	0.117	-0.0005	4.27	0.0883	7.89	1.3E-05	25.8	1.26	-0.00001	-0.0001	0.021	0.00177	0.00076	-0.003	0.0054	0.00036	0.00048
Bi-annual Seep Sampling	PAG Dump Seep 2	30-05-2013 9:56	5/30/2013	62.4	0.17	0.00031	0.00145	0.204	-0.0002	-0.001	0.058	-0.0004	361	-0.0005	0.0219	0.0186	7.36	0.00015	0.0044	67.3	9.12	0.31	0.0017	9.93	0.273	6.92	2.9E-05	23.4	1.44	-0.00002	-0.0002	0.012	0.00233	0.0023	0.0322	0.0117	0.00029	0.00077
Bi-annual Seep Sampling	PAG Dump Seep 3	30-05-2013 10:08	5/30/2013	9.26	0.384	-0.0001	0.00074	0.102	-0.0001	-0.0005	0.014	0.000245	184	-0.0005	0.00587	0.0199	2.03	0.00018	-0.0005	37.8	6.35	0.00254	0.0008	2.97	0.0363	8.36	2.4E-05	9.24	0.751	-0.00001	-0.0001	0.023	0.000074	0.002	0.0089	0.007	-0.0001	0.00033
Bi-annual Seep Sampling	PAG Dump Seep 3	29-05-2014 10:52	5/29/2014	5.04	0.0268	-0.0001	0.00026	0.0655	-0.0001	-0.0005	0.023	0.000035	202	-0.0005	0.0002	0.00578	0.099	-0.00005	-0.0005	39.4	0.0834	0.000201	-0.0005	2.09	0.0717	5.87	1.3E-05	13.3	0.985	-0.00001	-0.0001	-0.01	0.00001	-0.001	-0.003	0.003	-0.0001	0.00016
Bi-annual Seep Sampling	PAG Dump Seep 4	30-05-2013 11:03	5/30/2013	13.3	2.87	0.00025	0.00213	0.0768	-0.0001	-0.0005	0.038	0.000548	260	0.00311	0.00242	0.0635	3.44	0.00108	0.00303	45.6	1.26	0.0452	0.00275	3.51	0.152	12.4	0.0001	16.7	0.982	0.000022	-0.0001	0.175	0.0016	0.0109	0.0185	0.427	0.0004	0.00074
Bi-annual Seep Sampling	PAG Dump Seep 4	29-05-2014 11:11	5/29/2014	10.9	0.0418	0.00031	0.00081	0.0858	-0.0002	-0.001	0.058	-0.0004	416	-0.0005	0.00151	0.0211	0.114	-0.0001	0.0027	76.6	1.56	0.26	-0.001	4.64	0.243	5.98	-0.00002	30.1	1.55	-0.00002	-0.0002	0.012	0.00199	-0.002	-0.006	0.007	0.00031	0.00067
Bi-annual Seep Sampling	PAG Dump Seep 4	14-05-2015 13:57	5/14/2015	7.81	0.0324	-0.0002	0.0005	0.0485	-0.0002	-0.0001	0.055	0.000352	419	-0.0005	-0.0002	0.0118	0.034	-0.0001	-0.002	71.8	0.0531	0.208	-0.001	3.32	0.247	6.64	-0.00002	29.4	1.32	-0.00002	-0.0002	-0.01	0.00154	-0.001	-0.006	-0.003	-0.0002	0.00044
Bi-annual Seep Sampling	PAG Dump Seep 5	29-05-2014 10:40	5/29/2014	10.7	0.0906	0.00042	0.00071	0.149	-0.0002	-0.001	0.068	-0.0003	364	-0.0005	0.00592	0.0161	0.622	-0.0001	0.0029	63	2.77	0.233	0.0011	6.52	0.188	7.1	-0.00002	31.6	1.45	-0.00002	-0.0002	0.015	0.00153	-0.002	0.0097	0.0046	0.00034	0.00047
Bi-annual Seep Sampling	PAG Dump Seep 5	23-10-2014 10:50	10/23/2014	11.1	0.394	0.00037	0.00088	0.0932	-0.0002	-0.001	0.065	0.000144	325	0.00056	0.00348	0.0357	0.847	0.00026	0.004	56	2.31	0.177	0.0011	4.96	0.124	7.67	-0.00002	29.9	1.27	-0.00002	-0.0002	0.042	0.0015	-0.002	0.0079	0.0075	0.00037	0.00057
Bi-annual Seep Sampling	PAG Dump Seep 5	14-05-2015 14:22	5/14/2015	10.9	0.0307	0.00034	0.00059	0.0988	-0.0002	-0.0001	0.083	0.000336	437	-0.0005	0.00516	0.0207	0.292	-0.0001	0.0029	72.7	4.62	0.583	0.0011	5.77	0.224	6.54	-0.00002	44.1	1.49	-0.00002	-0.0002	-0.01	0.00172	-0.001	0.0095	0.0062	0.00033	0.00051
Bi-annual Seep Sampling	PAG Dump Seep 5	24-11-2015 12:38	11/24/2015	10	0.0165	-0.0002	0.00047	0.051	-0.0002	0.00012	0.08	-0.00012	433	-0.0005	0.0016	0.0125	0.355	-0.0001	0.0035	74.9	2.04	0.328	-0.001	5.24	0.104	7.25	7.6E-05	35.5	1.3	-0.00002	-0.0002	0.02	0.00272	-0.001	-0.006	0.005	-0.0002	0.0004
Bi-annual Seep Sampling	PAG Dump Seep 7	29-05-2014 9:01	5/29/2014	30.2	10.2	0.00027	0.00601	0.145	0.00034	-0.0005	0.017	0.000246	61.1	0.0113	0.0132	0.241	13.9	0.00422	0.0093	18.1	2.46	0.00383	0.0102	4.95	0.00124	27.1	0.00023	5.18	0.337	0.000055	0.00015	0.505	0.000381	0.0315	0.0422	0.0668	-0.0001	0.0028
Bi-annual Seep Sampling	PAG Dump Seep 7	23-10-2014 11:16	10/23/2014	107	0.528	0.0002	0.00241	0.174	-0.0001	-0.0005	0.025	0.000137	177	0.00104	0.0274	0.0463	10.8	0.00035	0.00245	40.5	9.28	0.0101	0.00369	9.26	0.0194	10.9	0.0001	9.46	0.861	-0.00001	-0.0001	0.04	0.000943	0.0061	0.0075	0.0718	0.00016	0.00166
Bi-annual Seep Sampling	PAG Dump Seep 7	20-05-2015 12:27	5/20/2015	19.9	2.59	0.00013	0.00639	0.154	0.00011	-0.00005	0.014	0.000144	177	0.00325	0.00758	0.0926	19.4	0.00175	0.0027	45.5	4.89	0.00428	0.00369	5.3	0.00462	11.6	8.2E-05	11.4	0.843	0.00002	-0.0001	0.124	0.000445	0.0147	0.0137	-0.003	-0.0001	0.00082
Bi-annual Seep Sampling	PAG Dump Seep 7	24-11-2015 12:48	11/24/2015	17.9	0.11	-0.0001	0.00193	0.114	-0.0001	0.000051	0.011	0.0000152	207	0.00062	0.00251	0.0057	17.6	6.8E-05	-0.001	55.8	5.92	0.000756	0.00055	4.97	0.000902	9.11	1.4E-05	11.4	0.746	-0.00001	-0.0001	0.026	0.000158	0.00377	-0.003	0.0067	-0.0001	0.00079
Bi-annual Seep Sampling	PAG Dump Seep 8	29-05-2014 9:20	5/29/2014	11	0.129	0.0006	0.00079	0.088	-0.0001	-0.0005	0.225	-0.0002	125	-0.0005	0.00213	0.0138	0.149	0.00008	0.00245	22.4	0.916	0.0438	0.00079	2.81	0.117	6.5	3.7E-05	22.5	0.796	-0.00001	-0.0001	0.012	0.00111	-0.001	0.004	0.0048	0.0005	0.00061
Bi-annual Seep Sampling	PAG Dump Seep 8	23-10-2014 12:15	10/23/2014	24.3	0.642	0.00025	0.00162	0.086	-0.0001	-0.0005	0.409	0.000084	113	0.00088	0.0105	0.0231	2.57	0.00024	0.00195	22	3.78	0.0526	0.00114	3.63	0.0408	8.74	2.9E-05	23.1	0.735	-0.00001	-0.0001	0.039	0.00133	0.003	0.0099	0.043	0.00017	0.00129
Bi-annual Seep Sampling	PAG Dump Seep 8	20-05-2015 12:44	5/20/2015	14.7	0.0337	0.00015	0.00107	0.106	-0.0001	-0.00005	0.271	0.0000784	166	-0.0005	0.00626	0.00865	3.26	-0.00005	-0.001	31.6	6.74	0.0629	0.00109	3.89	0.0103	7.7	2.1E-05	24.5	0.914	-0.00001	-0.0001	-0.01	0.00101	0.00204	-0.003	0.0046	0.0001	0.00053
Bi-annual Seep Sampling	SERDS Seep 1	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 10	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 11	6/6/2013	6/6/2013	13.4	2.97	0.00014	0.00312	0.157	-0.0001	-0.0005	0.066	-0.0002	160	0.00478	0.00901	0.00792	13.7	0.00074	0.00304	28.6	4.98	0.446	0.00482	4.17	0.00071	8.52	3.1E-05	25.3	6.88	0.000013	-0.0001	0.107	0.000074	0.0084	0.0101	0.0247	-0.0001	0.001
Bi-annual Seep Sampling	SERDS Seep 11	3/6/2014	3/6/2014	7.88	0.0136	0.0009	0.00081	0.0771	-0.0002	-0.001	0.256	-0.0003	461	-0.0005	0.00105	0.0071	0.059	-0.0001	0.0211	89.5	0.717	0.719	-0.001	3.61	0.135	4.22	-0.00002	40.7	15.8	-0.00002	-0.0002	-0.01	0.00456	-0.002	-0.006	-0.003	0.0009	0.00071
Bi-annual Seep Sampling	SERDS Seep 11	25-05-2015 12:41	5/25/2015	10.5	0.463	0.00079	0.00089	0.0936	-0.0002	-0.0001	0.21	0.000078	496	-0.0005	0.00212	0.0261	0.453	0.00019	0.0134	94.1	1.27	0.477	0.0013	4.39	0.12	5.04	2.9E-05	38.1	15.6	-0.00002	-0.0002	0.026	0.00255	0.0024	0.0066	0.0182	0.00078	0.00055
Bi-annual Seep Sampling	SERDS Seep 12	6/6/2013	6/6/2013	9.39	0.74	0.0008	0.00081	0.077	-0.0002	-0.001	0.187	-0.0002	365	0.00145	0.00156	0.0121	0.754	0.00022	0.012	72.8	0.644	0.605	0.0015	4	0.0617	5.8	0.00002	38.6	11.5	-0.00002	-0.0002	0.037	0.00374	0.0025	-0.006	0.0079	0.0008	0.00053
Bi-annual Seep Sampling	SERDS Seep 12	3/6/2014	3/6/2014	4.41	0.0098	0.00077	0.00093	0.0389	-0.0001	-0.0005	0.063	-0.0002	286	-0.0005	0.00026	0.0105	0.032	-0.00005	0.0041	49.3	0.0795	0.161	0.0006	1.75	0.0425	7.35	-0.00001	17	2.45	-0.00001	-0.0001	-0.01	0.00314	-0.001	-0.003	0.0042	0.00076	0.0009
Bi-annual Seep Sampling	SERDS Seep 13	6/6/2013	6/6/2013	6.24	0.0932	0.00067	0.00075	0.0506	-0.0001	-0.0005	0.076	-0.0001	252	-0.0005	0.00036	0.0153	0.119	-0.00005	0.00297	49.3	0.0874	0.164	0.00069	2.09	0.0384	6.8	-0.00001	18.2	2.65	-0.00001	-0.0001	-0.01	0.00234	-0.001	0.0044	0.0045	0.00061	0.00062
Bi-annual Seep Sampling	SERDS Seep 13	3/6/2014	3/6/2014	4.4	0.0249	0.00065	0.00075	0.0443	-0.0001	-0.0005	0.069	-0.0001	291	-0.0005	0.00021	0.0125	0.039	-0.00005	0.00369	51.8	0.0546	0.156	0.0007	1.93	0.0452	7.12	-0.00001	18.3	2.68	-0.00001	-0.0001	-0.01	0.0026	-0.001	0.0031	0.0037	0.00061	0.00067
Bi-annual Seep Sampling	SERDS Seep 13	27-10-2014 10:42	10/27/2014	4.86	0.0285	0.00057	0.00077	0.0421	-0.0001	-0.0005	0.07	0.000042	282	-0.0005	0.00018	0.0116	0.047	-0.00005	0.004	49.4	0.0465	0.131	-0.0005	1.86	0.0468	7.37	-0.00001	16.8	2.33	-0.00001	-0.0001	0.026	0.00263	-0.001	-0.003	0.0032	0.00055	0.00071
Bi-annual Seep Sampling	SERDS Seep 13	13-01-2015 10:51	1/13/2015	4.99	0.014	0.0006	0.0008	0.0443	-0.0002	-0.001	0.076	0.000052	302	-0.0005	-0.0002	0.0118	-0.03	-0.0001	0.0025	54.6	0.0312	0.137	-0.001	1.89	0.042	7.11	-0.00002	17.9	2.83	-0.00002	-0.0002	0.019	0.00289	-0.002	-0.006	0.0036	0.00054	0.00074
Bi-annual Seep Sampling	SERDS Seep 13	2/9/2015	2/9/2015	4.61	0.0457	0.00054	0.00075	0.0452	-0.0001	-0.00005	0.083	0.000039	305	-0.0005	0.00014	0.0134	0.068	-0.00005	0.0033	52.9	0.0424	0.104	0.00052	1.81	0.0308	8.06	-0.00001	17.2	2.34	-0.00001	-0.0001	-0.01	0.00276	0.00077	-0.003	-0.003	0.00047	0.00059
Bi-annual Seep Sampling	SERDS Seep 13	4/6/2015	4/6/2015	4.45	0.0948	0.00057	0.00078	0.0448	-0.0002	-0.0001	0.073	0.000026	314	-0.0005	-0.0002	0.0136	0.101	-0.0001	0.0036	54.1	0.0351	0.115	-0.001	1.9	0.0339	7.8	-0.00002	17.4	2.52	-0.00002	-0.0002	0.014	0.00294	-0.001	-0.006	0.0036	0.00055	0.00069
Bi-annual Seep Sampling	SERDS Seep 13	5/2/2015	5/2/2015	5.22	0.0114	0.00058	0.00078	0.0454	-0.0002	-0.001	0.082	0.000037	320	-0.0005	-0.0002	0.0116	-0.03	-0.0001	0.004	57.2	0.0334	0.155	-0.001	1.92	0.0402	7.46	-0.00002	19.7	3.05	-0.00002	-0.0002	0.017	0.00289	-0.002	-0.006	-0.003	0.00054	0.0007
Bi-annual Seep Sampling	SERDS Seep 13	5/3/2015	5/3/2015	4.93	0.0194	0.00062	0.00084	0.044	-0.0001	-0.0005	0.074	0.000053	320	-0.0005	0.00013	0.0112	-0.03	-0.00005	0.00423	53.7	0.0398	0.165	-0.0005	1.95	0.0405	7.13	1.3E-05	19	3.18	-0.00001	-0.0001	0.014	0.00303	-0.001	-0.003	0.0033	0.00058	0.00071
Bi-annual Seep Sampling	SERDS Seep 13	6/5/2015	6/5/2015	4.62	0.0167	0.00057	0.00081	0.0439	-0.0002	-0.0001	0.072	0.000024	305	-0.0005	-0.0002	0.0112	-0.03	-0.0001	0.0033	55.9	0.0249	0.127	-0.001	1.88	0.0402	7.64	-0.00002	17.2	2.58	-0.00002	-0.0002	-0.01	0.003	-0.001	-0.006	0.0038	0.00058	0.00073
Bi-annual Seep Sampling	SERDS Seep 13	7/7/2015	7/7/2015	4.42	0.0142	0.00054	0.00067	0.0461	-0.0002	-0.0001	0.068	0.000063	313	-0.0005	-0.0002	0.0112	-0.03	-0.0001	0.003	51.5	0.0397	0.109	-0.001	1.97	0.0294	7.59	-0.00002	16.6	2.42	-0.00002	-0.0002	-0.01	0.00283	-0.001	-0.006	0.0037	0.00051	0.00056
Bi-annual Seep Sampling	SERDS Seep 13	18-08-2015 13:01	8/18/2015	4.42	0.0197	0.00047	0.00054	0.0417	-0.0001	-0.00005	0.072	0.0000283	287	-0.0005	0.0001	0.0111	0.039	-0.00005	0.0027	51.5	0.0324	0.101	-0.0005	1.72	0.0297	7.67	-0.00001	16.3	2.18	-0.00001	-0.0001	-0.01	0.00266	-0.0005	-0.003	0.0032	0.00047	0.00056
Bi-annual Seep Sampling	SERDS Seep 13	9/4/2015	9/4/2015	4.7	0.0227	0.00059	0.00077	0.0442	-0.0002	-0.0001	0.063	0.000053	317	-0.0005	-0.0002	0.0119	-0.03	-0.0001	0.004	54	0.0362	0.127	-0.001	1.92	0.0461	7.43	-0.00002	18.4	2.57	-0.00002	-0.0002	0.02	0.003	-0.001	-0.006	0.0072	0.0006	0.00072
Bi-annual Seep Sampling	SERDS Seep 13	29-10-2015 10:30	10/29/2015	3.92	0.01	0.00045	0.00054	0.0426	-0.0001	-0.00005	0.086	0.0000383	296	-0.0005	-0.0001	0.0113	-0.03	-0.00005	0.0031	52	0.0183	0.0972	-0.0005	1.66	0.0357	8.31	-0.00001	15.9	2.22	-0.00001	-0.0001	-0.01	0.00255	0.00057	-0.003	-0.003	0.0004	0.00061
Bi-annual Seep Sampling	SERDS Seep 13	11/11/2015	11/11/2015	4.4	0.0111	0.00047	0.00061	0.0403	-0.0001	-0.00005	0.091	0.000029	273	-0.0005	-0.0001	0.0105	-0.03	-0.00005	0.003	50.1	0.0267	0.1	-0.0005	1.84	0.0359	7.46	-0.00001	16.6	2.35	-0.00001	-0.0001	0.014	0.00238	0.00051	-0.003	0.0031	0.00044	0.0005
Bi-annual Seep Sampling	SERDS Seep 14	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 14	25-05-2015 14:01	5/25/2015	8.18	0.0373	0.00036	0.00035	0.0434	-0.0002	-0.0001	0.091	0.000028	367	-0.0005	-0.0002	0.0027	0.049	-0.0001	0.0056	61.8	0.311	0.218	-0.001	3.19	0.0344	4.02	-0.00002	31.2	8.93	-0.00002	-0.0002	-0.01	0.00117	-0.001	-0.006	0.0053	0.00038	0.00031
Bi-annual Seep Sampling	SERDS Seep 15	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 16	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 17	6/6/2013	6/6/2013	9.08	0.0405	-0.0001	0.00029	0.063	-0.0001	-0.0005	0.102	-0.00007	216	0.00093	-0.0001	0.0102	0.044	-0.00005	-0.0005	42.7	0.0179	0.0779	0.00052	2.29	0.055	5.57	-0.00001	18.3	2.77	-0.00001	-0.0001	-0.01	0.000139	-0.001	0.0052	0.0067	-0.0001	0.00021
Bi-annual Seep Sampling	SERDS Seep 17	3/6/2014	3/6/2014	7.1	0.192	-0.0001	0.00029	0.0653	-0.0001	-0.0005	0.077	-0.0002	220	-0.0005	0.00044	0.0226	0.197	9.3E-05	0.00064	40.9	0.122	0.0849	0.00083	2.18	0.0384	5.87	1.7E-05	17.6	2.88	-0.00001	-0.0001	0.013	0.000172	-0.001	0.0064	0.0065	-0.0001	0.00022
Bi-annual Seep Sampling	SERDS Seep 18	27-10-2014 10:12	10/27/2014	4.53	0.0906	0.00144	0.00231	0.0429	-0.0001	-0.0005	0.043	0.000051	210	-0.0005	0.0002	0.0158	0.094	5.5E-05	0.00513	39.8	0.0257	0.357	-0.0005	1.98	0.0561	4.72	-0.00001	15.6	6.33	-0.00001	-0.0001	0.026	0.00255	0.001	-0.003	0.0036	0.00135	0.00223
Bi-annual Seep Sampling	SERDS Seep 18	25-05-2015 12:23	5/25/2015	7.41	0.109	0.00075	0.00116	0.0607	-0.0002	-0.0001	0.047	0.000076	380	-0.0005	0.00025	0.0173	0.118	-0.0001	0.0056	76.1	0.0416	0.289	-0.001	2.68	0.1	5.7	-0.00002	23.3	6.95	-0.00002	-0.0002	0.012	0.00214	0.001	-0.006	0.0061	0.00073	0.00102
Bi-annual Seep Sampling	SERDS Seep 19	27-10-2014 10:35	10/27/2014	13.9	0.192	0.00059	0.00069	0.0759	-0.0001	-0.0005	0.035	0.000129	260	-0.0005	0.00339	0.0263	0.34	9.8E-05	0.00209	51.7	2.01	0.115	0.00122	3.42	0.106	5.08	1.2E-05	18.1	3.71	-0.00001	-0.0001	0.03	0.00109	0.0011	0.0044	0.0236	0.0006	0.00055
Bi-annual Seep Sampling	SERDS Seep 19	25-05-2015 12:38	5/25/2015	10.4	0.0659	0.00053	0.00069	0.0604	-0.0002	-0.0001	0.049	0.000189	515	-0.0005	0.00217	0.0225	0.118	-0.0001	0.0032	101	1.11	0.111	0.0012	3.39	0.235	5.73	-0.00002	26.3	4.62	-0.00002	-0.0002	0.015	0.00192	-0.001	-0.006	0.0099	0.00051	0.00073
Bi-annual Seep Sampling	SERDS Seep 19	11/11/2015	11/11/2015	13.9	0.134	0.00044	0.0006	0.0763	-0.0002	-0.0001	0.046	0.00012	473	-0.0005	0.00239	0.0262	0.24	0.00015	0.0023	91.7	1.21	0.0687	0.0011	4.16	0.188	5.07	-0.00002	25.3	5.9	-0.00002	-0.0002	0.019	0.00144	-0.001	-0.006	0.0155	0.00036	0.00051
Bi-annual Seep Sampling	SERDS Seep 2	6/6/2013	6/6/2013	32.5	3.73	0.00058	0.00339	0.147	-0.0001	-0.0005	0.083	-0.0003	244	0.00558	0.00535	0.0778	3.87	0.00115	0.0139	63.3	3.4	0.219	0.00448	6.91	0.0182	11.8	5.6E-05	25.1	7.12	0.00002	-0.0001	0.178	0.00296	0.011	0.0175	0.0392	0.00051	0.00194
Bi-annual Seep Sampling	SERDS Seep 2	3/6/2014	3/6/2014	6.03	0.31	0.00094	0.00116	0.0554	-0.0001	-0.0005	0.036	-0.0002	281	-0.0005	0.00124	0.0237	0.344	0.00012	0.00409	53.5	0.44	0.219	0.00076	2.23	0.0965	5.95	1.1E-05	17.8	5.08	-0.00001	-0.0001	0.024	0.00191	0.0015	0.0036	0.009	0.00095	0.00097
Bi-annual Seep Sampling	SERDS Seep 20	25-05-2015 13:10	5/25/2015	12.5	0.153	0.00042	0.00065	0.0901	-0.0002	-0.0001	0.06	0.000289	507	-0.0005	0.00548	0.0742	0.182	0.00011	0.0032	96.6	2.12	0.0774	0.0016	3.9	0.296	5.75	-0.00002	27.8	4.59	-0.00002	-0.0002	0.015	0.00296	0.0012	0.0061	0.0095	0.0004	0.00064
Bi-annual Seep Sampling	SERDS Seep 21	25-05-2015 13:04	5/25/2015	11.2	0.164	0.00055	0.00091	0.0909	-0.0002	-0.0001	0.065	0.000184	419	-0.0005	0.00336	0.0329	0.215	-0.0001	0.0058	75.5	1.61	0.155	0.0012	4.3	0.202	5.6	-0.00002	26.7	4.6	-0.00002	-0.0002	0.013	0.00401	0.0015	0.0082	0.0085	0.00056	0.00087

Location Type	Sample Point	Original Date As Is	Recoded Date	Barium (Ba)-Dissolved (mg/L)	Beryllium (Be)-Dissolved (mg/L)	Bismuth (Bi)-Dissolved (mg/L)	Boron (B)-Dissolved (mg/L)	Cadmium (Cd)-Dissolved (mg/L)	Calcium (Ca)-Dissolved (mg/L)	Chromium (Cr)-Dissolved (mg/L)	Cobalt (Co)-Dissolved (mg/L)	Copper (Cu)-Dissolved (mg/L)	Iron (Fe)-Dissolved (mg/L)	Lead (Pb)-Dissolved (mg/L)	Lithium (Li)-Dissolved (mg/L)	Magnesium (Mg)-Dissolved (mg/L)	Manganese (Mn)-Dissolved (mg/L)	Molybdenum (Mo)-Dissolved (mg/L)	Nickel (Ni)-Dissolved (mg/L)	Potassium (K)-Dissolved (mg/L)	Selenium (Se)-Dissolved (mg/L)	Silicon (Si)-Dissolved (mg/L)	Silver (Ag)-Dissolved (mg/L)	Sodium (Na)-Dissolved (mg/L)	Strontium (Sr)-Dissolved (mg/L)	Thallium (Tl)-Dissolved (mg/L)	Tin (Sn)-Dissolved (mg/L)	Titanium (Ti)-Dissolved (mg/L)	Uranium (U)-Dissolved (mg/L)	Vanadium (V)-Dissolved (mg/L)	Zinc (Zn)-Dissolved (mg/L)		Julian Date	EC-Field
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L			μs/cm
Bi-annual Seep Sampling	NEZ Dump Seep 6	2/7/2013	2/7/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.1	531
Bi-annual Seep Sampling	NEZ Dump Seep 6	5/6/2014	5/6/2014	0.0694	-0.0001	-0.0005	0.413	-0.0002	259	-0.0005	-0.0001	0.00621	-0.03	-0.00005	0.00698	34.5	0.0189	0.183	-0.0005	1.89	0.0143	7.56	-0.00001	28.6	6.51	-0.00001	-0.0001	-0.01	0.00487	0.0013	-0.003		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 6	27-10-2014 14:22	10/27/2014	0.062	-0.0001	-0.0005	0.292	0.000019	219	-0.0005	-0.0001	0.00366	-0.03	-0.00005	0.0032	28.4	0.00342	0.0652	-0.0005	1.18	0.0135	7.06	-0.00001	22.1	5.34	-0.00001	-0.0001	0.019	0.00103	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 7	2/7/2013	2/7/2013	0.0235	-0.0001	0.00082	0.068	0.000018	79.5	-0.0005	-0.0001	0.00651	-0.03	-0.00005	-0.0005	10.5	0.00129	0.0253	-0.0005	0.626	0.0041	6.81	-0.00001	5.23	0.721	-0.00001	-0.0001	-0.01	0.000501	0.0013	-0.003		2013.1	5.4
Bi-annual Seep Sampling	NEZ Dump Seep 7	5/6/2014	5/6/2014	0.0453	-0.0001	-0.0005	0.164	-0.00004	151	-0.0005	-0.0001	0.00537	-0.03	-0.00005	0.00273	21.4	0.0008	0.0754	-0.0005	0.986	0.00927	6.54	-0.00001	12.1	2.12	-0.00001	-0.0001	-0.01	0.00176	0.0013	-0.003		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 7	27-10-2014 13:52	10/27/2014	0.048	-0.0001	-0.0005	0.098	0.000032	188	-0.0005	-0.0001	0.00617	-0.03	-0.00005	0.00227	24.3	0.00327	0.0803	-0.0005	1.18	0.0208	6.07	-0.00001	11.6	2.05	-0.00001	-0.0001	0.017	0.00134	0.0012	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 7	28-05-2015 14:25	5/28/2015	0.034	-0.0001	-0.00005	0.118	0.0000126	141	-0.0005	-0.0001	0.00402	-0.03	-0.00005	0.0024	17.4	0.00091	0.0419	-0.0005	0.769	0.0103	6.83	-0.00001	10	1.48	-0.00001	-0.0001	-0.01	0.00104	0.00122	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 8	4/7/2013	4/7/2013	0.0762	-0.0001	-0.0005	0.066	-0.00006	250	-0.0005	-0.0001	0.00289	-0.03	-0.00005	-0.0005	54.9	0.00333	0.0869	0.00086	3.19	0.00991	4.63	-0.00001	13.7	3.01	-0.00001	-0.0001	0.013	0.000174	-0.001	-0.003		2013.26	1452
Bi-annual Seep Sampling	NEZ Dump Seep 8	8/6/2015	8/6/2015	0.0479	-0.0001	-0.00005	0.045	0.0000323	191	-0.0005	-0.0001	0.00297	-0.03	-0.00005	-0.001	39.5	0.00806	0.0734	0.00051	2.43	0.00467	4.89	-0.00001	10.5	1.96	-0.00001	-0.0001	-0.01	0.000323	-0.0005	-0.003		2015.59	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 9	4/7/2013	4/7/2013	0.0379	-0.0002	-0.001	0.092	-0.0004	382	-0.0005	0.00062	0.0496	-0.03	-0.0001	0.0042	68.7	0.135	0.404	0.0021	2.46	0.0413	4.17	-0.00002	22.6	5.36	-0.00002	-0.0002	0.014	0.00264	-0.002	0.0242		2013.26	1984
Bi-annual Seep Sampling	NEZ Dump Seep 9	23-10-2013 13:21	10/23/2013	0.0324	-0.0002	-0.001	0.075	0.000316	308	-0.0005	0.00064	0.0495	-0.03	-0.0001	0.0035	62.2	0.183	0.149	0.0023	2.51	0.0503	5.04	-0.00002	17.9	3.59	-0.00002	-0.0002	-0.01	0.00141	-0.002	0.0299		2013.81	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 9	5/6/2014	5/6/2014	0.0285	-0.0001	-0.0005	0.057	-0.00025	264	-0.0005	0.00046	0.0371	-0.03	-0.00005	0.00211	53.3	0.114	0.15	0.00204	2.34	0.0708	4.59	-0.00001	15.9	3.24	-0.00001	-0.0001	-0.01	0.00101	-0.001	0.0184		2014.34	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 9	27-10-2014 13:31	10/27/2014	0.0292	-0.0001	-0.0005	0.067	0.000225	247	-0.0005	0.00045	0.0323	-0.03	-0.00005	0.00237	47.8	0.118	0.155	0.00153	2.2	0.0452	4.43	-0.00001	15	2.68	-0.00001	-0.0001	0.021	0.00104	-0.001	0.0147		2014.82	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 9	8/6/2015	8/6/2015	0.0301	-0.0001	-0.00005	0.063	0.000136	296	-0.0005	0.00027	0.0336	-0.03	-0.00005	0.0022	54.5	0.0938	0.142	0.00141	2.52	0.0566	4.72	-0.00001	17.2	3.27	-0.00001	-0.0001	-0.01	0.0011	-0.0005	0.0153		2015.59	#N/A
Bi-annual Seep Sampling	North Bell Dump Seep 1	30-05-2013 9:43	5/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.41	478
Bi-annual Seep Sampling	North Bell Dump Seep 1	14-10-2015 13:57	10/14/2015	0.055	-0.0001	-0.00005	0.026	0.0000553	99	-0.0005	0.00037	0.00823	0.042	-0.00005	0.0044	11.6	0.6	0.0313	-0.0005	0.993	0.0295	7.47	-0.00001	4.44	0.34	-0.00001	-0.0001	-0.01	0.000449	0.00054	0.0034		2015.78	#N/A
Bi-annual Seep Sampling	North Bell Dump Seep 2	4/6/2013	4/6/2013	0.0325	-0.0001	-0.0005	0.043	0.000101	113	-0.0005	0.00015	0.0255	-0.03	-0.00005	0.00379	21.3	0.089	0.0426	-0.0005	1.44	0.0742	6.28	-0.00001	8.55	0.376	-0.00001	-0.0001	-0.01	0.00168	0.002	0.003		2013.26	801
Bi-annual Seep Sampling	North Bell Dump Seep 3	4/6/2013	4/6/2013	0.0683	-0.0001	-0.0005	0.024	0.000019	162	-0.0005	-0.0001	0.00542	-0.03	-0.00005	-0.0005	22.8	0.00713	0.0146	-0.0005	1.75	0.00697	3.82	-0.00001	7.04	1.11	-0.00001	-0.0001	0.011	0.000086	-0.001	-0.003		2013.26	1083
Bi-annual Seep Sampling	North Bell Dump Seep 4	2/7/2013	2/7/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.1	588
Bi-annual Seep Sampling	PAG Dump Seep 1	30-05-2013 9:42	5/30/2013	0.108	-0.0001	-0.0005	0.048	0.000035	200	-0.0005	0.0001	0.0066	-0.03	-0.00005	0.00281	36.8	0.103	0.0556	-0.0005	4.64	0.155	8.21	-0.00001	16.7	0.783	-0.00001	-0.0001	-0.01	0.000812	-0.001	-0.003		2013.41	736
Bi-annual Seep Sampling	PAG Dump Seep 10	29-05-2014 9:48	5/29/2014	0.0881	-0.0001	-0.0005	0.036	-0.0001	144	-0.0005	0.00029	0.0213	-0.03	-0.00005	0.00076	23.2	0.588	0.0245	0.00067	3.15	0.0183	7.9	-0.00001	10.1	0.654	-0.00001	-0.0001	-0.01	0.000836	-0.001	0.0037		2014.4	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 10	23-10-2014 12:28	10/23/2014	0.126	-0.0001	-0.0005	0.036	0.000029	245	-0.0005	0.00023	0.0129	-0.03	-0.00005	0.00117	44.2	0.208	0.0184	-0.0005	4.24	0.0175	7.32	-0.00001	16.6	1.05	-0.00001	-0.0001	0.02	0.00185	-0.001	-0.003		2014.81	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 10	20-05-2015 13:03	5/20/2015	0.108	-0.0001	-0.00005	0.036	0.0000296	233	-0.0005	0.00011	0.00735	-0.03	-0.00005	0.001	38.6	0.0236	0.0456	-0.0005	2.9	0.0315	7.56	-0.00001	15.1	0.938	-0.00001	-0.0001	-0.01	0.00115	0.00053	-0.003		2015.38	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 10	24-11-2015 13:22	11/24/2015	0.103	-0.0001	-0.00005	0.033	0.0000111	284	-0.0005	-0.0001	0.00632	-0.03	-0.00005	-0.001	49.7	0.00863	0.0581	-0.0005	2.89	0.0321	7.32	-0.00001	16.7	0.995	-0.00001	-0.0001	0.02	0.00163	-0.0005	-0.003		2015.89	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 12	29-05-2014 10:04	5/29/2014	0.077	-0.0001	-0.0005	0.049	0.000088	102	-0.0005	0.0004	0.0234	0.052	-0.00005	0.00078	19.2	0.465	0.0101	0.00077	2.62	0.0154	6.42	0.00002	7.85	0.562	-0.00001	-0.0001	-0.01	0.000772	-0.001	0.0038		2014.4	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 13	23-10-2014 10:49	10/23/2014	0.0103	-0.0001	-0.0005	0.148	-0.00001	45.6	-0.0005	0.00087	0.00225	0.158	-0.00005	0.00173	8.6	0.864	0.0172	-0.0005	0.634	0.00118	9.5	-0.00001	6.12	0.205	-0.00001	-0.0001	-0.01	0.000437	0.0027	-0.003		2014.81	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 13	20-05-2015 13:36	5/20/2015	0.0111	-0.0001	-0.00005	0.16	0.0000074	46.1	-0.0005	0.0002	0.00314	-0.03	-0.00005	0.0022	8.61	0.428	0.0355	-0.0005	0.698	0.00357	8.82	-0.00001	7.03	0.21	-0.00001	-0.0001	-0.01	0.000573	0.00373	-0.003		2015.38	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 14	23-10-2014 11:13	10/23/2014	0.0955	-0.0001	-0.0005	0.06	0.000037	179	-0.0005	0.00131	0.0116	0.114	-0.00005	-0.0005	34.8	3.15	0.0201	0.00077	2.66	0.0148	7.76	-0.00001	11.3	0.831	-0.00001	-0.0001	0.017	0.00163	-0.001	-0.003		2014.81	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 14	20-05-2015 13:16	5/20/2015	0.1	-0.0001	-0.00005	0.068	0.0000101	263	-0.0005	0.00017	0.00683	-0.03	-0.00005	-0.001	48.1	0.463	0.0297	-0.0005	2.92	0.0414	6.99	-0.00001	16.4	1.23	-0.00001	-0.0001	-0.01	0.00267	-0.0005	-0.003		2015.38	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 14	24-11-2015 14:48	11/24/2015	0.109	-0.0001	-0.00005	0.064	-0.000005	298	-0.0005	-0.0001	0.00482	-0.03	-0.00005	-0.001	55.9	0.243	0.0475	-0.0005	2.98	0.0385	7.31	-0.00001	17.8	1.18	-0.00001	-0.0001	0.02	0.00274	0.00054	-0.003		2015.89	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	9/12/2014	9/12/2014	0.101	-0.0001	-0.0005	0.039	0.000109	208	-0.0005	0.00564	0.0104	0.05	-0.00005	0.00185	39	2.16	0.0803	0.00105	4	0.0684	5.86	-0.00001	15.7	1.01	-0.00001	-0.0001	0.024	0.000933	-0.001	0.0044		2014.7	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	23-10-2014 11:56	10/23/2014	0.139	-0.0001	-0.0005	0.04	0.000059	213	-0.0005	0.0165	0.00994	0.738	-0.00005	0.00116	43.8	7.83	0.0288	0.00155	6.91	0.0202	8.09	0.000021	13.9	1.19	-0.00001	-0.0001	0.02	0.00158	0.0012	0.0049		2014.81	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	1/9/2015	1/9/2015	0.0985	-0.0001	-0.00005	0.051	0.0000546	322	-0.0005	0.00524	0.00783	0.085	-0.00005	0.0026	55.6	1.71	0.119	0.00077	4.69	0.0818	7.09	-0.00001	24.5	1.41	-0.00001	-0.0001	-0.01	0.00161	-0.0005	-0.003		2015.02	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	2/2/2015	2/2/2015	0.133	-0.0002	-0.001	0.048	0.000115	299	-0.0005	0.00711	0.0102	0.033	-0.0001	0.0015	56.1	2.63	0.0866	0.0012	4.98	0.123	7.06	-0.00002	23.2	1.38	-0.00002	-0.0002	0.01	0.000967	-0.002	0.0052		2015.09	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	2/6/2015	2/6/2015	0.103	-0.0001	-0.00005	0.051	0.0000743	300	-0.0005	0.00504	0.00821	-0.03	-0.00005	0.0018	53.2	2.13	0.101	0.00089	4.78	0.0856	7.46	-0.00001	23.2	1.25	-0.00001	-0.0001	-0.01	0.00152	-0.0005	-0.003		2015.1	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	3/3/2015	3/3/2015	0.127	-0.0002	-0.001	0.044	0.000142	325	-0.0005	0.00361	0.00925	-0.03	-0.0001	0.0022	57.2	1.98	0.103	0.0011	4.99	0.127	6.82	-0.00002	26	1.42	-0.00002	-0.0002	0.02	0.00101	-0.002	0.0042		2015.17	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	5/5/2015	5/5/2015	0.108	-0.0001	-0.00005	0.056	0.0000958	278	-0.0005	0.00674	0.00857	0.089	-0.00005	0.0023	51.5	2.66	0.0909	0.00109	4.88	0.0926	7.79	-0.00001	23.5	1.17	-0.00001	-0.0001	-0.01	0.00124	-0.0005	0.0034		2015.34	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	6/1/2015	6/1/2015	0.144	-0.0001	-0.0005	0.045	0.000119	283	-0.0005	0.00962	0.0113	0.035	-0.00005	0.00206	53.4	3.92	0.0711	0.00141	5.54	0.093	7.03	-0.00001	23.8	1.29	-0.00001	-0.0001	-0.01	0.000952	-0.001	0.0031		2015.41	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	6/8/2015	6/8/2015	0.105	-0.0002	-0.0001	0.052	0.000074	325	-0.0005	0.00667	0.00848	0.038	-0.0001	0.0029	55.3	1.89	0.109	-0.001	4.74	0.0965	7.07	-0.00002	24.6	1.44	-0.00002	-0.0002	-0.01	0.00159	-0.001	-0.003		2015.43	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	7/7/2015	7/7/2015	0.108	-0.0002	-0.0001	0.049	0.000072	309	-0.0005	0.00521	0.00854	0.095	-0.0001	-0.002	51.9	2.06	0.103	-0.001	5.09	0.0758	7.18	-0.00002	24.1	1.3	-0.00002	-0.0002	-0.01	0.00155	-0.001	-0.003		2015.51	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	8/4/2015	8/4/2015	0.12	-0.0002	-0.0001	0.053	0.000095	338	-0.0005	0.00496	0.00901	0.049	-0.0001	0.0027	60.1	1.9	0.119	0.001	4.77	0.122	7.35	-0.00002	27.3	1.41	-0.00002	-0.0002	0.022	0.00105	-0.001	0.0043		2015.59	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	29-10-2015 12:55	10/29/2015	0.0861	-0.0001	-0.00005	0.057	0.0000298	295	-0.0005	0.00457	0.00796	0.034	-0.00005	0.0021	52.4	1.9	0.107	0.0007	4.8	0.0558	7.71	-0.00001	24.5	1.29	-0.00001	-0.0001	0.012	0.00159	-0.0005	-0.003		2015.82	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 15	24-11-2015 13:05	11/24/2015	0.0811	-0.0001	-0.00005	0.049	0.0000162	338	-0.0005	0.00076	0.00857	-0.03	-0.00005	0.0023	60.3	0.277	0.118	-0.0005	4.03	0.0864	7.65	-0.00001	25.2	1.26	-0.00001	-0.0001	0.019	0.00168	0.00055	-0.003		2015.89	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 2	30-05-2013 9:56	5/30/2013	0.192	-0.0002	-0.001	0.058	-0.0003	363	-0.0005	0.021	0.00555	0.171	-0.0001	0.0042	67.5	8.91	0.294	0.0017	9.79	0.265	6.57	-0.00002	23.4	1.38	-0.00002	-0.0002	-0.01	0.00227	-0.002	0.0283		2013.41	996
Bi-annual Seep Sampling	PAG Dump Seep 3	30-05-2013 10:08	5/30/2013	0.0963	-0.0001	-0.0005	0.015	0.000218	180	-0.0005	0.00481	0.00707	0.041	-0.00005	-0.0005	36.5	6.11	0.0021	0.00062	2.75	0.0351	7.32	-0.00001	9.02	0.713	-0.00001	-0.0001	-0.01	0.000064	-0.001	0.0062		2013.41	690
Bi-annual Seep Sampling	PAG Dump Seep 3	29-05-2014 10:52	5/29/2014	0.063	-0.0001	-0.0005	0.023	0.000012	207	-0.0005	-0.0001	0.00371	-0.03	-0.00005	-0.0005	39.1	0.000188	0.000183	-0.0005	1.87	0.0676	5.8	-0.00001	12.7	0.896	-0.00001	-0.0001	-0.01	0.00001	-0.001	-0.003		2014.4	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 4	30-05-2013 11:03	5/30/2013	0.0521	-0.0001	-0.0005	0.041	0.000498	258	0.00059	0.00108	0.0252	0.6	0.000201	0.00144	44.8	1.17	0.044	0.00121	3.04	0.149	8.17	0.000039	16.4	0.98	-0.00001	-0.0001	0.031	0.00152	0.0024	0.0063		2013.41	899
Bi-annual Seep Sampling	PAG Dump Seep 4	29-05-2014 11:11	5/29/2014	0.0849	-0.0002	-0.001	0.057	-0.0003	418	-0.0005	0.00147	0.017	-0.03	-0.0001	0.0025	76.5	1.56	0.256	-0.001	4.69	0.242	5.99	-0.00002	29.3	1.53	-0.00002	-0.0002	0.01	0.00195	-0.002	0.0034		2014.4	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 4	14-05-2015 13:57	5/14/2015	0.0465	-0.0002	-0.0001	0.052	0.000346	392	-0.0005	-0.0002	0.0101	-0.03	-0.0001	-0.002	68.1	0.0458	0.204	-0.001	3.15	0.244	6.36	-0.00002	28.2	1.29	-0.00002	-0.0002	-0.01	0.00154	-0.001	0.004		2015.36	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 5	29-05-2014 10:40	5/29/2014	0.135	-0.0002	-0.001	0.067	-0.0003	346	-0.0005	0.00478	0.00937	-0.03	-0.0001	0.003	59.8	2.87	0.226	-0.001	6.24	0.172	6.85	-0.00002	30.4	1.41	-0.00002	-0.0002	-0.01	0.00143	-0.002	0.008		2014.4	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 5	23-10-2014 10:50	10/23/2014	0.089	-0.0002	-0.001	0.062	0.00017	336	-0.0005	0.00297	0.0212	0.29	-0.0001	0.0037	55.8	2.13	0.185	-0.001	4.87	0.126	7	-0.00002	29.3	1.32	-0.00002	-0.0002	0.023	0.00161	-0.002	0.0041		2014.81	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 5	14-05-2015 14:22	5/14/2015	0.0952	-0.0002	-0.0001	0.083	0.000351	427	-0.0005	0.00499	0.0157	-0.03	0.00013	0.0031	70.5	4.57	0.585	0.0011	5.64	0.216	6.24	-0.00002	43.7	1.51	-0.00002	-0.0002	-0.01	0.00179	-0.001	0.0086		2015.36	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 5	24-11-2015 12:38	11/24/2015	0.0484	-0.0002	-0.0001	0.073	-0.0001	432	-0.0005	0.0015	0.0101	-0.03	-0.0001	0.0031	75	1.93	0.316	-0.001	5.12	0.101	7.18	-0.00002	34.8	1.28	-0.00002	-0.0002	0.019	0.00261	-0.001	0.0042		2015.89	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 7	29-05-2014 9:01	5/29/2014	0.0429	-0.0001	-0.0005	0.014	0.000027	60.7	-0.0005	0.00625	0.007	1.85	0.00007	0.00114	14.9	2.42	0.0029	0.00211	3.55	0.00052	7.52	0.00002	4.72	0.267	-0.00001	-0.0001	-0.01	0.000162	0.0033	-0.003		2014.4	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 7	23-10-2014 11:16	10/23/2014	0.169	-0.0001	-0.0005	0.019	0.00003	171	-0.0005	0.0265	0.00847	9.57	0.00005	0.00201	38.7	8.76	0.00934	0.00322	8.99	0.0203	9.36	0.000044	8.88	0.824	-0.00001	-0.0001	0.019	0.000871	0.004	-0.003		2014.81	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 7	20-05-2015 12:27	5/20/2015	0.0633	-0.0001	-0.00005	0.019	0.000006	176	-0.0005	0.00011	0.00783	-0.03	-0.00005	-0.001	43.8	0.00669	0.00192	0.0008	4.97	0.00279	6.69	-0.00001	11.3	0.798	-0.00001	-0.0001	-0.01	0.000335	-0.0005	-0.003		2015.38	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 7	24-11-2015 12:48	11/24/2015	0.0891	-0.0001	-0.00005	-0.01	-0.000005	200	-0.0005	0.0021	0.00111	0.062	-0.00005	-0.001	55	5.51	0.000605	-0.0005	4.75	0.000597	8.34	-0.00001	10.6	0.726	-0.00001	-0.0001	0.019	0.000147	-0.0005	-0.003		2015.89	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 8	29-05-2014 9:20	5/29/2014	0.0801	-0.0001	-0.0005	0.218	-0.00001	123	-0.0005	-0.0001	0.0047	-0.03	-0.00005	0.00194	22	0.000841	0.0346	-0.0005	2.81	0.113	6.02	-0.00001	21.3	0.703	-0.00001	-0.0001	-0.01	0.00106	-0.001	-0.003		2014.4	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 8	23-10-2014 12:15	10/23/2014	0.0796	-0.0001	-0.0005	0.383	0.000053	116	-0.0005	0.0102	0.00551	1.8	-0.00005	0.00149	22.4	3.82	0.0518	0.00063	3.62	0.0414	7.79	0.000015	23.2	0.719	-0.00001	-0.0001	0.013	0.00131	0.0012	0.0062		2014.81	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 8	20-05-2015 12:44	5/20/2015	0.0663	-0.0001	-0.00005	0.261	0.0000477	164	-0.0005	0.00133	0.00571	0.055	0.000065	-0.001	31.1	3.47	0.0507	0.00103	3.84	0.00884	7.48	-0.00001	24	0.88	-0.00001	-0.0001	-0.01	0.000946	-0.0005	-0.003		2015.38	#N/A
Bi-annual Seep Sampling	SERDS Seep 1	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	702
Bi-annual Seep Sampling	SERDS Seep 10	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	690
Bi-annual Seep Sampling	SERDS Seep 11	6/6/2013	6/6/2013	0.106	-0.0001	-0.0005	0.069	-0.0002	169	-0.0005	0.00605	0.00087	0.944	-0.00005	-0.0005	29.1	4.08	0.375	0.0018	3.74	-0.0005	3.89	-0.00001	24.6	7.4	-0.00001	-0.0001	0.013	0.000031	-0.001	0.0035		2013.43	880
Bi-annual Seep Sampling	SERDS Seep 11	3/6/2014	3/6/2014	0.074	-0.0002	-0.001	0.24	-0.0003	455	-0.0005	0.00103	0.00581	0.035	-0.0001	0.0195	87.9	0.696	0.66	-0.001	3.49	0.127	3.86	-0.00002	39.1	14.9	-0.00002	-0.0002	-0.01	0.0044	-0.002	-0.003		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 11	25-05-2015 12:41	5/25/2015	0.0892	-0.0002	-0.0001	0.208	0.000079	499	-0.0005	0.00145	0.00652	-0.03	-0.0001	0.0135	92.8	1.2	0.493	0.0011	4.33	0.124	4.14	-0.00002	39.6	15.8	-0.00002	-0.0002	-0.01	0.00255	-0.001	0.0052		2015.39	#N/A
Bi-annual Seep Sampling	SERDS Seep 12	6/6/2013	6/6/2013	0.0704	-0.0002	-0.001	0.181	-0.0002	366	-0.0005	0.00096	0.00607	-0.03	-0.0001	0.011	72.3	0.428	0.595	-0.001	3.81	0.0608	4.36	-0.00002	37	11.3	-0.00002	-0.0002	-0.01	0.00372	-0.002	-0.003		2013.43	2040
Bi-annual Seep Sampling	SERDS Seep 12	3/6/2014	3/6/2014	0.0403	-0.0001	-0.0005	0.062	-0.0002	287	-0.0005	0.00024	0.00855	-0.03	-0.00005	0.00395	47.6	0.0717	0.157	0.00066	1.76	0.0411	7.19	-0.00001	16.8	2.43	-0.00001	-0.0001	-0.01	0.00311	-0.001	-0.003		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	6/6/2013	6/6/2013	0.0458	-0.0001	-0.0005	0.068	-0.0001	251	-0.0005	0.00024	0.00975	-0.03	-0.00005	0.00246	48	0.0649	0.149	0.0006	1.97	0.0375	6.51	-0.00001	17.5	2.52	-0.00001	-0.0001	-0.01	0.00223	-0.001	-0.003		2013.43	1572
Bi-annual Seep Sampling	SERDS Seep 13	3/6/2014	3/6/2014	0.0429	-0.0001	-0.0005	0.067	-0.0001	283	-0.0005	0.0002	0.00995	-0.03	-0.00005	0.00368	49.9	0.0477	0.15	0.00073	1.86	0.0439	6.88	-0.00001	17	2.59	-0.00001	-0.0001	-0.01	0.00252	-0.001	-0.003		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	27-10-2014 10:42	10/27/2014	0.0412	-0.0001	-0.0005	0.064	0.000032	282	-0.0005	0.00014	0.00888	-0.03	-0.00005	0.00359	48.7	0.0414	0.123	-0.0005	1.8	0.0497	7.41	-0.00001	16	2.29	-0.00001	-0.0001	0.025	0.00249	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	13-01-2015 10:51	1/13/2015	0.0445	-0.0002	-0.001	0.075	0.000032	312	-0.0005	-0.0002	0.0099	-0.03	-0.0001	0.0025	56.3	0.0287	0.139	-0.001	1.89	0.0408	7.14	-0.00002	17.9	2.81	-0.00002	-0.0002	0.019	0.00296	-0.002	-0.003		2015.03	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	2/9/2015	2/9/2015	0.0441	-0.0001	-0.00005	0.08	0.000034	305	-0.0005	-0.0001	0.00911	-0.03	-0.00005	0.0036	51.7	0.0244	0.104	-0.0005	1.75	0.0288	7.82	-0.00001	16.5	2.35	-0.00001	-0.0001	-0.01	0.00276	-0.0005	-0.003		2015.11	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	4/6/2015	4/6/2015	0.0429	-0.0002	-0.0001	0.072	0.00004	308	-0.0005	-0.0002	0.00874	-0.03	-0.0001	0.0033	53	0.0214	0.112	-0.001	1.79	0.0334	7.46	-0.00002	16.7	2.45	-0.00002	-0.0002	0.01	0.00286	-0.001	-0.003		2015.26	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	5/2/2015	5/2/2015	0.0445	-0.0002	-0.001	0.078	0.000041	312	-0.0005	-0.0002	0.00967	-0.03	-0.0001	0.0037	56.6	0.0301	0.148	-0.001	1.83	0.0395	7.33	-0.00002	18.8	3.02	-0.00002	-0.0002	0.015	0.00284	-0.002	-0.003		2015.33	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	5/3/2015	5/3/2015	0.0423	-0.0001	-0.0005	0.072	0.000045	321	-0.0005	-0.0001	0.00921	-0.03	-0.00005	0.00395	52.9	0.0351	0.161	-0.0005	1.87	0.04	7.13	-0.00001	18.3	3.08	-0.00001	-0.0001	0.013	0.00295	-0.001	-0.003		2015.33	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	6/5/2015	6/5/2015	0.0431	-0.0002	-0.0001	0.069	0.000032	325	-0.0005	-0.0002	0.0092	-0.03	-0.0001	0.0032	54.6	0.0201	0.124	-0.001	1.84	0.0386	7.5	-0.00002	16.9	2.55	-0.00002	-0.0002	-0.01	0.00293	-0.001	-0.003		2015.42	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	7/7/2015	7/7/2015	0.0442	-0.0002	-0.0001	0.072	0.000029	303	-0.0005	-0.0002	0.00935	-0.03	-0.0001	-0.002	51.4	0.0389	0.107	-0.001	1.95	0.0277	7.44	-0.00002	16.7	2.39	-0.00002	-0.0002	-0.01	0.00272	-0.001	-0.003		2015.51	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	18-08-2015 13:01	8/18/2015	0.0421	-0.0001	-0.00005	0.072	-0.00005	287	-0.0005	-0.0001	0.00896	-0.03	-0.00005	0.0025	51	0.0264	0.101	-0.0005	1.76	0.0286	7.61	-0.00001	16.2	2.18	-0.00001	-0.0001	-0.01	0.00267	-0.0005	-0.003		2015.63	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	9/4/2015	9/4/2015	0.0448	-0.0002	-0.0001	0.062	0.00004	321	-0.0005	-0.0002	0.00972	-0.03	-0.0001	0.004	53.7	0.0282	0.125	-0.001	1.95	0.0447	7.43	-0.00002	18.4	2.56	-0.00002	0.00039	0.02	0.00294	-0.001	-0.003		2015.67	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	29-10-2015 10:30	10/29/2015	0.04	-0.0001	-0.00005	0.081	0.0000307	290	-0.0005	-0.0001	0.00943	-0.03	-0.00005	0.0027	50.8	0.0144	0.0941	0.00054	1.67	0.0361	8.06	-0.00001	15.5	2.19	-0.00001	-0.0001	-0.01	0.00248	-0.0005	-0.003		2015.82	#N/A
Bi-annual Seep Sampling	SERDS Seep 13	11/11/2015	11/11/2015	0.0408	-0.0001	-0.00005	0.077	0.0000315	274	-0.0005	-0.0001	0.00971	-0.03	-0.00005	0.0032	50.9	0.0214	0.0935	-0.0005	1.73	0.038	7.56	-0.00001	15.5	2.12	-0.00001	-0.0001	0.013	0.00241	-0.0005	-0.003		2015.86	#N/A
Bi-annual Seep Sampling	SERDS Seep 14	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	1644
Bi-annual Seep Sampling	SERDS Seep 14	25-05-2015 14:01	5/25/2015	0.0414	-0.0002	-0.0001	0.088	0.00003	367	-0.0005	-0.0002	0.00214	-0.03	-0.0001	0.0055	62.1	0.282	0.217	-0.001	3.18	0.0399	3.88	-0.00002	31	8.86	-0.00002	-0.0002	-0.01	0.00117	-0.001	-0.003		2015.39	#N/A
Bi-annual Seep Sampling	SERDS Seep 15	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	2210
Bi-annual Seep Sampling	SERDS Seep 16	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	755
Bi-annual Seep Sampling	SERDS Seep 17	6/6/2013	6/6/2013	0.0622	-0.0001	-0.0005	0.096	-0.00007	220	-0.0005	-0.0001	0.007	-0.03	-0.00005	-0.0005	43.2	0.00605	0.0783	-0.0005	2.11	0.0549	5.57	-0.00001	17.4	2.81	-0.00001	-0.0001	-0.01	0.000132	-0.001	0.0036		2013.43	1362
Bi-annual Seep Sampling	SERDS Seep 17	3/6/2014	3/6/2014	0.0603	-0.0001	-0.0005	0.078	-0.0001	223	-0.0005	-0.0001	0.00757	-0.03	-0.00005	-0.0005	41.9	0.0112	0.086	-0.0005	2.13	0.037	5.73	-0.00001	17.6	2.97	-0.00001	-0.0001	-0.01	0.000161	-0.001	0.0034		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 18	27-10-2014 10:12	10/27/2014	0.0412	-0.0001	-0.0005	0.036	0.000048	208	-0.0005	0.00015	0.0122	-0.03	-0.00005	0.00443	40.5	0.0217	0.309	-0.0005	1.95	0.0585	4.52	-0.00001	15.7	5.67	-0.00001	-0.0001	0.019	0.0023	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	SERDS Seep 18	25-05-2015 12:23	5/25/2015	0.061	-0.0002	-0.0001	0.045	0.000087	386	-0.0005	-0.0002	0.0128	-0.03	-0.0001	0.0055	77.1	0.0374	0.298	-0.001	2.71	0.102	5.46	-0.00002	23.5	7.08	-0.00002	-0.0002	-0.01	0.00221	-0.001	-0.003		2015.39	#N/A
Bi-annual Seep Sampling	SERDS Seep 19	27-10-2014 10:35	10/27/2014	0.069	-0.0001	-0.0005	0.03	0.000122	256	-0.0005	0.00264	0.0175	0.115	-0.00005	0.00169	50.8	1.72	0.112	0.00099	3.26	0.102	4.77	-0.00001	17.1	3.62	-0.00001	-0.0001	0.022	0.00102	-0.001	-0.003		2014.82	#N/A
Bi-annual Seep Sampling	SERDS Seep 19	25-05-2015 12:38	5/25/2015	0.0596	-0.0002	-0.0001	0.048	0.000191	518	-0.0005	0.00195	0.0177	-0.03	-0.0001	0.0032	104	1.09	0.11	0.0012	3.35	0.228	5.23	-0.00002	25.5	4.55	-0.00002	-0.0002	-0.01	0.00192	-0.001	0.0038		2015.39	#N/A
Bi-annual Seep Sampling	SERDS Seep 19	11/11/2015	11/11/2015	0.0768	-0.0002	-0.0001	0.045	0.000113	495	-0.0005	0.00212	0.0196	0.058	-0.0001	0.0027	95.2	1.21	0.0705	-0.001	4.15	0.195	5.02	-0.00002	25.9	6.05	-0.00002	-0.0002	0.014	0.00146	-0.001	-0.003		2015.86	#N/A
Bi-annual Seep Sampling	SERDS Seep 2	6/6/2013	6/6/2013	0.0862	-0.0001	-0.0005	0.087	-0.0002	267	-0.0005	0.00064	0.0271	0.086	-0.00005	0.0103	67.6	0.847	0.225	0.00103	6.84	0.0188	5.86	0.00001	25.5	7.43	-0.00001	-0.0001	0.014	0.003	-0.001	-0.003		2013.43	1622
Bi-annual Seep Sampling	SERDS Seep 2	3/6/2014	3/6/2014	0.0529	-0.0001	-0.0005	0.036	-0.0002	288	-0.0005	0.00105	0.0139	-0.03	-0.00005	0.00355	54.7	0.437	0.218	0.00065	2.25	0.0964	5.57	-0.00001	18.5	5.15	-0.00001	-0.0001	-0.01	0.00197	-0.001	0.0038		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 20	25-05-2015 13:10	5/25/2015	0.0864	-0.0002	-0.0001	0.057	0.000284	509	-0.0005	0.00533	0.0579	0.032	-0.0001	0.003	95.1	2.07	0.0769	0.0015	3.76	0.296	5.47	-0.00002	26.9	4.54	-0.00002	-0.0002	-0.01	0.00295	-0.001	0.0052		2015.39	#N/A
Bi-annual Seep Sampling	SERDS Seep 21	25-05-2015 13:04	5/25/2015	0.0927	-0.0002	-0.0001	0.063	0.000189	438	-0.0005	0.00336	0.0271	0.051	-0.0001	0.0059	78.7	1.65	0.161	0.0011	4.37	0.215	5.58	-0.00002	27.5	4.74	-0.00002	-0.0002	-0.01	0.00412	-0.001	0.0079		2015.39	#N/A

Location Type	Sample Point	Original Date As Is	Recoded Date	pH-field	Q	T	Turbidity-Field	EC	Hardness	pH	TDS	TSS	Turbidity	Alkalinity	NH3	Cl	F	NO3	NO3+NO2	NO2	PO4	P-D	P-T	SO4	N-T
					m3/s	C	NTU	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	NEZ Dump Seep 6	2/7/2013	2/7/2013	8.1	0.002	6.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	NEZ Dump Seep 6	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1390	790	8.28	1190	6.8	1.27	148	0.0025	2.5	0.77	6.49	6.49	0.005	0.0079	0.0097	0.0115	685	6.55
Bi-annual Seep Sampling	NEZ Dump Seep 6	27-10-2014 14:22	10/27/2014	#N/A	#N/A	#N/A	#N/A	1200	663	8.02	943	3.3	1.22	127	0.0025	2.5	0.36	2.11	2.11	0.005	0.0019	0.0033	0.0046	571	2.04
Bi-annual Seep Sampling	NEZ Dump Seep 7	2/7/2013	2/7/2013	8.3	0.002	7.1	#N/A	468	242	8.17	333	20	1.54	99.6	0.0025	0.25	0.178	0.638	0.638	0.0005	0.0059	0.0072	0.0329	137	0.687
Bi-annual Seep Sampling	NEZ Dump Seep 7	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	859	464	8.2	665	3.2	0.39	112	0.0025	1.25	0.31	2.52	2.52	0.0025	0.0047	0.0048	0.0071	361	2.66
Bi-annual Seep Sampling	NEZ Dump Seep 7	27-10-2014 13:52	10/27/2014	#N/A	#N/A	#N/A	#N/A	1020	571	8.02	819	1.5	1.92	86.3	0.0025	2.5	0.31	1.52	1.52	0.005	0.0061	0.0066	0.0093	501	1.48
Bi-annual Seep Sampling	NEZ Dump Seep 7	28-05-2015 14:25	5/28/2015	#N/A	#N/A	#N/A	#N/A	812	423	8.24	609	25.9	5.31	111	0.0025	0.5	0.245	1.09	1.09	0.001	0.0038	0.0055	0.135	322	1.1
Bi-annual Seep Sampling	NEZ Dump Seep 8	4/7/2013	4/7/2013	7.9	0.0025	5.8	#N/A	1430	850	7.65	1240	68.7	20	87.3	0.0025	2.5	0.1	1.58	1.58	0.005	0.006	0.0078	0.129	647	2.31
Bi-annual Seep Sampling	NEZ Dump Seep 8	8/6/2015	8/6/2015	#N/A	#N/A	#N/A	#N/A	1100	639	7.93	876	14.3	2.82	106	0.0057	1.25	0.05	0.959	0.959	0.0025	0.0062	0.0093	0.0224	543	1.09
Bi-annual Seep Sampling	NEZ Dump Seep 9	4/7/2013	4/7/2013	7.9	0.01	5.3	#N/A	1970	1240	7.79	1850	1.5	0.37	58.3	0.0025	5	0.2	4.7	4.7	0.01	0.0068	0.0085	0.0102	1180	4.56
Bi-annual Seep Sampling	NEZ Dump Seep 9	23-10-2013 13:21	10/23/2013	#N/A	#N/A	#N/A	#N/A	1690	1020	7.92	1500	1.5	0.46	71.8	0.0025	5	0.2	2.71	2.71	0.01	0.0042	0.0079	0.0082	1020	2.61
Bi-annual Seep Sampling	NEZ Dump Seep 9	5/6/2014	5/6/2014	#N/A	#N/A	#N/A	#N/A	1480	879	7.84	1230	3.5	0.43	56.2	0.0025	2.5	0.23	2.09	2.09	0.005	0.0052	0.0064	0.0211	852	2.2
Bi-annual Seep Sampling	NEZ Dump Seep 9	27-10-2014 13:31	10/27/2014	#N/A	#N/A	#N/A	#N/A	1420	814	7.99	1220	7.8	10.9	62.3	0.0025	2.5	0.21	1.55	1.55	0.005	0.0038	0.0069	0.0189	779	1.6
Bi-annual Seep Sampling	NEZ Dump Seep 9	8/6/2015	8/6/2015	#N/A	#N/A	#N/A	#N/A	1540	963	7.91	1360	1.5	0.28	67	0.0025	2.5	0.1	1.45	1.45	0.005	0.0047	0.0062	0.0048	918	1.53
Bi-annual Seep Sampling	North Bell Dump Seep 1	30-05-2013 9:43	5/30/2013	8.6	0	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	North Bell Dump Seep 1	14-10-2015 13:57	10/14/2015	#N/A	#N/A	#N/A	#N/A	562	295	7.11	411	11.6	4.41	127	0.233	0.92	0.064	1.64	4.14	2.5	0.0162	0.0312	0.445	162	6.04
Bi-annual Seep Sampling	North Bell Dump Seep 2	4/6/2013	4/6/2013	8.2	0	0.4	#N/A	712	369	7.91	498	106	108	95	0.0409	1.25	0.27	9.53	9.57	0.0364	0.0951	0.124	0.333	246	9.57
Bi-annual Seep Sampling	North Bell Dump Seep 3	4/6/2013	4/6/2013	7.8	0	4.4	#N/A	883	498	7.36	658	26.3	1.71	44.2	0.0077	2.5	0.23	0.86	0.86	0.005	0.0005	0.0061	0.0694	444	1.56
Bi-annual Seep Sampling	North Bell Dump Seep 4	2/7/2013	2/7/2013	6.8	0	15.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	PAG Dump Seep 1	30-05-2013 9:42	5/30/2013	7.23	0.005	4.36	#N/A	1220	650	8.01	996	6.8	0.99	139	0.0336	7.8	0.28	31.8	31.9	0.066	0.0536	0.0666	0.0739	428	30.7
Bi-annual Seep Sampling	PAG Dump Seep 10	29-05-2014 9:48	5/29/2014	#N/A	#N/A	#N/A	#N/A	842	455	8.08	606	9	3.54	172	0.0087	2.5	0.1	6.12	6.69	0.562	0.0005	0.0105	0.0331	273	6.76
Bi-annual Seep Sampling	PAG Dump Seep 10	23-10-2014 12:28	10/23/2014	#N/A	#N/A	#N/A	#N/A	1360	793	7.99	1100	1.5	0.37	251	0.0393	5.6	0.1	8.01	8.01	0.005	0.0073	0.0146	0.0175	540	7.8
Bi-annual Seep Sampling	PAG Dump Seep 10	20-05-2015 13:03	5/20/2015	#N/A	#N/A	#N/A	#N/A	1310	741	7.82	1070	1.5	0.25	173	0.0087	3.3	0.05	13.4	13.5	0.0103	0.0124	0.0169	0.0176	533	13.8
Bi-annual Seep Sampling	PAG Dump Seep 10	24-11-2015 13:22	11/24/2015	#N/A	#N/A	#N/A	#N/A	1570	914	7.78	1250	1.5	0.32	181	0.0025	3.6	0.05	13.8	13.8	0.0057	0.0154	0.0208	0.0181	670	13.6
Bi-annual Seep Sampling	PAG Dump Seep 12	29-05-2014 10:04	5/29/2014	#N/A	#N/A	#N/A	#N/A	645	333	8	501	6.5	3.49	116	0.0075	3.4	0.14	3.67	3.95	0.278	0.0005	0.018	0.0561	210	4.39
Bi-annual Seep Sampling	PAG Dump Seep 13	23-10-2014 10:49	10/23/2014	#N/A	#N/A	#N/A	#N/A	295	149	8.15	144	30.7	8.32	151	0.0232	0.79	0.115	0.0916	0.109	0.0173	0.0059	0.0061	0.0354	9.91	0.38
Bi-annual Seep Sampling	PAG Dump Seep 13	20-05-2015 13:36	5/20/2015	#N/A	#N/A	#N/A	#N/A	307	151	8.25	214	1.5	0.66	112	0.0176	0.57	0.119	0.808	0.809	0.002	0.0288	0.0283	0.037	26.8	0.964
Bi-annual Seep Sampling	PAG Dump Seep 14	23-10-2014 11:13	10/23/2014	#N/A	#N/A	#N/A	#N/A	1050	591	8.17	838	3.5	3.71	261	0.0577	2.5	0.1	5.95	6.12	0.166	0.0005	0.007	0.0177	328	5.94
Bi-annual Seep Sampling	PAG Dump Seep 14	20-05-2015 13:16	5/20/2015	#N/A	#N/A	#N/A	#N/A	1470	854	8.09	1210	1.5	0.35	196	0.0077	2.5	0.1	16.4	16.4	0.026	0.0092	0.0111	0.0155	647	15.2
Bi-annual Seep Sampling	PAG Dump Seep 14	24-11-2015 14:48	11/24/2015	#N/A	#N/A	#N/A	#N/A	1670	975	8.14	1340	1.5	0.46	210	0.0098	4.1	0.05	13.7	13.7	0.0025	0.0178	0.0213	0.0247	736	13.2
Bi-annual Seep Sampling	PAG Dump Seep 15	9/12/2014	9/12/2014	#N/A	#N/A	#N/A	#N/A	1260	679	7.96	959	103	23.9	120	0.236	5.6	0.1	21.2	22.3	1.03	0.0005	0.0043	0.196	533	21.2
Bi-annual Seep Sampling	PAG Dump Seep 15	23-10-2014 11:56	10/23/2014	#N/A	#N/A	#N/A	#N/A	1230	712	7.89	972	87.8	18.9	325	0.144	6.4	0.1	1.04	1.55	0.516	0.0022	0.0323	0.391	390	3
Bi-annual Seep Sampling	PAG Dump Seep 15	1/9/2015	1/9/2015	#N/A	#N/A	#N/A	#N/A	1730	1030	7.57	1480	9.1	7.38	187	0.0641	2.5	0.1	18.1	18.5	0.338	0.0029	0.0051	0.0517	805	18.3
Bi-annual Seep Sampling	PAG Dump Seep 15	2/2/2015	2/2/2015	#N/A	#N/A	#N/A	#N/A	1770	977	7.81	1520	45.2	28.9	161	0.2	8	0.1	34.7	36.7	2.07	0.002	0.0134	0.0997	771	35.9
Bi-annual Seep Sampling	PAG Dump Seep 15	2/6/2015	2/6/2015	#N/A	#N/A	#N/A	#N/A	1720	968	8.25	1450	6.8	7.16	186	0.0805	5.4	0.1	21	21.5	0.453	0.0005	0.001	0.0376	761	20.5
Bi-annual Seep Sampling	PAG Dump Seep 15	3/3/2015	3/3/2015	#N/A	#N/A	#N/A	#N/A	1820	1050	7.92	1560	17.1	9.49	148	0.156	10	0.29	37.1	38.4	1.33	0.0015	0.0073	0.0515	834	38.7
Bi-annual Seep Sampling	PAG Dump Seep 15	5/5/2015	5/5/2015	#N/A	#N/A	#N/A	#N/A	1630	906	8.06	1330	9.8	6.6	201	0.0806	5.8	0.1	23.8	24.5	0.722	0.0005	0.0081	0.0365	703	22.7
Bi-annual Seep Sampling	PAG Dump Seep 15	6/1/2015	6/1/2015	#N/A	#N/A	#N/A	#N/A	1640	926	7.76	1330	157	97.1	190	0.348	10	0.1	27	28.9	1.92	0.0015	0.0092	0.27	682	29.1
Bi-annual Seep Sampling	PAG Dump Seep 15	6/8/2015	6/8/2015	#N/A	#N/A	#N/A	#N/A	1780	1040	7.86	1660	15.2	9.18	180	0.0935	2.5	0.1	20	20.4	0.374	0.0029	0.001	0.0502	822	22.1
Bi-annual Seep Sampling	PAG Dump Seep 15	7/7/2015	7/7/2015	#N/A	#N/A	#N/A	#N/A	1690	986	8.07	1480	9.9	5.8	196	0.0573	2.5	0.1	17.7	18.1	0.413	0.0019	0.0059	0.0417	754	17.6
Bi-annual Seep Sampling	PAG Dump Seep 15	8/4/2015	8/4/2015	#N/A	#N/A	#N/A	#N/A	1840	1090	8.03	1600	7.5	6.25	150	0.0905	6.3	0.05	33.8	34.7	0.914	0.0005	0.0041	0.0244	863	33.5
Bi-annual Seep Sampling	PAG Dump Seep 15	29-10-2015 12:55	10/29/2015	#N/A	#N/A	#N/A	#N/A	1650	952	8	1370	5.2	6.19	238	0.0507	5.1	0.1	14.9	15.4	0.554	0.0018	0.001	0.0555	707	15.7
Bi-annual Seep Sampling	PAG Dump Seep 15	24-11-2015 13:05	11/24/2015	#N/A	#N/A	#N/A	#N/A	1840	1090	8.05	1550	1.5	1.24	183	0.0146	5.3	0.1	20.9	21	0.09	0.0148	0.0196	0.031	830	20.5
Bi-annual Seep Sampling	PAG Dump Seep 2	30-05-2013 9:56	5/30/2013	6.41	0.005	1.3	#N/A	2040	1190	7.57	1670	51.3	37.5	289	0.694	17	0.54	26.7	49.6	#N/A	0.0052	0.0342	0.236	819	45.4
Bi-annual Seep Sampling	PAG Dump Seep 3	30-05-2013 10:08	5/30/2013	6.79	0.003	9.4	#N/A	1060	599	7.87	841	24.7	7.21	127	0.538	7.6	0.2	2.67	2.68	0.016	0.0021	0.0067	0.048	469	3.17
Bi-annual Seep Sampling	PAG Dump Seep 3	29-05-2014 10:52	5/29/2014	#N/A	#N/A	#N/A	#N/A	1200	678	7.81	995	24.1	5.02	48.8	0.0025	2.5	0.1	18.8	18.9	0.018	0.0005	0.0041	0.0475	570	17.7
Bi-annual Seep Sampling	PAG Dump Seep 4	30-05-2013 11:03	5/30/2013	7.88	0.003	4.4	#N/A	1470	829	8.09	1100	47.3	27.1	210	0.0651	19.2	0.23	34.5	34.9	0.336	0.007	0.0088	0.0907	509	32.8
Bi-annual Seep Sampling	PAG Dump Seep 4	29-05-2014 11:11	5/29/2014	#N/A	#N/A	#N/A	#N/A	2230	1360	8.13	1940	5.2	1.16	151	0.0542	14	0.2	49.9	50	0.136	0.0079	0.0158	0.0219	1140	45.1
Bi-annual Seep Sampling	PAG Dump Seep 4	14-05-2015 13:57	5/14/2015	#N/A	#N/A	#N/A	#N/A	2180	1260	7.97	1850	3.2	0.24	146	0.0025	10.6	0.1	48.6	48.6	0.005	0.0116	0.0161	0.0193	959	51.3
Bi-annual Seep Sampling	PAG Dump Seep 5	29-05-2014 10:40	5/29/2014	#N/A	#N/A	#N/A	#N/A	1950	1110	8.02	1710	5.1	3.27	137	0.337	11	0.2	52.4	56	3.55	0.0022	0.008	0.0468	907	51.2
Bi-annual Seep Sampling	PAG Dump Seep 5	23-10-2014 10:50	10/23/2014	#N/A	#N/A	#N/A	#N/A	1810	1070	8.07	1530	12.3	4.73	171	0.288	11	0.2	35.9	36.8	0.95	0.0005	0.0041	0.054	797	34
Bi-annual Seep Sampling	PAG Dump Seep 5	14-05-2015 14:22	5/14/2015	#N/A	#N/A	#N/A	#N/A	2400	1360	8.08	2140	3.3	1.18	169	0.0475	11.5	0.1	54.4	54.4	0.049	0.0018	0.0083	0.0067	1100	53.3
Bi-annual Seep Sampling	PAG Dump Seep 5	24-11-2015 12:38	11/24/2015	#N/A	#N/A	#N/A	#N/A	2290	1390	7.86	1980	1.5	2.41	256	0.0299	9	0.1	34.1	34.2	0.017	0.0005	0.001	0.001	1060	34.3
Bi-annual Seep Sampling	PAG Dump Seep 7	29-05-2014 9:01	5/29/2014	#N/A	#N/A	#N/A	#N/A	376	213	7.47	340	180	235	193	0.18	2.15	0.086	0.0025	0.00255	0.0005	0.0267	0.0492	0.584	20.8	1.33
Bi-annual Seep Sampling	PAG Dump Seep 7	23-10-2014 11:16	10/23/2014	#N/A	#N/A	#N/A	#N/A	1050	587	7.42	849	33.7	33.2	355	1.2	6.1	0.1	0.025	0.0255	0.005	0.0257	0.0601	1.05	199	8.2
Bi-annual Seep Sampling	PAG Dump Seep 7	20-05-2015 12:27	5/20/2015	#N/A	#N/A	#N/A	#N/A	1110	619	7.63	913	69.9	80.7	300	0.869	3.2	0.05	0.0125	0.0125	0.0025	0.0105	0.0234	0.454	353	2.16
Bi-annual Seep Sampling	PAG Dump Seep 7	24-11-2015 12:48	11/24/2015	#N/A	#N/A	#N/A	#N/A	1260	727	7.34	927	57.6	142	379	1.63	3	0.05	0.0125	0.0125	0.0025	0.0018	0.0092	0.859	374	2.3
Bi-annual Seep Sampling	PAG Dump Seep 8	29-05-2014 9:20	5/29/2014	#N/A	#N/A	#N/A	#N/A	873	397	7.88	659	6.9	3.32	109	0.141	2.5	0.31	38.6	42.5	3.85	0.0005	0.0113	0.0456	186	40.8
Bi-annual Seep Sampling	PAG Dump Seep 8	23-10-2014 12:15	10/23/2014	#N/A	#N/A	#N/A	#N/A	776	381	7.87	548	11.7	11.4	227	0.0461	4.2	0.17	0.646	2.17	1.53	0.0025	0.0199	0.182	196	3.27
Bi-annual Seep Sampling	PAG Dump Seep 8	20-05-2015 12:44	5/20/2015	#N/A	#N/A	#N/A	#N/A	1030	538	7.69	803	6	5.9	279	0.858	2.8	0.05	2.23	2.43	0.201	0.0053	0.0131	0.036	301	3.58
Bi-annual Seep Sampling	SERDS Seep 1	6/6/2013	6/6/2013	7.6	0	15.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 10	6/6/2013	6/6/2013	8.6	0	9.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 11	6/6/2013	6/6/2013	6.7	0.005	12	#N/A	1060	541	7.59	843	148	159	91.4	0.39	2.5	0.1	0.025	0.0255	0.005	0.0167	0.0331	0.272	522	1.32
Bi-annual Seep Sampling	SERDS Seep 11	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	2530	1500	8.05	2370	1.5	0.42	98.4	0.0469	5	0.55	61.9	62.2	0.223	0.0078	0.0148	0.0226	1360	58.9
Bi-annual Seep Sampling	SERDS Seep 11	25-05-2015 12:41	5/25/2015	#N/A	#N/A	#N/A	#N/A	2780	1630	7.81	2770	73.1	22.7	87	0.0184	5	0.2	76.3	76.3	0.056	0.0131	0.0177	0.1	1500	70.7
Bi-annual Seep Sampling	SERDS Seep 12	6/6/2013	6/6/2013	8.3	0.01	15.9	#N/A	2130	1210	7.98	1840	44.2	16.4	102	0.0185	5	0.42	38.4	38.6	0.216	0.0016	0.0104	0.0493	1170	37
Bi-annual Seep Sampling	SERDS Seep 12	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	1590	912	8.17	1380	1.5	0.39	139	0.0025	5.2	0.4	25.7	25.7	0.02	0.0104	0.0133	0.0145	738	24.6
Bi-annual Seep Sampling	SERDS Seep 13	6/6/2013	6/6/2013	8.1	0.6	2.9	#N/A	1460	824	8.06	1170	3.4	0.78	111	0.0025	2.5	0.29	18.9	18.9	0.005	0.0067	0.0123	0.0184	718	18
Bi-annual Seep Sampling	SERDS Seep 13	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	1600	912	8.12	1390	1.5	0.49	126	0.0025	5.1	0.34	27.2	27.2	0.013	0.01	0.012	0.0139	758	26.5
Bi-annual Seep Sampling	SERDS Seep 13	27-10-2014 10:42	10/27/2014	#N/A	#N/A	#N/A	#N/A	1560	905	8.16	1370	1.5	0.75	133	0.0025	5.3	0.36	25.9	25.9	0.005	0.0119	0.0136	0.0172	716	25.3
Bi-annual Seep Sampling	SERDS Seep 13	13-01-2015 10:51	1/13/2015	#N/A	#N/A	#N/A	#N/A	1670	1010	8.06	1450	1.5	0.16	141	0.0025	2.5	0.38	26.3	26.3	0.005	0.011	0.0163	0.0147	824	24.5
Bi-annual Seep Sampling	SERDS Seep 13	2/9/2015	2/9/2015	#N/A	#N/A	#N/A	#N/A	1580	974	7.9	1350	3.4	0.38	142	0.0025	2.5	0.33	22.2	22.2	0.005	0.0111	0.0144	0.0119	745	21.9
Bi-annual Seep Sampling	SERDS Seep 13	4/6/2015	4/6/2015	#N/A	#N/A	#N/A	#N/A	1590	987	8.12	1450	6.4	0.37	145	0.0025	3.8	0.37	22.8	22.8	0.0025	0.0088	0.0139	0.0125	774	23
Bi-annual Seep Sampling	SERDS Seep 13	5/2/2015	5/2/2015	#N/A	#N/A	#N/A	#N/A	1710	1010	8.12	1490	1.5	0.23	143	0.0025	2.5	0.44	25.2	25.2	0.005	0.0129	0.0152	0.0155	819	23.9
Bi-annual Seep Sampling	SERDS Seep 13	5/3/2015	5/3/2015	#N/A	#N/A	#N/A	#N/A	1700	1020	8	1490	1.5	0.25	152	0.0025	2.5	0.45	24.7	24.7	0.005	0.0126	0.0165	0.0152	826	24.5
Bi-annual Seep Sampling	SERDS Seep 13	6/5/2015	6/5/2015	#N/A	#N/A	#N/A	#N/A	1720	1040	8.29	1440	1.5	0.37	146	0.0025	2.5	0.33	24.4	24.4	0.005	0.0095	0.0136	0.0143	815	23.3
Bi-annual Seep Sampling	SERDS Seep 13	7/7/2015	7/7/2015	#N/A	#N/A	#N/A	#N/A	1650	969	8.15	1420	1.5	0.17	151	0.0025	2.5	0.35	21.8	21.8	0.005	0.0086	0.0118	0.0126	763	21.9
Bi-annual Seep Sampling	SERDS Seep 13	18-08-2015 13:01	8/18/2015	#N/A	#N/A	#N/A	#N/A	1640	927	7.89	1380	1.5	0.48	143	0.0025	2.5	0.36	22.3	22.3	0.005	0.0099	0.0141	0.0117	761	20.5
Bi-annual Seep Sampling	SERDS Seep 13	9/4/2015	9/4/2015	#N/A	#N/A	#N/A	#N/A	1640	1020	8.15	1430	1.5	0.6	151	0.0025	2.5	0.35	25.5	25.5	0.005	0.0094	0.0144	0.013	849	23.5
Bi-annual Seep Sampling	SERDS Seep 13	29-10-2015 10:30	10/29/2015	#N/A	#N/A	#N/A	#N/A	1600	934	8.09	1370	1.5	0.19	136	0.0025	2.5	0.32	23.9	23.9	0.005	0.0105	0.0136	0.0114	724	24.2
Bi-annual Seep Sampling	SERDS Seep 13	11/11/2015	11/11/2015	#N/A	#N/A	#N/A	#N/A	1630	894	8.16	1340	3.2	0.24	135	0.0025	2.5	0.35	23.3	23.3	0.005	0.0113	0.0118	0.0106	716	24
Bi-annual Seep Sampling	SERDS Seep 14	6/6/2013	6/6/2013	8.1	0.005	6.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 14	25-05-2015 14:01	5/25/2015	#N/A	#N/A	#N/A	#N/A	1910	1170	7.72	1720	5.4	0.3	70.2	0.0513	5	0.2	0.62	0.62	0.01	0.004	0.0092	0.025	1170	0.863
Bi-annual Seep Sampling	SERDS Seep 15	6/6/2013	6/6/2013	7.9	0	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 16	6/6/2013	6/6/2013	7.3	0	14.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 17	6/6/2013	6/6/2013	7.8	0.01	5.6	#N/A	1310	729	7.97	1030	5	1.39	68.9	0.0025	6.4	0.1	6.93	6.93	0.005	0.0092	0.0168	0.0229	691	6.68
Bi-annual Seep Sampling	SERDS Seep 17	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	1320	729	8	1100	15.2	4.39	68.8	0.0025	6.5	0.1	3.98	3.98	0.005	0.009	0.0129	0.0445	690	4.05
Bi-annual Seep Sampling	SERDS Seep 18	27-10-2014 10:12	10/27/2014	#N/A	#N/A	#N/A	#N/A	1260	687	8.13	1050	1.5	0.79	90.7	0.0025	2.5	0.32	23.3	23.3	0.005	0.0257	0.0276	0.0238	548	22.4
Bi-annual Seep Sampling	SERDS Seep 18	25-05-2015 12:23	5/25/2015	#N/A	#N/A	#N/A	#N/A	2170	1280	8.07	2030	6.6	0.7	64.5	0.0074	5	0.2	71.5	71.5	0.01	0.0176	0.0239	0.0347	1050	67
Bi-annual Seep Sampling	SERDS Seep 19	27-10-2014 10:35	10/27/2014	#N/A	#N/A	#N/A	#N/A	1540	848	7.92	1330	3.6	1.64	87.4	0.117	5.8	0.1	42.5	42.6	0.07	0.0036	0.0068	0.0163	646	42.6
Bi-annual Seep Sampling	SERDS Seep 19	25-05-2015 12:38	5/25/2015	#N/A	#N/A	#N/A	#N/A	2860	1720	7.79	2800	11	1.31	62.9	0.024	5	0.2	129	129	0.062	0.0141	0.0156	0.0356	1340	119
Bi-annual Seep Sampling	SERDS Seep 19	11/11/2015	11/11/2015	#N/A	#N/A	#N/A	#N/A	2850	1630	7.84	2520	15.8	4.89	89.3	0.0105	5	0.2	130	130	0.036	0.0147	0.0187	0.305	1170	132
Bi-annual Seep Sampling	SERDS Seep 2	6/6/2013	6/6/2013	8	0.002	7.7	#N/A	1570	945	8.05	1410	525	168	160	0.115	2.5	0.34	2.87	3	0.131	0.0948	0.167	0.821	823	3.93
Bi-annual Seep Sampling	SERDS Seep 2	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	1660	945	7.92	1460	11.3	4.64	72.1	0.156	5.6	0.27	49	49.3	0.335	0.0114	0.0162	0.039	757	47.6
Bi-annual Seep Sampling	SERDS Seep 20	25-05-2015 13:10	5/25/2015	#N/A	#N/A	#N/A	#N/A	2870	1660	7.82	2710	9.9	1.78	73.6	0.184	5	0.2	135	135	0.197	0.0062	0.0058	0.0353	1230	125
Bi-annual Seep Sampling	SERDS Seep 21	25-05-2015 13:04	5/25/2015	#N/A	#N/A	#N/A	#N/A	2480	1420	7.87	2410	7.3	4.1	104	0.214	5	0.2	104	104	0.346	0.0258	0.0376	0.057	1090	95.1

Location Type	Sample Point	Original Date As Is	Recoded Date	DOC	Al-D	Sb-D	As-D	Ba-D	Be-D	Bi-D	B-D	Cd-D	Ca-D	Cr-D	Co-D	Cu-D	Fe-D	Pb-D	Li-D	Mg-D	Mn-D	Mo-D	Ni-D	K-D	Se-D	Si-D	Ag-D	Na-D	Sr-D	Tl-D	Sn-D	Ti-D	U-D	V-D	Zn-D		Se/SO4	Ca	Mg+K+Na	(Mg+K+Na)/Ca	Zn/Cd		Year
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/mgS	meq/L	meq/L	meq/meq			Year
Bi-annual Seep Sampling	NEZ Dump Seep 6	2/7/2013	2/7/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	NEZ Dump Seep 6	5/6/2014	5/6/2014	1.67	0.0015	0.00091	0.00105	0.0694	0.00005	0.00025	0.413	0.0001	259	0.00025	0.00005	0.00621	0.015	2.5E-05	0.00698	34.5	0.0189	0.183	0.00025	1.89	0.0143	7.56	5E-06	28.6	6.51	5E-06	0.00005	0.005	0.00487	0.0013	0.0015		6.26277E-05	12.95	3.3036	0.255104371	15		2014
Bi-annual Seep Sampling	NEZ Dump Seep 6	27-10-2014 14:22	10/27/2014	4.15	0.0049	0.00032	0.00027	0.062	0.00005	0.00025	0.292	1.9E-05	219	0.00025	0.00005	0.00366	0.015	2.5E-05	0.0032	28.4	0.00342	0.0652	0.00025	1.18	0.0135	7.06	5E-06	22.1	5.34	5E-06	0.00005	0.019	0.00103	0.0005	0.0015		7.09282E-05	10.95	2.6471	0.241744534	78.9474		2014
Bi-annual Seep Sampling	NEZ Dump Seep 7	2/7/2013	2/7/2013	3.13	0.0075	0.00013	0.00047	0.0235	0.00005	0.00082	0.068	1.8E-05	79.5	0.00025	0.00005	0.00651	0.015	2.5E-05	0.00025	10.5	0.00129	0.0253	0.00025	0.626	0.0041	6.81	5E-06	5.23	0.721	5E-06	0.00005	0.005	0.0005	0.0013	0.0015		8.9781E-05	3.975	0.85569	0.215267292	83.3333		2013
Bi-annual Seep Sampling	NEZ Dump Seep 7	5/6/2014	5/6/2014	2.16	0.0036	0.0003	0.00054	0.0453	0.00005	0.00025	0.164	0.00002	151	0.00025	0.00005	0.00537	0.015	2.5E-05	0.00273	21.4	0.0008	0.0754	0.00025	0.986	0.00927	6.54	5E-06	12.1	2.12	5E-06	0.00005	0.005	0.00176	0.0013	0.0015		7.7036E-05	7.55	1.79918	0.238302307	75		2014
Bi-annual Seep Sampling	NEZ Dump Seep 7	27-10-2014 13:52	10/27/2014	2.91	0.0035	0.00031	0.00057	0.048	0.00005	0.00025	0.098	3.2E-05	188	0.00025	0.00005	0.00617	0.015	2.5E-05	0.00227	24.3	0.00327	0.0803	0.00025	1.18	0.0208	6.07	5E-06	11.6	2.05	5E-06	0.00005	0.017	0.00134	0.0012	0.0015		0.000124551	9.4	1.95151	0.207607857	46.875		2014
Bi-annual Seep Sampling	NEZ Dump Seep 7	28-05-2015 14:25	5/28/2015	2.38	0.0015	0.00023	0.00045	0.034	0.00005	2.5E-05	0.118	1.3E-05	141	0.00025	0.00005	0.00402	0.015	2.5E-05	0.0024	17.4	0.00091	0.0419	0.00025	0.769	0.0103	6.83	5E-06	10	1.48	5E-06	0.00005	0.005	0.00104	0.00122	0.0015		9.59627E-05	7.05	1.46908	0.208379832	119.048		2015
Bi-annual Seep Sampling	NEZ Dump Seep 8	4/7/2013	4/7/2013	4.27	0.0037	0.00005	0.00018	0.0762	0.00005	0.00025	0.066	0.00003	250	0.00025	0.00005	0.00289	0.015	2.5E-05	0.00025	54.9	0.00333	0.0869	0.00086	3.19	0.00991	4.63	5E-06	13.7	3.01	5E-06	0.00005	0.013	0.00017	0.0005	0.0015		4.59505E-05	12.5	3.87861	0.310289058	50		2013
Bi-annual Seep Sampling	NEZ Dump Seep 8	8/6/2015	8/6/2015	3.9	0.0036	0.00005	0.00021	0.0479	0.00005	2.5E-05	0.045	3.2E-05	191	0.00025	0.00005	0.00297	0.015	2.5E-05	0.0005	39.5	0.00806	0.0734	0.00051	2.43	0.00467	4.89	5E-06	10.5	1.96	5E-06	0.00005	0.005	0.00032	0.00025	0.0015		2.58011E-05	9.55	2.82204	0.295501197	46.4396		2015
Bi-annual Seep Sampling	NEZ Dump Seep 9	4/7/2013	4/7/2013	3.85	0.0158	0.00025	0.00026	0.0379	0.0001	0.0005	0.092	0.0002	382	0.00025	0.00062	0.0496	0.015	0.00005	0.0042	68.7	0.135	0.404	0.0021	2.46	0.0413	4.17	0.00001	22.6	5.36	0.00001	0.0001	0.014	0.00264	0.001	0.0242		0.000105	19.1	5.05152	0.264477305	121		2013
Bi-annual Seep Sampling	NEZ Dump Seep 9	23-10-2013 13:21	10/23/2013	4.4	0.0096	0.0001	0.0001	0.0324	0.0001	0.0005	0.075	0.00032	308	0.00025	0.00064	0.0495	0.015	0.00005	0.0035	62.2	0.183	0.149	0.0023	2.51	0.0503	5.04	0.00001	17.9	3.59	0.00001	0.0001	0.005	0.00141	0.001	0.0299		0.000147941	15.4	4.46944	0.290223507	94.6203		2013
Bi-annual Seep Sampling	NEZ Dump Seep 9	5/6/2014	5/6/2014	4.07	0.013	0.00014	0.0002	0.0285	0.00005	0.00025	0.057	0.00013	264	0.00025	0.00046	0.0371	0.015	2.5E-05	0.00211	53.3	0.114	0.15	0.00204	2.34	0.0708	4.59	5E-06	15.9	3.24	5E-06	0.00005	0.005	0.00101	0.0005	0.0184		0.000249296	13.2	3.85918	0.292361823	147.2		2014
Bi-annual Seep Sampling	NEZ Dump Seep 9	27-10-2014 13:31	10/27/2014	4.78	0.0086	0.00015	0.00025	0.0292	0.00005	0.00025	0.067	0.00023	247	0.00025	0.00045	0.0323	0.015	2.5E-05	0.00237	47.8	0.118	0.155	0.00153	2.2	0.0452	4.43	5E-06	15	2.68	5E-06	0.00005	0.021	0.00104	0.0005	0.0147		0.000174069	12.35	3.49576	0.283057181	65.3333		2014
Bi-annual Seep Sampling	NEZ Dump Seep 9	8/6/2015	8/6/2015	5.34	0.0184	0.00012	0.0002	0.0301	0.00005	2.5E-05	0.063	0.00014	296	0.00025	0.00027	0.0336	0.015	2.5E-05	0.0022	54.5	0.0938	0.142	0.00141	2.52	0.0566	4.72	5E-06	17.2	3.27	5E-06	0.00005	0.005	0.0011	0.00025	0.0153		0.000184967	14.8	3.99028	0.269613786	112.5		2015
Bi-annual Seep Sampling	North Bell Dump Seep 1	30-05-2013 9:43	5/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	North Bell Dump Seep 1	14-10-2015 13:57	10/14/2015	6.6	0.0015	0.00029	0.00047	0.055	0.00005	2.5E-05	0.026	5.5E-05	99	0.00025	0.00037	0.00823	0.042	2.5E-05	0.0044	11.6	0.6	0.0313	0.00025	0.993	0.0295	7.47	5E-06	4.44	0.34	5E-06	0.00005	0.005	0.00045	0.00054	0.0034		0.000546296	4.95	0.89489	0.18078583	61.4828		2015
Bi-annual Seep Sampling	North Bell Dump Seep 2	4/6/2013	4/6/2013	4.86	0.0087	0.00024	0.00114	0.0325	0.00005	0.00025	0.043	0.0001	113	0.00025	0.00015	0.0255	0.015	2.5E-05	0.00379	21.3	0.089	0.0426	0.00025	1.44	0.0742	6.28	5E-06	8.55	0.376	5E-06	0.00005	0.005	0.00168	0.002	0.003		0.000904878	5.65	1.65064	0.292149507	29.703		2013
Bi-annual Seep Sampling	North Bell Dump Seep 3	4/6/2013	4/6/2013	5.85	0.0229	0.00022	0.00033	0.0683	0.00005	0.00025	0.024	1.9E-05	162	0.00025	0.00005	0.00542	0.015	2.5E-05	0.00025	22.8	0.00713	0.0146	0.00025	1.75	0.00697	3.82	5E-06	7.04	1.11	5E-06	0.00005	0.011	8.6E-05	0.0005	0.0015		4.70946E-05	8.1	1.6804	0.207457385	78.9474		2013
Bi-annual Seep Sampling	North Bell Dump Seep 4	2/7/2013	2/7/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	PAG Dump Seep 1	30-05-2013 9:42	5/30/2013	9.05	0.0053	0.00046	0.00068	0.108	0.00005	0.00025	0.048	3.5E-05	200	0.00025	0.0001	0.0066	0.015	2.5E-05	0.00281	36.8	0.103	0.0556	0.00025	4.64	0.155	8.21	5E-06	16.7	0.783	5E-06	0.00005	0.005	0.00081	0.0005	0.0015		0.001086449	10	2.99083	0.299083391	42.8571		2013
Bi-annual Seep Sampling	PAG Dump Seep 10	29-05-2014 9:48	5/29/2014	12.4	0.0117	0.00018	0.00063	0.0881	0.00005	0.00025	0.036	0.00005	144	0.00025	0.00029	0.0213	0.015	2.5E-05	0.00076	23.2	0.588	0.0245	0.00067	3.15	0.0183	7.9	5E-06	10.1	0.654	5E-06	0.00005	0.005	0.00084	0.0005	0.0037		0.000201099	7.2	1.87267	0.260092965	74		2014
Bi-annual Seep Sampling	PAG Dump Seep 10	23-10-2014 12:28	10/23/2014	12.6	0.0135	0.00012	0.00045	0.126	0.00005	0.00025	0.036	2.9E-05	245	0.00025	0.00023	0.0129	0.015	2.5E-05	0.00117	44.2	0.208	0.0184	0.00025	4.24	0.0175	7.32	5E-06	16.6	1.05	5E-06	0.00005	0.02	0.00185	0.0005	0.0015		9.72222E-05	12.25	3.40772	0.278180943	51.7241		2014
Bi-annual Seep Sampling	PAG Dump Seep 10	20-05-2015 13:03	5/20/2015	8.12	0.0093	0.00021	0.00034	0.108	0.00005	2.5E-05	0.036	3E-05	233	0.00025	0.00011	0.00735	0.015	2.5E-05	0.001	38.6	0.0236	0.0456	0.00025	2.9	0.0315	7.56	5E-06	15.1	0.938	5E-06	0.00005	0.005	0.00115	0.00053	0.0015		0.000177298	11.65	2.98161	0.255932152	50.6757		2015
Bi-annual Seep Sampling	PAG Dump Seep 10	24-11-2015 13:22	11/24/2015	7.3	0.0062	0.00021	0.00038	0.103	0.00005	2.5E-05	0.033	1.1E-05	284	0.00025	0.00005	0.00632	0.015	2.5E-05	0.0005	49.7	0.00863	0.0581	0.00025	2.89	0.0321	7.32	5E-06	16.7	0.995	5E-06	0.00005	0.02	0.00163	0.00025	0.0015		0.000143731	14.2	3.69815	0.260433007	135.135		2015
Bi-annual Seep Sampling	PAG Dump Seep 12	29-05-2014 10:04	5/29/2014	20.5	0.022	0.00016	0.00093	0.077	0.00005	0.00025	0.049	8.8E-05	102	0.00025	0.0004	0.0234	0.052	2.5E-05	0.00078	19.2	0.465	0.0101	0.00077	2.62	0.0154	6.42	0.00002	7.85	0.562	5E-06	0.00005	0.005	0.00077	0.0005	0.0038		0.00022	5.1	1.52802	0.299611248	43.1818		2014
Bi-annual Seep Sampling	PAG Dump Seep 13	23-10-2014 10:49	10/23/2014	4.87	0.0092	0.00043	0.00176	0.0103	0.00005	0.00025	0.148	5E-06	45.6	0.00025	0.00087	0.00225	0.158	2.5E-05	0.00173	8.6	0.864	0.0172	0.00025	0.634	0.00118	9.5	5E-06	6.12	0.205	5E-06	0.00005	0.005	0.00044	0.0027	0.0015		0.000357215	2.28	0.7838	0.343772409	300		2014
Bi-annual Seep Sampling	PAG Dump Seep 13	20-05-2015 13:36	5/20/2015	3.87	0.005	0.00043	0.00243	0.0111	0.00005	2.5E-05	0.16	7.4E-06	46.1	0.00025	0.0002	0.00314	0.015	2.5E-05	0.0022	8.61	0.428	0.0355	0.00025	0.698	0.00357	8.82	5E-06	7.03	0.21	5E-06	0.00005	0.005	0.00057	0.00373	0.0015		0.000399627	2.305	0.82559	0.358173721	202.703		2015
Bi-annual Seep Sampling	PAG Dump Seep 14	23-10-2014 11:13	10/23/2014	14.7	0.014	0.00011	0.00055	0.0955	0.00005	0.00025	0.06	3.7E-05	179	0.00025	0.00131	0.0116	0.114	2.5E-05	0.00025	34.8	3.15	0.0201	0.00077	2.66	0.0148	7.76	5E-06	11.3	0.831	5E-06	0.00005	0.017	0.00163	0.0005	0.0015		0.000135366	8.95	2.58866	0.289236201	40.5405		2014
Bi-annual Seep Sampling	PAG Dump Seep 14	20-05-2015 13:16	5/20/2015	9.04	0.0043	0.00015	0.00041	0.1	0.00005	2.5E-05	0.068	1E-05	263	0.00025	0.00017	0.00683	0.015	2.5E-05	0.0005	48.1	0.463	0.0297	0.00025	2.92	0.0414	6.99	5E-06	16.4	1.23	5E-06	0.00005	0.005	0.00267	0.00025	0.0015		0.000191963	13.15	3.59258	0.2732	148.515		2015
Bi-annual Seep Sampling	PAG Dump Seep 14	24-11-2015 14:48	11/24/2015	7.57	0.0034	0.00012	0.00049	0.109	0.00005	2.5E-05	0.064	2.5E-06	298	0.00025	0.00005	0.00482	0.015	2.5E-05	0.0005	55.9	0.243	0.0475	0.00025	2.98	0.0385	7.31	5E-06	17.8	1.18	5E-06	0.00005	0.02	0.00274	0.00054	0.0015		0.000156929	14.9	4.1098	0.275825404	600		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	9/12/2014	9/12/2014	14.6	0.016	0.00034	0.00057	0.101	0.00005	0.00025	0.039	0.00011	208	0.00025	0.00564	0.0104	0.05	2.5E-05	0.00185	39	2.16	0.0803	0.00105	4	0.0684	5.86	5E-06	15.7	1.01	5E-06	0.00005	0.024	0.00093	0.0005	0.0044		0.000384991	10.4	3.05923	0.294156277	40.367		2014
Bi-annual Seep Sampling	PAG Dump Seep 15	23-10-2014 11:56	10/23/2014	67.9	0.0307	0.00028	0.00106	0.139	0.00005	0.00025	0.04	5.9E-05	213	0.00025	0.0165	0.00994	0.738	2.5E-05	0.00116	43.8	7.83	0.0288	0.00155	6.91	0.0202	8.09	2.1E-05	13.9	1.19	5E-06	0.00005	0.02	0.00158	0.0012	0.0049		0.000155385	10.65	3.33546	0.31318903	83.0508		2014
Bi-annual Seep Sampling	PAG Dump Seep 15	1/9/2015	1/9/2015	15.3	0.0147	0.00033	0.00054	0.0985	0.00005	2.5E-05	0.051	5.5E-05	322	0.00025	0.00524	0.00783	0.085	2.5E-05	0.0026	55.6	1.71	0.119	0.00077	4.69	0.0818	7.09	5E-06	24.5	1.41	5E-06	0.00005	0.005	0.00161	0.00025	0.0015		0.000304845	16.1	4.42746	0.274997286	27.4725		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	2/2/2015	2/2/2015	18.9	0.0093	0.0003	0.00053	0.133	0.0001	0.0005	0.048	0.00012	299	0.00025	0.00711	0.0102	0.033	0.00005	0.0015	56.1	2.63	0.0866	0.0012	4.98	0.123	7.06	0.00001	23.2	1.38	0.00001	0.0001	0.01	0.00097	0.001	0.0052		0.000478599	14.95	4.40752	0.294817725	45.2174		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	2/6/2015	2/6/2015	14.8	0.0062	0.00033	0.0005	0.103	0.00005	2.5E-05	0.051	7.4E-05	300	0.00025	0.00504	0.00821	0.015	2.5E-05	0.0018	53.2	2.13	0.101	0.00089	4.78	0.0856	7.46	5E-06	23.2	1.25	5E-06	0.00005	0.005	0.00152	0.00025	0.0015		0.000337451	15	4.2333	0.282220038	20.1884		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	3/3/2015	3/3/2015	15	0.0061	0.0003	0.00044	0.127	0.0001	0.0005	0.044	0.00014	325	0.00025	0.00361	0.00925	0.015	0.00005	0.0022	57.2	1.98	0.103	0.0011	4.99	0.127	6.82	0.00001	26	1.42	0.00001	0.0001	0.02	0.00101	0.001	0.0042		0.000456835	16.25	4.59366	0.282686798	29.5775		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	5/5/2015	5/5/2015	19.3	0.0103	0.00035	0.00056	0.108	0.00005	2.5E-05	0.056	9.6E-05	278	0.00025	0.00674	0.00857	0.089	2.5E-05	0.0023	51.5	2.66	0.0909	0.00109	4.88	0.0926	7.79	5E-06	23.5	1.17	5E-06	0.00005	0.005	0.00124	0.00025	0.0034		0.000395164	13.9	4.14978	0.298545524	35.4906		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	6/1/2015	6/1/2015	24.6	0.0104	0.00031	0.00065	0.144	0.00005	0.00025	0.045	0.00012	283	0.00025	0.00962	0.0113	0.035	2.5E-05	0.00206	53.4	3.92	0.0711	0.00141	5.54	0.093	7.03	5E-06	23.8	1.29	5E-06	0.00005	0.005	0.00095	0.0005	0.0031		0.000409091	14.15	4.29054	0.303218128	26.0504		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	6/8/2015	6/8/2015	14.6	0.0095	0.00036	0.0005	0.105	0.0001	0.00005	0.052	7.4E-05	325	0.00025	0.00667	0.00848	0.038	0.00005	0.0029	55.3	1.89	0.109	0.0005	4.74	0.0965	7.07	0.00001	24.6	1.44	0.00001	0.0001	0.005	0.00159	0.0005	0.0015		0.00035219	16.25	4.41559	0.271728829	20.2703		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	7/7/2015	7/7/2015	14	0.0166	0.00035	0.00061	0.108	0.0001	0.00005	0.049	7.2E-05	309	0.00025	0.00521	0.00854	0.095	0.00005	0.001	51.9	2.06	0.103	0.0005	5.09	0.0758	7.18	0.00001	24.1	1.3	0.00001	0.0001	0.005	0.00155	0.0005	0.0015		0.000301592	15.45	4.20458	0.272140969	20.8333		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	8/4/2015	8/4/2015	14.1	0.0071	0.00033	0.00048	0.12	0.0001	0.00005	0.053	9.5E-05	338	0.00025	0.00496	0.00901	0.049	0.00005	0.0027	60.1	1.9	0.119	0.001	4.77	0.122	7.35	0.00001	27.3	1.41	0.00001	0.0001	0.022	0.00105	0.0005	0.0043		0.000424102	16.9	4.81364	0.284830615	45.2632		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	29-10-2015 12:55	10/29/2015	18.9	0.0097	0.00033	0.00053	0.0861	0.00005	2.5E-05	0.057	3E-05	295	0.00025	0.00457	0.00796	0.034	2.5E-05	0.0021	52.4	1.9	0.107	0.0007	4.8	0.0558	7.71	5E-06	24.5	1.29	5E-06	0.00005	0.012	0.00159	0.00025	0.0015		0.000236775	14.75	4.24369	0.287707654	50.3356		2015
Bi-annual Seep Sampling	PAG Dump Seep 15	24-11-2015 13:05	11/24/2015	8.93	0.0054	0.00036	0.00048	0.0811	0.00005	2.5E-05	0.049	1.6E-05	338	0.00025	0.00076	0.00857	0.015	2.5E-05	0.0023	60.3	0.277	0.118	0.00025	4.03	0.0864	7.65	5E-06	25.2	1.26	5E-06	0.00005	0.019	0.00168	0.00055	0.0015		0.000312289	16.9	4.71502	0.278995295	92.5926		2015
Bi-annual Seep Sampling	PAG Dump Seep 2	30-05-2013 9:56	5/30/2013	62.4	0.0117	0.00029	0.00077	0.192	0.0001	0.0005	0.058	0.00015	363	0.00025	0.021	0.00555	0.171	0.00005	0.0042	67.5	8.91	0.294	0.0017	9.79	0.265	6.57	0.00001	23.4	1.38	0.00001	0.0001	0.005	0.00227	0.001	0.0283		0.000970696	18.15	5.20428	0.286737025	188.667		2013
Bi-annual Seep Sampling	PAG Dump Seep 3	30-05-2013 10:08	5/30/2013	9.26	0.007	0.00005	0.00033	0.0963	0.00005	0.00025	0.015	0.00022	180	0.00025	0.00481	0.00707	0.041	2.5E-05	0.00025	36.5	6.11	0.0021	0.00062	2.75	0.0351	7.32	5E-06	9.02	0.713	5E-06	0.00005	0.005	6.4E-05	0.0005	0.0062		0.00022452	9	2.59097	0.28788518	28.4404		2013
Bi-annual Seep Sampling	PAG Dump Seep 3	29-05-2014 10:52	5/29/2014	5.04	0.003	0.00005	0.00016	0.063	0.00005	0.00025	0.023	1.2E-05	207	0.00025	0.00005	0.00371	0.015	2.5E-05	0.00025	39.1	0.00019	0.00018	0.00025	1.87	0.0676	5.8	5E-06	12.7	0.896	5E-06	0.00005	0.005	0.00001	0.0005	0.0015		0.000355789	10.35	2.88001	0.278261451	125		2014
Bi-annual Seep Sampling	PAG Dump Seep 4	30-05-2013 11:03	5/30/2013	13.3	0.427	0.0004	0.00074	0.0521	0.00005	0.00025	0.041	0.0005	258	0.00059	0.00108	0.0252	0.6	0.0002	0.00144	44.8	1.17	0.044	0.00121	3.04	0.149	8.17	3.9E-05	16.4	0.98	5E-06	0.00005	0.031	0.00152	0.0024	0.0063		0.000878193	12.9	3.40324	0.263816829	12.6506		2013
Bi-annual Seep Sampling	PAG Dump Seep 4	29-05-2014 11:11	5/29/2014	10.9	0.007	0.00031	0.00067	0.0849	0.0001	0.0005	0.057	0.00015	418	0.00025	0.00147	0.017	0.015	0.00005	0.0025	76.5	1.56	0.256	0.0005	4.69	0.242	5.99	0.00001	29.3	1.53	0.00001	0.0001	0.01	0.00195	0.001	0.0034		0.000636842	20.9	5.85481	0.280134491	22.6667		2014
Bi-annual Seep Sampling	PAG Dump Seep 4	14-05-2015 13:57	5/14/2015	7.81	0.0015	0.0001	0.00044	0.0465	0.0001	0.00005	0.052	0.00035	392	0.00025	0.0001	0.0101	0.015	0.00005	0.001	68.1	0.0458	0.204	0.0005	3.15	0.244	6.36	0.00001	28.2	1.29	0.00001	0.0001	0.005	0.00154	0.0005	0.004		0.000763295	19.6	5.2777	0.269270493	11.5607		2015
Bi-annual Seep Sampling	PAG Dump Seep 5	29-05-2014 10:40	5/29/2014	10.7	0.0046	0.00034	0.00047	0.135	0.0001	0.0005	0.067	0.00015	346	0.00025	0.00478	0.00937	0.015	0.00005	0.003	59.8	2.87	0.226	0.0005	6.24	0.172	6.85	0.00001	30.4	1.41	0.00001	0.0001	0.005	0.00143	0.001	0.008		0.000568908	17.3	4.96862	0.287203445	53.3333		2014
Bi-annual Seep Sampling	PAG Dump Seep 5	23-10-2014 10:50	10/23/2014	11.1	0.0075	0.00037	0.00057	0.089	0.0001	0.0005	0.062	0.00017	336	0.00025	0.00297	0.0212	0.29	0.00005	0.0037	55.8	2.13	0.185	0.0005	4.87	0.126	7	0.00001	29.3	1.32	0.00001	0.0001	0.023	0.00161	0.001	0.0041		0.000474279	16.8	4.65243	0.276930307	24.1176		2014
Bi-annual Seep Sampling	PAG Dump Seep 5	14-05-2015 14:22	5/14/2015	10.9	0.0062	0.00033	0.00051	0.0952	0.0001	0.00005	0.083	0.00035	427	0.00025	0.00499	0.0157	0.015	0.00013	0.0031	70.5	4.57	0.585	0.0011	5.64	0.216	6.24	0.00001	43.7	1.51	0.00001	0.0001	0.005	0.00179	0.0005	0.0086		0.000589091	21.35	6.1554	0.288309253	24.5014		2015
Bi-annual Seep Sampling	PAG Dump Seep 5	24-11-2015 12:38	11/24/2015	10	0.005	0.0001	0.0004	0.0484	0.0001	0.00005	0.073	0.00005	432	0.00025	0.0015	0.0101	0.015	0.00005	0.0031	75	1.93	0.316	0.0005	5.12	0.101	7.18	0.00001	34.8	1.28	0.00001	0.0001	0.019	0.00261	0.0005	0.0042		0.000285849	21.6	6.0175	0.278588119	84		2015
Bi-annual Seep Sampling	PAG Dump Seep 7	29-05-2014 9:01	5/29/2014	30.2	0.0668	0.00005	0.0028	0.0429	0.00005	0.00025	0.014	2.7E-05	60.7	0.00025	0.00625	0.007	1.85	0.00007	0.00114	14.9	2.42	0.0029	0.00211	3.55	0.00052	7.52	0.00002	4.72	0.267	5E-06	0.00005	0.005	0.00016	0.0033	0.0015		0.000075	3.035	1.16505	0.38387074	55.5556		2014
Bi-annual Seep Sampling	PAG Dump Seep 7	23-10-2014 11:16	10/23/2014	107	0.0718	0.00016	0.00166	0.169	0.00005	0.00025	0.019	0.00003	171	0.00025	0.0265	0.00847	9.57	0.00005	0.00201	38.7	8.76	0.00934	0.00322	8.99	0.0203	9.36	4.4E-05	8.88	0.824	5E-06	0.00005	0.019	0.00087	0.004	0.0015		0.00030603	8.55	2.87316	0.336042052	50		2014
Bi-annual Seep Sampling	PAG Dump Seep 7	20-05-2015 12:27	5/20/2015	19.9	0.0015	0.00005	0.00082	0.0633	0.00005	2.5E-05	0.019	6E-06	176	0.00025	0.00011	0.00783	0.015	2.5E-05	0.0005	43.8	0.00669	0.00192	0.0008	4.97	0.00279	6.69	5E-06	11.3	0.798	5E-06	0.00005	0.005	0.00034	0.00025	0.0015		2.3711E-05	8.8	3.17268	0.360531376	250		2015
Bi-annual Seep Sampling	PAG Dump Seep 7	24-11-2015 12:48	11/24/2015	17.9	0.0067	0.00005	0.00079	0.0891	0.00005	2.5E-05	0.005	2.5E-06	200	0.00025	0.0021	0.00111	0.062	2.5E-05	0.0005	55	5.51	0.00061	0.00025	4.75	0.0006	8.34	5E-06	10.6	0.726	5E-06	0.00005	0.019	0.00015	0.00025	0.0015		4.78877E-06	10	3.78966	0.378966152	600		2015
Bi-annual Seep Sampling	PAG Dump Seep 8	29-05-2014 9:20	5/29/2014	11	0.0048	0.0005	0.00061	0.0801	0.00005	0.00025	0.218	5E-06	123	0.00025	0.00005	0.0047	0.015	2.5E-05	0.00194	22	0.00084	0.0346	0.00025	2.81	0.113	6.02	5E-06	21.3	0.703	5E-06	0.00005	0.005	0.00106	0.0005	0.0015		0.001822581	6.15	2.28094	0.370884077	300		2014
Bi-annual Seep Sampling	PAG Dump Seep 8	23-10-2014 12:15	10/23/2014	24.3	0.043	0.00017	0.00129	0.0796	0.00005	0.00025	0.383	5.3E-05	116	0.00025	0.0102	0.00551	1.8	2.5E-05	0.00149	22.4	3.82	0.0518	0.00063	3.62	0.0414	7.79	1.5E-05	23.2	0.719	5E-06	0.00005	0.013	0.00131	0.0012	0.0062		0.000633673	5.8	2.40764	0.415110106	116.981		2014
Bi-annual Seep Sampling	PAG Dump Seep 8	20-05-2015 12:44	5/20/2015	14.7	0.0046	0.0001	0.00053	0.0663	0.00005	2.5E-05	0.261	4.8E-05	164	0.00025	0.00133	0.00571	0.055	6.5E-05	0.0005	31.1	3.47	0.0507	0.00103	3.84	0.00884	7.48	5E-06	24	0.88	5E-06	0.00005	0.005	0.00095	0.00025	0.0015		8.81063E-05	8.2	2.95535	0.360408644	31.4465		2015
Bi-annual Seep Sampling	SERDS Seep 1	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	SERDS Seep 10	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	SERDS Seep 11	6/6/2013	6/6/2013	13.4	0.0247	0.00005	0.001	0.106	0.00005	0.00025	0.069	0.0001	169	0.00025	0.00605	0.00087	0.944	2.5E-05	0.00025	29.1	4.08	0.375	0.0018	3.74	0.00025	3.89	5E-06	24.6	7.4	5E-06	0.00005	0.013	3.1E-05	0.0005	0.0035		1.43678E-06	8.45	2.86226	0.33872848	35		2013
Bi-annual Seep Sampling	SERDS Seep 11	3/6/2014	3/6/2014	7.88	0.0015	0.0009	0.00071	0.074	0.0001	0.0005	0.24	0.00015	455	0.00025	0.00103	0.00581	0.035	0.00005	0.0195	87.9	0.696	0.66	0.0005	3.49	0.127	3.86	0.00001	39.1	14.9	0.00001	0.0001	0.005	0.0044	0.001	0.0015		0.000280147	22.75	6.91485	0.303949521	10		2014
Bi-annual Seep Sampling	SERDS Seep 11	25-05-2015 12:41	5/25/2015	10.5	0.0182	0.00078	0.00055	0.0892	0.0001	0.00005	0.208	7.9E-05	499	0.00025	0.00145	0.00652	0.015	0.00005	0.0135	92.8	1.2	0.493	0.0011	4.33	0.124	4.14	0.00001	39.6	15.8	0.00001	0.0001	0.005	0.00255	0.0005	0.0052		0.000248	24.95	7.24384	0.290334408	65.8228		2015
Bi-annual Seep Sampling	SERDS Seep 12	6/6/2013	6/6/2013	9.39	0.0079	0.0008	0.00053	0.0704	0.0001	0.0005	0.181	0.0001	366	0.00025	0.00096	0.00607	0.015	0.00005	0.011	72.3	0.428	0.595	0.0005	3.81	0.0608	4.36	0.00001	37	11.3	0.00001	0.0001	0.005	0.00372	0.001	0.0015		0.000155897	18.3	5.92213	0.323613738	15		2013
Bi-annual Seep Sampling	SERDS Seep 12	3/6/2014	3/6/2014	4.41	0.0042	0.00076	0.0009	0.0403	0.00005	0.00025	0.062	0.0001	287	0.00025	0.00024	0.00855	0.015	2.5E-05	0.00395	47.6	0.0717	0.157	0.00066	1.76	0.0411	7.19	5E-06	16.8	2.43	5E-06	0.00005	0.005	0.00311	0.0005	0.0015		0.000167073	14.35	3.55107	0.247461546	15		2014
Bi-annual Seep Sampling	SERDS Seep 13	6/6/2013	6/6/2013	6.24	0.0045	0.00061	0.00062	0.0458	0.00005	0.00025	0.068	0.00005	251	0.00025	0.00024	0.00975	0.015	2.5E-05	0.00246	48	0.0649	0.149	0.0006	1.97	0.0375	6.51	5E-06	17.5	2.52	5E-06	0.00005	0.005	0.00223	0.0005	0.0015		0.000156685	12.55	3.61022	0.28766663	30		2013
Bi-annual Seep Sampling	SERDS Seep 13	3/6/2014	3/6/2014	4.4	0.0037	0.00061	0.00067	0.0429	0.00005	0.00025	0.067	0.00005	283	0.00025	0.0002	0.00995	0.015	2.5E-05	0.00368	49.9	0.0477	0.15	0.00073	1.86	0.0439	6.88	5E-06	17	2.59	5E-06	0.00005	0.005	0.00252	0.0005	0.0015		0.000173747	14.15	3.69644	0.261232773	30		2014
Bi-annual Seep Sampling	SERDS Seep 13	27-10-2014 10:42	10/27/2014	4.86	0.0032	0.00055	0.00071	0.0412	0.00005	0.00025	0.064	3.2E-05	282	0.00025	0.00014	0.00888	0.015	2.5E-05	0.00359	48.7	0.0414	0.123	0.00025	1.8	0.0497	7.41	5E-06	16	2.29	5E-06	0.00005	0.025	0.00249	0.0005	0.0015		0.00020824	14.1	3.58146	0.254003983	46.875		2014
Bi-annual Seep Sampling	SERDS Seep 13	13-01-2015 10:51	1/13/2015	4.99	0.0036	0.00054	0.00074	0.0445	0.0001	0.0005	0.075	3.2E-05	312	0.00025	0.0001	0.0099	0.015	0.00005	0.0025	56.3	0.0287	0.139	0.0005	1.89	0.0408	7.14	0.00001	17.9	2.81	0.00001	0.0001	0.019	0.00296	0.001	0.0015		0.000148544	15.6	4.10952	0.263430849	46.875		2015
Bi-annual Seep Sampling	SERDS Seep 13	2/9/2015	2/9/2015	4.61	0.0015	0.00047	0.00059	0.0441	0.00005	2.5E-05	0.08	3.4E-05	305	0.00025	0.00005	0.00911	0.015	2.5E-05	0.0036	51.7	0.0244	0.104	0.00025	1.75	0.0288	7.82	5E-06	16.5	2.35	5E-06	0.00005	0.005	0.00276	0.00025	0.0015		0.000115973	15.25	3.77684	0.247661663	44.1176		2015
Bi-annual Seep Sampling	SERDS Seep 13	4/6/2015	4/6/2015	4.45	0.0036	0.00055	0.00069	0.0429	0.0001	0.00005	0.072	0.00004	308	0.00025	0.0001	0.00874	0.015	0.00005	0.0033	53	0.0214	0.112	0.0005	1.79	0.0334	7.46	0.00001	16.7	2.45	0.00001	0.0001	0.01	0.00286	0.0005	0.0015		0.000129457	15.4	3.86236	0.250802818	37.5		2015
Bi-annual Seep Sampling	SERDS Seep 13	5/2/2015	5/2/2015	5.22	0.0015	0.00054	0.0007	0.0445	0.0001	0.0005	0.078	4.1E-05	312	0.00025	0.0001	0.00967	0.015	0.00005	0.0037	56.6	0.0301	0.148	0.0005	1.83	0.0395	7.33	0.00001	18.8	3.02	0.00001	0.0001	0.015	0.00284	0.001	0.0015		0.000144689	15.6	4.16461	0.266961918	36.5854		2015
Bi-annual Seep Sampling	SERDS Seep 13	5/3/2015	5/3/2015	4.93	0.0033	0.00058	0.00071	0.0423	0.00005	0.00025	0.072	4.5E-05	321	0.00025	0.00005	0.00921	0.015	2.5E-05	0.00395	52.9	0.0351	0.161	0.00025	1.87	0.04	7.13	5E-06	18.3	3.08	5E-06	0.00005	0.013	0.00295	0.0005	0.0015		0.000145278	16.05	3.92815	0.244744486	33.3333		2015
Bi-annual Seep Sampling	SERDS Seep 13	6/5/2015	6/5/2015	4.62	0.0038	0.00058	0.00073	0.0431	0.0001	0.00005	0.069	3.2E-05	325	0.00025	0.0001	0.0092	0.015	0.00005	0.0032	54.6	0.0201	0.124	0.0005	1.84	0.0386	7.5	0.00001	16.9	2.55	0.00001	0.0001	0.005	0.00293	0.0005	0.0015		0.000142086	16.25	3.96564	0.244039112	46.875		2015
Bi-annual Seep Sampling	SERDS Seep 13	7/7/2015	7/7/2015	4.42	0.0037	0.00051	0.00056	0.0442	0.0001	0.00005	0.072	2.9E-05	303	0.00025	0.0001	0.00935	0.015	0.00005	0.001	51.4	0.0389	0.107	0.0005	1.95	0.0277	7.44	0.00001	16.7	2.39	0.00001	0.0001	0.005	0.00272	0.0005	0.0015		0.000108912	15.15	3.77317	0.249054225	51.7241		2015
Bi-annual Seep Sampling	SERDS Seep 13	18-08-2015 13:01	8/18/2015	4.42	0.0032	0.00047	0.00056	0.0421	0.00005	2.5E-05	0.072	2.5E-05	287	0.00025	0.00005	0.00896	0.015	2.5E-05	0.0025	51	0.0264	0.101	0.00025	1.76	0.0286	7.61	5E-06	16.2	2.18	5E-06	0.00005	0.005	0.00267	0.00025	0.0015		0.000112746	14.35	3.72324	0.259459022	60		2015
Bi-annual Seep Sampling	SERDS Seep 13	9/4/2015	9/4/2015	4.7	0.0072	0.0006	0.00072	0.0448	0.0001	0.00005	0.062	0.00004	321	0.00025	0.0001	0.00972	0.015	0.00005	0.004	53.7	0.0282	0.125	0.0005	1.95	0.0447	7.43	0.00001	18.4	2.56	0.00001	0.00039	0.02	0.00294	0.0005	0.0015		0.000157951	16.05	3.9812	0.248049554	37.5		2015
Bi-annual Seep Sampling	SERDS Seep 13	29-10-2015 10:30	10/29/2015	3.92	0.0015	0.0004	0.00061	0.04	0.00005	2.5E-05	0.081	3.1E-05	290	0.00025	0.00005	0.00943	0.015	2.5E-05	0.0027	50.8	0.0144	0.0941	0.00054	1.67	0.0361	8.06	5E-06	15.5	2.19	5E-06	0.00005	0.005	0.00248	0.00025	0.0015		0.000149586	14.5	3.67883	0.253712599	48.8599		2015
Bi-annual Seep Sampling	SERDS Seep 13	11/11/2015	11/11/2015	4.4	0.0031	0.00044	0.0005	0.0408	0.00005	2.5E-05	0.077	3.2E-05	274	0.00025	0.00005	0.00971	0.015	2.5E-05	0.0032	50.9	0.0214	0.0935	0.00025	1.73	0.038	7.56	5E-06	15.5	2.12	5E-06	0.00005	0.013	0.00241	0.00025	0.0015		0.000159218	13.7	3.6862	0.269065843	47.619		2015
Bi-annual Seep Sampling	SERDS Seep 14	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	SERDS Seep 14	25-05-2015 14:01	5/25/2015	8.18	0.0053	0.00038	0.00031	0.0414	0.0001	0.00005	0.088	0.00003	367	0.00025	0.0001	0.00214	0.015	0.00005	0.0055	62.1	0.282	0.217	0.0005	3.18	0.0399	3.88	0.00001	31	8.86	0.00001	0.0001	0.005	0.00117	0.0005	0.0015		0.000102308	18.35	5.05036	0.275223749	50		2015
Bi-annual Seep Sampling	SERDS Seep 15	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	SERDS Seep 16	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	SERDS Seep 17	6/6/2013	6/6/2013	9.08	0.0067	0.00005	0.00021	0.0622	0.00005	0.00025	0.096	3.5E-05	220	0.00025	0.00005	0.007	0.015	2.5E-05	0.00025	43.2	0.00605	0.0783	0.00025	2.11	0.0549	5.57	5E-06	17.4	2.81	5E-06	0.00005	0.005	0.00013	0.0005	0.0036		0.00023835	11	3.32957	0.302688613	102.857		2013
Bi-annual Seep Sampling	SERDS Seep 17	3/6/2014	3/6/2014	7.1	0.0065	0.00005	0.00022	0.0603	0.00005	0.00025	0.078	0.00005	223	0.00025	0.00005	0.00757	0.015	2.5E-05	0.00025	41.9	0.0112	0.086	0.00025	2.13	0.037	5.73	5E-06	17.6	2.97	5E-06	0.00005	0.005	0.00016	0.0005	0.0034		0.00016087	11.15	3.26298	0.292644077	68		2014
Bi-annual Seep Sampling	SERDS Seep 18	27-10-2014 10:12	10/27/2014	4.53	0.0036	0.00135	0.00223	0.0412	0.00005	0.00025	0.036	4.8E-05	208	0.00025	0.00015	0.0122	0.015	2.5E-05	0.00443	40.5	0.0217	0.309	0.00025	1.95	0.0585	4.52	5E-06	15.7	5.67	5E-06	0.00005	0.019	0.0023	0.0005	0.0015		0.000320255	10.4	3.09412	0.297511993	31.25		2014
Bi-annual Seep Sampling	SERDS Seep 18	25-05-2015 12:23	5/25/2015	7.41	0.0061	0.00073	0.00102	0.061	0.0001	0.00005	0.045	8.7E-05	386	0.00025	0.0001	0.0128	0.015	0.00005	0.0055	77.1	0.0374	0.298	0.0005	2.71	0.102	5.46	0.00001	23.5	7.08	0.00001	0.0001	0.005	0.00221	0.0005	0.0015		0.000291429	19.3	5.58685	0.289474256	17.2414		2015
Bi-annual Seep Sampling	SERDS Seep 19	27-10-2014 10:35	10/27/2014	13.9	0.0236	0.0006	0.00055	0.069	0.00005	0.00025	0.03	0.00012	256	0.00025	0.00264	0.0175	0.115	2.5E-05	0.00169	50.8	1.72	0.112	0.00099	3.26	0.102	4.77	5E-06	17.1	3.62	5E-06	0.00005	0.022	0.00102	0.0005	0.0015		0.000473684	12.8	3.78917	0.296028682	12.2951		2014
Bi-annual Seep Sampling	SERDS Seep 19	25-05-2015 12:38	5/25/2015	10.4	0.0099	0.00051	0.00073	0.0596	0.0001	0.00005	0.048	0.00019	518	0.00025	0.00195	0.0177	0.015	0.00005	0.0032	104	1.09	0.11	0.0012	3.35	0.228	5.23	0.00001	25.5	4.55	0.00001	0.0001	0.005	0.00192	0.0005	0.0038		0.000510448	25.9	7.25873	0.280259963	19.8953		2015
Bi-annual Seep Sampling	SERDS Seep 19	11/11/2015	11/11/2015	13.9	0.0155	0.00036	0.00051	0.0768	0.0001	0.00005	0.045	0.00011	495	0.00025	0.00212	0.0196	0.058	0.00005	0.0027	95.2	1.21	0.0705	0.0005	4.15	0.195	5.02	0.00001	25.9	6.05	0.00001	0.0001	0.014	0.00146	0.0005	0.0015		0.0005	24.75	6.78352	0.27408152	13.2743		2015
Bi-annual Seep Sampling	SERDS Seep 2	6/6/2013	6/6/2013	32.5	0.0392	0.00051	0.00194	0.0862	0.00005	0.00025	0.087	0.0001	267	0.00025	0.00064	0.0271	0.086	2.5E-05	0.0103	67.6	0.847	0.225	0.00103	6.84	0.0188	5.86	0.00001	25.5	7.43	5E-06	0.00005	0.014	0.003	0.0005	0.0015		6.85298E-05	13.35	5.22577	0.391443538	15		2013
Bi-annual Seep Sampling	SERDS Seep 2	3/6/2014	3/6/2014	6.03	0.009	0.00095	0.00097	0.0529	0.00005	0.00025	0.036	0.0001	288	0.00025	0.00105	0.0139	0.015	2.5E-05	0.00355	54.7	0.437	0.218	0.00065	2.25	0.0964	5.57	5E-06	18.5	5.15	5E-06	0.00005	0.005	0.00197	0.0005	0.0038		0.000382034	14.4	4.05154	0.281357257	38		2014
Bi-annual Seep Sampling	SERDS Seep 20	25-05-2015 13:10	5/25/2015	12.5	0.0095	0.0004	0.00064	0.0864	0.0001	0.00005	0.057	0.00028	509	0.00025	0.00533	0.0579	0.032	0.00005	0.003	95.1	2.07	0.0769	0.0015	3.76	0.296	5.47	0.00001	26.9	4.54	0.00001	0.0001	0.005	0.00295	0.0005	0.0052		0.000721951	25.45	6.81116	0.267629272	18.3099		2015
Bi-annual Seep Sampling	SERDS Seep 21	25-05-2015 13:04	5/25/2015	11.2	0.0085	0.00056	0.00087	0.0927	0.0001	0.00005	0.063	0.00019	438	0.00025	0.00336	0.0271	0.051	0.00005	0.0059	78.7	1.65	0.161	0.0011	4.37	0.215	5.58	0.00001	27.5	4.74	0.00001	0.0001	0.005	0.00412	0.0005	0.0079		0.000591743	21.9	5.89662	0.269252271	41.7989		2015

Location Type	Sample Point	Original Date As Is	Recoded Date	Location	Source Term Group	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Q (m3/s)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Alkalinity (CaCO3) (mg/L)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Total Nitrogen (mg/L)
							µs/cm	su	m3/s	C	ntu	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	SERDS Seep 21	11/11/2015	11/11/2015	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2420	1330	7.95	2100	5	1.48	105	0.0112	-10	-0.4	96.9	97	0.098	0.0325	0.0357	0.0557	985	98.3
Bi-annual Seep Sampling	SERDS Seep 3	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken (will have TSS due to shallow sampling enviro). Multiple seeps adjacent that are not samplable (likely all the same source).	1663	7.4	0.001	15.6	#N/A	1670	939	7.81	1540	272	134	57.8	0.0196	-5	-0.2	5.88	5.88	-0.01	-0.001	0.014	0.521	974	7.71
Bi-annual Seep Sampling	SERDS Seep 3	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2400	1430	7.79	2170	17.7	5.34	70.7	0.185	11	-0.4	88.5	89.7	1.24	0.0098	0.0197	0.0501	1130	83
Bi-annual Seep Sampling	SERDS Seep 4	6/6/2013	6/6/2013	South East	All Non-PAG	Not sampled - water chemistry expected to be the sample as seeps 2 and 3.	1633	7.5	0.003	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 4	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1760	988	7.92	1510	15.7	4.89	67.8	0.181	5.8	-0.2	53.4	54	0.584	0.0195	0.0281	0.036	786	51.8
Bi-annual Seep Sampling	SERDS Seep 5	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken. Comes out of dump toe in a few places, feeds into major pooling. Stinky (organic matter in pools).	2025	7.5	0.003	9.1	#N/A	2010	1170	8	1820	9	7.95	112	0.0769	-10	-0.4	5.98	6.01	0.028	0.0186	0.0357	0.0597	1210	6.14
Bi-annual Seep Sampling	SERDS Seep 5	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2190	1330	8.07	2030	14.8	6.41	106	0.0644	13	-0.4	55.1	55.5	0.337	0.0137	0.0243	0.044	1110	52.1
Bi-annual Seep Sampling	SERDS Seep 6	6/6/2013	6/6/2013	South East	All Non-PAG	No sample taken (virtually stagnant). Second similar seep ~5 m north - similar conditions.	1317	8.2	0.001	10.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 7	6/6/2013	6/6/2013	South East	All Non-PAG	Sample taken. Comes out of dump toe in a few places (likely same source).	1613	7.9	0.01	7	#N/A	1570	902	8.01	1240	31.8	15.9	104	0.0709	-5	0.25	12.5	12.6	0.063	0.0674	0.0879	0.133	828	12.2
Bi-annual Seep Sampling	SERDS Seep 8	6/6/2013	6/6/2013	South East	All Non-PAG	No sample (water chemistry expected to be similary to seep 7).	1324	7.9	0.005	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 8	3/6/2014	3/6/2014	South East	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1630	901	7.92	1390	6.7	2.35	70.9	0.0713	-5	-0.2	45.8	46	0.168	0.0354	0.0461	0.058	737	43.5
Bi-annual Seep Sampling	SERDS Seep 9	6/6/2013	6/6/2013	South East	All Non-PAG	No sample taken. No flow but ground saturated.	1417	7.6	0	11.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-06-2014 8:47	6/26/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	440	237	8.3	315	16.3	8.09	198	-0.005	-0.5	0.132	-0.005	-0.0051	-0.001	0.0012	0.0066	0.0766	51.9	0.351
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-05-2015 11:10	5/26/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	896	462	8.1	684	221	7.54	94.9	0.0109	1.1	0.114	6.21	6.22	0.01	0.0076	0.0097	0.465	371	6.24
Bi-annual Seep Sampling	TSF Haul Road Seep 11	30-07-2013 13:52	7/30/2013	TSF Haul Road	All Non-PAG	Full suite sample taken.	734	7.4	0.002	8.7	#N/A	658	315	7.41	542	98.5	39.2	59.2	-0.005	3.71	0.087	35	35	0.0081	0.0127	0.0159	0.233	148	35
Bi-annual Seep Sampling	TSF Haul Road Seep 11	26-11-2013 11:06	11/26/2013	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	555	264	7.35	413	14.9	11	58.9	-0.005	3.1	0.095	19.9	19.9	0.0021	0.0105	0.0131	0.0452	132	19
Bi-annual Seep Sampling	TSF Haul Road Seep 12	30-07-2013 14:05	7/30/2013	TSF Haul Road	All Non-PAG	Not sampled.	650	8	0.002	7.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 12	26-06-2014 10:45	6/26/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1480	757	7.98	1160	4.9	1.18	96.6	0.0352	6.1	-0.2	60.7	60.8	0.106	0.0011	0.0066	0.0538	533	54.8
Bi-annual Seep Sampling	TSF Haul Road Seep 12	11/5/2015	11/5/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1030	557	8.14	754	13.4	3.53	90	0.021	-2.5	0.12	21.4	21.4	0.0414	0.0098	0.0148	0.0495	397	20.5
Bi-annual Seep Sampling	TSF Haul Road Seep 14	26-05-2015 11:28	5/26/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	629	311	8.02	425	3.4	0.73	80.8	0.0115	-0.5	0.28	4.59	4.59	0.0068	-0.001	0.0035	0.0375	226	4.79
Bi-annual Seep Sampling	TSF Haul Road Seep 15	26-06-2014 9:30	6/26/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2160	1250	8.11	1590	4.7	0.75	122	0.0159	-10	-0.4	55.2	55.2	0.059	-0.001	0.0059	0.0146	1080	50.6
Bi-annual Seep Sampling	TSF Haul Road Seep 16	30-09-2014 12:56	9/30/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1930	1110	7.68	1630	17.9	10.8	84	0.052	-10	-0.4	49.2	49.3	0.077	0.0278	0.0398	0.0939	933	45
Bi-annual Seep Sampling	TSF Haul Road Seep 16	11/5/2015	11/5/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1640	936	8.04	1370	24.8	5.66	93.2	-0.005	-5	-0.2	46.1	46.1	-0.01	0.0259	0.0306	0.116	714	44.5
Bi-annual Seep Sampling	TSF Haul Road Seep 16	26-05-2015 12:10	5/26/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1900	1070	7.81	1710	14.6	4.15	65.7	0.0205	-5	-0.2	34.5	34.5	0.029	0.0365	0.0488	0.0665	945	34.3
Bi-annual Seep Sampling	TSF Haul Road Seep 3	30-07-2013 12:23	7/30/2013	TSF Haul Road	All Non-PAG	Not sampled. Ground saturated downstream.	1123	7.9	0	21.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 4	30-07-2013 12:27	7/30/2013	TSF Haul Road	All Non-PAG	Not sampled. Ground saturated downstream.	1419	7.5	0	18.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-07-2013 12:37	7/30/2013	TSF Haul Road	All Non-PAG	Full suite sample taken of one branch of the seep. May have been slightly contaminated by algae.	846	7.8	0.008	8.4	#N/A	829	407	8.02	665	5	0.58	109	0.0057	-5	0.75	15.4	15.4	-0.01	0.0041	0.0079	0.011	284	15.5
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-06-2014 9:39	6/26/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1020	545	8.09	670	-3	0.79	137	0.0118	-5	0.41	13.6	13.6	0.022	0.0015	0.0033	0.0123	394	12.8
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-09-2014 12:29	9/30/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	872	480	7.87	630	-3	0.17	114	-0.005	-5	0.62	13.1	13.1	0.013	0.0139	0.0187	0.0132	319	12.4
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-05-2015 11:40	5/26/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	965	512	8.16	727	-3	0.3	108	-0.005	2.2	0.593	13.7	13.7	-0.002	0.01	0.0123	0.0147	371	13.5
Bi-annual Seep Sampling	TSF Haul Road Seep 6	30-07-2013 12:50	7/30/2013	TSF Haul Road	All Non-PAG	Full suite sample taken.	734	8	0.001	7.4	#N/A	698	345	7.99	544	4.9	0.98	99.9	-0.005	-2.5	0.71	12.9	12.9	-0.005	0.0044	0.0084	0.0106	225	13.1
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-06-2014 9:50	6/26/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	933	488	8.05	696	-3	0.17	103	-0.005	-5	0.55	16.9	16.9	-0.01	0.0115	0.0151	0.0162	352	14.9
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-05-2015 11:51	5/26/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	865	447	8.14	665	5.6	0.4	106	-0.005	2	0.613	10.7	10.7	-0.002	0.0099	0.0128	0.0142	322	10.6
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-07-2013 13:00	7/30/2013	TSF Haul Road	All Non-PAG	Not sampled.	1088	7.5	0	20.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-09-2014 12:42	9/30/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2010	1210	7.9	1760	12	3.56	140	0.0765	-10	-0.4	59.3	59.4	0.085	0.0894	0.109	0.144	937	53.7
Bi-annual Seep Sampling	TSF Haul Road Seep 7	26-05-2015 12:00	5/26/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2160	1280	7.98	1960	-3	0.71	115	0.0193	-10	-0.4	46.3	46.4	0.022	0.0727	0.0938	0.185	1080	44.9
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-07-2013 13:10	7/30/2013	TSF Haul Road	All Non-PAG	Full suite sample taken.	666	8	0.003	6.6	#N/A	637	320	7.81	475	6.2	0.88	93	-0.005	2.09	0.175	15.6	15.6	0.0036	0.0027	0.004	0.0098	179	15.4
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-06-2014 10:02	6/26/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	802	419	7.88	596	3.3	0.8	91.6	-0.005	-5	-0.2	18.4	18.4	-0.01	0.004	0.0057	0.0207	276	17.9
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-09-2014 13:20	9/30/2014	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1700	952	7.86	1410	46.1	19.1	106	0.0203	-10	-0.4	52.3	52.4	0.167	0.0297	0.038	0.0565	718	49.4
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-05-2015 12:25	5/26/2015	TSF Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1280	690	8.03	1050	-3	0.84	71.6	0.0062	2.7	-0.1	21.1	21.1	0.0114	0.0351	0.0353	0.0434	570	20.3
Bi-annual Seep Sampling	TSF Haul Road Seep 9	30-07-2013 13:21	7/30/2013	TSF Haul Road	All Non-PAG	Not sampled. Small pool at toe of road.	985	7.6	0	16.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 1	30-05-2013 9:15	5/30/2013	Waste Haul Road	All Non-PAG	D-Metals and T-Metals only	594	7	0.001	2.4	#N/A	525	246	7.25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Location Type	Sample Point	Original Date As Is	Recoded Date	Dissolved Organic Carbon (mg/L)	Aluminum (Al)-Total (mg/L)	Antimony (Sb)-Total (mg/L)	Arsenic (As)-Total (mg/L)	Barium (Ba)-Total (mg/L)	Beryllium (Be)-Total (mg/L)	Bismuth (Bi)-Total (mg/L)	Boron (B)-Total (mg/L)	Cadmium (Cd)-Total (mg/L)	Calcium (Ca)-Total (mg/L)	Chromium (Cr)-Total (mg/L)	Cobalt (Co)-Total (mg/L)	Copper (Cu)-Total (mg/L)	Iron (Fe)-Total (mg/L)	Lead (Pb)-Total (mg/L)	Lithium (Li)-Total (mg/L)	Magnesium (Mg)-Total (mg/L)	Manganese (Mn)-Total (mg/L)	Molybdenum (Mo)-Total (mg/L)	Nickel (Ni)-Total (mg/L)	Potassium (K)-Total (mg/L)	Selenium (Se)-Total (mg/L)	Silicon (Si)-Total (mg/L)	Silver (Ag)-Total (mg/L)	Sodium (Na)-Total (mg/L)	Strontium (Sr)-Total (mg/L)	Thallium (Tl)-Total (mg/L)	Tin (Sn)-Total (mg/L)	Titanium (Ti)-Total (mg/L)	Uranium (U)-Total (mg/L)	Vanadium (V)-Total (mg/L)	Zinc (Zn) Total (mg/L)	Aluminum (Al)-Dissolved (mg/L)	Antimony (Sb)-Dissolved (mg/L)	Arsenic (As) Dissolved (mg/L)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	SERDS Seep 21	11/11/2015	11/11/2015	13.1	0.645	0.00051	0.00098	0.0882	-0.0002	-0.0001	0.046	0.000322	405	0.00118	0.0046	0.065	0.737	0.00033	0.0039	73.5	2.14	0.121	0.0017	4.12	0.198	6.3	-0.00002	24.5	2.65	-0.00002	-0.0002	0.04	0.00312	0.0025	0.0097	0.0106	0.00045	0.0007
Bi-annual Seep Sampling	SERDS Seep 3	6/6/2013	6/6/2013	14.8	7.69	0.00052	0.00321	0.249	0.00016	-0.0005	0.062	-0.0002	257	0.0124	0.00385	0.0424	8.43	0.0021	0.0079	66.1	0.234	0.0237	0.0103	6.02	0.012	15	8.7E-05	24.7	5.58	0.000037	0.00014	0.306	0.000292	0.0212	0.0286	0.0308	0.00048	0.00048
Bi-annual Seep Sampling	SERDS Seep 3	3/6/2014	3/6/2014	14.2	0.283	0.00039	0.00076	0.0976	-0.0002	-0.001	0.055	-0.0003	416	0.0005	0.00252	0.0358	0.272	0.00013	0.0027	89.9	1.54	0.0497	0.0019	4.7	0.146	6.65	-0.00002	26.9	4.94	-0.00002	-0.0002	0.022	0.00183	-0.002	-0.006	0.0342	0.0004	0.00067
Bi-annual Seep Sampling	SERDS Seep 4	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 4	3/6/2014	3/6/2014	9.02	0.132	0.00032	0.00077	0.0569	-0.0001	-0.0005	0.057	-0.0002	288	-0.0005	0.00186	0.0263	0.134	5.5E-05	0.0023	67.5	0.645	0.0734	0.00108	3.9	0.0987	8.28	1.3E-05	20.8	2.97	-0.00001	-0.0001	0.014	0.00132	-0.001	0.0046	0.0148	0.00029	0.00064
Bi-annual Seep Sampling	SERDS Seep 5	6/6/2013	6/6/2013	14.9	0.414	0.00057	0.00126	0.105	-0.0002	-0.001	0.105	-0.0002	339	0.00082	0.00169	0.0247	0.432	0.00014	0.005	77	0.797	0.232	0.0013	4.3	0.0266	6	2.8E-05	34.3	9.51	-0.00002	-0.0002	0.026	0.00215	-0.002	-0.006	0.0163	0.00061	0.00107
Bi-annual Seep Sampling	SERDS Seep 5	3/6/2014	3/6/2014	0.61	0.618	0.00038	0.00115	0.116	-0.0002	-0.001	0.104	-0.0003	374	0.00101	0.00242	0.0842	0.6	0.0004	0.0034	86.2	1.52	0.103	0.0015	4.47	0.0713	8.28	2.3E-05	26.6	5.43	-0.00002	0.00028	0.038	0.00193	0.0029	-0.006	0.0183	0.00038	0.00092
Bi-annual Seep Sampling	SERDS Seep 6	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 7	6/6/2013	6/6/2013	12.7	1.18	0.00041	0.00133	0.076	-0.0001	-0.0005	0.112	-0.0001	254	0.00213	0.00094	0.015	1.12	0.00034	0.00928	59	0.401	0.168	0.00176	5.01	0.0266	9.15	1.7E-05	26.6	6.08	-0.00001	-0.0001	0.061	0.00098	0.0037	0.0066	0.008	0.00038	0.00091
Bi-annual Seep Sampling	SERDS Seep 8	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 8	3/6/2014	3/6/2014	6.71	0.145	0.00026	0.00067	0.0664	-0.0001	-0.0005	0.077	-0.0002	261	-0.0005	0.00125	0.0155	0.156	6.9E-05	0.0057	60.3	0.433	0.148	0.00078	3	0.0788	8.2	-0.00001	18.4	3.93	-0.00001	-0.0001	0.014	0.000841	0.001	0.0045	0.0073	0.00026	0.00056
Bi-annual Seep Sampling	SERDS Seep 9	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-06-2014 8:47	6/26/2014	9.79	0.377	-0.0001	0.00065	0.0271	-0.0001	-0.0005	0.012	0.000013	63.2	0.00058	0.00047	0.0159	0.477	0.00013	0.00274	18.3	0.13	0.00451	0.00147	0.627	0.00113	8.92	1.1E-05	5.78	0.237	-0.00001	-0.0001	0.028	0.000191	0.0019	-0.003	0.0052	-0.0001	0.00048
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-05-2015 11:10	5/26/2015	2.33	3.1	0.00038	0.00232	0.11	-0.0001	-0.00005	0.058	0.0000871	136	0.00131	0.00258	0.124	2.64	0.00099	0.0053	30.5	0.434	0.0841	0.00232	2.09	0.0636	10.5	3.6E-05	13.2	0.576	-0.00001	0.00011	0.222	0.00134	0.00969	0.0111	0.0069	0.00032	0.00072
Bi-annual Seep Sampling	TSF Haul Road Seep 11	30-07-2013 13:52	7/30/2013	4.55	1.33	-0.0001	0.00069	0.0519	-0.0001	-0.0005	0.017	0.000116	83.7	0.0012	0.00132	0.0499	1.27	0.00052	0.00443	25.9	0.0944	0.00143	0.00276	1.59	0.0347	11.6	2.8E-05	6.12	0.318	-0.00001	-0.0001	0.069	0.000055	0.0036	0.0117	0.0096	-0.0001	0.00011
Bi-annual Seep Sampling	TSF Haul Road Seep 11	26-11-2013 11:06	11/26/2013	3.87	0.873	-0.0001	0.00044	0.0384	-0.0001	-0.0005	0.015	0.000052	65.3	0.00053	0.00075	0.0311	0.848	0.00032	0.00294	20	0.0356	0.0014	0.00189	1.26	0.0173	10.7	1.5E-05	5.5	0.241	-0.00001	-0.0001	0.06	0.000039	0.0025	0.0075	0.0075	-0.0001	-0.0001
Bi-annual Seep Sampling	TSF Haul Road Seep 12	30-07-2013 14:05	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 12	26-06-2014 10:45	6/26/2014	7.01	0.755	0.00013	0.00073	0.109	-0.0001	-0.0005	0.022	0.000048	225	0.00051	0.00081	0.0367	0.684	0.0002	0.0032	53.8	0.236	0.0124	0.00121	2.88	0.119	7.45	1.2E-05	10.6	0.84	-0.00001	-0.0001	0.062	0.000433	0.0023	0.0058	-0.003	-0.0001	0.00039
Bi-annual Seep Sampling	TSF Haul Road Seep 12	11/5/2015	11/5/2015	6.62	0.345	0.00015	0.00058	0.0715	-0.0001	-0.00005	0.02	0.0000306	157	-0.0005	0.00044	0.0225	0.368	0.00011	0.0022	39.4	0.249	0.0194	0.00064	2.55	0.0544	7.86	-0.00001	9.03	0.564	-0.00001	-0.0001	0.025	0.000227	0.0014	-0.003	0.0051	0.00014	0.00043
Bi-annual Seep Sampling	TSF Haul Road Seep 14	26-05-2015 11:28	5/26/2015	2.9	0.0275	0.00039	0.0008	0.0192	-0.0001	-0.00005	0.042	0.0000203	86.4	-0.0005	0.00012	0.00862	0.03	-0.00005	0.0031	21.2	0.0747	0.111	-0.0005	0.271	0.034	6.47	-0.00001	12.3	0.351	-0.00001	-0.0001	-0.01	0.000443	0.001	-0.003	0.0034	0.00036	0.00076
Bi-annual Seep Sampling	TSF Haul Road Seep 15	26-06-2014 9:30	6/26/2014	9.01	0.219	0.00024	0.00054	0.146	-0.0002	-0.001	0.072	-0.00025	354	0.00057	0.00042	0.0131	0.281	0.0001	0.0034	81	0.257	0.205	0.0015	4.17	0.282	2.41	-0.00002	40	1.27	-0.00002	-0.0002	0.029	0.000769	-0.002	-0.006	0.0041	0.00022	0.00041
Bi-annual Seep Sampling	TSF Haul Road Seep 16	30-09-2014 12:56	9/30/2014	20.4	1.13	-0.0002	0.00105	0.117	-0.0002	-0.001	0.032	0.000112	322	0.00072	0.0014	0.0629	1.05	0.00038	0.002	64.7	0.52	0.0329	0.002	8.15	0.139	7.92	3.2E-05	28.8	1.48	-0.00002	-0.0002	0.094	0.000272	0.0035	0.009	0.0179	-0.0002	0.00057
Bi-annual Seep Sampling	TSF Haul Road Seep 16	11/5/2015	11/5/2015	8.03	0.622	0.00032	0.00084	0.0652	-0.0001	-0.00005	0.028	0.0000292	274	0.00072	0.00068	0.0255	0.61	0.00022	0.0037	57.5	0.0905	0.0881	0.00118	2.76	0.0935	8.85	-0.00001	14.2	2.07	-0.00001	-0.0001	0.037	0.00103	0.00212	0.0042	0.004	0.0003	0.00053
Bi-annual Seep Sampling	TSF Haul Road Seep 16	26-05-2015 12:10	5/26/2015	19.5	0.327	0.00022	0.00082	0.101	-0.0002	-0.0001	0.026	0.000081	313	-0.0005	0.00054	0.0275	0.284	0.00013	-0.002	66.5	0.159	0.0581	0.0012	7.93	0.151	6.28	-0.00002	26	1.38	-0.00002	-0.0002	0.03	0.000172	0.0013	-0.006	0.0208	0.0002	0.0006
Bi-annual Seep Sampling	TSF Haul Road Seep 3	30-07-2013 12:23	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 4	30-07-2013 12:27	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-07-2013 12:37	7/30/2013	3.36	0.436	0.00286	0.00243	0.0474	-0.0001	-0.0005	0.043	-0.00015	123	0.00092	0.00053	0.0112	0.469	0.00024	0.00915	24.4	0.174	0.0969	0.00102	1.32	0.048	10.1	1.9E-05	11.5	0.451	-0.00001	-0.0001	0.021	0.00594	0.0023	0.01	-0.003	0.00287	0.00208
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-06-2014 9:39	6/26/2014	6.98	0.068	0.00162	0.00064	0.0545	-0.0001	-0.0005	0.044	-0.00008	166	-0.0005	0.00098	0.00462	0.109	-0.00005	0.00455	34.3	0.585	0.0096	0.00057	2.04	0.0647	7.76	-0.00001	14.1	0.545	-0.00001	-0.0001	0.019	0.00295	-0.001	-0.003	0.0054	0.00151	0.00052
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-09-2014 12:29	9/30/2014	2.13	0.011	0.00384	0.003	0.0271	-0.0001	-0.0005	0.051	0.000063	146	-0.0005	-0.0001	0.00525	-0.03	-0.00005	0.0143	28.5	0.0286	0.128	-0.0005	0.814	0.0559	11.5	-0.00001	11.6	0.472	-0.00001	-0.0001	0.02	0.0123	0.0019	0.0041	-0.003	0.00388	0.00281
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-05-2015 11:40	5/26/2015	2.18	0.1	0.00344	0.00333	0.0284	-0.0001	-0.00005	0.046	0.000117	151	-0.0005	0.00017	0.00864	0.139	9.8E-05	0.0116	29.9	0.0357	0.17	-0.0005	0.752	0.0727	11.1	-0.00001	12.5	0.445	-0.00001	-0.0001	0.015	0.00876	0.0022	0.0045	-0.003	0.00342	0.00309
Bi-annual Seep Sampling	TSF Haul Road Seep 6	30-07-2013 12:50	7/30/2013	2.37	0.0297	0.00326	0.00211	0.0308	-0.0001	-0.0005	0.04	-0.00005	106	-0.0005	-0.0001	0.00211	-0.03	-0.00005	0.00866	20.6	0.000894	0.103	-0.0005	0.459	0.0325	10.5	-0.00001	9.35	0.362	-0.00001	-0.0001	-0.01	0.00574	-0.001	-0.003	0.0039	0.0033	0.00216
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-06-2014 9:50	6/26/2014	3.03	0.012	0.00297	0.00147	0.042	-0.0001	-0.0005	0.043	-0.00005	154	-0.0005	-0.0001	0.00103	-0.03	-0.00005	0.00665	29	0.00126	0.129	-0.0005	0.87	0.0785	10.1	-0.00001	11.6	0.453	-0.00001	-0.0001	0.016	0.00493	-0.001	-0.003	0.0035	0.00284	0.00134
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-05-2015 11:51	5/26/2015	2.33	0.0064	0.00368	0.0032	0.0269	-0.0001	-0.00005	0.043	0.00003	141	-0.0005	-0.0001	0.00112	-0.03	-0.00005	0.0113	28.3	0.00016	0.121	-0.0005	0.609	0.0508	11.7	-0.00001	10.7	0.386	-0.00001	-0.0001	0.01	0.00843	0.0016	-0.003	-0.0032	0.0036	0.00312
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-07-2013 13:00	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-09-2014 12:42	9/30/2014	20.1	0.342	0.00063	0.00134	0.1	-0.0002	-0.001	0.037	0.000075	376	-0.0005	0.00054	0.0254	0.297	0.00012	0.0053	74.6	0.25	0.0728	-0.001	8.28	0.25	8.21	-0.00002	22.5	1.37	-0.00002	0.00058	0.044	0.00258	-0.002	-0.006	0.0094	0.00056	0.00109
Bi-annual Seep Sampling	TSF Haul Road Seep 7	26-05-2015 12:00	5/26/2015	22.8	0.0677	0.00034	0.00112	0.0823	-0.0002	-0.0001	0.025	0.000068	370	-0.0005	0.00028	0.0185	0.058	-0.0001	0.0038	80.6	0.118	0.0804	-0.001	8.95	0.283	6.36	-0.00002	21.2	1.28	-0.00002	-0.0002	0.015	0.00184	-0.001	-0.006	0.0282	0.00029	0.00107
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-07-2013 13:10	7/30/2013	1.48	0.101	-0.0001	0.00017	0.00921	-0.0001	-0.0005	0.016	0.000126	83.8	-0.0005	-0.0001	0.00343	0.098	-0.00005	0.00501	29.1	0.00784	0.00441	-0.0005	1.87	0.0445	9.25	0.00001	5.24	0.298	-0.00001	-0.0001	0.011	0.000148	-0.001	0.0074	-0.003	-0.0001	0.00011
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-06-2014 10:02	6/26/2014	1.51	0.095	-0.0001	0.00019	0.0112	-0.0001	-0.0005	0.018	0.00014	110	-0.0005	-0.0001	0.00449	0.093	-0.00005	0.00393	35.8	0.00986	0.00396	-0.0005	1.94	0.0767	9.1	0.00001	6.18	0.354	-0.00001	-0.0001	0.019	0.000159	-0.001	0.009	-0.003	-0.0001	0.0001
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-09-2014 13:20	9/30/2014	13.3	0.877	0.00018	0.0011	0.134	-0.0001	-0.0005	0.031	0.000119	268	0.00085	0.00113	0.0538	0.886	0.00028	0.00268	61	0.502	0.0288	0.00212	6.05	0.148	8.28	0.00002	22.2	1.19	-0.00001	-0.0001	0.075	0.00137	0.0035	0.0076	0.0118	0.00016	0.00076
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-05-2015 12:25	5/26/2015	13.7	0.179	0.00023	0.00109	0.0454	-0.0001	-0.00005	0.022	0.0000839	195	-0.0005	0.00072	0.0503	0.219	0.00013	0.0016	46.4	0.349	0.0313	0.00128	5.47	0.0523	6.71	-0.00001	18	0.809	-0.00001	-0.0001	0.017	0.00107	0.00182	-0.003	0.0078	0.00022	0.00094
Bi-annual Seep Sampling	TSF Haul Road Seep 9	30-07-2013 13:21	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 1	30-05-2013 9:15	5/30/2013	#N/A	0.442	-0.0001	0.00031	0.041	0.00014	-0.0005	0.027	0.000049	63.5	-0.0005	0.0003	0.0216	0.341	0.00014	0.00106	20.2	0.0378	0.0113	0.00053	2.1	0.0705	6.63	2.9E-05	6.34	0.312	-0.00001	-0.0001	0.017	0.000023	0.0012	0.0072	0.033	-0.0001	0.00015

Location Type	Sample Point	Original Date As Is	Recoded Date	Barium (Ba) Dissolved (mg/L)	Beryllium (Be)-Dissolved (mg/L)	Bismuth (Bi)-Dissolved (mg/L)	Boron (B)-Dissolved (mg/L)	Cadmium (Cd)-Dissolved (mg/L)	Calcium (Ca)-Dissolved (mg/L)	Chromium (Cr)-Dissolved (mg/L)	Cobalt (Co)-Dissolved (mg/L)	Copper (Cu)-Dissolved (mg/L)	Iron (Fe)-Dissolved (mg/L)	Lead (Pb)-Dissolved (mg/L)	Lithium (Li)-Dissolved (mg/L)	Magnesium (Mg)-Dissolved (mg/L)	Manganese (Mn)-Dissolved (mg/L)	Molybdenum (Mo)-Dissolved (mg/L)	Nickel (Ni)-Dissolved (mg/L)	Potassium (K)-Dissolved (mg/L)	Selenium (Se)-Dissolved (mg/L)	Silicon (Si)-Dissolved (mg/L)	Silver (Ag)-Dissolved (mg/L)	Sodium (Na)-Dissolved (mg/L)	Strontium (Sr)-Dissolved (mg/L)	Thallium (Tl)-Dissolved (mg/L)	Tin (Sn)-Dissolved (mg/L)	Titanium (Ti)-Dissolved (mg/L)	Uranium (U)-Dissolved (mg/L)	Vanadium (V)-Dissolved (mg/L)	Zinc (Zn)-Dissolved (mg/L)		Julian Date	EC-Field
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L			µs/cm
Bi-annual Seep Sampling	SERDS Seep 21	11/11/2015	11/11/2015	0.0807	-0.0002	-0.0001	0.045	0.000279	411	-0.0005	0.00401	0.0476	0.051	-0.0001	0.0033	74.3	2.06	0.117	0.0011	4.17	0.196	5.39	-0.00002	24.9	2.57	-0.00002	-0.0002	0.014	0.00315	-0.001	0.0075		2015.86	#N/A
Bi-annual Seep Sampling	SERDS Seep 3	6/6/2013	6/6/2013	0.172	-0.0001	-0.0005	0.058	0.000086	267	-0.0005	0.00016	0.00439	-0.03	-0.00005	-0.0005	66	0.0503	0.0242	0.00113	5.33	0.0122	5.86	-0.00001	25.3	5.63	-0.00001	-0.0001	-0.01	0.000132	-0.001	-0.003		2013.43	1663
Bi-annual Seep Sampling	SERDS Seep 3	3/6/2014	3/6/2014	0.0925	-0.0002	-0.001	0.055	-0.0003	423	-0.0005	0.0024	0.0227	0.03	-0.0001	0.0024	89.7	1.48	0.0499	0.0017	4.58	0.145	6.24	-0.00002	26.8	4.94	-0.00002	-0.0002	-0.01	0.00181	-0.002	0.005		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 4	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	1633
Bi-annual Seep Sampling	SERDS Seep 4	3/6/2014	3/6/2014	0.0547	-0.0001	-0.0005	0.057	-0.0002	286	-0.0005	0.00174	0.0209	-0.03	-0.00005	0.00237	66.8	0.635	0.074	0.00099	3.86	0.0939	8.03	-0.00001	20.3	2.9	-0.00001	-0.0001	-0.01	0.00129	-0.001	0.0035		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 5	6/6/2013	6/6/2013	0.098	-0.0002	-0.001	0.107	-0.0002	343	-0.0005	0.00053	0.0157	-0.03	-0.0001	0.0047	77	0.366	0.241	-0.001	4.22	0.0254	5.18	-0.00002	34.2	9.73	-0.00002	-0.0002	-0.01	0.00234	-0.002	-0.003		2013.43	2025
Bi-annual Seep Sampling	SERDS Seep 5	3/6/2014	3/6/2014	0.113	-0.0002	-0.001	0.106	-0.0002	387	-0.0005	0.00206	0.0639	-0.03	-0.0001	0.0032	87.4	1.47	0.106	0.0011	4.41	0.0709	7.45	-0.00002	27.2	5.65	-0.00002	-0.0002	-0.01	0.00194	-0.002	-0.003		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 6	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	1317
Bi-annual Seep Sampling	SERDS Seep 7	6/6/2013	6/6/2013	0.063	-0.0001	-0.0005	0.101	-0.00007	263	-0.0005	0.00034	0.00882	0.037	-0.00005	0.00717	59.4	0.112	0.158	-0.0005	4.74	0.0261	7.22	-0.00001	24.3	5.73	-0.00001	-0.0001	0.013	0.000893	-0.001	-0.003		2013.43	1613
Bi-annual Seep Sampling	SERDS Seep 8	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	1324
Bi-annual Seep Sampling	SERDS Seep 8	3/6/2014	3/6/2014	0.0657	-0.0001	-0.0005	0.078	-0.0002	264	-0.0005	0.00118	0.0115	-0.03	-0.00005	0.00562	58.7	0.435	0.152	0.00072	2.96	0.0874	8	-0.00001	18.1	3.96	-0.00001	-0.0001	-0.01	0.000839	-0.001	0.0034		2014.18	#N/A
Bi-annual Seep Sampling	SERDS Seep 9	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.43	1417
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-06-2014 8:47	6/26/2014	0.0208	-0.0001	-0.0005	0.012	-0.00001	64.3	-0.0005	-0.0001	0.00689	-0.03	-0.00005	0.00242	18.6	0.0124	0.00447	0.00115	0.575	0.00114	8.24	-0.00001	5.67	0.242	-0.00001	-0.0001	0.01	0.000184	-0.001	-0.003		2014.48	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-05-2015 11:10	5/26/2015	0.0308	-0.0001	-0.00005	0.056	0.000042	137	-0.0005	0.00038	0.0121	-0.03	-0.00005	0.003	29	0.314	0.0869	-0.0005	1.55	0.0648	4.34	-0.00001	13	0.569	-0.00001	-0.0001	-0.01	0.00127	0.00083	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 11	30-07-2013 13:52	7/30/2013	0.0332	-0.0001	-0.0005	0.018	0.000079	85.3	-0.0005	0.00012	0.00519	-0.03	-0.00005	0.00351	24.9	0.00763	0.00124	0.00106	1.38	0.0347	8.78	-0.00001	6.33	0.305	-0.00001	-0.0001	-0.01	0.000016	-0.001	0.0051		2013.57	734
Bi-annual Seep Sampling	TSF Haul Road Seep 11	26-11-2013 11:06	11/26/2013	0.0255	-0.0001	-0.0005	0.015	0.000054	72	-0.0005	-0.0001	0.00525	-0.03	-0.00005	0.00232	20.4	0.00491	0.00139	0.00091	1.23	0.0187	9.42	-0.00001	5.81	0.25	-0.00001	-0.0001	0.011	0.000021	-0.001	0.0034		2013.9	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 12	30-07-2013 14:05	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.57	650
Bi-annual Seep Sampling	TSF Haul Road Seep 12	26-06-2014 10:45	6/26/2014	0.092	-0.0001	-0.0005	0.022	0.00004	219	-0.0005	0.00015	0.00805	-0.03	-0.00005	0.00267	50.9	0.125	0.0136	0.00053	2.79	0.112	5.49	-0.00001	10.8	0.796	-0.00001	-0.0001	0.018	0.000439	-0.001	-0.003		2014.48	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 12	11/5/2015	11/5/2015	0.0657	-0.0001	-0.00005	0.019	0.0000237	158	-0.0005	0.00015	0.00861	-0.03	-0.00005	0.0019	39.3	0.119	0.0197	-0.0005	2.58	0.0539	7.21	-0.00001	9.29	0.575	-0.00001	-0.0001	-0.01	0.000224	-0.0005	-0.003		2015.84	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 14	26-05-2015 11:28	5/26/2015	0.0172	-0.0001	-0.00005	0.039	0.0000142	89.8	-0.0005	-0.0001	0.00697	-0.03	-0.00005	0.003	21	0.0675	0.108	-0.0005	0.272	0.0332	6.47	-0.00001	12.1	0.328	-0.00001	-0.0001	-0.01	0.000469	0.00081	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 15	26-06-2014 9:30	6/26/2014	0.145	-0.0002	-0.001	0.074	-0.0002	364	-0.0005	-0.0002	0.007	-0.03	-0.0001	0.0031	83.1	0.106	0.213	0.0011	4.22	0.285	1.87	-0.00002	40.8	1.29	-0.00002	-0.0002	0.019	0.000777	-0.002	-0.003		2014.48	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 16	30-09-2014 12:56	9/30/2014	0.108	-0.0002	-0.001	0.031	0.00011	337	-0.0005	0.00072	0.0246	0.031	-0.0001	-0.001	65.7	0.501	0.0344	-0.001	8.35	0.143	5.72	-0.00002	29.3	1.55	-0.00002	-0.0002	0.027	0.000261	-0.002	0.0038		2014.74	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 16	11/5/2015	11/5/2015	0.0556	-0.0001	-0.00005	0.029	0.0000198	282	-0.0005	0.00016	0.00475	-0.03	-0.00005	0.0034	56.5	0.00519	0.091	-0.0005	2.71	0.0942	7.74	-0.00001	14.2	2.13	-0.00001	-0.0001	-0.01	0.00103	-0.0005	-0.003		2015.84	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 16	26-05-2015 12:10	5/26/2015	0.0988	-0.0002	-0.0001	0.025	0.000079	316	-0.0005	0.0003	0.0173	-0.03	-0.0001	-0.002	67.1	0.142	0.0586	-0.001	7.77	0.15	5.72	-0.00002	25.5	1.42	-0.00002	-0.0002	0.012	0.000161	-0.001	0.0037		2015.4	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 3	30-07-2013 12:23	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.57	1123
Bi-annual Seep Sampling	TSF Haul Road Seep 4	30-07-2013 12:27	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.57	1419
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-07-2013 12:37	7/30/2013	0.0405	-0.0001	-0.0005	0.043	-0.00006	124	-0.0005	-0.0001	0.00129	-0.03	-0.00005	0.00899	23.9	0.012	0.0975	-0.0005	1.22	0.0471	9.37	-0.00001	11.4	0.434	-0.00001	-0.0001	-0.01	0.00558	-0.001	0.0033		2013.57	846
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-06-2014 9:39	6/26/2014	0.0487	-0.0001	-0.0005	0.041	-0.00006	163	-0.0005	-0.0001	0.00346	-0.03	-0.00005	0.00434	33.5	0.174	0.0957	-0.0005	1.95	0.0603	7.41	-0.00001	13.3	0.537	-0.00001	-0.0001	0.016	0.00282	-0.001	-0.003		2014.48	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-09-2014 12:29	9/30/2014	0.0268	-0.0001	-0.0005	0.05	0.000079	146	-0.0005	-0.0001	0.00422	-0.03	-0.00005	0.0139	28	0.0267	0.129	-0.0005	0.758	0.057	11.7	-0.00001	10.8	0.486	-0.00001	-0.0001	0.019	0.0119	0.0018	0.0038		2014.74	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-05-2015 11:40	5/26/2015	0.0273	-0.0001	-0.00005	0.044	0.0000809	155	-0.0005	-0.0001	0.00431	-0.03	-0.00005	0.011	30.5	0.0109	0.169	-0.0005	0.727	0.0708	11.2	-0.00001	12.5	0.43	-0.00001	-0.0001	0.01	0.00898	0.00169	0.0035		2015.4	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 6	30-07-2013 12:50	7/30/2013	0.0294	-0.0001	-0.0005	0.041	-0.00005	105	-0.0005	-0.0001	0.00075	-0.03	-0.00005	0.00905	20	0.000298	0.0966	-0.0005	0.487	0.0315	10.3	-0.00001	9.27	0.342	-0.00001	-0.0001	-0.01	0.00583	-0.001	-0.003		2013.57	734
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-06-2014 9:50	6/26/2014	0.041	-0.0001	-0.0005	0.039	-0.00005	149	-0.0005	-0.0001	0.00087	-0.03	-0.00005	0.00625	28.1	0.000522	0.122	-0.0005	0.839	0.0762	9.76	-0.00001	11	0.428	-0.00001	-0.0001	0.015	0.0048	-0.001	-0.003		2014.48	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-05-2015 11:51	5/26/2015	0.0263	-0.0001	-0.00005	0.04	0.0000203	136	-0.0005	-0.0001	0.00091	-0.03	-0.00005	0.0108	26.3	-0.0001	0.117	-0.0005	0.596	0.0493	11.3	-0.00001	10.3	0.37	-0.00001	-0.0001	-0.01	0.00847	0.0014	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-07-2013 13:00	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.57	1088
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-09-2014 12:42	9/30/2014	0.0929	-0.0002	-0.001	0.032	0.000075	370	-0.0005	0.00027	0.0136	-0.03	-0.0001	0.0042	70.6	0.225	0.0649	-0.001	8.06	0.248	7.45	-0.00002	21.5	1.22	-0.00002	-0.0002	0.027	0.00229	-0.002	0.004		2014.74	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 7	26-05-2015 12:00	5/26/2015	0.0845	-0.0002	-0.0001	0.024	0.000061	376	-0.0005	0.00026	0.0172	0.033	-0.0001	0.0035	82.9	0.12	0.0804	-0.001	9	0.28	6.35	-0.00002	21.8	1.29	-0.00002	-0.0002	0.014	0.00184	-0.001	0.0032		2015.4	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-07-2013 13:10	7/30/2013	0.00746	-0.0001	-0.0005	0.015	0.00011	81.7	-0.0005	-0.0001	0.00092	-0.03	-0.00005	0.00481	28.1	0.00462	0.00415	-0.0005	1.82	0.0423	8.78	-0.00001	5.26	0.282	-0.00001	-0.0001	-0.01	0.000134	-0.001	0.0063		2013.57	666
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-06-2014 10:02	6/26/2014	0.01	-0.0001	-0.0005	0.017	0.000147	109	-0.0005	-0.0001	0.00177	-0.03	-0.00005	0.00374	35.5	0.00662	0.0038	-0.0005	1.92	0.0744	8.79	-0.00001	6.37	0.357	-0.00001	-0.0001	0.013	0.000153	-0.001	0.0074		2014.48	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-09-2014 13:20	9/30/2014	0.124	-0.0001	-0.0005	0.031	0.000105	278	-0.0005	0.00053	0.0284	-0.03	-0.00005	0.00204	62.7	0.48	0.0311	0.00148	6.11	0.152	6.66	-0.00001	22.7	1.29	-0.00001	-0.0001	0.026	0.00142	-0.001	-0.003		2014.74	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-05-2015 12:25	5/26/2015	0.0422	-0.0001	-0.00005	0.022	0.0000768	198	-0.0005	0.00054	0.0434	-0.03	-0.00005	0.0017	47.2	0.329	0.0332	0.00094	5.21	0.0545	6.54	-0.00001	17.7	0.809	-0.00001	-0.0001	0.011	0.00111	0.00098	-0.003		2015.4	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 9	30-07-2013 13:21	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.57	985
Bi-annual Seep Sampling	Waste Haul Road Seep 1	30-05-2013 9:15	5/30/2013	0.0387	-0.0001	-0.0005	0.027	0.000047	64.8	-0.0005	-0.0001	0.00556	-0.03	-0.00005	0.00089	20.4	0.0208	0.0113	-0.0005	2.1	0.0709	6.14	-0.00001	6.35	0.324	-0.00001	-0.0001	-0.01	-0.00001	-0.001	0.005		2013.41	594

Location Type	Sample Point	Original Date As Is	Recoded Date	pH-field	Q	T	Turbidity-Field	EC	Hardness	pH	TDS	TSS	Turbidity	Alkalinity	NH3	Cl	F	NO3	NO3+NO2	NO2	PO4	P-D	P-T	SO4	N-T
					m3/s	C	NTU	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	SERDS Seep 21	11/11/2015	11/11/2015	#N/A	#N/A	#N/A	#N/A	2420	1330	7.95	2100	5	1.48	105	0.0112	5	0.2	96.9	97	0.098	0.0325	0.0357	0.0557	985	98.3
Bi-annual Seep Sampling	SERDS Seep 3	6/6/2013	6/6/2013	7.4	0.001	15.6	#N/A	1670	939	7.81	1540	272	134	57.8	0.0196	2.5	0.1	5.88	5.88	0.005	0.0005	0.014	0.521	974	7.71
Bi-annual Seep Sampling	SERDS Seep 3	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	2400	1430	7.79	2170	17.7	5.34	70.7	0.185	11	0.2	88.5	89.7	1.24	0.0098	0.0197	0.0501	1130	83
Bi-annual Seep Sampling	SERDS Seep 4	6/6/2013	6/6/2013	7.5	0.003	14	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 4	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	1760	988	7.92	1510	15.7	4.89	67.8	0.181	5.8	0.1	53.4	54	0.584	0.0195	0.0281	0.036	786	51.8
Bi-annual Seep Sampling	SERDS Seep 5	6/6/2013	6/6/2013	7.5	0.003	9.1	#N/A	2010	1170	8	1820	9	7.95	112	0.0769	5	0.2	5.98	6.01	0.028	0.0186	0.0357	0.0597	1210	6.14
Bi-annual Seep Sampling	SERDS Seep 5	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	2190	1330	8.07	2030	14.8	6.41	106	0.0644	13	0.2	55.1	55.5	0.337	0.0137	0.0243	0.044	1110	52.1
Bi-annual Seep Sampling	SERDS Seep 6	6/6/2013	6/6/2013	8.2	0.001	10.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 7	6/6/2013	6/6/2013	7.9	0.01	7	#N/A	1570	902	8.01	1240	31.8	15.9	104	0.0709	2.5	0.25	12.5	12.6	0.063	0.0674	0.0879	0.133	828	12.2
Bi-annual Seep Sampling	SERDS Seep 8	6/6/2013	6/6/2013	7.9	0.005	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	SERDS Seep 8	3/6/2014	3/6/2014	#N/A	#N/A	#N/A	#N/A	1630	901	7.92	1390	6.7	2.35	70.9	0.0713	2.5	0.1	45.8	46	0.168	0.0354	0.0461	0.058	737	43.5
Bi-annual Seep Sampling	SERDS Seep 9	6/6/2013	6/6/2013	7.6	0	11.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-06-2014 8:47	6/26/2014	#N/A	#N/A	#N/A	#N/A	440	237	8.3	315	16.3	8.09	198	0.0025	0.25	0.132	0.0025	0.00255	0.0005	0.0012	0.0066	0.0766	51.9	0.351
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-05-2015 11:10	5/26/2015	#N/A	#N/A	#N/A	#N/A	896	462	8.1	684	221	7.54	94.9	0.0109	1.1	0.114	6.21	6.22	0.01	0.0076	0.0097	0.465	371	6.24
Bi-annual Seep Sampling	TSF Haul Road Seep 11	30-07-2013 13:52	7/30/2013	7.4	0.002	8.7	#N/A	658	315	7.41	542	98.5	39.2	59.2	0.0025	3.71	0.087	35	35	0.0081	0.0127	0.0159	0.233	148	35
Bi-annual Seep Sampling	TSF Haul Road Seep 11	26-11-2013 11:06	11/26/2013	#N/A	#N/A	#N/A	#N/A	555	264	7.35	413	14.9	11	58.9	0.0025	3.1	0.095	19.9	19.9	0.0021	0.0105	0.0131	0.0452	132	19
Bi-annual Seep Sampling	TSF Haul Road Seep 12	30-07-2013 14:05	7/30/2013	8	0.002	7.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 12	26-06-2014 10:45	6/26/2014	#N/A	#N/A	#N/A	#N/A	1480	757	7.98	1160	4.9	1.18	96.6	0.0352	6.1	0.1	60.7	60.8	0.106	0.0011	0.0066	0.0538	533	54.8
Bi-annual Seep Sampling	TSF Haul Road Seep 12	11/5/2015	11/5/2015	#N/A	#N/A	#N/A	#N/A	1030	557	8.14	754	13.4	3.53	90	0.021	1.25	0.12	21.4	21.4	0.0414	0.0098	0.0148	0.0495	397	20.5
Bi-annual Seep Sampling	TSF Haul Road Seep 14	26-05-2015 11:28	5/26/2015	#N/A	#N/A	#N/A	#N/A	629	311	8.02	425	3.4	0.73	80.8	0.0115	0.25	0.28	4.59	4.59	0.0068	0.0005	0.0035	0.0375	226	4.79
Bi-annual Seep Sampling	TSF Haul Road Seep 15	26-06-2014 9:30	6/26/2014	#N/A	#N/A	#N/A	#N/A	2160	1250	8.11	1590	4.7	0.75	122	0.0159	5	0.2	55.2	55.2	0.059	0.0005	0.0059	0.0146	1080	50.6
Bi-annual Seep Sampling	TSF Haul Road Seep 16	30-09-2014 12:56	9/30/2014	#N/A	#N/A	#N/A	#N/A	1930	1110	7.68	1630	17.9	10.8	84	0.052	5	0.2	49.2	49.3	0.077	0.0278	0.0398	0.0939	933	45
Bi-annual Seep Sampling	TSF Haul Road Seep 16	11/5/2015	11/5/2015	#N/A	#N/A	#N/A	#N/A	1640	936	8.04	1370	24.8	5.66	93.2	0.0025	2.5	0.1	46.1	46.1	0.005	0.0259	0.0306	0.116	714	44.5
Bi-annual Seep Sampling	TSF Haul Road Seep 16	26-05-2015 12:10	5/26/2015	#N/A	#N/A	#N/A	#N/A	1900	1070	7.81	1710	14.6	4.15	65.7	0.0205	2.5	0.1	34.5	34.5	0.029	0.0365	0.0488	0.0665	945	34.3
Bi-annual Seep Sampling	TSF Haul Road Seep 3	30-07-2013 12:23	7/30/2013	7.9	0	21.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 4	30-07-2013 12:27	7/30/2013	7.5	0	18.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-07-2013 12:37	7/30/2013	7.8	0.008	8.4	#N/A	829	407	8.02	665	5	0.58	109	0.0057	2.5	0.75	15.4	15.4	0.005	0.0041	0.0079	0.011	284	15.5
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-06-2014 9:39	6/26/2014	#N/A	#N/A	#N/A	#N/A	1020	545	8.09	670	1.5	0.79	137	0.0118	2.5	0.41	13.6	13.6	0.022	0.0015	0.0033	0.0123	394	12.8
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-09-2014 12:29	9/30/2014	#N/A	#N/A	#N/A	#N/A	872	480	7.87	630	1.5	0.17	114	0.0025	2.5	0.62	13.1	13.1	0.013	0.0139	0.0187	0.0132	319	12.4
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-05-2015 11:40	5/26/2015	#N/A	#N/A	#N/A	#N/A	965	512	8.16	727	1.5	0.3	108	0.0025	2.2	0.593	13.7	13.7	0.001	0.01	0.0123	0.0147	371	13.5
Bi-annual Seep Sampling	TSF Haul Road Seep 6	30-07-2013 12:50	7/30/2013	8	0.001	7.4	#N/A	698	345	7.99	544	4.9	0.98	99.9	0.0025	1.25	0.71	12.9	12.9	0.0025	0.0044	0.0084	0.0106	225	13.1
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-06-2014 9:50	6/26/2014	#N/A	#N/A	#N/A	#N/A	933	488	8.05	696	1.5	0.17	103	0.0025	2.5	0.55	16.9	16.9	0.005	0.0115	0.0151	0.0162	352	14.9
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-05-2015 11:51	5/26/2015	#N/A	#N/A	#N/A	#N/A	865	447	8.14	665	5.6	0.4	106	0.0025	2	0.613	10.7	10.7	0.001	0.0099	0.0128	0.0142	322	10.6
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-07-2013 13:00	7/30/2013	7.5	0	20.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-09-2014 12:42	9/30/2014	#N/A	#N/A	#N/A	#N/A	2010	1210	7.9	1760	12	3.56	140	0.0765	5	0.2	59.3	59.4	0.085	0.0894	0.109	0.144	937	53.7
Bi-annual Seep Sampling	TSF Haul Road Seep 7	26-05-2015 12:00	5/26/2015	#N/A	#N/A	#N/A	#N/A	2160	1280	7.98	1960	1.5	0.71	115	0.0193	5	0.2	46.3	46.4	0.022	0.0727	0.0938	0.185	1080	44.9
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-07-2013 13:10	7/30/2013	8	0.003	6.6	#N/A	637	320	7.81	475	6.2	0.88	93	0.0025	2.09	0.175	15.6	15.6	0.0036	0.0027	0.004	0.0098	179	15.4
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-06-2014 10:02	6/26/2014	#N/A	#N/A	#N/A	#N/A	802	419	7.88	596	3.3	0.8	91.6	0.0025	2.5	0.1	18.4	18.4	0.005	0.004	0.0057	0.0207	276	17.9
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-09-2014 13:20	9/30/2014	#N/A	#N/A	#N/A	#N/A	1700	952	7.86	1410	46.1	19.1	106	0.0203	5	0.2	52.3	52.4	0.167	0.0297	0.038	0.0565	718	49.4
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-05-2015 12:25	5/26/2015	#N/A	#N/A	#N/A	#N/A	1280	690	8.03	1050	1.5	0.84	71.6	0.0062	2.7	0.05	21.1	21.1	0.0114	0.0351	0.0353	0.0434	570	20.3
Bi-annual Seep Sampling	TSF Haul Road Seep 9	30-07-2013 13:21	7/30/2013	7.6	0	16.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 1	30-05-2013 9:15	5/30/2013	7	0.001	2.4	#N/A	525	246	7.25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A

Location Type	Sample Point	Original Date As Is	Recoded Date	DOC	Al-D	Sb-D	As-D	Ba-D	Be-D	Bi-D	B-D	Cd-D	Ca-D	Cr-D	Co-D	Cu-D	Fe-D	Pb-D	Li-D	Mg-D	Mn-D	Mo-D	Ni-D	K-D	Se-D	Si-D	Ag-D	Na-D	Sr-D	Tl-D	Sn-D	Ti-D	U-D	V-D	Zn-D	Se/SO4	Ca	Mg+K+Na	(Mg+K+Na)/Ca	Zn/Cd	Year
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/mgS	meq/L	meq/L	meq/meq		Year
Bi-annual Seep Sampling	SERDS Seep 21	11/11/2015	11/11/2015	13.1	0.0106	0.00045	0.0007	0.0807	0.0001	0.00005	0.045	0.00028	411	0.00025	0.00401	0.0476	0.051	0.00005	0.0033	74.3	2.06	0.117	0.0011	4.17	0.196	5.39	0.00001	24.9	2.57	0.00001	0.0001	0.014	0.00315	0.0005	0.0075	0.000596954	20.55	5.52189	0.26870527	26.8817	2015
Bi-annual Seep Sampling	SERDS Seep 3	6/6/2013	6/6/2013	14.8	0.0308	0.00048	0.00048	0.172	0.00005	0.00025	0.058	8.6E-05	267	0.00025	0.00016	0.00439	0.015	2.5E-05	0.00025	66	0.0503	0.0242	0.00113	5.33	0.0122	5.86	5E-06	25.3	5.63	5E-06	0.00005	0.005	0.00013	0.0005	0.0015	3.7577E-05	13.35	5.08506	0.380903608	17.4419	2013
Bi-annual Seep Sampling	SERDS Seep 3	3/6/2014	3/6/2014	14.2	0.0342	0.0004	0.00067	0.0925	0.0001	0.0005	0.055	0.00015	423	0.00025	0.0024	0.0227	0.03	0.00005	0.0024	89.7	1.48	0.0499	0.0017	4.58	0.145	6.24	0.00001	26.8	4.94	0.00001	0.0001	0.005	0.00181	0.001	0.005	0.000384956	21.15	6.51297	0.307942033	33.3333	2014
Bi-annual Seep Sampling	SERDS Seep 4	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	SERDS Seep 4	3/6/2014	3/6/2014	9.02	0.0148	0.00029	0.00064	0.0547	0.00005	0.00025	0.057	0.0001	286	0.00025	0.00174	0.0209	0.015	2.5E-05	0.00237	66.8	0.635	0.074	0.00099	3.86	0.0939	8.03	5E-06	20.3	2.9	5E-06	0.00005	0.005	0.00129	0.0005	0.0035	0.000358397	14.3	4.87663	0.341022852	35	2014
Bi-annual Seep Sampling	SERDS Seep 5	6/6/2013	6/6/2013	14.9	0.0163	0.00061	0.00107	0.098	0.0001	0.0005	0.107	0.0001	343	0.00025	0.00053	0.0157	0.015	0.00005	0.0047	77	0.366	0.241	0.0005	4.22	0.0254	5.18	0.00001	34.2	9.73	0.00001	0.0001	0.005	0.00234	0.001	0.0015	6.29752E-05	17.15	6.08496	0.354808021	15	2013
Bi-annual Seep Sampling	SERDS Seep 5	3/6/2014	3/6/2014	0.61	0.0183	0.00038	0.00092	0.113	0.0001	0.0005	0.106	0.0001	387	0.00025	0.00206	0.0639	0.015	0.00005	0.0032	87.4	1.47	0.106	0.0011	4.41	0.0709	7.45	0.00001	27.2	5.65	0.00001	0.0001	0.005	0.00194	0.001	0.0015	0.000191622	19.35	6.3919	0.330330518	15	2014
Bi-annual Seep Sampling	SERDS Seep 6	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	SERDS Seep 7	6/6/2013	6/6/2013	12.7	0.008	0.00038	0.00091	0.063	0.00005	0.00025	0.101	3.5E-05	263	0.00025	0.00034	0.00882	0.037	2.5E-05	0.00717	59.4	0.112	0.158	0.00025	4.74	0.0261	7.22	5E-06	24.3	5.73	5E-06	0.00005	0.013	0.00089	0.0005	0.0015	9.45652E-05	13.15	4.64162	0.352974681	42.8571	2013
Bi-annual Seep Sampling	SERDS Seep 8	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	SERDS Seep 8	3/6/2014	3/6/2014	6.71	0.0073	0.00026	0.00056	0.0657	0.00005	0.00025	0.078	0.0001	264	0.00025	0.00118	0.0115	0.015	2.5E-05	0.00562	58.7	0.435	0.152	0.00072	2.96	0.0874	8	5E-06	18.1	3.96	5E-06	0.00005	0.005	0.00084	0.0005	0.0034	0.000355767	13.2	4.28559	0.324666249	34	2014
Bi-annual Seep Sampling	SERDS Seep 9	6/6/2013	6/6/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-06-2014 8:47	6/26/2014	9.79	0.0052	0.00005	0.00048	0.0208	0.00005	0.00025	0.012	5E-06	64.3	0.00025	0.00005	0.00689	0.015	2.5E-05	0.00242	18.6	0.0124	0.00447	0.00115	0.575	0.00114	8.24	5E-06	5.67	0.242	5E-06	0.00005	0.01	0.00018	0.0005	0.0015	6.5896E-05	3.215	1.34581	0.41860449	300	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 1	26-05-2015 11:10	5/26/2015	2.33	0.0069	0.00032	0.00072	0.0308	0.00005	2.5E-05	0.056	4.2E-05	137	0.00025	0.00038	0.0121	0.015	2.5E-05	0.003	29	0.314	0.0869	0.00025	1.55	0.0648	4.34	5E-06	13	0.569	5E-06	0.00005	0.005	0.00127	0.00083	0.0015	0.000523989	6.85	2.29592	0.335171253	35.7143	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 11	30-07-2013 13:52	7/30/2013	4.55	0.0096	0.00005	0.00011	0.0332	0.00005	0.00025	0.018	7.9E-05	85.3	0.00025	0.00012	0.00519	0.015	2.5E-05	0.00351	24.9	0.00763	0.00124	0.00106	1.38	0.0347	8.78	5E-06	6.33	0.305	5E-06	0.00005	0.005	1.6E-05	0.0005	0.0051	0.000703378	4.265	1.7625	0.413246671	64.557	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 11	26-11-2013 11:06	11/26/2013	3.87	0.0075	0.00005	0.00005	0.0255	0.00005	0.00025	0.015	5.4E-05	72	0.00025	0.00005	0.00525	0.015	2.5E-05	0.00232	20.4	0.00491	0.00139	0.00091	1.23	0.0187	9.42	5E-06	5.81	0.25	5E-06	0.00005	0.011	2.1E-05	0.0005	0.0034	0.000425	3.6	1.47365	0.409347647	62.963	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 12	30-07-2013 14:05	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 12	26-06-2014 10:45	6/26/2014	7.01	0.0015	0.00005	0.00039	0.092	0.00005	0.00025	0.022	0.00004	219	0.00025	0.00015	0.00805	0.015	2.5E-05	0.00267	50.9	0.125	0.0136	0.00053	2.79	0.112	5.49	5E-06	10.8	0.796	5E-06	0.00005	0.018	0.00044	0.0005	0.0015	0.000630394	10.95	3.50903	0.320459699	37.5	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 12	11/5/2015	11/5/2015	6.62	0.0051	0.00014	0.00043	0.0657	0.00005	2.5E-05	0.019	2.4E-05	158	0.00025	0.00015	0.00861	0.015	2.5E-05	0.0019	39.3	0.119	0.0197	0.00025	2.58	0.0539	7.21	5E-06	9.29	0.575	5E-06	0.00005	0.005	0.00022	0.00025	0.0015	0.000407305	7.9	2.76161	0.349571149	63.2911	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 14	26-05-2015 11:28	5/26/2015	2.9	0.0034	0.00036	0.00076	0.0172	0.00005	2.5E-05	0.039	1.4E-05	89.8	0.00025	0.00005	0.00697	0.015	2.5E-05	0.003	21	0.0675	0.108	0.00025	0.272	0.0332	6.47	5E-06	12.1	0.328	5E-06	0.00005	0.005	0.00047	0.00081	0.0015	0.000440708	4.49	1.75755	0.391436773	105.634	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 15	26-06-2014 9:30	6/26/2014	9.01	0.0041	0.00022	0.00041	0.145	0.0001	0.0005	0.074	0.0001	364	0.00025	0.0001	0.007	0.015	0.00005	0.0031	83.1	0.106	0.213	0.0011	4.22	0.285	1.87	0.00001	40.8	1.29	0.00001	0.0001	0.019	0.00078	0.001	0.0015	0.000791667	18.2	6.7276	0.369648309	15	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 16	30-09-2014 12:56	9/30/2014	20.4	0.0179	0.0001	0.00057	0.108	0.0001	0.0005	0.031	0.00011	337	0.00025	0.00072	0.0246	0.031	0.00005	0.0005	65.7	0.501	0.0344	0.0005	8.35	0.143	5.72	0.00001	29.3	1.55	0.00001	0.0001	0.027	0.00026	0.001	0.0038	0.000459807	16.85	5.31892	0.315662872	34.5455	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 16	11/5/2015	11/5/2015	8.03	0.004	0.0003	0.00053	0.0556	0.00005	2.5E-05	0.029	2E-05	282	0.00025	0.00016	0.00475	0.015	2.5E-05	0.0034	56.5	0.00519	0.091	0.00025	2.71	0.0942	7.74	5E-06	14.2	2.13	5E-06	0.00005	0.005	0.00103	0.00025	0.0015	0.000395798	14.1	3.98134	0.282364477	75.7576	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 16	26-05-2015 12:10	5/26/2015	19.5	0.0208	0.0002	0.0006	0.0988	0.0001	0.00005	0.025	7.9E-05	316	0.00025	0.0003	0.0173	0.015	0.00005	0.001	67.1	0.142	0.0586	0.0005	7.77	0.15	5.72	0.00001	25.5	1.42	0.00001	0.0001	0.012	0.00016	0.0005	0.0037	0.00047619	15.8	5.22046	0.330409042	46.8354	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 3	30-07-2013 12:23	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 4	30-07-2013 12:27	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-07-2013 12:37	7/30/2013	3.36	0.0015	0.00287	0.00208	0.0405	0.00005	0.00025	0.043	0.00003	124	0.00025	0.00005	0.00129	0.015	2.5E-05	0.00899	23.9	0.012	0.0975	0.00025	1.22	0.0471	9.37	5E-06	11.4	0.434	5E-06	0.00005	0.005	0.00558	0.0005	0.0033	0.000497535	6.2	1.92052	0.309731328	110	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-06-2014 9:39	6/26/2014	6.98	0.0054	0.00151	0.00052	0.0487	0.00005	0.00025	0.041	0.00003	163	0.00025	0.00005	0.00346	0.015	2.5E-05	0.00434	33.5	0.174	0.0957	0.00025	1.95	0.0603	7.41	5E-06	13.3	0.537	5E-06	0.00005	0.016	0.00282	0.0005	0.0015	0.000459137	8.15	2.58161	0.31676241	50	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 5	30-09-2014 12:29	9/30/2014	2.13	0.0015	0.00388	0.00281	0.0266	0.00005	0.00025	0.05	7.9E-05	146	0.00025	0.00005	0.00422	0.015	2.5E-05	0.0139	28	0.0267	0.129	0.00025	0.758	0.057	11.7	5E-06	10.8	0.466	5E-06	0.00005	0.019	0.00119	0.0018	0.0038	0.00053605	7.3	2.12165	0.290637558	48.1013	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 5	26-05-2015 11:40	5/26/2015	2.18	0.0015	0.00342	0.00309	0.0273	0.00005	2.5E-05	0.044	8.1E-05	155	0.00025	0.00005	0.00431	0.015	2.5E-05	0.011	30.5	0.0109	0.169	0.00025	0.727	0.0708	11.2	5E-06	12.5	0.43	5E-06	0.00005	0.01	0.00898	0.00169	0.0035	0.000572507	7.75	2.34054	0.302005799	43.2633	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 6	30-07-2013 12:50	7/30/2013	2.37	0.0039	0.0033	0.00216	0.0294	0.00005	0.00025	0.041	2.5E-05	105	0.00025	0.00005	0.00075	0.015	2.5E-05	0.00905	20	0.0003	0.0966	0.00025	0.487	0.0315	10.3	5E-06	9.27	0.342	5E-06	0.00005	0.005	0.00583	0.0005	0.0015	0.00042	5.25	1.58171	0.301278365	60	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 6	26-06-2014 9:50	6/26/2014	3.03	0.0035	0.00284	0.00134	0.041	0.00005	0.00025	0.039	2.5E-05	149	0.00025	0.00005	0.00087	0.015	2.5E-05	0.00625	28.1	0.00052	0.122	0.00025	0.839	0.0762	9.76	5E-06	11	0.428	5E-06	0.00005	0.015	0.0048	0.0005	0.0015	0.000649432	7.45	2.13826	0.28701445	60	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 7	26-05-2015 11:51	5/26/2015	2.33	0.0032	0.0036	0.00312	0.0263	0.00005	2.5E-05	0.04	2E-05	136	0.00025	0.00005	0.00091	0.015	2.5E-05	0.0108	26.3	0.00005	0.117	0.00025	0.596	0.0493	11.3	5E-06	10.3	0.37	5E-06	0.00005	0.005	0.00847	0.0014	0.0015	0.000459317	6.8	1.99664	0.293622917	73.8916	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-07-2013 13:00	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 7	30-09-2014 12:42	9/30/2014	20.1	0.0094	0.00056	0.00109	0.0929	0.0001	0.0005	0.032	7.5E-05	370	0.00025	0.00027	0.0136	0.015	0.00005	0.0042	70.6	0.225	0.0649	0.0005	8.06	0.248	7.45	0.00001	21.5	1.22	0.00001	0.0001	0.027	0.00229	0.001	0.004	0.000794023	18.5	5.25807	0.284219857	53.3333	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 7	26-05-2015 12:00	5/26/2015	22.8	0.0282	0.00029	0.00107	0.0845	0.0001	0.00005	0.024	6.1E-05	376	0.00025	0.00026	0.0172	0.033	0.00005	0.0035	82.9	0.12	0.0804	0.0005	9	0.28	6.35	0.00001	21.8	1.29	0.00001	0.0001	0.014	0.00184	0.0005	0.0032	0.000777778	18.8	6.01241	0.319809285	52.459	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-07-2013 13:10	7/30/2013	1.48	0.0015	0.00005	0.00011	0.00746	0.00005	0.00025	0.015	0.00011	81.7	0.00025	0.00005	0.00092	0.015	2.5E-05	0.00481	28.1	0.00462	0.00415	0.00025	1.82	0.0423	8.78	5E-06	5.26	0.282	5E-06	0.00005	0.005	0.00013	0.0005	0.0063	0.000708939	4.085	1.91385	0.468505822	57.2727	2013
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-06-2014 10:02	6/26/2014	1.51	0.0015	0.00005	0.0001	0.01	0.00005	0.00025	0.017	0.00015	109	0.00025	0.00005	0.00177	0.015	2.5E-05	0.00374	35.5	0.00662	0.0038	0.00025	1.92	0.0744	8.79	5E-06	6.37	0.357	5E-06	0.00005	0.013	0.00015	0.0005	0.0074	0.000808696	5.45	2.39616	0.439662043	50.3401	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 8	30-09-2014 13:20	9/30/2014	13.3	0.0118	0.00016	0.00076	0.124	0.00005	0.00025	0.031	0.00011	278	0.00025	0.00053	0.0284	0.015	2.5E-05	0.00204	62.7	0.48	0.0311	0.00148	6.11	0.152	6.66	5E-06	22.7	1.29	5E-06	0.00005	0.026	0.00142	0.0005	0.0015	0.000635097	13.9	4.7996	0.345294954	14.2857	2014
Bi-annual Seep Sampling	TSF Haul Road Seep 8	26-05-2015 12:25	5/26/2015	13.7	0.0078	0.00022	0.00094	0.0422	0.00005	2.5E-05	0.022	7.7E-05	198	0.00025	0.00054	0.0434	0.015	2.5E-05	0.0017	47.2	0.329	0.0332	0.00094	5.21	0.0545	6.54	5E-06	17.7	0.809	5E-06	0.00005	0.011	0.00111	0.00098	0.0015	0.000286842	9.9	3.65534	0.369226419	19.5313	2015
Bi-annual Seep Sampling	TSF Haul Road Seep 9	30-07-2013 13:21	7/30/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2013
Bi-annual Seep Sampling	Waste Haul Road Seep 1	30-05-2013 9:15	5/30/2013	#N/A	0.033	0.00005	0.00015	0.0387	0.00005	0.00025	0.027	4.7E-05	64.8	0.00025	0.00005	0.00556	0.015	2.5E-05	0.00089	20.4	0.0208	0.0113	0.00025	2.1	0.0709	6.14	5E-06	6.35	0.324	5E-06	0.00005	0.005	5E-06	0.0005	0.005	#N/A	3.24	1.51944	0.468962186	106.383	2013

Location Type	Sample Point	Original Date As Is	Recoded Date	Location	Source Term Group	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Q (m3/s)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Alkalinity (CaCO3) (mg/L)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Total Nitrogen (mg/L)
							µs/cm	su	m3/s	C	ntu	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	Waste Haul Road Seep 1	10/6/2014	10/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	568	282	7.98	438	9.2	1.99	73.8	0.0068	9.08	0.072	8.22	8.22	0.002	0.0196	0.0236	0.0394	174	8.01
Bi-annual Seep Sampling	Waste Haul Road Seep 1	20-10-2014 15:12	10/20/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	765	389	8.07	607	14.9	8.12	89.6	0.0826	-5	-0.2	4.62	4.66	0.041	0.0166	0.0192	0.0675	302	4.59
Bi-annual Seep Sampling	Waste Haul Road Seep 10	30-05-2013 11:27	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. The sample was taken from a pond at the toe of the road, with no apparent flow. Heavy algae.	337	7.8	#N/A	9	#N/A	301	149	7.8	226	8	2.84	108	0.0564	17.7	0.039	1.55	1.57	0.0186	-0.001	0.0057	0.0247	30	1.83
Bi-annual Seep Sampling	Waste Haul Road Seep 11	30-05-2013 11:37	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. The sample was taken from a corner of a natural gulley, where the water is directed towards BJ Lake, not parallel to the toe of the road. Heavy algae.	369	7.9	0.0075	7.9	#N/A	331	161	7.86	243	-3	0.96	93.3	0.0152	16.5	0.048	3.28	3.28	0.002	0.0034	0.0056	0.0064	49.2	3.17
Bi-annual Seep Sampling	Waste Haul Road Seep 12	30-05-2013 11:56	5/30/2013	Waste Haul Road	All Non-PAG	Full suite.	744	7.5	0.004	7	#N/A	675	335	7.71	492	-3	1.78	143	0.0113	13.7	-0.1	17.3	17.3	0.0149	0.0063	0.0106	0.0183	151	16.5
Bi-annual Seep Sampling	Waste Haul Road Seep 13	24-06-2013 13:10	6/24/2013	Waste Haul Road	All Non-PAG	No sample taken.	509	6.4	0	6.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 14	24-06-2013 13:18	6/24/2013	Waste Haul Road	All Non-PAG	No sample taken.	414	7.4	0	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 15	24-06-2013 13:23	6/24/2013	Waste Haul Road	All Non-PAG	No sample taken.	413	7.1	0	9.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 16	24-06-2013 13:28	6/24/2013	Waste Haul Road	All Non-PAG	No sample taken.	862	7.1	0	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 17	24-06-2013 13:40	6/24/2013	Waste Haul Road	All Non-PAG	Full suite sample taken. Some algae in sample pool. Seep comes out of toe in 2 channels	1609	8.4	0.003	15.6	#N/A	1620	925	8.04	1360	15.2	6.16	189	0.239	-10	0.43	44.1	50.8	6.69	0.0013	0.0132	0.0586	602	50.5
Bi-annual Seep Sampling	Waste Haul Road Seep 17	20-10-2014 14:15	10/20/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2080	1250	8.2	1810	6.5	4.77	233	0.322	-10	-0.4	26.5	32.6	6.06	-0.001	0.0053	0.0434	1010	29.8
Bi-annual Seep Sampling	Waste Haul Road Seep 18	24-06-2013 13:46	6/24/2013	Waste Haul Road	All Non-PAG	Full suite sample taken. Adjacent small seep (assumed to be the same source) flows out at 1L/min.	2025	8	0.003	8.8	#N/A	1980	1210	7.96	1770	25.8	4.25	148	0.114	-10	0.41	52.2	56.3	4.12	0.0012	0.0075	0.0481	899	54.4
Bi-annual Seep Sampling	Waste Haul Road Seep 19	24-06-2013 13:53	6/24/2013	Waste Haul Road	All Non-PAG	Full suite sample taken.	782	8	0.0015	4.7	#N/A	718	375	8.06	510	21.2	4.25	122	0.0052	-2.5	0.28	6.01	6.23	0.218	-0.001	-0.002	0.048	244	6.26
Bi-annual Seep Sampling	Waste Haul Road Seep 19	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1060	572	8.09	793	6.1	3.8	87.2	0.0147	-2.5	-0.1	11.5	11.6	0.026	-0.001	-0.002	0.0101	460	11.2
Bi-annual Seep Sampling	Waste Haul Road Seep 2	30-05-2013 9:22	5/30/2013	Waste Haul Road	All Non-PAG	D-Metals and T-Metals only	724	8	0.004	10	#N/A	689	352	8.11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 20	24-06-2013 13:58	6/24/2013	Waste Haul Road	All Non-PAG	Full suite sample taken.	1313	8.3	0.005	1.5	#N/A	1180	654	8.01	1000	41.8	11.6	75.5	0.052	-5	0.29	24.9	25	0.112	-0.001	-0.002	0.075	510	24.5
Bi-annual Seep Sampling	Waste Haul Road Seep 20	10/6/2014	10/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1360	786	7.93	1180	4.9	3.7	66.2	0.027	-5	0.21	39.6	39.6	0.042	0.0069	0.0087	0.0131	583	39.8
Bi-annual Seep Sampling	Waste Haul Road Seep 20	20-10-2014 13:57	10/20/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1390	768	7.99	1170	10	3.26	113	0.0583	7.3	-0.2	25	25.1	0.106	-0.001	-0.002	0.0104	616	23.4
Bi-annual Seep Sampling	Waste Haul Road Seep 20	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1920	1120	8.14	1700	39	10.7	89.8	-0.005	-5	-0.2	36.2	36.3	0.031	0.0011	0.0038	0.0904	982	34.5
Bi-annual Seep Sampling	Waste Haul Road Seep 21	24-06-2013 14:14	6/24/2013	Waste Haul Road	All Non-PAG	No sample taken.	1422	7.8	0	3.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	24-06-2013 14:14	6/24/2013	Waste Haul Road	All Non-PAG	Full suite sample taken. Flows out of toe in a few streams. Flows directly into creek approximately 20m d/s.	794	7.8	0.006	2.6	#N/A	765	385	7.78	611	4.5	1.18	50.4	0.0156	-5	0.25	27.6	27.7	0.073	0.0092	0.0151	0.0254	249	26.9
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/12/2013	10/12/2013	Waste Haul Road	All Non-PAG	Sample Taken	797	7.877	#N/A	0.9	#N/A	768	391	7.38	566	16	12.1	82.1	0.0258	6.8	0.11	10.3	10.3	0.01	0.0037	0.0085	0.0539	287	10.1
Bi-annual Seep Sampling	Waste Haul Road Seep 22	26-11-2013 10:20	11/26/2013	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	636	314	7.67	459	35.1	31.2	79.3	0.0332	10.5	0.049	5.35	5.36	0.0147	0.0023	0.0078	0.0769	208	5.49
Bi-annual Seep Sampling	Waste Haul Road Seep 22	14-01-2014 12:15	1/14/2014	Waste Haul Road	All Non-PAG	Stirred up some silt	773	7.859	#N/A	1.4	38.7	753	384	7.35	567	78.7	60.1	103	0.0146	6.8	-0.2	8.56	8.56	-0.01	0.0046	0.0094	0.206	262	8.5
Bi-annual Seep Sampling	Waste Haul Road Seep 22	18-02-2014 13:24	2/18/2014	Waste Haul Road	All Non-PAG	Sample taken	805	7.602	#N/A	0.7	2.64	782	392	7.59	581	5.6	2.86	76.1	0.0709	7.5	-0.2	6.59	6.61	0.018	0.0035	0.008	0.0239	319	6.41
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/7/2014	3/7/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1350	767	7.8	1130	9	12.6	91.7	0.0261	5	-0.2	28.3	28.3	0.033	0.0029	0.0067	0.0239	585	26.6
Bi-annual Seep Sampling	Waste Haul Road Seep 22	15-05-2014 10:50	5/15/2014	Waste Haul Road	All Non-PAG	Filled ambers and 1L with D-metals (pH taken with pen)	637	8	#N/A	4.2	#N/A	640	308	7.65	484	8.5	4.41	40.1	0.0595	1.36	0.03	9.83	9.85	0.0142	0.0293	0.0377	0.0525	242	9.66
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/8/2014	6/8/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1110	627	7.87	958	8.8	1.48	119	0.0292	-5	-0.2	9.26	9.28	0.018	0.0041	0.0075	0.009	481	8.87
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/4/2014	8/4/2014	Waste Haul Road	All Non-PAG	disturbed a bit in the morning. When we came back 3 hours later for sampling, still turbid	662	7.827	#N/A	0.8	84.8	643	311	7.64	462	146	65	89.3	0.0813	4.56	0.067	7.2	7.21	0.0132	0.0057	0.0129	0.268	208	7.52
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/9/2014	8/9/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1170	668	7.78	970	218	69.1	177	0.0575	-5	-0.2	4.22	#N/A	0.022	0.0064	0.0134	0.391	507	4.52
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/12/2014	9/12/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	735	382	8.11	511	78	29.9	180	0.0274	5.2	-0.2	2.14	2.14	-0.01	0.0054	0.0087	0.135	224	2.35
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/6/2014	10/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1120	614	7.6	907	14.2	38.6	103	0.0229	-5	-0.2	28.9	29	0.019	0.0014	0.0029	0.0465	424	29.3
Bi-annual Seep Sampling	Waste Haul Road Seep 22	20-10-2014 13:40	10/20/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1130	661	8.07	858	65.8	19.8	222	0.0613	8.3	-0.2	0.757	0.769	0.012	0.0055	0.0071	0.224	437	1.14
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/3/2014	11/3/2014	Waste Haul Road	All Non-PAG	Open, snow and dirt pushed into seep area from road above	877	6.87	#N/A	0.9	1.65	843	440	7.45	637	7.7	2.84	99.8	0.0201	5.5	-0.2	8.03	8.05	0.015	0.004	0.0085	0.0335	329	7.64
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/11/2014	11/11/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	947	519	8.02	673	-3	1.93	217	0.0608	-5	-0.2	0.823	0.835	0.012	0.0036	0.0039	0.01	331	0.88
Bi-annual Seep Sampling	Waste Haul Road Seep 22	13-01-2015 11:30	1/13/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	921	493	7.44	692	5.2	3.26	175	0.0356	5.2	0.049	4.19	4.2	0.0069	0.004	0.005	0.0246	321	4.26
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/3/2015	3/3/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	803	429	7.62	603	39.2	14	124	0.0227	4.6	0.087	5.45	5.45	0.0042	0.0036	0.0046	0.0431	306	5.68
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/2/2015	4/2/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	766	421	7.44	571	94.3	31.7	159	0.0473	5.3	0.072	1.45	1.45	0.0035	0.0033	0.0073	0.281	257	1.74
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/6/2015	4/6/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	988	574	7.78	797	457	149	121	0.0236	3.5	0.051	4.82	4.82	0.0049	0.0015	0.006	1.93	428	5.21
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/5/2015	6/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1030	532	8.08	781	25.8	6.34	113	0.011	4.1	-0.1	10.7	10.7	-0.005	-0.001	0.004	0.113	410	10.6
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/4/2015	9/4/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	833	451	7.7	608	29.7	3.37	118	0.0125	2.5	0.045	7.01	7.02	0.0063	-0.001	0.0037	0.0677	311	6.99
Bi-annual Seep Sampling	Waste Haul Road Seep 22	29-10-2015 13:39	10/29/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1080	573	7.28	831	15.3	19.7	183	0.0988	6.2	-0.1	0.067	0.067	-0.005	0.0082	0.0089	0.0481	434	0.423
Bi-annual Seep Sampling	Waste Haul Road Seep 22	30-11-2015 12:40	11/30/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1050	573	6.85	777	6.7	5.63	173	0.113	6.1	0.1	-0.025	0.025	0.0054	0.0208	0.0182	0.125	412	0.366
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/6/2014	12/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	952	514	8.27	763	13	5.79	164	0.0073	10.2	-0.2	11	11	0.019	0.0057	0.0117	0.0229	333	10.8
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	874	436	8.37	620	164	55.9	172	0.0107	15.3	0.111	22.7	22.7	0.0109	0.0116	0.0151	0.45	209	21.7
Bi-annual Seep Sampling	Waste Haul Road Seep 24	12/6/2014	12/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1100	560	7.8	791	-3	0.85	125	0.0454	12.9	-0.2	14	14.1	0.077	0.0161	0.0188	0.0294	426	13.5
Bi-annual Seep Sampling	Waste Haul Road Seep 25	11/5/2015	11/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1330	739	7.92	1090	8	3.58	65	0.0229	3.1	-0.1	31.4	31.4	0.0882	0.0028	0.0022	0.0407	566	28.9
Bi-annual Seep Sampling	Waste Haul Road Seep 26	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	2140	1290	8.09	1980	5.1	0.33	76.4	0.0096	-10	-0.4	62.7	62.8	0.03	0.004	0.0059	0.0096	1040	58.3
Bi-annual Seep Sampling	Waste Haul Road Seep 27	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1400	769	8.19	1110	13	14.2	130	0.0705	10.6	-0.1	16.6	16.7	0.0258	0.0032	0.0042	0.13	614	15.7
Bi-annual Seep Sampling	Waste Haul Road Seep 28	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1330	746	8.16	1030	-3	0.42	167	0.0323	5.5	-0.1	12.5	12.6	0.0556	0.006	0.0065	0.0267	551	12.1
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 9:30	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. Sample site previously named WHR Runoff""	527	7.9	0.02	4.5	#N/A	480	230	8.09	321	-3	0.72	104	-0.005	10	0.18	12.3	12.3	0.0093	0.019	0.0209	0.0238	81.8	12
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 12:17	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. Dug a small sump and sampled later.	615	7.9	0.005	7.5	#N/A	578	293	8.17	250	18	12.2	178	0.0129	13.1	0.114	5.71	5.72	0.0087	0.0104	0.016	0.0667	92.5	5.9
Bi-annual Seep Sampling	Waste Haul Road Seep 3	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	413	189	8.21	286	-3	2.24	90.4	-0.005	5.25	0.184	4.21	4.21	0.0012	0.023	0.0231	0.0272	90.4	3.99
Bi-annual Seep Sampling	Waste Haul Road Seep 4	10/6/2014	10/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	417	207	8.03	287	-3	1.85	97.6	-0.005	4.83	0.172	4.59	4.6	0.0011	0.0204	0.0208	0.0242	93	4.51
Bi-annual Seep Sampling	Waste Haul Road Seep 4	20-10-2014 15:42	10/20/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	467	224	8.23	338	4	5.56	85.6	-0.005	5.64	0.198	5.2	5.2	0.002	0.0218	0.0231	0.0298	118	4.53
Bi-annual Seep Sampling	Waste Haul Road Seep 5	30-05-2013 12:24	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. Dug a small sump and sampled later.	696	8.2	0.003	3.7	#N/A	639	325	8.19	304	19.3	15.3	217	0.284	17.3	0.098	6.4	6.6	0.198	0.014	0.026	0.0807	78.7	6.95
Bi-annual Seep Sampling	Waste Haul Road Seep 5	10/6/2014	10/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	590	308	8.01	418	14	9.29	154	0.0838	10.8	0.16	2.08	2.09	0.0118	0.0184	0.0191	0.0851	139	2.39
Bi-annual Seep Sampling	Waste Haul Road Seep 5	20-10-2014 15:55	10/20/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	512	259	8.36	354	14	14.6	165	0.0922	5.93	0.142	0.59	0.598	0.0075	0.0243	0.0307	0.0636	105	0.883
Bi-annual Seep Sampling	Waste Haul Road Seep 5	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	586	293	8.25	407	15.4	12.2	111	0.0458	9.91	0.12	1.77	1.78	0.0089	0.0165	0.0218	0.0675	150	1.85
Bi-annual Seep Sampling	Waste Haul Road Seep 6	30-05-2013 9:45	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. Filled sample bottles with 120ml amber. Multiple seeps, sample taken from largest one.	932	6.9	0.005	5.8	#N/A	871	453	7.81	537	4.7	17.1	220	0.279	10.4	-0.2	2.84	3.77	0.926	0.0147	0.0351	0.0964	239	5.21
Bi-annual Seep Sampling	Waste Haul Road Seep 6	10/6/2014	10/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	867	477	7.98	637	150	48	244	0.277	5.3	-0.2	4.36	4.41	0.05	0.0048	0.0081	0.146	224	5.26
Bi-annual Seep Sampling	Waste Haul Road Seep 7	30-05-2013 10:16	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. Multiple seeps, sample taken from lagest one. This seep may reach BJ Lake on surface.	655	7.7	0.04	5.4	#N/A	586	308	7.98	443	14.4	17.3	182	0.0125	4.6	0.083	4.59	4.59	0.0056	0.0132	0.0207	0.051	133	4.6
Bi-annual Seep Sampling	Waste Haul Road Seep 7	26-11-2013 12:10	11/26/2013	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	929	491	8.19	664	26.9	17.7	189	0.037	6.5	-0.2	14.6	14.6	0.037	0.0093	0.0145	0.0875	246	14.5
Bi-annual Seep Sampling	Waste Haul Road Seep 7	3/7/2014	3/7/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1070	605	8.36	851	124	106	208	0.0164	5.1	-0.2	15.4	15.4	0.052	0.0164	0.0241	0.161	355	14.9
Bi-annual Seep Sampling	Waste Haul Road Seep 7	15-05-2014 10:09	5/15/2014	Waste Haul Road	All Non-PAG	Sample taken ~20m d/s of WHR toe, multiple streams, filled bottles with 250mL amber, bear scat, squirrel, butterfly. (pH taken with pen)	714	8.1	#N/A	4	#N/A	705	367	8.17	530	25.5	16.9	150	0.0144	2.5	0.08	9.33	9.34	0.0097	0.0159	0.0203	0.0751	189	9.22
Bi-annual Seep Sampling	Waste Haul Road Seep 7	11/11/2014	11/11/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	1230	706	8.35	911	88.1	55.3	255	0.016	9	-0.2	4.9	4.91	0.013	0.0075	0.0131	0.226	462	4.74
Bi-annual Seep Sampling	Waste Haul Road Seep 7	12/6/2014	12/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	861	468	8.09	664	8.7	4.58	183	0.0172	-5	-0.2	9.69	9.71	0.017	0.0156	0.0163	0.0531	262	9.53
Bi-annual Seep Sampling	Waste Haul Road Seep 8	30-05-2013 10:50	5/30/2013	Waste Haul Road	All Non-PAG	Full suite.	929	7.7	0.001	1.5	#N/A	813	411	7.73	624	7	1.87	105	0.0052	22.4	-0.2	13.8	13.9	0.024	0.0521	0.0618	0.0702	272	13.2
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/6/2014	12/6/2014	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	889	461	7.97	689	-3	0.69	90.3	0.0075	13.9	-0.2	9.55	9.57	0.022	0.0265	0.0334	0.0386	344	9.6
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/5/2015	12/5/2015	Waste Haul Road	All Non-PAG		#N/A	#N/A	#N/A	#N/A	#N/A	869	424	8.13	636	11	0.15	79.4	-0.005	7.1	0.045	5.19	5.19	-0.002	0.0212	0.0243	0.0256	353	5.03
Bi-annual Seep Sampling	Waste Haul Road Seep 9	30-05-2013 11:06	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. The sample was taken from a pond in a small gulley with no apparent flow. Heavy algae.	497	7.4	#N/A	5.3	#N/A	444	220	7.41	318	-3	0.55	119	0.0168	22.6	0.038	2.56	2.57	0.0075	0.0058	0.0078	0.0155	79.9	3.35
Bi-annual Seep Sampling	Waste Haul Road Under Culvert	30-05-2013 12:47	5/30/2013	Waste Haul Road	All Non-PAG	Full suite. Sample taken from below WHR culvert where it appears as though water is flowing from under the culvert. Flow unkown because it comes out of the rocks and enters the stream and its hard to see where one starts and the other begins.	526	8.3	#N/A	8.8	#N/A	495	231	7.91	294	9.3	2.87	68.3	-0.005	18.3	0.085	1.89	1.9	0.0061	0.006	0.0104	0.0325	146	2.03

Location Type	Sample Point	Original Date As Is	Recoded Date	Dissolved Organic Carbon (mg/L)	Aluminum (Al)-Total (mg/L)	Antimony (Sb)-Total (mg/L)	Arsenic (As)-Total (mg/L)	Barium (Ba)-Total (mg/L)	Beryllium (Be)-Total (mg/L)	Bismuth (Bi)-Total (mg/L)	Boron (B)-Total (mg/L)	Cadmium (Cd)-Total (mg/L) (mg/L)	Calcium (Ca)-Total (mg/L)	Chromium (Cr)-Total (mg/L)	Cobalt (Co)-Total (mg/L)	Copper (Cu)-Total (mg/L)	Iron (Fe)-Total (mg/L) (mg/L)	Lead (Pb)-Total (mg/L)	Lithium (Li)-Total (mg/L)	Magnesium (Mg)-Total (mg/L)	Manganese (Mn)-Total (mg/L)	Molybdenum (Mo)-Total (mg/L)	Nickel (Ni)-Total (mg/L)	Potassium (K)-Total (mg/L)	Selenium (Se)-Total (mg/L)	Silicon (Si)-Total (mg/L)	Silver (Ag)-Total (mg/L)	Sodium (Na)-Total (mg/L)	Strontium (Sr)-Total (mg/L)	Thallium (Tl)-Total (mg/L)	Tin (Sn)-Total (mg/L)	Titanium (Ti)-Total (mg/L)	Uranium (U)-Total (mg/L)	Vanadium (V)-Total (mg/L)	Zinc (Zn)-Total (mg/L)	Aluminum (Al)-Dissolved (mg/L)	Antimony (Sb)-Dissolved (mg/L)	Arsenic (As)-Dissolved (mg/L)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	Waste Haul Road Seep 1	10/6/2014	10/6/2014	7.39	0.184	0.00011	0.0009	0.0336	-0.0001	-0.0005	0.043	0.000051	80.2	-0.0005	0.00029	0.0195	0.171	9.2E-05	0.00087	21	0.0664	0.0525	0.0005	2.09	0.024	8.29	1.4E-05	8.73	0.364	-0.00001	-0.0001	0.019	0.000293	0.0019	0.0079	0.0391	-0.0001	0.00074
Bi-annual Seep Sampling	Waste Haul Road Seep 1	20-10-2014 15:12	10/20/2014	7.5	0.601	0.00011	0.00045	0.0674	-0.0001	-0.0005	0.034	0.000107	104	-0.0005	0.00097	0.0304	0.451	0.00015	0.00125	27.5	0.512	0.0162	0.00087	2.62	0.0279	8.27	1.8E-05	9.18	0.459	-0.00001	-0.0001	0.04	0.000043	0.0016	0.0066	0.0322	-0.0001	0.00025
Bi-annual Seep Sampling	Waste Haul Road Seep 10	30-05-2013 11:27	5/30/2013	5.63	0.058	-0.0001	0.00028	0.0232	-0.0001	-0.0005	0.019	0.000022	49.2	-0.0005	-0.0001	0.0112	0.075	-0.00005	0.00111	6.97	0.00731	0.00284	-0.0005	0.679	0.00819	7.34	-0.00001	4.96	0.12	-0.00001	-0.0001	-0.01	0.000025	-0.001	-0.003	-0.003	-0.0001	0.00023
Bi-annual Seep Sampling	Waste Haul Road Seep 11	30-05-2013 11:37	5/30/2013	4.21	0.0764	-0.0001	0.00027	0.026	-0.0001	-0.0005	0.016	0.000017	49.3	-0.0005	-0.0001	0.00704	0.063	5.1E-05	0.00116	9.62	0.00348	0.00199	-0.0005	1.01	0.0141	8.08	-0.00001	4.98	0.134	-0.00001	-0.0001	0.011	-0.00001	-0.001	0.0031	0.0031	-0.0001	0.00022
Bi-annual Seep Sampling	Waste Haul Road Seep 12	30-05-2013 11:56	5/30/2013	3.92	0.0911	0.00013	0.00048	0.0584	-0.0001	-0.0005	0.048	0.000112	97.9	0.0011	0.00044	0.0171	0.159	-0.00005	0.00329	23.9	0.137	0.0118	0.00063	1.8	0.0254	8.85	-0.00001	10.6	0.352	-0.00001	-0.0001	0.012	0.000535	0.0016	0.0066	0.0115	0.00012	0.00036
Bi-annual Seep Sampling	Waste Haul Road Seep 13	24-06-2013 13:10	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 14	24-06-2013 13:18	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 15	24-06-2013 13:23	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 16	24-06-2013 13:28	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 17	24-06-2013 13:40	6/24/2013	23.2	0.103	0.0005	0.0015	0.0883	-0.0001	-0.0005	0.035	0.000239	268	-0.0005	0.00963	0.0161	0.91	7.4E-05	0.00516	48.7	4.4	0.0824	0.00226	5.13	0.276	6.33	8.1E-05	16.9	0.859	-0.00001	-0.0001	0.018	0.0016	0.0012	0.0092	0.0104	0.00049	0.00135
Bi-annual Seep Sampling	Waste Haul Road Seep 17	20-10-2014 14:15	10/20/2014	26.4	0.0247	0.00035	0.00099	0.0845	-0.0002	-0.001	0.033	0.000289	386	-0.0005	0.0186	0.0258	0.832	-0.0001	0.0031	62.7	7.35	0.125	0.0028	3.02	0.279	5.89	2.1E-05	17.8	1.04	-0.00002	-0.0002	0.028	0.00178	-0.002	0.0068	0.01	0.00031	0.0009
Bi-annual Seep Sampling	Waste Haul Road Seep 18	24-06-2013 13:46	6/24/2013	11.4	0.317	0.00036	0.00137	0.0705	-0.0002	-0.001	0.024	-0.0005	351	0.00074	0.0107	0.0176	0.965	0.00016	0.0039	60.9	5.28	0.16	0.0034	1.93	0.631	6.03	-0.00002	17	0.899	-0.00002	-0.0002	0.029	0.00256	-0.002	-0.006	0.007	0.00036	0.00117
Bi-annual Seep Sampling	Waste Haul Road Seep 19	24-06-2013 13:53	6/24/2013	5.55	0.284	0.00041	0.00163	0.0307	-0.0001	-0.0005	0.027	-0.0003	107	-0.0005	0.0015	0.0311	0.45	0.00025	0.00301	20.2	0.859	0.113	0.00092	0.754	0.117	5.13	1.2E-05	11.7	0.371	-0.00001	-0.0001	0.021	0.00283	0.0022	0.006	-0.003	0.00043	0.00156
Bi-annual Seep Sampling	Waste Haul Road Seep 19	12/5/2015	12/5/2015	3.25	0.095	0.00031	0.00079	0.0332	-0.0001	-0.00005	0.029	0.000112	177	-0.0005	0.00086	0.00992	0.421	5.6E-05	0.0054	35.2	0.447	0.192	-0.0005	0.911	0.21	8.06	-0.00001	8.89	0.455	-0.00001	-0.0001	0.011	0.00221	0.00106	-0.003	-0.003	0.00027	0.00055
Bi-annual Seep Sampling	Waste Haul Road Seep 2	30-05-2013 9:22	5/30/2013	#N/A	0.367	-0.0001	0.00128	0.0366	-0.0001	-0.0005	0.14	0.000021	96.4	-0.0005	0.0006	0.0176	0.479	0.00013	0.00108	26.6	0.23	0.0113	0.00074	2.26	0.00259	7.68	-0.00001	11.2	0.453	-0.00001	-0.0001	0.025	0.000408	0.0021	0.0031	0.0148	-0.0001	0.00103
Bi-annual Seep Sampling	Waste Haul Road Seep 20	24-06-2013 13:58	6/24/2013	4.32	1.39	0.00038	0.00145	0.0547	-0.0001	-0.0005	0.028	-0.0002	185	0.00068	0.00206	0.0588	1.28	0.00035	0.00656	37.7	0.646	0.127	0.00146	1.58	0.213	9.43	2.4E-05	12.5	0.572	-0.00001	-0.0001	0.09	0.00217	0.0052	0.0061	0.0041	0.00038	0.00071
Bi-annual Seep Sampling	Waste Haul Road Seep 20	10/6/2014	10/6/2014	2.6	0.105	0.00032	0.00071	0.0345	-0.0001	-0.0005	0.033	-0.0003	229	-0.0005	0.00065	0.0168	0.118	9.1E-05	0.0045	46.2	0.296	0.279	0.00062	1.25	0.298	7.53	-0.00001	12.1	0.624	-0.00001	-0.0001	0.021	0.00223	0.0011	0.0067	0.003	0.0003	0.00057
Bi-annual Seep Sampling	Waste Haul Road Seep 20	20-10-2014 13:57	10/20/2014	3.89	0.17	0.00031	0.00071	0.0359	-0.0001	-0.0005	0.041	0.000139	226	-0.0005	0.00145	0.0201	0.309	9.1E-05	0.00457	45	0.986	0.129	0.00078	1.42	0.186	6.84	1.1E-05	13.4	0.655	-0.00001	-0.0001	0.03	0.00198	0.0012	0.005	-0.003	0.0003	0.00055
Bi-annual Seep Sampling	Waste Haul Road Seep 20	12/5/2015	12/5/2015	4.37	0.804	0.00064	0.0019	0.0669	-0.0002	-0.0001	0.069	0.000113	342	0.00117	0.001	0.0162	1.08	0.00044	0.0091	64.7	0.105	0.452	0.0012	2.16	0.343	7.16	-0.00002	21.7	0.946	-0.00002	-0.0002	0.043	0.00284	0.0045	-0.006	0.0068	0.00066	0.00116
Bi-annual Seep Sampling	Waste Haul Road Seep 21	24-06-2013 14:14	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	24-06-2013 14:14	6/24/2013	3.43	0.174	0.00018	0.00055	0.0411	-0.0001	-0.0005	0.018	0.000073	105	-0.0005	0.00039	0.00396	0.232	0.00011	0.00144	26.7	0.128	0.0512	0.00067	2.03	0.134	8.09	-0.00001	11	0.452	-0.00001	-0.0001	0.019	0.000325	0.0013	-0.003	0.0061	0.00017	0.00038
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/12/2013	10/12/2013	5.99	0.49	0.00016	0.00078	0.0557	-0.0001	-0.0005	0.069	0.000038	109	0.00105	0.00094	0.00559	1.5	0.00036	0.00055	33	0.284	0.00212	0.00145	1.67	0.0364	7.38	-0.00001	13.5	0.464	-0.00001	-0.0001	0.038	0.00004	0.0031	-0.003	0.006	0.00013	0.00019
Bi-annual Seep Sampling	Waste Haul Road Seep 22	26-11-2013 10:20	11/26/2013	7.97	0.14	0.00012	0.00033	0.0437	-0.0001	-0.0005	0.042	0.000029	81.4	-0.0005	0.00047	0.00385	0.226	-0.00005	-0.0005	26.1	0.312	0.00196	0.00126	1.53	0.0245	6.12	-0.00001	10.6	0.351	-0.00001	-0.0001	0.021	0.000032	-0.001	-0.003	0.0136	0.0001	0.00021
Bi-annual Seep Sampling	Waste Haul Road Seep 22	14-01-2014 12:15	1/14/2014	6.07	2	0.00021	0.00248	0.0702	-0.0001	-0.0005	0.078	0.000079	108	0.00367	0.00292	0.0142	6.26	0.00079	0.00173	33	0.54	0.00356	0.00349	1.9	0.0205	10.7	2.9E-05	13.8	0.443	0.000017	-0.0001	0.106	0.000093	0.0121	0.0083	0.0143	0.00015	0.00021
Bi-annual Seep Sampling	Waste Haul Road Seep 22	18-02-2014 13:24	2/18/2014	4.09	0.0817	0.00036	0.00027	0.0486	-0.0001	-0.0005	0.133	0.000032	106	-0.0005	0.00037	0.00234	0.14	-0.00005	-0.0005	30.7	0.209	0.0046	0.00083	1.61	0.0231	5.72	1.5E-05	16.9	0.421	-0.00001	-0.0001	0.011	0.000043	-0.001	-0.003	0.0072	0.00033	0.0002
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/7/2014	3/7/2014	5.71	0.762	0.00025	0.00057	0.11	-0.0001	-0.0005	0.076	0.000067	214	0.00133	0.00055	0.0068	0.748	0.00021	0.0009	56.7	0.305	0.00565	0.00198	2.24	0.182	7.59	-0.00001	18.5	1.02	-0.00001	-0.0001	0.047	0.000071	0.0023	0.0049	0.0044	0.00023	0.00029
Bi-annual Seep Sampling	Waste Haul Road Seep 22	15-05-2014 10:50	5/15/2014	5.67	0.145	-0.0001	0.00027	0.0402	-0.0001	-0.0005	0.013	0.000025	87.1	-0.0005	0.00013	0.00233	0.162	-0.00005	-0.0005	22.4	0.00515	0.00527	-0.0005	2.75	0.0594	6.98	-0.00001	8.42	0.361	-0.00001	-0.0001	0.018	-0.00001	-0.001	-0.003	0.0146	-0.0001	0.00021
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/8/2014	6/8/2014	6.45	0.0798	0.0002	0.00038	0.0793	-0.0001	-0.0005	0.077	0.000064	172	-0.0005	0.00037	0.00444	0.116	-0.00005	-0.0005	43.9	0.456	0.0063	0.00166	2.01	0.0878	6.56	-0.00001	17.2	0.69	-0.00001	-0.0001	0.014	0.000109	-0.001	-0.003	0.007	0.00019	0.00032
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/4/2014	8/4/2014	6.09	4.32	0.00045	0.00251	0.0866	-0.0001	-0.0005	0.079	0.000068	82.6	0.0068	0.00374	0.0327	6.42	0.00148	0.00283	24	0.578	0.00976	0.00582	2	0.0267	13.7	0.00003	12.3	0.345	0.00003	-0.0001	0.226	0.000196	0.0142	0.0152	0.0135	0.00032	0.00034
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/9/2014	8/9/2014	8.56	7.28	0.00036	0.00518	0.165	0.0002	-0.0005	0.06	0.000234	181	0.0109	0.0071	0.0589	9.83	0.00327	0.00559	49.8	1.76	0.00928	0.0114	3.49	0.0709	20.4	4.6E-05	16.7	0.775	0.000045	-0.0001	0.371	0.000441	0.0255	0.0284	0.0069	0.00016	0.00042
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/12/2014	9/12/2014	9.77	2.81	0.00028	0.00212	0.0731	-0.0001	-0.0005	0.029	0.000104	103	0.00392	0.00439	0.032	4.45	0.00105	0.00278	28	1.44	0.0153	0.00453	2.1	0.0154	10.5	2.5E-05	9.97	0.427	0.000017	-0.0001	0.151	0.000389	0.0093	0.0113	0.0105	0.00017	0.00035
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/6/2014	10/6/2014	5.36	1.04	0.00026	0.00084	0.0991	-0.0001	-0.0005	0.065	0.000067	172	0.00198	0.00128	0.0113	1.35	0.00044	0.00094	46	0.555	0.00531	0.00239	2.29	0.173	7.58	-0.00001	14.6	0.706	-0.00001	-0.0001	0.052	0.00014	0.0038	0.005	0.0104	0.00025	0.0003
Bi-annual Seep Sampling	Waste Haul Road Seep 22	20-10-2014 13:40	10/20/2014	10.1	2.24	0.00026	0.00157	0.0866	-0.0001	-0.0005	0.056	0.000098	170	0.00365	0.00316	0.0179	2.89	0.00077	0.00197	44.6	1.4	0.00587	0.00547	2.52	0.0177	11	2.8E-05	14.9	0.675	0.000017	-0.0001	0.133	0.000322	0.0072	0.0101	0.0114	0.00017	0.00038
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/3/2014	11/3/2014	4.35	0.158	0.00031	0.00044	0.0533	-0.0001	-0.0005	0.167	0.000036	118	-0.0005	0.00075	0.00337	0.615	6.2E-05	0.00089	32.8	0.226	0.00376	0.00092	1.81	0.0231	5.68	-0.00001	18.6	0.477	-0.00001	-0.0001	0.02	0.000051	0.002	-0.003	0.0079	0.00027	0.00021
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/11/2014	11/11/2014	9.88	0.15	0.00025	0.00068	0.0562	-0.0001	-0.0005	0.041	0.000059	146	0.00055	0.00318	0.00515	0.77	8.7E-05	-0.0005	38.1	1.44	0.00665	0.00253	1.98	0.0135	7.19	-0.00001	13.9	0.571	-0.00001	-0.0001	0.024	0.000221	0.0013	-0.003	0.004	0.00017	0.00033
Bi-annual Seep Sampling	Waste Haul Road Seep 22	13-01-2015 11:30	1/13/2015	8.02	0.219	0.00018	0.00051	0.0579	-0.0001	-0.0005	0.032	0.000052	138	0.00059	0.00184	0.0047	0.65	9.1E-05	-0.0005	37.2	0.94	0.00274	0.00195	1.7	0.0315	6.54	-0.00001	11.7	0.56	-0.00001	-0.0001	0.023	0.000126	0.0016	0.003	0.0085	0.00016	0.00023
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/3/2015	3/3/2015	7.3	0.488	0.00019	0.00061	0.0498	-0.0001	-0.0005	0.029	0.000039	113	0.00097	0.00126	0.00543	0.993	0.00019	0.00064	31.5	0.507	0.00224	0.00162	1.47	0.0415	6.09	-0.00001	10.2	0.481	-0.00001	-0.0001	0.035	0.000057	0.0024	0.0034	0.0077	0.00014	0.0002
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/2/2015	4/2/2015	7.89	0.187	0.00018	0.00047	0.0454	-0.0001	-0.0005	0.033	0.000042	112	0.00072	0.00172	0.00448	0.561	9.5E-05	0.0005	30.1	0.783	0.00293	0.00183	1.59	0.0161	5.93	-0.00001	11.5	0.457	-0.00001	-0.0001	0.017	0.000106	0.0015	-0.003	0.0079	0.00014	0.00026
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/6/2015	4/6/2015	7.36	11.6	0.00049	0.00839	0.221	0.00035	0.000069	0.04	0.000211	165	0.018	0.0158	0.0751	21.1	0.0042	0.0101	46.1	3.14	0.0091	0.0169	2.97	0.0867	27.3	6.4E-05	14.6	0.689	0.000058	0.00014	0.512	0.000379	0.0419	0.0381	0.016	0.00014	0.00026
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/5/2015	6/5/2015	6.8	1.52	0.0002	0.00144	0.0803	-0.0001	-0.00005	0.028	0.0000514	146	0.0023	0.00275	0.0128	3.16	0.00055	0.001	41.1	0.741	0.00354	0.00279	1.96	0.13	8.61	1.4E-05	12.2	0.614	-0.00001	-0.0001	0.078	0.000086	0.00636	0.0061	0.0041	0.00014	0.00022
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/4/2015	9/4/2015	6.64	0.83	0.00022	0.00107	0.0614	-0.0001	0.000056	0.031	0.0000482	125	0.00158	0.00181	0.0099	1.76	0.00038	0.0011	32.8	0.509	0.00314	0.00188	1.78	0.0745	7.11	1.2E-05	9.87	0.503	-0.00001	-0.0001	0.051	0.000094	0.00427	0.0045	0.006	0.00017	0.00023
Bi-annual Seep Sampling	Waste Haul Road Seep 22	29-10-2015 13:39	10/29/2015	10.1	0.0949	-0.0001	0.00232	0.0903	-0.0001	-0.00005	0.039	0.0000199	167	0.00071	0.00976	0.00191	5.37	-0.00005	-0.001	42.7	3.66	0.00702	0.00448	2.51	0.00145	7.69	-0.00001	20	0.677	-0.00001	-0.0001	0.013	0.000117	0.0029	-0.003	0.0068	-0.0001	0.00108
Bi-annual Seep Sampling	Waste Haul Road Seep 22	30-11-2015 12:40	11/30/2015	9.32	0.0822	-0.0001	0.00189	0.0731	-0.0001	-0.00005	0.041	0.0000324	164	0.00072	0.00754	0.00242	5.69	-0.00005	-0.001	40.6	3.03	0.0043	0.0043	1.74	0.000694	6.86	-0.00001	18.5	0.638	-0.00001	-0.0001	-0.01	0.000075	0.00232	-0.003	0.0085	-0.0001	0.00093
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/6/2014	12/6/2014	9.54	0.124	0.00036	0.00078	0.041	-0.0001	-0.0005	0.049	-0.0001	149	-0.0005	0.00081	0.0266	0.2	5.9E-05	0.00322	36	0.461	0.161	0.00063	3.08	0.0254	7.14	-0.00001	17.4	0.606	-0.00001	-0.0001	0.021	0.00179	0.0013	-0.003	0.0068	0.00033	0.00065
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/5/2015	12/5/2015	8.08	0.527	0.00021	0.00092	0.0382	-0.0001	-0.00005	0.036	0.0000427	128	0.00055	0.00165	0.03	0.651	0.00022	0.002	31.7	0.19	0.0743	0.00068	2.88	0.0206	7.53	0.00001	15.1	0.578	-0.00001	-0.0001	0.037	0.000981	0.00236	0.0036	0.0078	0.00023	0.00054
Bi-annual Seep Sampling	Waste Haul Road Seep 24	12/6/2014	12/6/2014	4.87	0.0474	0.00128	0.00049	0.0704	-0.0001	-0.0005	0.122	-0.0002	177	-0.0005	0.00052	0.015	0.081	-0.00005	0.00374	31.3	0.299	0.0754	-0.0005	2.66	0.0425	7.04	-0.00001	22.4	0.803	-0.00001	-0.0001	0.016	0.00338	-0.001	0.0045	0.0078	0.00126	0.00042
Bi-annual Seep Sampling	Waste Haul Road Seep 25	11/5/2015	11/5/2015	5.41	0.0914	0.00033	0.00104	0.0505	-0.0001	-0.00005	0.046	0.0000545	218	-0.0005	0.00153	0.00375	1.91	-0.00005	0.0025	49.6	0.8	0.501	0.00108	2.06	0.322	8.19	-0.00001	16.4	0.751	-0.00001	-0.0001	0.012	0.000251	0.00281	-0.003	0.0041	0.00032	0.00052
Bi-annual Seep Sampling	Waste Haul Road Seep 26	12/5/2015	12/5/2015	3.46	0.0378	0.00032	0.00087	0.0393	-0.0002	-0.0001	0.038	0.000094	388	-0.0005	0.00032	0.013	0.087	-0.0001	0.0053	75.8	0.157	0.18	-0.001	1.93	0.482	6.12	-0.00002	21	1.12	-0.00002	-0.0002	-0.01	0.0035	-0.001	-0.006	-0.003	0.00034	0.00064
Bi-annual Seep Sampling	Waste Haul Road Seep 27	12/5/2015	12/5/2015	7.24	0.272	0.00027	0.00068	0.0545	-0.0001	-0.00005	0.059	0.0000881	215	-0.0005	0.00106	0.0247	0.454	9.7E-05	0.0025	49.6	0.711	0.0783	0.00084	2.1	0.0561	6.3	-0.00001	19.6	0.83	-0.00001	-0.0001	0.024	0.000982	0.00148	0.0032	0.0074	0.00026	0.00041
Bi-annual Seep Sampling	Waste Haul Road Seep 28	12/5/2015	12/5/2015	11.2	0.0544	0.00023	0.00062	0.0614	-0.0001	-0.00005	0.035	0.0000532	227	-0.0005	0.00088	0.0158	0.443	-0.00005	0.0017	45.8	0.737	0.202	0.00056	2.93	0.0453	6.69	-0.00001	16	0.976	-0.00001	-0.0001	0.01	0.00196	0.00103	-0.003	0.0104	0.00021	0.00044
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 9:30	5/30/2013	2.86	0.0441	0.00013	0.00291	0.0157	-0.0001	-0.0005	0.242	0.000014	67.9	0.00072	-0.0001	0.00669	0.053	-0.00005	0.00215	15.6	0.0203	0.0349	-0.0005	1.01	0.0143	12.1	-0.00001	7.15	0.293	-0.00001	-0.0001	-0.01	0.000493	0.003	-0.003	-0.003	0.00012	0.00278
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 12:17	5/30/2013	8.6	0.711	0.0001	0.00182	0.0386	-0.0001	-0.0005	0.076	0.000022	85.6	0.00063	0.00056	0.0314	0.689	0.00028	0.00225	19.4	0.0473	0.0216	0.00118	3.6	0.00808	11.9	1.5E-05	7.43	0.394	-0.00001	-0.0001	0.05	0.00135	0.0035	0.0049	0.0222	-0.0001	0.00142
Bi-annual Seep Sampling	Waste Haul Road Seep 3	12/5/2015	12/5/2015	1.47	0.12	0.00014	0.00359	0.0132	-0.0001	-0.00005	0.24	0.0000102	59.2	0.00151	0.00012	0.00808	0.13	-0.00005	0.0018	12.6	0.0169	0.0312	-0.0005	0.8	0.00711	13.2	-0.00001	7.1	0.246	-0.00001	-0.0001	-0.01	0.000326	0.00374	-0.003	0.0035	0.00014	0.00329
Bi-annual Seep Sampling	Waste Haul Road Seep 4	10/6/2014	10/6/2014	1.83	0.0587	0.00013	0.0029	0.0167	-0.0001	-0.0005	0.227	0.000025	60.2	-0.0005	-0.0001	0.00799	0.071	-0.00005	0.00188	13.2	0.0218	0.0334	-0.0005	0.999	0.00947	11.7	-0.00001	6.44	0.26	-0.00001	-0.0001	0.011	0.00037	0.0029	-0.003	0.0036	0.00012	0.00285
Bi-annual Seep Sampling	Waste Haul Road Seep 4	20-10-2014 15:42	10/20/2014	1.66	0.319	0.00016	0.00382	0.0242	-0.0001	-0.0005	0.268	0.000018	66.3	-0.0005	0.00027	0.0161	0.272	0.00011	0.00283	13.6	0.0256	0.0354	-0.0005	0.871	0.00788	12.7	-0.00001	7.78	0.294	-0.00001	-0.0001	0.028	0.00041	0.0041	-0.003	0.003	0.00015	0.00383
Bi-annual Seep Sampling	Waste Haul Road Seep 5	30-05-2013 12:24	5/30/2013	14.4	0.417	-0.0001	0.00129	0.038	0.00011	-0.0005	0.033	0.000066	94.5	0.00066	0.00165	0.0271	0.834	0.00017	0.00101	20.9	1.71	0.0172	0.00103	4.7	0.0108	11.1	-0.00001	7.57	0.377	-0.00001	-0.0001	0.03	0.000516	0.0023	0.0044	0.014	-0.0001	0.001
Bi-annual Seep Sampling	Waste Haul Road Seep 5	10/6/2014	10/6/2014	7.14	0.174	0.0001	0.00102	0.0362	-0.0001	-0.0005	0.045	0.000053	91.8	-0.0005	0.00084	0.0165	0.691	0.0001	0.00103	18.3	0.842	0.0264	0.00057	3.08	0.0075	10	-0.00001	7.32	0.358	-0.00001	-0.0001	0.019	0.000394	0.0016	-0.003	0.0061	-0.0001	0.00064
Bi-annual Seep Sampling	Waste Haul Road Seep 5	20-10-2014 15:55	10/20/2014	7.86	0.71	0.00012	0.0015	0.0406	-0.0001	-0.0005	0.077	0.000029	74.8	0.0006	0.00097	0.0293	0.909	0.00026	0.00203	13.7	0.864	0.0214	0.00086	2.33	0.00278	12.4	1.6E-05	8.47	0.298	-0.00001	-0.0001	0.05	0.000306	0.0028	0.0041	0.0119	-0.0001	0.0012
Bi-annual Seep Sampling	Waste Haul Road Seep 5	12/5/2015	12/5/2015	5.86	0.634	0.00012	0.00136	0.0357	-0.0001	-0.00005	0.061	0.000034	88.5	0.00058	0.00083	0.024	0.719	0.00026	0.0014	17	0.366	0.0269	0.00085	2.04	0.00785	11.8	-0.00001	8.02	0.34	-0.00001	-0.0001	0.039	0.000373	0.00266	0.004	0.0087	-0.0001	0.00098
Bi-annual Seep Sampling	Waste Haul Road Seep 6	30-05-2013 9:45	5/30/2013	26	0.141	-0.0001	0.00131	0.0997	0.00015	-0.0005	0.019	0.000075	133	0.00072	0.0096	0.0349	5.55	0.00007	0.00052	27.9	4.52	0.00929	0.00177	6.76	0.00865	8.08	2.7E-05	11.6	0.605	-0.00001	-0.0001	0.015	0.00062	0.0035	0.0051	0.0601	-0.0001	0.001
Bi-annual Seep Sampling	Waste Haul Road Seep 6	10/6/2014	10/6/2014	14.4	5.66	0.00021	0.00504	0.25	0.00026	-0.0005	0.027	-0.0004	146	0.00327	0.00792	0.376	14.7	0.00319	0.00441	31.6	2.37	0.024	0.00511	5.32	0.00662	16.7	5.8E-05	9.88	0.648	0.000016	0.0001	0.219	0.000735	0.0192	0.0365	0.0129	0.00012	0.00038
Bi-annual Seep Sampling	Waste Haul Road Seep 7	30-05-2013 10:16	5/30/2013	13.8	0.926	0.0002	0.0009	0.0564	-0.0001	-0.0005	0.022	0.000043	86.2	0.00066	0.00075	0.0574	0.849	0.00026	0.00146	20.7	0.146	0.0207	0.00118	2.73	0.00574	8.47	2.4E-05	8.37	0.417	-0.00001	-0.0001	0.054	0.000732	0.0033	0.0103	0.015	0.00017	0.00056
Bi-annual Seep Sampling	Waste Haul Road Seep 7	26-11-2013 12:10	11/26/2013	13.4	0.765	0.00014	0.00089	0.071	-0.0001	-0.0005	0.018	0.00006	139	-0.0005	0.00091	0.053	0.73	0.00027	0.00171	33.4	0.524	0.0133	0.00107	2.84	0.00761	8.07	1.6E-05	12.2	0.654	-0.00001	-0.0001	0.065	0.000901	0.0029	0.006	0.0092	0.00011	0.00048
Bi-annual Seep Sampling	Waste Haul Road Seep 7	3/7/2014	3/7/2014	10.1	2.13	0.00021	0.00138	0.131	-0.0001	-0.0005	0.035	-0.0001	177	0.0012	0.0017	0.0942	1.95	0.00061	0.00329	40.7	0.216	0.0594	0.00242	4.58	0.016	11.8	2.4E-05	14.6	0.923	0.00001	-0.0001	0.163	0.0013	0.0063	0.0122	0.0119	0.00018	0.0006
Bi-annual Seep Sampling	Waste Haul Road Seep 7	15-05-2014 10:09	5/15/2014	9.41	1.66	0.00018	0.00122	0.0834	-0.0001	-0.0005	0.021	0.000041	109	0.00098	0.00128	0.0792	1.62	0.00051	0.00243	23.6	0.172	0.0261	0.00149	2.78	0.0139	9.42	2.3E-05	8.9	0.472	-0.00001	-0.0001	0.12	0.000522	0.0055	0.0096	0.0102	0.00014	0.00044
Bi-annual Seep Sampling	Waste Haul Road Seep 7	11/11/2014	11/11/2014	12.1	1.99	0.00014	0.00137	0.12	-0.0001	-0.0005	0.024	0.000067	208	0.00097	0.00172	0.0881	1.95	0.0005	0.00336	46.9	0.39	0.0309	0.00206	3.87	0.0116	11.5	0.00002	18	0.822	-0.00001	-0.0001	0.175	0.00135	0.006	0.0118	0.0165	0.00011	0.0005
Bi-annual Seep Sampling	Waste Haul Road Seep 7	12/6/2014	12/6/2014	10	0.168	0.00022	0.00062	0.0646	-0.0001	-0.0005	0.027	-0.0001	138	-0.0005	0.00023	0.0302	0.164	7.3E-05	0.00183	29.8	0.136	0.0448	0.00059	2.99	0.0134	6.66	-0.00001	11.1	0.598	-0.00001	-0.0001	0.022	0.000841	0.0012	0.0046	0.0076	0.00016	0.00054
Bi-annual Seep Sampling	Waste Haul Road Seep 8	30-05-2013 10:50	5/30/2013	8.64	0.223	0.00028	0.00094	0.0512	0.00021	-0.0005	0.092	0.000024	118	-0.0005	0.00024	0.0216	0.253	9.1E-05	0.00135	25.1	0.0434	0.0141	-0.0005	2.73	0.0452	8.49	-0.00001	12.5	0.435	-0.00001	-0.0001	0.022	0.000244	0.0015	0.0031	0.0051	0.00029	0.00081
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/6/2014	12/6/2014	6.74	0.0148	0.0002	0.0006	0.0473	-0.0001	-0.0005	0.042	0.000024	142	-0.0005	0.00012	0.00865	-0.03	-0.00005	0.0015	28.4	0.0375	0.0147	-0.0005	2.31	0.0328	8.58	-0.00001	12.7	0.448	-0.00001	-0.0001	0.014	0.000249	-0.001	-0.003	0.0031	0.00018	0.00057
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/5/2015	12/5/2015	6.39	0.0224	0.00019	0.0005	0.0385	-0.0001	-0.00005	0.111	0.0000127	125	-0.0005	-0.0001	0.00697	-0.03	-0.00005	0.0014	23.9	0.00563	0.0191	-0.0005	1.56	0.0173	8.67	-0.00001	13.8	0.41	-0.00001	-0.0001	-0.01	0.000124	0.00103	-0.003	0.0041	0.00017	0.00047
Bi-annual Seep Sampling	Waste Haul Road Seep 9	30-05-2013 11:06	5/30/2013	4.83	0.0179	-0.0001	0.00028	0.0347	-0.0001	-0.0005	0.035	0.000025	68.2	-0.0005	-0.0001	0.00566	0.031	-0.00005	0.00071	11.9	0.0645	0.00425	-0.0005	1.31	0.025	7.16	-0.00001	5.29	0.179	-0.00001	-0.0001	-0.01	0.000027	-0.001	0.0033	0.0037	-0.0001	0.00025
Bi-annual Seep Sampling	Waste Haul Road Under Culvert	30-05-2013 12:47	5/30/2013	8.17	0.214	-0.0001	0.00059	0.0308	-0.0001	-0.0005	0.032	0.000036	65.5	0.00132	0.00049	0.0227	0.27	7.2E-05	0.00107	16.9	0.23	0.0249	0.0005	1.75	0.00547	7.56	1.2E-05	9.15	0.303	-0.00001	-0.0001	0.018	0.000188	0.0015	0.201	0.0206	-0.0001	0.00044

Location Type	Sample Point	Original Date As Is	Recoded Date	Barium (Ba)-Dissolved (mg/L)	Beryllium (Be)-Dissolved (mg/L)	Bismuth (Bi)-Dissolved (mg/L)	Boron (B)-Dissolved (mg/L)	Cadmium (Cd)-Dissolved (mg/L)	Calcium (Ca)-Dissolved (mg/L)	Chromium (Cr)-Dissolved (mg/L)	Cobalt (Co)-Dissolved (mg/L)	Copper (Cu)-Dissolved (mg/L)	Iron (Fe)-Dissolved (mg/L)	Lead (Pb)-Dissolved (mg/L)	Lithium (Li)-Dissolved (mg/L)	Magnesium (Mg)-Dissolved (mg/L)	Manganese (Mn)-Dissolved (mg/L)	Molybdenum (Mo)-Dissolved (mg/L)	Nickel (Ni)-Dissolved (mg/L)	Potassium (K)-Dissolved (mg/L)	Selenium (Se)-Dissolved (mg/L)	Silicon (Si)-Dissolved (mg/L)	Silver (Ag)-Dissolved (mg/L)	Sodium (Na)-Dissolved (mg/L)	Strontium (Sr)-Dissolved (mg/L)	Thallium (Tl)-Dissolved (mg/L)	Tin (Sn)-Dissolved (mg/L)	Titanium (Ti)-Dissolved (mg/L)	Uranium (U)-Dissolved (mg/L)	Vanadium (V)-Dissolved (mg/L)	Zinc (Zn)-Dissolved (mg/L)		Julian Date	EC-Field
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L			µs/cm
Bi-annual Seep Sampling	Waste Haul Road Seep 1	10/6/2014	10/6/2014	0.0297	-0.0001	-0.0005	0.041	0.000043	79	-0.0005	0.00014	0.0137	-0.03	-0.00005	0.00079	20.5	0.0435	0.0514	-0.0005	2.01	0.0231	7.86	-0.00001	8.64	0.35	-0.00001	-0.0001	0.01	0.00029	0.0013	0.0068		2014.76	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 1	20-10-2014 15:12	10/20/2014	0.0576	-0.0001	-0.0005	0.031	0.000093	109	-0.0005	0.00062	0.00555	0.057	-0.00005	0.00113	28.3	0.48	0.0163	0.00056	2.63	0.0278	7.56	-0.00001	9.54	0.489	-0.00001	-0.0001	0.014	0.000021	-0.001	0.0049		2014.8	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 10	30-05-2013 11:27	5/30/2013	0.0216	-0.0001	-0.0005	0.018	0.000019	48.5	-0.0005	-0.0001	0.00783	-0.03	-0.00005	0.00096	6.86	0.0037	0.00274	-0.0005	0.568	0.00796	7.07	-0.00001	4.77	0.113	-0.00001	-0.0001	-0.01	0.000022	-0.001	-0.003		2013.41	337
Bi-annual Seep Sampling	Waste Haul Road Seep 11	30-05-2013 11:37	5/30/2013	0.0256	-0.0001	-0.0005	0.015	0.000016	49	-0.0005	-0.0001	0.00423	-0.03	-0.00005	0.00105	9.42	0.00083	0.0019	-0.0005	0.974	0.0137	7.81	-0.00001	4.86	0.129	-0.00001	-0.0001	-0.01	-0.00001	-0.001	-0.003		2013.41	369
Bi-annual Seep Sampling	Waste Haul Road Seep 12	30-05-2013 11:56	5/30/2013	0.0546	-0.0001	-0.0005	0.047	0.000097	95.8	-0.0005	0.00039	0.0125	0.031	-0.00005	0.00316	23.2	0.128	0.0116	0.00061	1.73	0.025	8.46	-0.00001	10.1	0.35	-0.00001	-0.0001	-0.01	0.000528	-0.001	0.0051		2013.41	744
Bi-annual Seep Sampling	Waste Haul Road Seep 13	24-06-2013 13:10	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.48	509
Bi-annual Seep Sampling	Waste Haul Road Seep 14	24-06-2013 13:18	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.48	414
Bi-annual Seep Sampling	Waste Haul Road Seep 15	24-06-2013 13:23	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.48	413
Bi-annual Seep Sampling	Waste Haul Road Seep 16	24-06-2013 13:28	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.48	862
Bi-annual Seep Sampling	Waste Haul Road Seep 17	24-06-2013 13:40	6/24/2013	0.0899	-0.0001	-0.0005	0.033	0.000225	284	-0.0005	0.00957	0.0116	0.301	-0.00005	0.00535	52.8	4.45	0.0802	0.00221	5.31	0.304	6.32	0.000014	17.5	0.854	-0.00001	-0.0001	0.013	0.00158	-0.001	0.0094		2013.48	1609
Bi-annual Seep Sampling	Waste Haul Road Seep 17	20-10-2014 14:15	10/20/2014	0.0854	-0.0002	-0.001	0.026	0.000261	393	-0.0005	0.018	0.0186	0.613	-0.0001	0.003	63.9	7.12	0.114	0.0028	2.94	0.291	5.92	-0.00002	17	1	-0.00002	-0.0002	0.027	0.00166	-0.002	0.0063		2014.8	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 18	24-06-2013 13:46	6/24/2013	0.0699	-0.0002	-0.001	0.023	-0.0005	376	-0.0005	0.0105	0.0111	0.131	-0.0001	0.0034	66.4	5.48	0.154	0.003	1.98	0.684	5.76	-0.00002	17.3	0.864	-0.00002	-0.0002	0.014	0.00263	-0.002	0.0086		2013.48	2025
Bi-annual Seep Sampling	Waste Haul Road Seep 19	24-06-2013 13:53	6/24/2013	0.0287	-0.0001	-0.0005	0.027	-0.0003	115	-0.0005	0.00133	0.0177	-0.03	-0.00005	0.00284	21.4	0.848	0.113	0.00064	0.729	0.136	4.91	-0.00001	12	0.373	-0.00001	-0.0001	-0.01	0.00285	-0.001	0.0055		2013.48	782
Bi-annual Seep Sampling	Waste Haul Road Seep 19	12/5/2015	12/5/2015	0.0334	-0.0001	-0.00005	0.028	0.0000839	173	-0.0005	0.00082	0.00439	-0.03	-0.00005	0.0051	33.9	0.479	0.188	-0.0005	1	0.203	7.61	-0.00001	9.58	0.449	-0.00001	-0.0001	-0.01	0.00215	-0.0005	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 2	30-05-2013 9:22	5/30/2013	0.0329	-0.0001	-0.0005	0.14	0.000016	97.2	-0.0005	0.00039	0.00662	0.074	-0.00005	0.00067	26.5	0.216	0.0114	0.00053	2.19	0.00257	6.99	-0.00001	11.4	0.456	-0.00001	-0.0001	-0.01	0.000405	-0.001	-0.003		2013.41	724
Bi-annual Seep Sampling	Waste Haul Road Seep 20	24-06-2013 13:58	6/24/2013	0.0333	-0.0001	-0.0005	0.026	-0.0002	197	-0.0005	0.00108	0.00942	-0.03	-0.00005	0.00535	39.3	0.584	0.124	0.00065	1.38	0.245	7.38	-0.00001	12.4	0.56	-0.00001	-0.0001	0.012	0.00213	-0.001	-0.003		2013.48	1313
Bi-annual Seep Sampling	Waste Haul Road Seep 20	10/6/2014	10/6/2014	0.033	-0.0001	-0.0005	0.034	-0.0003	237	-0.0005	0.00054	0.00955	-0.03	-0.00005	0.00508	47	0.284	0.278	0.00056	1.27	0.299	7.54	-0.00001	12.1	0.654	-0.00001	-0.0001	0.016	0.00226	-0.001	0.0059		2014.76	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 20	20-10-2014 13:57	10/20/2014	0.0337	-0.0001	-0.0005	0.032	0.000132	233	-0.0005	0.00132	0.0107	0.038	-0.00005	0.00447	45.2	0.958	0.125	0.00067	1.39	0.197	6.62	-0.00001	13.2	0.656	-0.00001	-0.0001	0.021	0.00193	-0.001	0.0031		2014.8	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 20	12/5/2015	12/5/2015	0.0604	-0.0002	-0.0001	0.068	0.000104	343	-0.0005	0.0002	0.00731	-0.03	-0.0001	0.0079	64.6	0.0643	0.461	-0.001	2.09	0.343	5.97	-0.00002	22	0.96	-0.00002	-0.0002	-0.01	0.00269	-0.001	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 21	24-06-2013 14:14	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		2013.48	1422
Bi-annual Seep Sampling	Waste Haul Road Seep 22	24-06-2013 14:14	6/24/2013	0.0414	-0.0001	-0.0005	0.017	0.000063	109	-0.0005	0.00019	0.00229	-0.03	-0.00005	0.00136	27.4	0.109	0.0454	-0.0005	1.95	0.152	7.87	-0.00001	10.6	0.423	-0.00001	-0.0001	-0.01	0.000291	-0.001	-0.003		2013.48	794
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/12/2013	10/12/2013	0.0475	-0.0001	-0.0005	0.06	0.000019	105	-0.0005	-0.0001	0.00223	-0.03	-0.00005	-0.0005	31.3	0.0751	0.00175	0.00073	1.47	0.0341	5.98	-0.00001	12.5	0.431	-0.00001	-0.0001	0.013	0.000033	-0.001	-0.003		2013.78	797
Bi-annual Seep Sampling	Waste Haul Road Seep 22	26-11-2013 10:20	11/26/2013	0.0402	-0.0001	-0.0005	0.04	0.000026	83.9	-0.0005	0.00027	0.00304	-0.03	-0.00005	-0.0005	25.3	0.24	0.00193	0.00094	1.46	0.0246	5.75	-0.00001	10.2	0.341	-0.00001	-0.0001	0.013	0.000027	-0.001	-0.003		2013.9	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	14-01-2014 12:15	1/14/2014	0.048	-0.0001	-0.0005	0.082	0.000035	104	-0.0005	0.00031	0.00237	-0.03	-0.00005	-0.0005	30.4	0.113	0.00171	0.00079	1.68	0.0207	6.19	-0.00001	14.6	0.444	-0.00001	-0.0001	0.01	0.000038	-0.001	-0.003		2014.03	773
Bi-annual Seep Sampling	Waste Haul Road Seep 22	18-02-2014 13:24	2/18/2014	0.0482	-0.0001	-0.0005	0.131	0.000035	107	-0.0005	0.00031	0.00186	-0.03	-0.00005	-0.0005	30.6	0.228	0.00496	0.00078	1.57	0.0227	5.59	-0.00001	16.9	0.431	-0.00001	-0.0001	-0.01	0.000037	-0.001	-0.003		2014.13	805
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/7/2014	3/7/2014	0.101	-0.0001	-0.0005	0.075	0.000065	215	-0.0005	-0.0001	0.00302	-0.03	-0.00005	-0.0005	55.8	0.165	0.00543	0.00129	2.1	0.18	6.13	-0.00001	18.8	0.99	-0.00001	-0.0001	0.017	0.000052	-0.001	-0.003		2014.18	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	15-05-2014 10:50	5/15/2014	0.0395	-0.0001	-0.0005	0.012	0.000022	87.1	-0.0005	-0.0001	0.00185	-0.03	-0.00005	-0.0005	22.1	0.00271	0.00488	-0.0005	2.64	0.0587	6.62	-0.00001	8.5	0.318	-0.00001	-0.0001	0.011	-0.00001	-0.001	-0.003		2014.37	637
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/8/2014	6/8/2014	0.0805	-0.0001	-0.0005	0.075	0.000067	178	-0.0005	0.00029	0.00385	-0.03	-0.00005	-0.0005	44.5	0.45	0.00632	0.00164	2.1	0.0896	6.56	-0.00001	17.7	0.702	-0.00001	-0.0001	0.01	0.000107	-0.001	-0.003		2014.43	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/4/2014	8/4/2014	0.053	-0.0001	-0.0005	0.096	0.000035	85.9	-0.0005	0.00023	0.00407	-0.03	-0.00005	-0.0005	23.5	0.211	0.00924	0.00102	2.12	0.0266	4.94	-0.00001	13	0.356	-0.00001	-0.0001	0.011	0.000104	-0.001	-0.003		2014.59	662
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/9/2014	8/9/2014	0.0783	-0.0001	-0.0005	0.058	0.000034	187	-0.0005	-0.0001	0.00468	-0.03	-0.00005	-0.0005	48.6	0.047	0.00612	0.00163	2.78	0.0715	7.16	-0.00001	16.7	0.78	-0.00001	-0.0001	0.017	0.000269	-0.001	-0.003		2014.6	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/12/2014	9/12/2014	0.0359	-0.0001	-0.0005	0.028	0.000033	107	-0.0005	0.00056	0.0074	-0.03	-0.00005	-0.0005	27.7	0.367	0.0145	0.00101	1.87	0.0159	5.46	-0.00001	10.8	0.431	-0.00001	-0.0001	0.016	0.000358	-0.001	-0.003		2014.7	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/6/2014	10/6/2014	0.0842	-0.0001	-0.0005	0.063	0.000052	171	-0.0005	0.0003	0.00309	-0.03	-0.00005	-0.0005	45.3	0.403	0.00572	0.00118	2.08	0.171	5.46	-0.00001	14.2	0.693	-0.00001	-0.0001	0.015	0.000121	-0.001	-0.003		2014.76	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	20-10-2014 13:40	10/20/2014	0.0668	-0.0001	-0.0005	0.048	0.000077	185	-0.0005	0.00144	0.00431	0.031	-0.00005	0.00053	48.4	1.15	0.00522	0.00286	2.38	0.0204	7.36	-0.00001	15.8	0.71	-0.00001	-0.0001	0.021	0.000288	-0.001	-0.003		2014.8	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/3/2014	11/3/2014	0.0501	-0.0001	-0.0005	0.136	0.000026	121	-0.0005	0.00031	0.00202	-0.03	-0.00005	-0.0005	33.4	0.106	0.00333	0.0007	1.68	0.0232	5.5	-0.00001	18.8	0.477	-0.00001	-0.0001	0.014	0.000043	-0.001	-0.003		2014.84	877
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/11/2014	11/11/2014	0.0493	-0.0001	-0.0005	0.042	0.000032	145	-0.0005	0.00015	0.00312	-0.03	-0.00005	0.00061	37.8	0.367	0.00502	0.00202	1.98	0.0132	6.85	-0.00001	14	0.558	-0.00001	-0.0001	0.017	0.000214	-0.001	-0.003		2014.86	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	13-01-2015 11:30	1/13/2015	0.0526	-0.0001	-0.0005	0.031	0.000047	137	-0.0005	0.00151	0.00297	0.052	-0.00005	-0.0005	37	0.951	0.0025	0.00185	1.72	0.032	6.14	-0.00001	11.9	0.555	-0.00001	-0.0001	0.014	0.000126	-0.001	-0.003		2015.03	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/3/2015	3/3/2015	0.0452	-0.0001	-0.0005	0.026	0.000033	119	-0.0005	0.00048	0.00242	-0.03	-0.00005	-0.0005	31.7	0.349	0.00198	0.0011	1.48	0.0451	5.37	-0.00001	10.7	0.497	-0.00001	-0.0001	0.012	0.000049	-0.001	-0.003		2015.17	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/2/2015	4/2/2015	0.0419	-0.0001	-0.0005	0.027	0.000032	118	-0.0005	0.0003	0.00286	-0.03	-0.00005	-0.0005	30.9	0.359	0.00244	0.00143	1.62	0.0168	5.93	-0.00001	11.5	0.414	-0.00001	-0.0001	-0.01	0.000091	-0.001	-0.003		2015.25	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/6/2015	4/6/2015	0.0602	-0.0001	-0.00005	0.036	0.0000263	161	-0.0005	0.00023	0.00297	-0.03	-0.00005	-0.001	41.5	0.168	0.00325	0.00116	1.57	0.0855	6.36	-0.00001	14.1	0.632	-0.00001	-0.0001	0.011	0.000093	-0.0005	-0.003		2015.26	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/5/2015	6/5/2015	0.0566	-0.0001	-0.00005	0.028	0.0000164	147	-0.0005	-0.0001	0.00222	-0.03	-0.00005	-0.001	40.2	0.0609	0.00254	0.00079	1.77	0.13	5.47	-0.00001	12.3	0.611	-0.00001	-0.0001	-0.01	0.000051	-0.0005	-0.003		2015.42	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/4/2015	9/4/2015	0.0491	-0.0001	-0.00005	0.028	0.0000259	127	-0.0005	0.00034	0.00234	-0.03	-0.00005	-0.001	32.6	0.239	0.00276	0.00089	1.6	0.0737	5.02	-0.00001	10.3	0.521	-0.00001	-0.0001	0.013	0.000069	-0.0005	-0.003		2015.67	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	29-10-2015 13:39	10/29/2015	0.0811	-0.0001	-0.00005	0.037	0.0000208	163	-0.0005	0.00845	0.0009	0.29	-0.00005	-0.001	40.4	3.25	0.00593	0.004	2.38	0.00113	7.17	-0.00001	18.8	0.652	-0.00001	-0.0001	-0.01	0.000106	-0.0005	-0.003		2015.82	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	30-11-2015 12:40	11/30/2015	0.0685	-0.0001	-0.00005	0.041	0.0000239	163	-0.0005	0.00756	0.001	0.581	-0.00005	-0.001	40.3	3.14	0.00375	0.00336	1.73	0.000463	6.56	-0.00001	18.2	0.629	-0.00001	-0.0001	-0.01	0.000075	-0.0005	-0.003		2015.91	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/6/2014	12/6/2014	0.0365	-0.0001	-0.0005	0.045	-0.0001	148	-0.0005	0.0006	0.0184	-0.03	-0.00005	0.00316	35.3	0.283	0.158	0.00056	3.1	0.0253	6.7	-0.00001	17	0.599	-0.00001	-0.0001	0.014	0.00175	-0.001	-0.003		2014.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/5/2015	12/5/2015	0.0285	-0.0001	-0.00005	0.036	0.0000191	123	-0.0005	0.00118	0.0117	-0.03	-0.00005	0.0024	31	0.0975	0.076	-0.0005	2.79	0.0185	6.32	-0.00001	15.1	0.547	-0.00001	-0.0001	-0.01	0.000952	0.00065	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 24	12/6/2014	12/6/2014	0.0687	-0.0001	-0.0005	0.12	-0.0002	174	-0.0005	0.00031	0.0119	-0.03	-0.00005	0.00372	30.6	0.244	0.0747	-0.0005	2.58	0.0456	6.82	-0.00001	22.2	0.796	-0.00001	-0.0001	0.015	0.00337	-0.001	0.0073		2014.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 25	11/5/2015	11/5/2015	0.0483	-0.0001	-0.00005	0.045	0.000041	215	-0.0005	0.00138	0.00251	-0.03	-0.00005	0.0025	49.1	0.76	0.475	0.00095	2.02	0.325	7.66	-0.00001	16.2	0.716	-0.00001	-0.0001	-0.01	0.000235	-0.0005	-0.003		2015.84	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 26	12/5/2015	12/5/2015	0.037	-0.0002	-0.0001	0.035	0.000084	391	-0.0005	0.00028	0.00898	-0.03	-0.0001	0.0052	75.8	0.164	0.189	-0.001	1.94	0.448	6.08	-0.00002	20.1	1.08	-0.00002	-0.0002	-0.01	0.00362	-0.001	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 27	12/5/2015	12/5/2015	0.0507	-0.0001	-0.00005	0.054	0.000073	224	-0.0005	0.00089	0.0128	0.036	-0.00005	0.0022	51	0.714	0.0802	0.00063	2.12	0.0581	5.9	-0.00001	19.2	0.843	-0.00001	-0.0001	-0.01	0.00101	-0.0005	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 28	12/5/2015	12/5/2015	0.0599	-0.0001	-0.00005	0.031	0.0000559	225	-0.0005	0.0008	0.00942	0.226	-0.00005	0.0014	44.8	0.714	0.191	0.00059	2.85	0.0442	6.48	-0.00001	15.4	0.916	-0.00001	-0.0001	-0.01	0.00173	0.00064	0.0034		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 9:30	5/30/2013	0.0152	-0.0001	-0.0005	0.232	0.000014	67.2	-0.0005	-0.0001	0.00391	-0.03	-0.00005	0.00196	15.1	0.018	0.034	-0.0005	0.973	0.014	11.7	-0.00001	6.76	0.288	-0.00001	-0.0001	-0.01	0.000481	0.0025	-0.003		2013.41	527
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 12:17	5/30/2013	0.0279	-0.0001	-0.0005	0.072	0.000016	86.1	-0.0005	-0.0001	0.0103	-0.03	-0.00005	0.00149	19	0.0201	0.0214	-0.0005	3.48	0.00828	10.5	-0.00001	7.41	0.383	-0.00001	-0.0001	-0.01	0.00131	0.0015	-0.003		2013.41	615
Bi-annual Seep Sampling	Waste Haul Road Seep 3	12/5/2015	12/5/2015	0.011	-0.0001	-0.00005	0.224	0.0000122	56.4	-0.0005	-0.0001	0.00283	-0.03	-0.00005	0.0023	11.8	0.00953	0.0292	-0.0005	0.765	0.00702	12.3	-0.00001	7.33	0.234	0.000028	-0.0001	-0.01	0.000334	0.00311	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 4	10/6/2014	10/6/2014	0.0153	-0.0001	-0.0005	0.231	0.000021	60.8	-0.0005	-0.0001	0.00452	-0.03	-0.00005	0.00178	13.3	0.0148	0.0325	-0.0005	0.981	0.00937	11.8	-0.00001	6.32	0.248	-0.00001	-0.0001	-0.01	0.000366	0.0025	-0.003		2014.76	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 4	20-10-2014 15:42	10/20/2014	0.0191	-0.0001	-0.0005	0.255	0.00001	67.4	-0.0005	-0.0001	0.00222	-0.03	-0.00005	0.00275	13.7	0.0138	0.0338	-0.0005	0.842	0.00848	12.2	-0.00001	7.99	0.29	-0.00001	-0.0001	-0.01	0.000393	0.0034	-0.003		2014.8	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 5	30-05-2013 12:24	5/30/2013	0.034	-0.0001	-0.0005	0.034	0.000051	96	-0.0005	0.00131	0.00985	0.252	-0.00005	0.00076	20.8	1.69	0.018	0.00066	4.39	0.0108	10.5	-0.00001	7.26	0.39	-0.00001	-0.0001	-0.01	0.00051	0.001	-0.003		2013.41	696
Bi-annual Seep Sampling	Waste Haul Road Seep 5	10/6/2014	10/6/2014	0.0292	-0.0001	-0.0005	0.044	0.000036	93.2	-0.0005	0.00025	0.00738	0.081	-0.00005	0.00099	18.4	0.447	0.0266	0.0005	3.11	0.00737	9.72	-0.00001	7.44	0.36	-0.00001	-0.0001	0.011	0.000382	-0.001	-0.003		2014.76	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 5	20-10-2014 15:55	10/20/2014	0.0288	-0.0001	-0.0005	0.072	0.000025	80.2	-0.0005	0.00051	0.00276	0.223	-0.00005	0.00144	14.3	0.855	0.0211	-0.0005	2.31	0.00316	11.8	-0.00001	8.79	0.301	-0.00001	-0.0001	0.011	0.000301	-0.001	-0.003		2014.8	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 5	12/5/2015	12/5/2015	0.0255	-0.0001	-0.00005	0.056	0.0000296	89.6	-0.0005	0.00038	0.00523	0.037	0.000155	0.0013	16.8	0.337	0.027	-0.0005	1.98	0.00746	10.7	-0.00001	8.06	0.329	-0.00001	-0.0001	-0.01	0.000353	0.00097	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 6	30-05-2013 9:45	5/30/2013	0.0943	-0.0001	-0.0005	0.019	0.000063	135	-0.0005	0.00881	0.0211	3.15	-0.00005	-0.0005	28.4	3.97	0.00961	0.00253	6.73	0.00928	7.85	0.000014	11.5	0.589	-0.00001	-0.0001	0.012	0.000525	0.002	0.0042		2013.41	932
Bi-annual Seep Sampling	Waste Haul Road Seep 6	10/6/2014	10/6/2014	0.0663	-0.0001	-0.0005	0.024	-0.0001	144	-0.0005	0.00026	0.021	-0.03	-0.00005	-0.0005	28.9	0.398	0.023	0.00076	4.66	0.00559	6.98	-0.00001	10.3	0.592	-0.00001	-0.0001	0.014	0.000645	-0.001	-0.003		2014.76	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 7	30-05-2013 10:16	5/30/2013	0.0433	-0.0001	-0.0005	0.022	0.000032	88.8	-0.0005	0.00017	0.0261	0.035	-0.00005	0.00065	20.8	0.101	0.0207	0.00056	2.63	0.00592	6.78	-0.00001	8.48	0.426	-0.00001	-0.0001	-0.01	0.000741	-0.001	0.0051		2013.41	655
Bi-annual Seep Sampling	Waste Haul Road Seep 7	26-11-2013 12:10	11/26/2013	0.0576	-0.0001	-0.0005	0.018	0.000045	142	-0.0005	0.00037	0.0224	-0.03	-0.00005	0.00134	33.4	0.444	0.0137	0.00063	2.69	0.00775	6.55	-0.00001	12.2	0.678	-0.00001	-0.0001	0.016	0.000868	-0.001	-0.003		2013.9	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 7	3/7/2014	3/7/2014	0.0764	-0.0001	-0.0005	0.034	-0.0001	177	-0.0005	0.00019	0.0192	0.944	-0.00005	0.00177	39.8	0.053	0.0604	0.00055	3.97	0.016	6.96	-0.00001	14.7	0.918	-0.00001	-0.0001	0.016	0.00128	-0.001	0.0032		2014.18	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 7	15-05-2014 10:09	5/15/2014	0.049	-0.0001	-0.0005	0.02	0.000025	109	-0.0005	0.00012	0.0204	-0.03	-0.00005	0.001	23.1	0.0585	0.0263	-0.0005	2.42	0.014	5.83	-0.00001	8.67	0.46	-0.00001	-0.0001	0.013	0.00048	-0.001	-0.003		2014.37	714
Bi-annual Seep Sampling	Waste Haul Road Seep 7	11/11/2014	11/11/2014	0.0767	-0.0001	-0.0005	0.027	0.000044	208	-0.0005	0.00022	0.0178	-0.03	-0.00005	0.00196	45.6	0.249	0.035	0.00058	3.76	0.0129	7.15	-0.00001	18.8	0.902	-0.00001	-0.0001	0.02	0.00152	-0.001	0.0031		2014.86	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 7	12/6/2014	12/6/2014	0.0603	-0.0001	-0.0005	0.025	-0.00005	139	-0.0005	0.0001	0.0226	-0.03	-0.00005	0.00158	29.5	0.0772	0.0452	0.00051	2.98	0.0135	6.33	-0.00001	10.9	0.596	-0.00001	-0.0001	0.014	0.000852	-0.001	0.0031		2014.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 8	30-05-2013 10:50	5/30/2013	0.0483	-0.0001	-0.0005	0.092	0.000019	122	-0.0005	-0.0001	0.00645	-0.03	-0.00005	0.00106	25.7	0.0133	0.0142	-0.0005	2.74	0.0455	8.37	-0.00001	12.7	0.426	-0.00001	-0.0001	-0.01	0.000239	-0.001	-0.003		2013.41	929
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/6/2014	12/6/2014	0.0456	-0.0001	-0.0005	0.038	0.000017	139	-0.0005	-0.0001	0.00694	-0.03	-0.00005	0.00138	27.9	0.00397	0.014	-0.0005	2.27	0.0314	8.29	-0.00001	12.6	0.433	-0.00001	-0.0001	0.013	0.000236	-0.001	-0.003		2014.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/5/2015	12/5/2015	0.0388	-0.0001	-0.00005	0.112	0.000015	130	-0.0005	-0.0001	0.00628	-0.03	-0.00005	0.0013	24.5	0.00366	0.0193	-0.0005	1.59	0.0169	8.86	-0.00001	14	0.422	-0.00001	-0.0001	-0.01	0.000127	0.00079	-0.003		2015.93	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 9	30-05-2013 11:06	5/30/2013	0.0346	-0.0001	-0.0005	0.033	0.000018	68.6	-0.0005	-0.0001	0.00466	-0.03	-0.00005	-0.0005	11.8	0.0666	0.00405	-0.0005	1.26	0.0252	7.07	-0.00001	5.02	0.169	-0.00001	-0.0001	-0.01	0.000026	-0.001	-0.003		2013.41	497
Bi-annual Seep Sampling	Waste Haul Road Under Culvert	30-05-2013 12:47	5/30/2013	0.0273	-0.0001	-0.0005	0.031	0.000028	65.3	-0.0005	0.00035	0.0141	0.044	-0.00005	0.00096	16.6	0.219	0.0253	-0.0005	1.71	0.00527	7.08	-0.00001	8.85	0.304	-0.00001	-0.0001	-0.01	0.000191	-0.001	0.173		2013.41	526

Location Type	Sample Point	Original Date As Is	Recoded Date	pH-field	Q	T	Turbidity-Field	EC	Hardness	pH	TDS	TSS	Turbidity	Alkalinity	NH3	Cl	F	NO3	NO3+NO2	NO2	PO4	P-D	P-T	SO4	N-T
					m3/s	C	NTU	µs/cm	mg/L	-	mg/L	mg/L	ntu	mg/L	mgN/L	mg/L	mg/L	mgN/L	mgN/L	mg/L	mgP/L	mg/L	mg/L	mg/L	mg/L
Bi-annual Seep Sampling	Waste Haul Road Seep 1	10/6/2014	10/6/2014	#N/A	#N/A	#N/A	#N/A	568	282	7.98	438	9.2	1.99	73.8	0.0068	9.08	0.072	8.22	8.22	0.002	0.0196	0.0236	0.0394	174	8.01
Bi-annual Seep Sampling	Waste Haul Road Seep 1	20-10-2014 15:12	10/20/2014	#N/A	#N/A	#N/A	#N/A	765	389	8.07	607	14.9	8.12	89.6	0.0826	2.5	0.1	4.62	4.66	0.041	0.0166	0.0192	0.0675	302	4.59
Bi-annual Seep Sampling	Waste Haul Road Seep 10	30-05-2013 11:27	5/30/2013	7.8	#N/A	9	#N/A	301	149	7.8	226	8	2.84	108	0.0564	17.7	0.039	1.55	1.57	0.0186	0.0005	0.0057	0.0247	30	1.83
Bi-annual Seep Sampling	Waste Haul Road Seep 11	30-05-2013 11:37	5/30/2013	7.9	0.0075	7.9	#N/A	331	161	7.86	243	1.5	0.96	93.3	0.0152	16.5	0.048	3.28	3.28	0.002	0.0034	0.0056	0.0064	49.2	3.17
Bi-annual Seep Sampling	Waste Haul Road Seep 12	30-05-2013 11:56	5/30/2013	7.5	0.004	7	#N/A	675	335	7.71	492	1.5	1.78	143	0.0113	13.7	0.05	17.3	17.3	0.0149	0.0063	0.0106	0.0183	151	16.5
Bi-annual Seep Sampling	Waste Haul Road Seep 13	24-06-2013 13:10	6/24/2013	6.4	0	6.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 14	24-06-2013 13:18	6/24/2013	7.4	0	8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 15	24-06-2013 13:23	6/24/2013	7.1	0	9.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 16	24-06-2013 13:28	6/24/2013	7.1	0	17	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 17	24-06-2013 13:40	6/24/2013	8.4	0.003	15.6	#N/A	1620	925	8.04	1360	15.2	6.16	189	0.239	5	0.43	44.1	50.8	6.69	0.0013	0.0132	0.0586	602	50.5
Bi-annual Seep Sampling	Waste Haul Road Seep 17	20-10-2014 14:15	10/20/2014	#N/A	#N/A	#N/A	#N/A	2080	1250	8.2	1810	6.5	4.77	233	0.322	5	0.2	26.5	32.6	6.06	0.0005	0.0053	0.0434	1010	29.8
Bi-annual Seep Sampling	Waste Haul Road Seep 18	24-06-2013 13:46	6/24/2013	8	0.003	8.8	#N/A	1980	1210	7.96	1770	25.8	4.25	148	0.114	5	0.41	52.2	56.3	4.12	0.0012	0.0075	0.0481	899	54.4
Bi-annual Seep Sampling	Waste Haul Road Seep 19	24-06-2013 13:53	6/24/2013	8	0.0015	4.7	#N/A	718	375	8.06	510	21.2	4.25	122	0.0052	1.25	0.28	6.01	6.23	0.218	0.0005	0.001	0.048	244	6.26
Bi-annual Seep Sampling	Waste Haul Road Seep 19	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	1060	572	8.09	793	6.1	3.8	87.2	0.0147	1.25	0.05	11.5	11.6	0.026	0.0005	0.001	0.0101	460	11.2
Bi-annual Seep Sampling	Waste Haul Road Seep 2	30-05-2013 9:22	5/30/2013	8	0.004	10	#N/A	689	352	8.11	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 20	24-06-2013 13:58	6/24/2013	8.3	0.005	1.5	#N/A	1180	654	8.01	1000	41.8	11.6	75.5	0.052	2.5	0.29	24.9	25	0.112	0.0005	0.001	0.075	510	24.5
Bi-annual Seep Sampling	Waste Haul Road Seep 20	10/6/2014	10/6/2014	#N/A	#N/A	#N/A	#N/A	1360	786	7.93	1180	4.9	3.7	66.2	0.027	2.5	0.21	39.6	39.6	0.042	0.0069	0.0087	0.0131	583	39.8
Bi-annual Seep Sampling	Waste Haul Road Seep 20	20-10-2014 13:57	10/20/2014	#N/A	#N/A	#N/A	#N/A	1390	768	7.99	1170	10	3.26	113	0.0583	7.3	0.1	25	25.1	0.106	0.0005	0.001	0.0104	616	23.4
Bi-annual Seep Sampling	Waste Haul Road Seep 20	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	1920	1120	8.14	1700	39	10.7	89.8	0.0025	2.5	0.1	36.2	36.3	0.031	0.0011	0.0038	0.0904	982	34.5
Bi-annual Seep Sampling	Waste Haul Road Seep 21	24-06-2013 14:14	6/24/2013	7.8	0	3.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bi-annual Seep Sampling	Waste Haul Road Seep 22	24-06-2013 14:14	6/24/2013	7.8	0.006	2.6	#N/A	765	385	7.78	611	4.5	1.18	50.4	0.0156	2.5	0.25	27.6	27.7	0.073	0.0092	0.0151	0.0254	249	26.9
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/12/2013	10/12/2013	7.877	#N/A	0.9	#N/A	768	391	7.38	566	16	12.1	82.1	0.0258	6.8	0.11	10.3	10.3	0.01	0.0037	0.0085	0.0539	287	10.1
Bi-annual Seep Sampling	Waste Haul Road Seep 22	26-11-2013 10:20	11/26/2013	#N/A	#N/A	#N/A	#N/A	636	314	7.67	459	35.1	31.2	79.3	0.0332	10.5	0.049	5.35	5.36	0.0147	0.0023	0.0078	0.0769	208	5.49
Bi-annual Seep Sampling	Waste Haul Road Seep 22	14-01-2014 12:15	1/14/2014	7.859	#N/A	1.4	38.7	753	384	7.35	567	78.7	60.1	103	0.0146	6.8	0.1	8.56	8.56	0.005	0.0046	0.0094	0.206	262	8.5
Bi-annual Seep Sampling	Waste Haul Road Seep 22	18-02-2014 13:24	2/18/2014	7.602	#N/A	0.7	2.64	782	392	7.59	581	5.6	2.86	76.1	0.0709	7.5	0.1	6.59	6.61	0.018	0.0035	0.008	0.0239	319	6.41
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/7/2014	3/7/2014	#N/A	#N/A	#N/A	#N/A	1350	767	7.8	1130	9	12.6	91.7	0.0261	5	0.1	28.3	28.3	0.033	0.0029	0.0067	0.0239	585	26.6
Bi-annual Seep Sampling	Waste Haul Road Seep 22	15-05-2014 10:50	5/15/2014	8	#N/A	4.2	#N/A	640	308	7.65	484	8.5	4.41	40.1	0.0595	1.36	0.03	9.83	9.85	0.0142	0.0293	0.0377	0.0525	242	9.66
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/8/2014	6/8/2014	#N/A	#N/A	#N/A	#N/A	1110	627	7.87	958	8.8	1.48	119	0.0292	2.5	0.1	9.26	9.28	0.018	0.0041	0.0075	0.009	481	8.87
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/4/2014	8/4/2014	7.827	#N/A	0.8	84.8	643	311	7.64	462	146	65	89.3	0.0813	4.56	0.067	7.2	7.21	0.0132	0.0057	0.0129	0.268	208	7.52
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/9/2014	8/9/2014	#N/A	#N/A	#N/A	#N/A	1170	668	7.78	970	218	69.1	177	0.0575	2.5	0.1	4.22	#N/A	0.022	0.0064	0.0134	0.391	507	4.52
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/12/2014	9/12/2014	#N/A	#N/A	#N/A	#N/A	735	382	8.11	511	78	29.9	180	0.0274	5.2	0.1	2.14	2.14	0.005	0.0054	0.0087	0.135	224	2.35
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/6/2014	10/6/2014	#N/A	#N/A	#N/A	#N/A	1120	614	7.6	907	14.2	38.6	103	0.0229	2.5	0.1	28.9	29	0.019	0.0014	0.0029	0.0465	424	29.3
Bi-annual Seep Sampling	Waste Haul Road Seep 22	20-10-2014 13:40	10/20/2014	#N/A	#N/A	#N/A	#N/A	1130	661	8.07	858	65.8	19.8	222	0.0613	8.3	0.1	0.757	0.769	0.012	0.0055	0.0071	0.224	437	1.14
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/3/2014	11/3/2014	6.87	#N/A	0.9	1.65	843	440	7.45	637	7.7	2.84	99.8	0.0201	5.5	0.1	8.03	8.05	0.015	0.004	0.0085	0.0335	329	7.64
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/11/2014	11/11/2014	#N/A	#N/A	#N/A	#N/A	947	519	8.02	673	1.5	1.93	217	0.0608	2.5	0.1	0.823	0.835	0.012	0.0036	0.0039	0.01	331	0.88
Bi-annual Seep Sampling	Waste Haul Road Seep 22	13-01-2015 11:30	1/13/2015	#N/A	#N/A	#N/A	#N/A	921	493	7.44	692	5.2	3.26	175	0.0356	5.2	0.049	4.19	4.2	0.0069	0.004	0.005	0.0246	321	4.26
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/3/2015	3/3/2015	#N/A	#N/A	#N/A	#N/A	803	429	7.62	603	39.2	14	124	0.0227	4.6	0.087	5.45	5.45	0.0042	0.0036	0.0046	0.0431	306	5.68
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/2/2015	4/2/2015	#N/A	#N/A	#N/A	#N/A	766	421	7.44	571	94.3	31.7	159	0.0473	5.3	0.072	1.45	1.45	0.0035	0.0033	0.0073	0.281	257	1.74
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/6/2015	4/6/2015	#N/A	#N/A	#N/A	#N/A	988	574	7.78	797	457	149	121	0.0236	3.5	0.051	4.82	4.82	0.0049	0.0015	0.006	1.93	428	5.21
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/5/2015	6/5/2015	#N/A	#N/A	#N/A	#N/A	1030	532	8.08	781	25.8	6.34	113	0.011	4.1	0.05	10.7	10.7	0.0025	0.0005	0.004	0.113	410	10.6
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/4/2015	9/4/2015	#N/A	#N/A	#N/A	#N/A	833	451	7.7	608	29.7	3.37	118	0.0125	2.5	0.045	7.01	7.02	0.0063	0.0005	0.0037	0.0677	311	6.99
Bi-annual Seep Sampling	Waste Haul Road Seep 22	29-10-2015 13:39	10/29/2015	#N/A	#N/A	#N/A	#N/A	1080	573	7.28	831	15.3	19.7	183	0.0988	6.2	0.05	0.067	0.067	0.0025	0.0082	0.0089	0.0481	434	0.423
Bi-annual Seep Sampling	Waste Haul Road Seep 22	30-11-2015 12:40	11/30/2015	#N/A	#N/A	#N/A	#N/A	1050	573	6.85	777	6.7	5.63	173	0.113	6.1	0.05	0.0125	0.0125	0.0054	0.0208	0.0182	0.125	412	0.366
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/6/2014	12/6/2014	#N/A	#N/A	#N/A	#N/A	952	514	8.27	763	13	5.79	164	0.0073	10.2	0.1	11	11	0.019	0.0057	0.0117	0.0229	333	10.8
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	874	436	8.37	620	164	55.9	172	0.0107	15.3	0.111	22.7	22.7	0.0109	0.0116	0.0151	0.45	209	21.7
Bi-annual Seep Sampling	Waste Haul Road Seep 24	12/6/2014	12/6/2014	#N/A	#N/A	#N/A	#N/A	1100	560	7.8	791	1.5	0.85	125	0.0454	12.9	0.1	14	14.1	0.077	0.0161	0.0188	0.0294	426	13.5
Bi-annual Seep Sampling	Waste Haul Road Seep 25	11/5/2015	11/5/2015	#N/A	#N/A	#N/A	#N/A	1330	739	7.92	1090	8	3.58	65	0.0229	3.1	0.05	31.4	31.4	0.0882	0.0028	0.0022	0.0407	566	28.9
Bi-annual Seep Sampling	Waste Haul Road Seep 26	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	2140	1290	8.09	1980	5.1	0.33	76.4	0.0096	5	0.2	62.7	62.8	0.03	0.004	0.0059	0.0096	1040	58.3
Bi-annual Seep Sampling	Waste Haul Road Seep 27	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	1400	769	8.19	1110	13	14.2	130	0.0705	10.6	0.05	16.6	16.7	0.0258	0.0032	0.0042	0.13	614	15.7
Bi-annual Seep Sampling	Waste Haul Road Seep 28	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	1330	746	8.16	1030	1.5	0.42	167	0.0323	5.5	0.05	12.5	12.6	0.0556	0.006	0.0065	0.0267	551	12.1
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 9:30	5/30/2013	7.9	0.02	4.5	#N/A	480	230	8.09	321	1.5	0.72	104	0.0025	10	0.18	12.3	12.3	0.0093	0.019	0.0209	0.0238	81.8	12
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 12:17	5/30/2013	7.9	0.005	7.5	#N/A	578	293	8.17	250	18	12.2	178	0.0129	13.1	0.114	5.71	5.72	0.0087	0.0104	0.016	0.0667	92.5	5.9
Bi-annual Seep Sampling	Waste Haul Road Seep 3	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	413	189	8.21	286	1.5	2.24	90.4	0.0025	5.25	0.184	4.21	4.21	0.0012	0.023	0.0231	0.0272	90.4	3.99
Bi-annual Seep Sampling	Waste Haul Road Seep 4	10/6/2014	10/6/2014	#N/A	#N/A	#N/A	#N/A	417	207	8.03	287	1.5	1.85	97.6	0.0025	4.83	0.172	4.59	4.6	0.0011	0.0204	0.0208	0.0242	93	4.51
Bi-annual Seep Sampling	Waste Haul Road Seep 4	20-10-2014 15:42	10/20/2014	#N/A	#N/A	#N/A	#N/A	467	224	8.23	338	4	5.56	85.6	0.0025	5.64	0.198	5.2	5.2	0.002	0.0218	0.0231	0.0298	118	4.53
Bi-annual Seep Sampling	Waste Haul Road Seep 5	30-05-2013 12:24	5/30/2013	8.2	0.003	3.7	#N/A	639	325	8.19	304	19.3	15.3	217	0.284	17.3	0.098	6.4	6.6	0.198	0.014	0.026	0.0807	78.7	6.95
Bi-annual Seep Sampling	Waste Haul Road Seep 5	10/6/2014	10/6/2014	#N/A	#N/A	#N/A	#N/A	590	308	8.01	418	14	9.29	154	0.0838	10.8	0.16	2.08	2.09	0.0118	0.0184	0.0191	0.0851	139	2.39
Bi-annual Seep Sampling	Waste Haul Road Seep 5	20-10-2014 15:55	10/20/2014	#N/A	#N/A	#N/A	#N/A	512	259	8.36	354	14	14.6	165	0.0922	5.93	0.142	0.59	0.598	0.0075	0.0243	0.0307	0.0636	105	0.883
Bi-annual Seep Sampling	Waste Haul Road Seep 5	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	586	293	8.25	407	15.4	12.2	111	0.0458	9.91	0.12	1.77	1.78	0.0089	0.0165	0.0218	0.0675	150	1.85
Bi-annual Seep Sampling	Waste Haul Road Seep 6	30-05-2013 9:45	5/30/2013	6.9	0.005	5.8	#N/A	871	453	7.81	537	4.7	17.1	220	0.279	10.4	0.1	2.84	3.77	0.926	0.0147	0.0351	0.0964	239	5.21
Bi-annual Seep Sampling	Waste Haul Road Seep 6	10/6/2014	10/6/2014	#N/A	#N/A	#N/A	#N/A	867	477	7.98	637	150	48	244	0.277	5.3	0.1	4.36	4.41	0.05	0.0048	0.0081	0.146	224	5.26
Bi-annual Seep Sampling	Waste Haul Road Seep 7	30-05-2013 10:16	5/30/2013	7.7	0.04	5.4	#N/A	586	308	7.98	443	14.4	17.3	182	0.0125	4.6	0.083	4.59	4.59	0.0056	0.0132	0.0207	0.051	133	4.6
Bi-annual Seep Sampling	Waste Haul Road Seep 7	26-11-2013 12:10	11/26/2013	#N/A	#N/A	#N/A	#N/A	929	491	8.19	664	26.9	17.7	189	0.037	6.5	0.1	14.6	14.6	0.037	0.0093	0.0145	0.0875	246	14.5
Bi-annual Seep Sampling	Waste Haul Road Seep 7	3/7/2014	3/7/2014	#N/A	#N/A	#N/A	#N/A	1070	605	8.36	851	124	106	208	0.0164	5.1	0.1	15.4	15.4	0.052	0.0164	0.0241	0.161	355	14.9
Bi-annual Seep Sampling	Waste Haul Road Seep 7	15-05-2014 10:09	5/15/2014	8.1	#N/A	4	#N/A	705	367	8.17	530	25.5	16.9	150	0.0144	2.5	0.08	9.33	9.34	0.0097	0.0159	0.0203	0.0751	189	9.22
Bi-annual Seep Sampling	Waste Haul Road Seep 7	11/11/2014	11/11/2014	#N/A	#N/A	#N/A	#N/A	1230	706	8.35	911	88.1	55.3	255	0.016	9	0.1	4.9	4.91	0.013	0.0075	0.0131	0.226	462	4.74
Bi-annual Seep Sampling	Waste Haul Road Seep 7	12/6/2014	12/6/2014	#N/A	#N/A	#N/A	#N/A	861	468	8.09	664	8.7	4.58	183	0.0172	2.5	0.1	9.69	9.71	0.017	0.0156	0.0163	0.0531	262	9.53
Bi-annual Seep Sampling	Waste Haul Road Seep 8	30-05-2013 10:50	5/30/2013	7.7	0.001	1.5	#N/A	813	411	7.73	624	7	1.87	105	0.0052	22.4	0.1	13.8	13.9	0.024	0.0521	0.0618	0.0702	272	13.2
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/6/2014	12/6/2014	#N/A	#N/A	#N/A	#N/A	889	461	7.97	689	1.5	0.69	90.3	0.0075	13.9	0.1	9.55	9.57	0.022	0.0265	0.0334	0.0388	344	9.6
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/5/2015	12/5/2015	#N/A	#N/A	#N/A	#N/A	869	424	8.13	636	11	0.15	79.4	0.0025	7.1	0.045	5.19	5.19	0.001	0.0212	0.0243	0.0256	353	5.03
Bi-annual Seep Sampling	Waste Haul Road Seep 9	30-05-2013 11:06	5/30/2013	7.4	#N/A	5.3	#N/A	444	220	7.41	318	1.5	0.55	119	0.0168	22.6	0.038	2.56	2.57	0.0075	0.0058	0.0078	0.0155	79.9	3.35
Bi-annual Seep Sampling	Waste Haul Road Under Culvert	30-05-2013 12:47	5/30/2013	8.3	#N/A	8.8	#N/A	495	231	7.91	294	9.3	2.87	68.3	0.0025	18.3	0.085	1.89	1.9	0.0061	0.006	0.0104	0.0325	146	2.03

Location Type	Sample Point	Original Date As Is	Recoded Date	DOC	Al-D	Sb-D	As-D	Ba-D	Be-D	Bi-D	B-D	Cd-D	Ca-D	Cr-D	Co-D	Cu-D	Fe-D	Pb-D	Li-D	Mg-D	Mn-D	Mo-D	Ni-D	K-D	Se-D	Si-D	Ag-D	Na-D	Sr-D	Tl-D	Sn-D	Ti-D	U-D	V-D	Zn-D		Se/SO4	Ca	Mg+K+Na	(Mg+K+Na)/Ca	Zn/Cd		Year
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/mgS	meq/L	meq/L	meq/meq			Year
Bi-annual Seep Sampling	Waste Haul Road Seep 1	10/6/2014	10/6/2014	7.39	0.0391	0.00005	0.00074	0.0297	0.00005	0.00025	0.041	4.3E-05	79	0.00025	0.00014	0.0137	0.015	2.5E-05	0.00079	20.5	0.0435	0.0514	0.00025	2.01	0.0231	7.86	5E-06	8.64	0.35	5E-06	0.00005	0.01	0.00029	0.0013	0.0068		0.000398276	3.95	1.62253	0.410766054	158.14		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 1	20-10-2014 15:12	10/20/2014	7.5	0.0322	0.00005	0.00025	0.0576	0.00005	0.00025	0.031	9.3E-05	109	0.00025	0.00062	0.00555	0.057	2.5E-05	0.00113	28.3	0.48	0.0163	0.00056	2.63	0.0278	7.56	5E-06	9.54	0.489	5E-06	0.00005	0.014	2.1E-05	0.0005	0.0049		0.000276159	5.45	2.13236	0.391259501	52.6882		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 10	30-05-2013 11:27	5/30/2013	5.63	0.0015	0.00005	0.00023	0.0216	0.00005	0.00025	0.018	1.9E-05	48.5	0.00025	0.00005	0.00783	0.015	2.5E-05	0.00096	6.86	0.0037	0.00274	0.00025	0.568	0.00796	7.07	5E-06	4.77	0.113	5E-06	0.00005	0.005	2.2E-05	0.0005	0.0015		0.000796	2.425	0.62196	0.256476456	78.9474		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 11	30-05-2013 11:37	5/30/2013	4.21	0.0031	0.00005	0.00022	0.0256	0.00005	0.00025	0.015	1.6E-05	49	0.00025	0.00005	0.00423	0.015	2.5E-05	0.00105	9.42	0.00083	0.0019	0.00025	0.974	0.0137	7.81	5E-06	4.86	0.129	5E-06	0.00005	0.005	5E-06	0.0005	0.0015		0.000835366	2.45	0.78555	0.320632589	93.75		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 12	30-05-2013 11:56	5/30/2013	3.92	0.0115	0.00012	0.00036	0.0546	0.00005	0.00025	0.047	9.7E-05	95.8	0.00025	0.00039	0.0125	0.031	2.5E-05	0.00316	23.2	0.128	0.0116	0.00061	1.73	0.025	8.46	5E-06	10.1	0.35	5E-06	0.00005	0.005	0.00053	0.0005	0.0051		0.000496689	4.79	1.83626	0.383352628	52.5773		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 13	24-06-2013 13:10	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 14	24-06-2013 13:18	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 15	24-06-2013 13:23	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 16	24-06-2013 13:28	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 17	24-06-2013 13:40	6/24/2013	23.2	0.0104	0.00049	0.00135	0.0899	0.00005	0.00025	0.033	0.00023	284	0.00025	0.00957	0.0116	0.301	2.5E-05	0.00535	52.8	4.45	0.0802	0.00221	5.31	0.304	6.32	1.4E-05	17.5	0.854	5E-06	0.00005	0.013	0.00158	0.0005	0.0094		0.00151495	14.2	3.97574	0.279981733	41.7778		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 17	20-10-2014 14:15	10/20/2014	26.4	0.01	0.00031	0.0009	0.0854	0.0001	0.0005	0.026	0.00026	393	0.00025	0.018	0.0186	0.613	0.00005	0.003	63.9	7.12	0.114	0.0028	2.94	0.291	5.92	0.00001	17	1	0.00001	0.0001	0.027	0.00166	0.001	0.0063		0.000864356	19.65	4.54046	0.231066798	24.1379		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 18	24-06-2013 13:46	6/24/2013	11.4	0.007	0.00036	0.00117	0.0699	0.0001	0.0005	0.023	0.00025	376	0.00025	0.0105	0.0111	0.131	0.00005	0.0034	66.4	5.48	0.154	0.003	1.98	0.684	5.76	0.00001	17.3	0.864	0.00001	0.0001	0.014	0.00263	0.001	0.0086		0.002282536	18.8	4.67466	0.248652301	34.4		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 19	24-06-2013 13:53	6/24/2013	5.55	0.0015	0.00043	0.00156	0.0287	0.00005	0.00025	0.027	0.00015	115	0.00025	0.00133	0.0177	0.015	2.5E-05	0.00284	21.4	0.848	0.113	0.00064	0.729	0.136	4.91	5E-06	12	0.373	5E-06	0.00005	0.005	0.00285	0.0005	0.0055		0.001672131	5.75	1.78824	0.310999104	36.6667		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 19	12/5/2015	12/5/2015	3.25	0.0015	0.00027	0.00055	0.0334	0.00005	2.5E-05	0.028	8.4E-05	173	0.00025	0.00082	0.00439	0.015	2.5E-05	0.0051	33.9	0.479	0.188	0.00025	1	0.203	7.61	5E-06	9.58	0.449	5E-06	0.00005	0.005	0.00215	0.00025	0.0015		0.001323913	8.65	2.41884	0.279634584	17.8784		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 2	30-05-2013 9:22	5/30/2013	#N/A	0.0148	0.00005	0.00103	0.0329	0.00005	0.00025	0.14	1.6E-05	97.2	0.00025	0.00039	0.00662	0.074	2.5E-05	0.00067	26.5	0.216	0.0114	0.00053	2.19	0.00257	6.99	5E-06	11.4	0.456	5E-06	0.00005	0.005	0.00041	0.0005	0.0015		#N/A	4.86	2.097	0.431480561	93.75		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 20	24-06-2013 13:58	6/24/2013	4.32	0.0041	0.00038	0.00071	0.0333	0.00005	0.00025	0.026	0.0001	197	0.00025	0.00108	0.00942	0.015	2.5E-05	0.00535	39.3	0.584	0.124	0.00065	1.38	0.245	7.38	5E-06	12.4	0.56	5E-06	0.00005	0.012	0.00213	0.0005	0.0015		0.001441176	9.85	2.86606	0.290970583	15		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 20	10/6/2014	10/6/2014	2.6	0.003	0.0003	0.00057	0.033	0.00005	0.00025	0.034	0.00015	237	0.00025	0.00054	0.00955	0.015	2.5E-05	0.00508	47	0.284	0.278	0.00056	1.27	0.299	7.54	5E-06	12.1	0.654	5E-06	0.00005	0.016	0.00226	0.0005	0.0059		0.001538593	11.85	3.29918	0.278411463	39.3333		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 20	20-10-2014 13:57	10/20/2014	3.89	0.0015	0.0003	0.00055	0.0337	0.00005	0.00025	0.032	0.00013	233	0.00025	0.00132	0.0107	0.038	2.5E-05	0.00447	45.2	0.958	0.125	0.00067	1.39	0.197	6.62	5E-06	13.2	0.656	5E-06	0.00005	0.021	0.00193	0.0005	0.0031		0.000959416	11.65	3.24512	0.278551295	23.4848		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 20	12/5/2015	12/5/2015	4.37	0.0068	0.00066	0.00116	0.0604	0.0001	0.00005	0.068	0.0001	343	0.00025	0.0002	0.00731	0.015	0.00005	0.0079	64.6	0.0643	0.461	0.0005	2.09	0.343	5.97	0.00001	22	0.96	0.00001	0.0001	0.005	0.00269	0.0005	0.0015		0.001047862	17.15	4.77688	0.278535005	14.4231		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 21	24-06-2013 14:14	6/24/2013	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 22	24-06-2013 14:14	6/24/2013	3.43	0.0061	0.00017	0.00038	0.0414	0.00005	0.00025	0.017	6.3E-05	109	0.00025	0.00019	0.00229	0.015	2.5E-05	0.00136	27.4	0.109	0.0454	0.00025	1.95	0.152	7.87	5E-06	10.6	0.423	5E-06	0.00005	0.005	0.00029	0.0005	0.0015		0.001831325	5.45	2.10854	0.38688756	23.8095		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/12/2013	10/12/2013	5.99	0.006	0.00013	0.00019	0.0475	0.00005	0.00025	0.06	1.9E-05	105	0.00025	0.00005	0.00223	0.015	2.5E-05	0.00025	31.3	0.0751	0.00175	0.00073	1.47	0.0341	5.98	5E-06	12.5	0.431	5E-06	0.00005	0.013	3.3E-05	0.0005	0.0015		0.000356446	5.25	2.40624	0.458332087	78.9474		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 22	26-11-2013 10:20	11/26/2013	7.97	0.0136	0.0001	0.00021	0.0402	0.00005	0.00025	0.04	2.6E-05	83.9	0.00025	0.00027	0.00304	0.015	2.5E-05	0.00025	25.3	0.24	0.00193	0.00094	1.46	0.0246	5.75	5E-06	10.2	0.341	5E-06	0.00005	0.013	2.7E-05	0.0005	0.0015		0.000354808	4.195	1.95613	0.466301029	57.6923		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 22	14-01-2014 12:15	1/14/2014	6.07	0.0143	0.00015	0.00021	0.048	0.00005	0.00025	0.082	3.5E-05	104	0.00025	0.00031	0.00237	0.015	2.5E-05	0.00025	30.4	0.113	0.00171	0.00079	1.68	0.0207	6.19	5E-06	14.6	0.444	5E-06	0.00005	0.01	3.8E-05	0.0005	0.0015		0.000237023	5.2	2.45045	0.471241208	42.8571		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	18-02-2014 13:24	2/18/2014	4.09	0.0072	0.00033	0.0002	0.0482	0.00005	0.00025	0.131	3.5E-05	107	0.00025	0.00031	0.00186	0.015	2.5E-05	0.00025	30.6	0.228	0.00496	0.00078	1.57	0.0227	5.59	5E-06	16.9	0.431	5E-06	0.00005	0.005	3.7E-05	0.0005	0.0015		0.00021348	5.35	2.5593	0.478373005	42.8571		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/7/2014	3/7/2014	5.71	0.0044	0.00023	0.00029	0.101	0.00005	0.00025	0.075	6.5E-05	215	0.00025	0.00005	0.00302	0.015	2.5E-05	0.00025	55.8	0.165	0.00543	0.00129	2.1	0.18	6.13	5E-06	18.8	0.99	5E-06	0.00005	0.017	5.2E-05	0.0005	0.0015		0.000923077	10.75	4.12488	0.383709932	23.0769		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	15-05-2014 10:50	5/15/2014	5.67	0.0146	0.00005	0.00021	0.0395	0.00005	0.00025	0.012	2.2E-05	87.1	0.00025	0.00005	0.00185	0.015	2.5E-05	0.00025	22.1	0.00271	0.00488	0.00025	2.64	0.0587	6.62	5E-06	8.5	0.318	5E-06	0.00005	0.011	5E-06	0.0005	0.0015		0.000727686	4.355	1.72589	0.396300175	68.1818		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/8/2014	6/8/2014	6.45	0.007	0.00019	0.00032	0.0805	0.00005	0.00025	0.075	6.7E-05	178	0.00025	0.00029	0.00385	0.015	2.5E-05	0.00025	44.5	0.45	0.00632	0.00164	2.1	0.0896	6.56	5E-06	17.7	0.702	5E-06	0.00005	0.01	0.00011	0.0005	0.0015		0.000558836	8.9	3.41816	0.384063321	22.3881		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/4/2014	8/4/2014	6.09	0.0135	0.00032	0.00034	0.053	0.00005	0.00025	0.096	3.5E-05	85.9	0.00025	0.00023	0.00407	0.015	2.5E-05	0.00025	23.5	0.211	0.00924	0.00102	2.12	0.0266	4.94	5E-06	13	0.356	5E-06	0.00005	0.011	0.0001	0.0005	0.0015		0.000383654	4.295	1.98984	0.463291911	42.8571		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	8/9/2014	8/9/2014	8.56	0.0069	0.00016	0.00042	0.0783	0.00005	0.00025	0.058	3.4E-05	187	0.00025	0.00005	0.00468	0.015	2.5E-05	0.00025	48.6	0.047	0.00612	0.00163	2.78	0.0715	7.16	5E-06	16.7	0.78	5E-06	0.00005	0.017	0.00027	0.0005	0.0015		0.000423077	9.35	3.63119	0.38836238	44.1176		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/12/2014	9/12/2014	9.77	0.0105	0.00017	0.00035	0.0359	0.00005	0.00025	0.028	3.3E-05	107	0.00025	0.00056	0.0074	0.015	2.5E-05	0.00025	27.7	0.367	0.0145	0.00101	1.87	0.0159	5.46	5E-06	10.8	0.431	5E-06	0.00005	0.016	0.00036	0.0005	0.0015		0.000212946	5.35	2.13267	0.398630708	45.4545		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	10/6/2014	10/6/2014	5.36	0.0104	0.00025	0.0003	0.0842	0.00005	0.00025	0.063	5.2E-05	171	0.00025	0.0003	0.00309	0.015	2.5E-05	0.00025	45.3	0.403	0.00572	0.00118	2.08	0.171	5.46	5E-06	14.2	0.693	5E-06	0.00005	0.015	0.00012	0.0005	0.0015		0.001209906	8.55	3.31212	0.38738293	28.8462		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	20-10-2014 13:40	10/20/2014	10.1	0.0114	0.00017	0.00038	0.0668	0.00005	0.00025	0.048	7.7E-05	185	0.00025	0.00144	0.00431	0.031	2.5E-05	0.00053	48.4	1.15	0.00522	0.00286	2.38	0.0204	7.36	5E-06	15.8	0.71	5E-06	0.00005	0.021	0.00029	0.0005	0.0015		0.000140046	9.25	3.57014	0.385961038	19.4805		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/3/2014	11/3/2014	4.35	0.0079	0.00027	0.00021	0.0501	0.00005	0.00025	0.136	2.6E-05	121	0.00025	0.00031	0.00202	0.015	2.5E-05	0.00025	33.4	0.106	0.00333	0.0007	1.68	0.0232	5.5	5E-06	18.8	0.477	5E-06	0.00005	0.014	4.3E-05	0.0005	0.0015		0.00021155	6.05	2.80799	0.464130594	57.6923		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	11/11/2014	11/11/2014	9.88	0.004	0.00017	0.00033	0.0493	0.00005	0.00025	0.042	3.2E-05	145	0.00025	0.00015	0.00312	0.015	2.5E-05	0.00061	37.8	0.367	0.00502	0.00202	1.98	0.0132	6.85	5E-06	14	0.558	5E-06	0.00005	0.017	0.00021	0.0005	0.0015		0.000119637	7.25	2.86355	0.394971933	46.875		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 22	13-01-2015 11:30	1/13/2015	8.02	0.0085	0.00016	0.00023	0.0526	0.00005	0.00025	0.031	4.7E-05	137	0.00025	0.00151	0.00297	0.052	2.5E-05	0.00025	37	0.951	0.0025	0.00185	1.72	0.032	6.14	5E-06	11.9	0.555	5E-06	0.00005	0.014	0.00013	0.0005	0.0015		0.000299065	6.85	2.71893	0.396923835	31.9149		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 22	3/3/2015	3/3/2015	7.3	0.0077	0.00014	0.0002	0.0452	0.00005	0.00025	0.026	3.3E-05	119	0.00025	0.00048	0.00242	0.015	2.5E-05	0.00025	31.7	0.349	0.00198	0.0011	1.48	0.0451	5.37	5E-06	10.7	0.497	5E-06	0.00005	0.012	4.9E-05	0.0005	0.0015		0.000442157	5.95	2.35156	0.395220607	45.4545		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/2/2015	4/2/2015	7.89	0.0079	0.00014	0.00026	0.0419	0.00005	0.00025	0.027	3.2E-05	118	0.00025	0.0003	0.00286	0.015	2.5E-05	0.00025	30.9	0.359	0.00244	0.00143	1.62	0.0168	5.93	5E-06	11.5	0.414	5E-06	0.00005	0.005	9.1E-05	0.0005	0.0015		0.000196109	5.9	2.34329	0.397167412	46.875		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 22	4/6/2015	4/6/2015	7.36	0.016	0.00014	0.00026	0.0602	0.00005	2.5E-05	0.036	2.6E-05	161	0.00025	0.00023	0.00297	0.015	2.5E-05	0.0005	41.5	0.168	0.00325	0.00116	1.57	0.0855	6.36	5E-06	14.1	0.632	5E-06	0.00005	0.011	9.3E-05	0.00025	0.0015		0.000599299	8.05	3.07312	0.381754654	57.0342		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 22	6/5/2015	6/5/2015	6.8	0.0041	0.00014	0.00022	0.0566	0.00005	2.5E-05	0.028	1.6E-05	147	0.00025	0.00005	0.00222	0.015	2.5E-05	0.0005	40.2	0.0609	0.00254	0.00079	1.77	0.13	5.47	5E-06	12.3	0.611	5E-06	0.00005	0.005	5.1E-05	0.00025	0.0015		0.00095122	7.35	2.92419	0.397849054	91.4634		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 22	9/4/2015	9/4/2015	6.64	0.006	0.00017	0.00023	0.0491	0.00005	2.5E-05	0.028	2.6E-05	127	0.00025	0.00034	0.00234	0.015	2.5E-05	0.0005	32.6	0.239	0.00276	0.00089	1.6	0.0737	5.02	5E-06	10.3	0.521	5E-06	0.00005	0.013	6.9E-05	0.00025	0.0015		0.000710932	6.35	2.38973	0.37633486	57.9151		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 22	29-10-2015 13:39	10/29/2015	10.1	0.0068	0.00005	0.00108	0.0811	0.00005	2.5E-05	0.037	2.1E-05	163	0.00025	0.00845	0.0009	0.29	2.5E-05	0.0005	40.4	3.25	0.00593	0.004	2.38	0.00113	7.17	5E-06	18.8	0.652	5E-06	0.00005	0.005	0.00011	0.00025	0.0015		7.81106E-06	8.15	3.2341	0.396822341	72.1154		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 22	30-11-2015 12:40	11/30/2015	9.32	0.0085	0.00005	0.00093	0.0685	0.00005	2.5E-05	0.041	2.4E-05	163	0.00025	0.00756	0.001	0.581	2.5E-05	0.0005	40.3	3.14	0.00375	0.00336	1.73	0.00046	6.56	5E-06	18.2	0.629	5E-06	0.00005	0.005	7.5E-05	0.00025	0.0015		3.37136E-06	8.15	3.18552	0.390861049	62.7615		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/6/2014	12/6/2014	9.54	0.0068	0.00033	0.00065	0.0365	0.00005	0.00025	0.045	0.00005	148	0.00025	0.0006	0.0184	0.015	2.5E-05	0.00316	35.3	0.283	0.158	0.00056	3.1	0.0253	6.7	5E-06	17	0.599	5E-06	0.00005	0.014	0.00175	0.0005	0.0015		0.000227928	7.4	2.87693	0.388773872	30		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 23	12/5/2015	12/5/2015	8.08	0.0078	0.00023	0.00054	0.0285	0.00005	2.5E-05	0.036	1.9E-05	123	0.00025	0.00118	0.0117	0.015	2.5E-05	0.0024	31	0.0975	0.076	0.00025	2.79	0.0185	6.32	5E-06	15.1	0.547	5E-06	0.00005	0.005	0.00095	0.00065	0.0015		0.00026555	6.15	2.53564	0.412299248	78.534		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 24	12/6/2014	12/6/2014	4.87	0.0078	0.00126	0.00042	0.0687	0.00005	0.00025	0.12	0.0001	174	0.00025	0.00031	0.0119	0.015	2.5E-05	0.00372	30.6	0.244	0.0747	0.00025	2.58	0.0456	6.82	5E-06	22.2	0.796	5E-06	0.00005	0.015	0.00337	0.0005	0.0073		0.000321127	8.7	2.81563	0.323635379	73		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 25	11/5/2015	11/5/2015	5.41	0.0041	0.00032	0.00052	0.0483	0.00005	2.5E-05	0.045	4.1E-05	215	0.00025	0.00138	0.00251	0.015	2.5E-05	0.0025	49.1	0.76	0.475	0.00095	2.02	0.325	7.66	5E-06	16.2	0.716	5E-06	0.00005	0.005	0.00024	0.00025	0.0015		0.001722615	10.75	3.61912	0.336661996	36.5854		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 26	12/5/2015	12/5/2015	3.46	0.0015	0.00034	0.00064	0.037	0.0001	0.00005	0.035	8.4E-05	391	0.00025	0.00028	0.00898	0.015	0.00005	0.0052	75.8	0.164	0.189	0.0005	1.94	0.448	6.08	0.00001	20.1	1.08	0.00001	0.0001	0.005	0.00362	0.0005	0.0015		0.001292308	19.55	5.34348	0.273323872	17.8571		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 27	12/5/2015	12/5/2015	7.24	0.0074	0.00026	0.00041	0.0507	0.00005	2.5E-05	0.054	7.3E-05	224	0.00025	0.00089	0.0128	0.036	2.5E-05	0.0022	51	0.714	0.0802	0.00063	2.12	0.0581	5.9	5E-06	19.2	0.843	5E-06	0.00005	0.005	0.00101	0.00025	0.0015		0.000283876	11.2	3.8629	0.34490201	20.5479		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 28	12/5/2015	12/5/2015	11.2	0.0104	0.00021	0.00044	0.0599	0.00005	2.5E-05	0.031	5.6E-05	225	0.00025	0.0008	0.00942	0.226	2.5E-05	0.0014	44.8	0.714	0.191	0.00059	2.85	0.0442	6.48	5E-06	15.4	0.916	5E-06	0.00005	0.005	0.00173	0.00064	0.0034		0.000240653	11.25	3.35489	0.298212181	60.8229		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 9:30	5/30/2013	2.86	0.0015	0.00012	0.00278	0.0152	0.00005	0.00025	0.232	1.4E-05	67.2	0.00025	0.00005	0.00391	0.015	2.5E-05	0.00196	15.1	0.018	0.034	0.00025	0.973	0.014	11.7	5E-06	6.76	0.288	5E-06	0.00005	0.005	0.00048	0.0025	0.0015		0.000513447	3.36	1.19933	0.356942927	107.143		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 3	30-05-2013 12:17	5/30/2013	8.6	0.0222	0.00005	0.00142	0.0279	0.00005	0.00025	0.072	1.6E-05	86.1	0.00025	0.00005	0.0103	0.015	2.5E-05	0.00149	19	0.0201	0.0214	0.00025	3.48	0.00828	10.5	5E-06	7.41	0.383	5E-06	0.00005	0.005	0.00131	0.0015	0.0015		0.000268541	4.305	1.51928	0.352909733	93.75		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 3	12/5/2015	12/5/2015	1.47	0.0035	0.00014	0.00329	0.011	0.00005	2.5E-05	0.224	1.2E-05	56.4	0.00025	0.00005	0.00283	0.015	2.5E-05	0.0023	11.8	0.00953	0.0292	0.00025	0.765	0.00702	12.3	5E-06	7.33	0.234	2.8E-05	0.00005	0.005	0.00033	0.00311	0.0015		0.000232965	2.82	1.02636	0.363956626	122.951		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 4	10/6/2014	10/6/2014	1.83	0.0036	0.00012	0.00285	0.0153	0.00005	0.00025	0.231	2.1E-05	60.8	0.00025	0.00005	0.00452	0.015	2.5E-05	0.00178	13.3	0.0148	0.0325	0.00025	0.981	0.00937	11.8	5E-06	6.32	0.248	5E-06	0.00005	0.005	0.00037	0.0025	0.0015		0.000302258	3.04	1.07545	0.353765348	71.4286		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 4	20-10-2014 15:42	10/20/2014	1.66	0.003	0.00015	0.00383	0.0191	0.00005	0.00025	0.255	0.00001	67.4	0.00025	0.00005	0.00222	0.015	2.5E-05	0.00275	13.7	0.0138	0.0338	0.00025	0.842	0.00848	12.2	5E-06	7.99	0.29	5E-06	0.00005	0.005	0.00039	0.0034	0.0015		0.000215593	3.37	1.16781	0.346532602	150		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 5	30-05-2013 12:24	5/30/2013	14.4	0.014	0.00005	0.001	0.034	0.00005	0.00025	0.034	5.1E-05	96	0.00025	0.00131	0.00985	0.252	2.5E-05	0.00076	20.8	1.69	0.018	0.00066	4.39	0.0108	10.5	5E-06	7.26	0.39	5E-06	0.00005	0.005	0.00051	0.001	0.0015		0.00041169	4.8	1.64104	0.341884222	29.4118		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 5	10/6/2014	10/6/2014	7.14	0.0061	0.00005	0.00064	0.0292	0.00005	0.00025	0.044	3.6E-05	93.2	0.00025	0.00025	0.00738	0.081	2.5E-05	0.00099	18.4	0.447	0.0266	0.0005	3.11	0.00737	9.72	5E-06	7.44	0.36	5E-06	0.00005	0.011	0.00038	0.0005	0.0015		0.000159065	4.66	1.47611	0.316761405	41.6667		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 5	20-10-2014 15:55	10/20/2014	7.86	0.0119	0.00005	0.0012	0.0288	0.00005	0.00025	0.072	2.5E-05	80.2	0.00025	0.00051	0.00276	0.223	2.5E-05	0.00144	14.3	0.855	0.0211	0.00025	2.31	0.00316	11.8	5E-06	8.79	0.301	5E-06	0.00005	0.011	0.0003	0.0005	0.0015		9.02857E-05	4.01	1.27522	0.318010954	60		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 5	12/5/2015	12/5/2015	5.86	0.0087	0.00005	0.00098	0.0255	0.00005	2.5E-05	0.056	3E-05	89.6	0.00025	0.00038	0.00523	0.037	0.00016	0.0013	16.8	0.337	0.027	0.00025	1.98	0.00746	10.7	5E-06	8.06	0.329	5E-06	0.00005	0.005	0.00035	0.00097	0.0015		0.0001492	4.48	1.3808	0.308213359	50.6757		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 6	30-05-2013 9:45	5/30/2013	26	0.0601	0.00005	0.001	0.0943	0.00005	0.00025	0.019	6.3E-05	135	0.00025	0.00881	0.0211	3.15	2.5E-05	0.00025	28.4	3.97	0.00961	0.00253	6.73	0.00928	7.85	1.4E-05	11.5	0.589	5E-06	0.00005	0.012	0.00053	0.002	0.0042		0.000116485	6.75	2.32854	0.344969004	66.6667		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 6	10/6/2014	10/6/2014	14.4	0.0129	0.00012	0.00038	0.0663	0.00005	0.00025	0.024	0.00005	144	0.00025	0.00026	0.021	0.015	2.5E-05	0.00025	28.9	0.398	0.023	0.00076	4.66	0.00559	6.98	5E-06	10.3	0.592	5E-06	0.00005	0.014	0.00065	0.0005	0.0015		7.48661E-05	7.2	2.25244	0.312839509	30		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 7	30-05-2013 10:16	5/30/2013	13.8	0.015	0.00017	0.00056	0.0433	0.00005	0.00025	0.022	3.2E-05	88.8	0.00025	0.00017	0.0261	0.035	2.5E-05	0.00065	20.8	0.101	0.0207	0.00056	2.63	0.00592	6.78	5E-06	8.48	0.426	5E-06	0.00005	0.005	0.00074	0.0005	0.0051		0.000133534	4.44	1.64896	0.371387283	159.375		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 7	26-11-2013 12:10	11/26/2013	13.4	0.0092	0.00011	0.00048	0.0576	0.00005	0.00025	0.018	4.5E-05	142	0.00025	0.00037	0.0224	0.015	2.5E-05	0.00134	33.4	0.444	0.0137	0.00063	2.69	0.00775	6.55	5E-06	12.2	0.678	5E-06	0.00005	0.016	0.00087	0.0005	0.0015		9.45122E-05	7.1	2.54693	0.358722677	33.3333		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 7	3/7/2014	3/7/2014	10.1	0.0119	0.00018	0.0006	0.0764	0.00005	0.00025	0.034	0.00005	177	0.00025	0.00019	0.0192	0.944	2.5E-05	0.00177	39.8	0.053	0.0604	0.00055	3.97	0.016	6.96	5E-06	14.7	0.918	5E-06	0.00005	0.016	0.00128	0.0005	0.0032		0.000135211	8.85	3.06163	0.345946329	64		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 7	15-05-2014 10:09	5/15/2014	9.41	0.0102	0.00014	0.00044	0.049	0.00005	0.00025	0.02	2.5E-05	109	0.00025	0.00012	0.0204	0.015	2.5E-05	0.001	23.1	0.0585	0.0263	0.00025	2.42	0.014	5.83	5E-06	8.67	0.46	5E-06	0.00005	0.013	0.00048	0.0005	0.0015		0.000222222	5.45	1.78595	0.32769662	60		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 7	11/11/2014	11/11/2014	12.1	0.0165	0.00011	0.0005	0.0767	0.00005	0.00025	0.027	4.4E-05	208	0.00025	0.00022	0.0178	0.015	2.5E-05	0.00196	45.6	0.249	0.035	0.00058	3.76	0.0129	7.15	5E-06	18.8	0.902	5E-06	0.00005	0.02	0.00152	0.0005	0.0031		8.37662E-05	10.4	3.57269	0.343528239	70.4545		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 7	12/6/2014	12/6/2014	10	0.0076	0.00016	0.00054	0.0603	0.00005	0.00025	0.025	2.5E-05	139	0.00025	0.0001	0.0226	0.015	2.5E-05	0.00158	29.5	0.0772	0.0452	0.00051	2.98	0.0135	6.33	5E-06	10.9	0.596	5E-06	0.00005	0.014	0.00085	0.0005	0.0031		0.00015458	6.95	2.27044	0.326682003	124		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 8	30-05-2013 10:50	5/30/2013	8.64	0.0051	0.00029	0.00081	0.0483	0.00005	0.00025	0.092	1.9E-05	122	0.00025	0.00005	0.00645	0.015	2.5E-05	0.00106	25.7	0.0133	0.0142	0.00025	2.74	0.0455	8.37	5E-06	12.7	0.426	5E-06	0.00005	0.005	0.00024	0.0005	0.0015		0.000501838	6.1	2.12097	0.347700426	78.9474		2013
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/6/2014	12/6/2014	6.74	0.0031	0.00018	0.00057	0.0456	0.00005	0.00025	0.038	1.7E-05	139	0.00025	0.00005	0.00694	0.015	2.5E-05	0.00138	27.9	0.00397	0.014	0.00025	2.27	0.0314	8.29	5E-06	12.6	0.433	5E-06	0.00005	0.013	0.00024	0.0005	0.0015		0.000273837	6.95	2.23285	0.321273867	88.2353		2014
Bi-annual Seep Sampling	Waste Haul Road Seep 8	12/5/2015	12/5/2015	6.39	0.0041	0.00017	0.00047	0.0388	0.00005	2.5E-05	0.112	1.5E-05	130	0.00025	0.00005	0.00628	0.015	2.5E-05	0.0013	24.5	0.00366	0.0193	0.00025	1.59	0.0169	8.86	5E-06	14	0.422	5E-06	0.00005	0.005	0.00013	0.00079	0.0015		0.000143626	6.5	2.07804	0.319697894	100		2015
Bi-annual Seep Sampling	Waste Haul Road Seep 9	30-05-2013 11:06	5/30/2013	4.83	0.0037	0.00005	0.00025	0.0346	0.00005	0.00025	0.033	1.8E-05	68.6	0.00025	0.00005	0.00466	0.015	2.5E-05	0.00025	11.8	0.0666	0.00405	0.00025	1.26	0.0252	7.07	5E-06	5.02	0.169	5E-06	0.00005	0.005	2.6E-05	0.0005	0.0015		0.000946183	3.43	0.93862	0.273648749	83.3333		2013
Bi-annual Seep Sampling	Waste Haul Road Under Culvert	30-05-2013 12:47	5/30/2013	8.17	0.0206	0.00005	0.00044	0.0273	0.00005	0.00025	0.031	2.8E-05	65.3	0.00025	0.00035	0.0141	0.044	2.5E-05	0.00096	16.6	0.219	0.0253	0.00025	1.71	0.00527	7.08	5E-06	8.85	0.304	5E-06	0.00005	0.005	0.00019	0.0005	0.173		0.000108288	3.265	1.39656	0.42773623	6178.57		2013

Appendix F – NAG Waste Rock Source Terms

		pH	Alkalinity	Cl	F	P-D	SO4	Al-D	Sb-D	As-D	Ba-D	Be-D	Bi-D	B-D	Cd-D	Ca-D	Cr-D	Co-D	Cu-D	Fe-D	Pb-D	Li-D	Mg-D	Mn-D	Mo-D	Ni-D	K-D	Se-D	Si-D	Ag-D	Na-D	Sr-D	Tl-D	Sn-D	Ti-D	U-D	V-D	Zn-D
Boundary	Median Cation Ratio	8.3496	220.4	5.769812	0.686377	0.554225	1510.721	0.056152	0.000536	0.006165	0.12634	0.000354	0.000577	0.158047	0.000169	601.7683	0.000577	0.003337	0.021672	0.087701	0.000385331	0.006657	93.11092	1.101942	0.12376	0.001311	4.532764	0.014703	17.25912	2.00789E-05	19.98063	7.899103	3.71576E-05	0.000115	0.05299	0.003452	0.003012	0.009232
Wight	Median Cation Ratio	8.3356	238.98	15.69779	0.922136	0.021402	1591.257	0.072452	0.00084	0.000874	0.090618	0.000118	0.000643	0.366612	0.000711	475.8903	0.000295	0.009447	0.355212	0.017702	5.90054E-05	0.006329	106.441	1.249026	0.498737	0.0095	4.284972	0.250065	8.475062	1.18011E-05	34.03195	8.321412	1.59315E-05	0.000153	0.029668	0.00577	0.001534	0.097522
All Other Non-PAG	Median Cation Ratio	8.36	240.59	26.14414	0.844002	0.147679	1675.136	0.048464	0.004381	0.004001	0.170842	0.000124	0.000619	0.293699	0.000338	625.7321	0.000309	0.012613	0.067437	0.01856	6.18679E-05	0.017036	117.7557	6.360145	0.694579	0.004011	10.21353	0.511462	14.93244	1.56897E-05	48.79522	16.96666	1.23736E-05	0.000124	0.033409	0.010903	0.003599	0.011305
All PAG - Pre-Acid	Median Cation Ratio	8.25	369.4	26.24464	0.84179	0.091684	1610.206	0.408167	0.000693	0.003799	0.261873	0.000143	0.000716	0.478764	0.000629	616.0041	0.00065	0.034811	0.035069	0.048707	0.000247261	0.00573	108.7319	12.67822	0.683908	0.003977	13.56642	0.367597	13.52917	6.01678E-05	57.50327	2.180368	1.43257E-05	0.000143	0.040398	0.003885	0.005576	0.029253
Boundary	High Cation Ratio	8.3496	220.4	5.893454	0.701085	0.566102	1543.095	0.057355	0.000547	0.006297	0.129048	0.000362	0.000589	0.161433	0.000173	614.6637	0.000589	0.003409	0.022137	0.08958	0.000393588	0.0068	95.1062	1.125555	0.126412	0.001339	4.629897	0.015018	17.62897	2.05092E-05	20.4088	8.068374	3.79538E-05	0.000118	0.054125	0.003526	0.003076	0.00943
Wight	High Cation Ratio	8.3356	238.98	16.43347	0.965352	0.022405	1665.831	0.075847	0.00088	0.000915	0.094865	0.000124	0.000673	0.383793	0.000744	498.1927	0.000309	0.00989	0.371859	0.018531	6.17707E-05	0.006626	111.4293	1.307561	0.52211	0.009945	4.485785	0.261784	8.872243	1.23541E-05	35.62684	8.711392	1.66781E-05	0.00016	0.031058	0.006041	0.001606	0.102092
All Non-PAG	High Cation Ratio	8.36	240.59	27.68951	0.893891	0.156408	1774.152	0.051328	0.00464	0.004238	0.18094	0.000131	0.000655	0.31106	0.000358	662.7187	0.000328	0.013358	0.071423	0.019657	6.55249E-05	0.018043	124.7161	6.736089	0.735635	0.004248	10.81724	0.541694	15.81509	1.66171E-05	51.67948	17.96955	1.3105E-05	0.000131	0.035383	0.011548	0.003812	0.011973
All PAG - Pre-Acid	High Cation Ratio	8.25	369.4	27.61957	0.675413	0.096488	1694.563	0.429551	0.00073	0.003998	0.275593	0.000151	0.000754	0.503846	0.000662	648.276	0.000684	0.036635	0.036907	0.051259	0.000260215	0.00603	114.4283	13.34243	0.719737	0.004185	14.27715	0.386855	14.23795	6.332E-05	60.51581	2.294596	1.50762E-05	0.000151	0.042515	0.004089	0.005868	0.030786

Nitrogen				
		NH3	NO3	NO2
		mgN/L	mgN/L	mgN/L
Inactive	LCL	0	1.699526	0
	Average	0.053287	3.446876	0.50763
	UCL	0.17855	5.194225	1.89058
Active	LCL	0.03428	11.0534	0
	Average	0.152813	27.91705	0.294244
	UCL	0.271345	44.7807	0.613134

Appendix G – Pit Wall Source Terms

Source Terms

Case	Alkalinity	Cl	F	P	SO4	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Mo	Ni	K	Se	Si	Ag	Na	Sr	Tl	Sn	Ti	U	V	Zn		Acidity
	mgCaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
PAG Low	0	0	0	0	1341.014	4.288598	0.006371	0.058803	2.572783	0.011654	0.003587	2.879341	0.005819	195.4517	0.008946	0.630366	11.15438	1.644187	0.004691	0.19557	35.78528	17.74187	0.018239	0.154679	21.40939	0.104655	367.835	0.001443	86.74184	0.730488	0.000688	0.011555	0.037682	0.001893	0.018246	2.895168		45.65833
PAG High	0	0	0	0	1828.241	4.431467	0.011108	0.109706	3.144059	0.016543	0.006766	3.278481	0.006704	224.6746	0.010225	1.029472	17.96628	2.44708	0.006766	0.288323	39.48672	23.70838	0.031152	0.224855	30.42945	0.191079	516.1487	0.001691	141.7211	0.89643	0.000921	0.016344	0.04136	0.003383	0.021176	3.575614		54.94504
NAG Average	187.0697854	#N/A	#N/A	#N/A	111.393	0.073312	0.00081	0.00231	0.03145	-0.0001	#N/A	0.37968	0.000237	125.5831	0.000587	0.001157	0.064399	0.144091	0.000755	#N/A	10.57866	0.034505	0.089177	0.001039	2.335905	0.0462	8.5954	2.8E-06	10.38601	0.27285	#N/A	-0.0001	#N/A	#N/A	#N/A	0.025448		

Nitrogen Forms:

Assume 0 mg/L

Explanatory Notes

1 MPMC estimates PAG rock about 1050 masl is 18%. Acidification will be progressive.

2 Concentrations are "annual". Seasonal variation can be expected but these concentrations are intended to reflect seasonal worst for each case.

3 Concentations are dissolved.

4 Probabilities cannot be attached to the terms. Use the terms to assess proximity to trigger levels but not to assess probability of exceedance.

Appendix H – Tailings Seepage Water Chemistry Database

Index	Sample Point	Date	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Alkalinity (CaCO3) (mg/L)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen N-WDGWA (mg/L)
1	E4 - Main Embankment Seepage Pond	7/12/2001 13:30		545	8.84	22.4		82		148			11	1.75	0.011				16.3		
3	E4 - Main Embankment Seepage Pond	7/26/2001 8:00		593	8.43	15.3		94		207			-4	3.2	-0.005				27.2		
4	E4 - Main Embankment Seepage Pond	8/3/2001		567	8.78	16.2		87		192			-4	1.27	-0.005				24.4		
5	E4 - Main Embankment Seepage Pond	8/10/2001 10:15		577	8.97	16.8		73		179			-4	0.68	0.013				28.9		
7	E4 - Main Embankment Seepage Pond	8/30/2001 14:25		545	9.18	18.3		71		141			-4	1.01	0.019				15.8		
8	E4 - Main Embankment Seepage Pond	10/23/2001 14:30		768	7.82	5.1		112		143			5	7.99	0.017				8.1		
9	E4 - Main Embankment Seepage Pond	11/13/2001 8:45		657	7.46	6.1		140		217			-4	0.78	-0.005				17.9		
15	E4 - Main Embankment Seepage Pond	5/22/2002 12:30		362	7.98	8.05		96		131		230	17	27.8	0.12				6.52		7.43
17	E4 - Main Embankment Seepage Pond	7/31/2002 9:10		423	7.57	16		102		114		256	-4	0.48	0.03				2.51		3.06
26	E4 - Main Embankment Seepage Pond	5/5/2003 14:50		364	9.15	13		124		154		234	6	5.1	0.079				1.61	0.033	
27	E4 - Main Embankment Seepage Pond	5/29/2003 10:30		355	9.51	17.4		121		132		244	-4	1.33	0.038					0.031	
28	E4 - Main Embankment Seepage Pond	6/24/2003 7:00		366	9.06	20.3		125		135		250	-4	1.66	0.166					0.031	
29	E4 - Main Embankment Seepage Pond	8/5/2003 14:30		345	9.82	22.9		106		99.3		226	-4	0.76	-0.005					-0.005	
30	E4 - Main Embankment Seepage Pond	8/20/2003 10:00		330	9.32	19.6		102		86.4		206	-4	2.54	-0.005					-0.005	
31	E4 - Main Embankment Seepage Pond	10/16/2003 16:00		473	8.16	10		139		134		222	-4	2.81	0.016					0.011	
32	E4 - Main Embankment Seepage Pond	11/11/2003 9:55		425	8.16	6		160		172		278	-4	4.12	-0.005					0.019	
33	E4 - Main Embankment Seepage Pond	3/4/2004 10:00		178.1	6.98	1.7		108		146		204	9	10.9	0.031					0.009	
34	E4 - Main Embankment Seepage Pond	3/22/2004		515	7.2	1		161		185		280	-4	2.15	0.086					0.007	
35	E4 - Main Embankment Seepage Pond	3/22/2004 10:40		515	7.2	1		161		185		280	-4	2.15	0.086					0.007	
36	E4 - Main Embankment Seepage Pond	4/3/2004 10:00		178.1	6.98	1.7		108		146		204	9	10.9	0.031					0.009	
37	E4 - Main Embankment Seepage Pond	5/1/2004 13:32		293	8.61	12		112		130		182	7	5.7	0.07				0.46	0.013	
38	E4 - Main Embankment Seepage Pond	5/7/2004		355	8.13	20.7		126		143		244	-4	2.21	0.055				0.17	0.009	
39	E4 - Main Embankment Seepage Pond	6/9/2004		278	8.56	6.3		106		117		174	-4	2.07	0.008					-0.005	
40	E4 - Main Embankment Seepage Pond	7/5/2004		355	8.13	20.7		126		143		244	-4	2.21	0.055				0.17	0.009	
41	E4 - Main Embankment Seepage Pond	8/2/2004		342	8.65	22.3		114		151		276	-4	2.98	-0.005				-0.02	-0.005	
42	E4 - Main Embankment Seepage Pond	8/25/2004		438	7.91	16.3		123		154		300	-4	2.05	0.031				-0.02	-0.005	
43	E4 - Main Embankment Seepage Pond	12/8/2004		403	7.85	2.4		141		174		290	-4	2.39	0.042				0.52	0.014	
44	E4 - Main Embankment Seepage Pond	1/31/2005		275	7.75	1.9		107		147		192	6	11	0.042				0.71	0.009	
45	E4 - Main Embankment Seepage Pond	2/16/2005		596	7.65	3.2		137		200		358	-4	5.8	0.01				0.51	0.044	
46	E4 - Main Embankment Seepage Pond	3/16/2005		723	7.6	4.5		157		260		210	3	3.1	0.088				0.181		
48	E4 - Main Embankment Seepage Pond	4/11/2005		494	7.14	6.6		134		170		312	6	5.4	0.024				-0.002		
49	E4 - Main Embankment Seepage Pond	5/4/2005		557	7.93	12.7		144		170		336	27.5	17.2	0.04				0.005		
50	E4 - Main Embankment Seepage Pond	6/6/2005		613	7.87	7.5		138		160		344	1	1.2	-0.005				0.052		
52	E4 - Main Embankment Seepage Pond	8/11/2005		543	7.99	17.6		133		170		336	3	4.6	0.017						
53	E4 - Main Embankment Seepage Pond	9/13/2005		585	7.59	13.1		151		180		378	8	7.4	0.035						
55	E4 - Main Embankment Seepage Pond	11/8/2005			7.97	3.1		147		190		314	13	9.9	0.117						
56	E4 - Main Embankment Seepage Pond	12/14/2005			7.49	3		196		200		288	4	4.6	-0.005						
57	E4 - Main Embankment Seepage Pond	1/17/2006		593	7.34	3.4		151		180		354	7	4.1	-0.01						
58	E4 - Main Embankment Seepage Pond	2/8/2006		604	7.37	4		149		180		356	4	5.1	-0.005						
59	E4 - Main Embankment Seepage Pond	3/6/2006 12:30		645	7.59	4.15		153		180		388	3	5.2	0.017			0.1		0.063	
60	E4 - Main Embankment Seepage Pond	4/11/2006 9:20		380	7.87	8.7		115		140		236	30	41.8	0.016					0.015	
61	E4 - Main Embankment Seepage Pond	5/9/2006		524	9.3	12.5		142		175		345	13.9	12	0.0493						
62	E4 - Main Embankment Seepage Pond	6/14/2006		565	8.41	18.4		142		175		351	-3	2.66	0.009			0.0575		0.0017	
63	E4 - Main Embankment Seepage Pond	7/4/2006		558	8.53	22.9		138		174		373	3	2.82	-0.02			-0.005		-0.001	
64	E4 - Main Embankment Seepage Pond	8/3/2006		580	7.66	15		125		152		363	4.5	3.42	0.025			-0.005		-0.001	
66	E4 - Main Embankment Seepage Pond	10/12/2006		651	7.74	8		149		211		422	8.1	5.76	0.0187			0.21		-0.001	
67	E4 - Main Embankment Seepage Pond	11/15/2006		706	7.41	2.4		146		237		443	6.3	7.45	0.0613			1.72		0.0207	
68	E4 - Main Embankment Seepage Pond	12/4/2006		713	7.7	1		152		234		465	6.2	4.53	0.0107			1.21		0.0676	
72	E4 - Main Embankment Seepage Pond	2/5/2007 10:59		669	7.3	2.4		156		218		446	7.7	6.93	-0.005			0.283		0.0426	
73	E4 - Main Embankment Seepage Pond	3/5/2007		658	7.41	0		149		213		426	7	6.64	-0.005			0.249		0.0433	
74	E4 - Main Embankment Seepage Pond	4/11/2007 11:15		445	7.68	5.5		100		202		303	24	45.2	0.0089			2.49		0.0066	
75	E4 - Main Embankment Seepage Pond	5/7/2007 10:00		720	8.16	10.1		132		273		482	20.5	20.7	0.0285			2.56		0.0134	
77	E4 - Main Embankment Seepage Pond	6/4/2007 10:34		786	8.47	19.6		121		288		514	8.3	3.13	0.164			2.51		0.0206	
79	E4 - Main Embankment Seepage Pond	6/11/2007 10:59		761	8.19	14		113		277		501	8.5	6.19	0.0188			2.64		0.0134	
80	E4 - Main Embankment Seepage Pond	6/18/2007 9:45		727	8.43	14.5		105		275		476	20.2	17.2	0.025			2.31		0.016	
81	E4 - Main Embankment Seepage Pond	6/25/2007 10:00		731	8.52	14.9		102		272		499	-3	4.1	0.0542			2.57		0.0216	
83	E4 - Main Embankment Seepage Pond	7/9/2007 13:30		730	8.39	18		91		246		515	10.4	7.61	0.0363			2.52		0.0203	
84	E4 - Main Embankment Seepage Pond	7/17/2007 10:59		757	8.21	18.2		91.4		249		511	-3	5.53	0.017			1.75		0.0187	
85	E4 - Main Embankment Seepage Pond	7/24/2007 14:19		733	8.7	16.3		87.9		262		487	-3	4.52	0.0174			1.66		0.0136	
86	E4 - Main Embankment Seepage Pond	7/31/2007 14:44		730	8.27	18.3		71		220		460	-3	5.06	0.0186			1.44		0.0114	
87	E4 - Main Embankment Seepage Pond	8/2/2007 10:14		689	8.8	18		66.2		204		453	3	2.83	0.0163			1.35		0.0128	
88	E4 - Main Embankment Seepage Pond	8/14/2007 9:15		689	8.8	14.7		73		205		471	6	3.55	0.0132			1.28		0.0127	
89	E4 - Main Embankment Seepage Pond	8/29/2007 15:15		679	8.9	14.6		94.8		203		449	5.5	3.17	0.0223			0.709		0.0128	
90	E4 - Main Embankment Seepage Pond	9/5/2007 11:30		695	8.43	13.9		103		227		449	-3	2.2	0.0362			0.753		0.0095	
91	E4 - Main Embankment Seepage Pond	10/2/2007 15:00		716	8.1	8.3		123		245		458	9	9.78	0.0511			1.46		0.0139	
92	E4 - Main Embankment Seepage Pond	11/5/2007 10:45		750	8.1	0.8		131		312		519	3.8	5.7	0.0265			3.08		0.0114	
94	E4 - Main Embankment Seepage Pond	12/27/2007		856	7.817	1.6		148		307		590	-3	2.48	0.0344			2.3		0.0584	
96	E4 - Main Embankment Seepage Pond	1/8/2008 14:15		789	7.97	0.2		122		249		474	-3	1.35	0.0343			1.6		0.0399	
97	E4 - Main Embankment Seepage Pond	1/15/2008 14:19		814	8.06	2		158		282		520	-3	1.87	0.0276			1.41		0.0269	
98	E4 - Main Embankment Seepage Pond	1/22/2008 10:50		828	8.07	1.2		143		312		528	-3	1.75	0.0319			1.32		0.0412	
100	E4 - Main Embankment Seepage Pond	2/6/2008 10:09		812	8.03	1.2		146		266		538	4.8	2.68	-0.005			0.963		0.0437	
102	E4 - Main Embankment Seepage Pond	3/4/2008 10:09		781	7.867	3.3		137		261		523	-3	1.15	0.0968			0.76		0.0544	
104	E4 - Main Embankment Seepage Pond	4/16/2008 10:14		638	7.931	2.65		106		228		368	10.3	15.8	-0.005			2.24		0.008	
105	E4 - Main Embankment Seepage Pond	5/13/2008 10:45		847	8.61	10.7		108		337		609	6.3	5.21	0.0388			3.48		0.0124	
106	E4 - Main Embankment Seepage Pond	5/20/2008 13:50		836	8.679	13.7		106		348		584	-3	1.75	0.0126			2.91		0.0161	
107	E4 - Main Embankment Seepage Pond	6/16/2008 10:00		814	8.883	14.7		61.6		294		592	-3	1.48	0.0281			2.34		0.0189	
108	E4 - Main Embankment Seepage Pond	7/15/2008 9:00		782	8.202	18.3		53		267		540	5	5	0.0105			1.14		0.0169	
109	E4 - Main Embankment Seepage Pond	8/6/2008 9:24		785	8.7	16.7		57.1		230		538	13.4	15	0.0172	20.3		0.699		0.0127	
110	E4 - Main Embankment Seepage Pond	9/9/2008 8:15		829	8.1	11.9		108		254		541	-3	3.49	0.0158	19.9		0.761		0.0235	
111	E4 - Main Embankment Seepage Pond	9/30/2008 11:39		823	8.32	10.6		113		263		544	-3	2.34	0.0104	20.4		0.65		0.0213	
112	E4 - Main Embankment Seepage Pond	10/22/2008 11:39			8.449	5.2		125		267		548	5.9	6.28	0.0062	19.1		0.879		0.0152	
113	E4 - Main Embankment Seepage Pond	11/4/2008 13:39		832	8.38	5.6		128		286		590	-3	3.48	0.137	19.7		0.902		0.0161	
114	E4 - Main Embankment Seepage Pond	12/2/2008 11:28			8.46	3.1		134		326		609	3.6	4.3	0.0587	18.9		1.76		0.0204	
115	E4 - Main Embankment Seepage Pond	1/14/2009 14:05		885	7.98	0.9		146		307		610	133	62.1	0.168	19.5		0.854		0.0816	
116	E4 - Main Embankment Seepage Pond	2/10/2009 12:00		880	7.82	2.4		135		278		581	5.8	5.54	0.0967	19.2		0.284		0.117	
117	E4 - Main Embankment Seepage Pond	3/4/2009		852	7.81	1.7		133		283		552	8.8	7.58	0.0883			0.449		0.101	
118	E4 - Main Embankment Seepage Pond	4/7/2009 13:39		798	7.8	1.7		120		279		529	-3	6.92	0.0569	15.1		1.27		0.0452	
119	E4 - Main Embankment Seepage Pond	5/12/2009 10:14		808	8.52	10.7		115		368		638	11.2	5.52	-0.005	12.9		3.66		0.0235	
120	E4 - Main Embankment Seepage Pond	6/9/2009 9:45		912	8.53	14.2		66.6		315		856	-3	3.19	0.0139	18.2		1.82		0.0154	
121	E4 - Main Embankment Seepage Pond	7/7/2009 10:00		862	8.1	15.5		66.2		293		596	18.5	24.5	-0.005	16.8		1.12		0.0183	
122	E4 - Main Embankment Seepage Pond	8/5/2009 10:39		875	8.91	17.4		71.9		282		612	-3	1.98	0.022	19.3		0.692		0.0131	
123	E4 - Main Embankment Seepage Pond	8/19/2009		867	9.05	20.5		81.9		289		614	4	2.98	0.0292	22		0.545		-0.01	
124	E4 - Main Embankment Seepage Pond	9/2/2009 9:00		891	8.48	16.9		99		300		594	4	3.91	0.0487	20.3		0.567		0.016	
125	E4 - Main Embankment Seepage Pond	10/6/2009 9:49		898	8.51	7.6		120		312		612	3.8	3.16	0.0381	19.1		0.683		0.0193	
126	E4 - Main Embankment Seepage Pond	10/29/2009 12:15		877	8.35	2.7		126		298		602	4.7	4.08	0.05	18.6		0.848		0.0109	
127	E4 - Main Embankment Seepage Pond	11/19/2009 9:18		957	8.27	3		146		384		520	5	3.67	0.012	15.5		2.21		0.0278	
129	E4 - Main Embankment Seepage Pond	1/13/2010 14:05		983	7.91	2.4		159		332		570	4	3.84	0.027	13		1.41		0.0273	
130	E4 - Main Embankment Seepage Pond	2/10/2010 13:32		987	7.72	1		143		361		688	5.8	2.52	0.0412	18.8		0.749		0.227	
131	E4 - Main Embankment Seepage Pond	3/3/2010 12:00		613	7.99	1.6		125		217		347	6.3	4.11	-0.005	7.17		0.765		0.0155	
132	E4 - Main Embankment Seepage Pond	4/7/2010 13:20		872	8.61	6.7		129		356		605	5	11.3	0.0098	15.7		1.04		0.0154	
133	E4 - Main Embankment Seepage Pond	5/11/2010		1061	8.05	8.2		173		546		780	7	4.12	0.006	17.4		1.82	1.82	-0.01	
134	E4 - Main Embankment Seepage Pond	6/3/2010 8:40			6.57	7.8		68.1	844	296	8.06	574	4	0.73	0.012	16.9		0.563	0.568	0.0054	
135	E4 - Main Embankment Seepage Pond	7/8/2010		872	8.87	19.6		41.7	848	312	8.77	648	-3	0.86	0.0141	20.1		0.418	0.426	0.0087	
136	E4 - Main Embankment Seepage Pond	8/5/2010		1000	8.02	19.4		84.9		372		743	-3	0.78	0.0398	24.8		0.376	0.395	0.019	
138	E4 - Main Embankment Seepage Pond	10/7/2010		1334	7.56	9.3		104	1310	537	8.21	992	-3	0.92	0.0445	26.8		2.05	2.11	0.055	
139	E4 - Main Embankment Seepage Pond	11/4/2010		1502	7.63	5.6		92.9	1490	656	8.04	1190	-3	1.35	0.1	28.7		3.83	3.91	0.08	
140	E4 - Main Embankment Seepage Pond	12/1/2010 9:50		1604	7.99	2.2		94.2	1380	570	7.96	1060	7.3	7.09	0.0371	30.3		3.11	3.14	0.027	
141	E4 - Main Embankment Seepage Pond	1/10/2011 10:30		1583	7.49	1.3		76.5	1550	711	7.8	1280	-3	2.26	0.0612	31.9		5.97	6.02	0.049	
144	E4 - Main Embankment Seepage Pond	4/5/2011 11:16		1138	7.57	12.2		105	1090	508	7.94	859	64.2	45.8	0.0119	16		3.77	3.77	-0.01	
145	E4 - Main Embankment Seepage Pond	5/12/2011 13:29		1017	7.78	11.7		90.3	999	423	8	752	37.2	27.8	0.0075	18.7		3.82	3.84	0.016	
146	E4 - Main Embankment Seepage Pond	6/9/2011 13:02		1117	8.42	16.7		51.8	1080	473	8.09	786	4	1.19	0.0137	18	0.53	4.23	4.26	0.028	
147	E4 - Main Embankment Seepage Pond	7/13/2011 9:25		1111	8.32	15.6		50.8	1100	466	7.86	847	3.5	3.17	0.0128	18.3		3.99	4.06	0.07	

Index	Sample Point	Date	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Sulphide as S (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	Aluminum (Al)-Total	Antimony (Sb)-Total	Arsenic (As)-Total	Barium (Ba)-Total	Beryllium (Be)-Total	Bismuth (Bi)-Total	Boron (B)-Total	Cadmium (Cd)-Total	Calcium (Ca)-Total	Chromium (Cr)-Total	Cobalt (Co)-Total
1	E4 - Main Embankment Seepage Pond	7/12/2001 13:30	-0.005	0.022	0.025	86.8		0.81	17.1	5.1		0.0185	0.00026	0.0021	0.0497	-0.00005	-0.00005		0.00013	41.8	-0.0002	0.00025
3	E4 - Main Embankment Seepage Pond	7/26/2001 8:00	0.03	0.06	0.055	71.1		0.2	27.4	6.9		0.0111	0.00027	0.0015	0.075	-0.00005	-0.00005		0.0001	63.5	0.0006	0.00026
4	E4 - Main Embankment Seepage Pond	8/3/2001	0.015	0.016	0.026	77.7		0.2	24.6	5.3		0.0175	0.00027	0.0016	0.07	-0.00005	-0.00005		0.0001	58.6	0.0006	0.00039
5	E4 - Main Embankment Seepage Pond	8/10/2001 10:15	0.006	0.015	0.038	96.2		0.34	29.2	4.2		0.0055	0.00033	0.0017	0.0661	-0.00005	0.0001		0.00011	52	0.0005	0.00021
7	E4 - Main Embankment Seepage Pond	8/30/2001 14:25	-0.005	0.017	0.027	103		0.21	16	4.2		0.0032	0.00035	0.0021	0.0546	-0.00005	0.0001		0.00019	37.7	-0.0002	0.00023
8	E4 - Main Embankment Seepage Pond	10/23/2001 14:30	0.022	0.031	0.051	44.9		0.85	8.95	6.2		0.0165	0.00017	0.0014	0.0388	-0.00005	-0.00005		0.0001	40.4	0.0003	0.00013
9	E4 - Main Embankment Seepage Pond	11/13/2001 8:45	0.025	0.065	0.078	92.1		0.73	18.6	5.6		0.0093	0.00021	0.0024	0.0693	-0.00005	0.00017		0.00014	70.1	-0.0002	0.00028
15	E4 - Main Embankment Seepage Pond	5/22/2002 12:30	0.005	0.013	0.046	34.2		0.91		8.2		0.0141	0.00015	0.001	0.0348	-0.00005	-0.00005		0.00002	42.9	-0.0002	-0.00002
17	E4 - Main Embankment Seepage Pond	7/31/2002 9:10	-0.005	0.015	0.032	72.5		0.55		4		0.002	0.00014	0.002	0.0249	-0.00005	-0.00005		0.00012	30.3	-0.0002	-0.00002
26	E4 - Main Embankment Seepage Pond	5/5/2003 14:50	0.008	0.02	0.036	56.8				5.7		0.0052	0.00014	0.0014	0.0365	-0.00005	-0.00005		0.00004	45.2	-0.0002	0.00016
27	E4 - Main Embankment Seepage Pond	5/29/2003 10:30	0.007	-0.005	0.019	57.6				6.7		0.0013	0.00015	0.0017	0.034	-0.00005	-0.00005		0.00007	36	-0.0002	0.00011
28	E4 - Main Embankment Seepage Pond	6/24/2003 7:00	-0.005	0.007	0.022	62.2				7.2		0.0044	0.00015	0.0023	0.0303	-0.00005	-0.00005		0.00009	35.8	0.0003	0.00007
29	E4 - Main Embankment Seepage Pond	8/5/2003 14:30	-0.005	0.016	0.024	51.9				8.4		0.0059	0.00012	0.0033	0.0249	-0.00005	-0.00005		0.00012	22.3	-0.0002	0.00008
30	E4 - Main Embankment Seepage Pond	8/20/2003 10:00	-0.005	0.013	0.022	48				7.1		0.0094	0.00012	0.0032	0.0193	-0.00005	-0.00005		0.00012	17.6	0.0007	0.00008
31	E4 - Main Embankment Seepage Pond	10/16/2003 16:00	-0.005	0.028	0.023	46.3				6.1		0.0206	0.00014	0.0016	0.0335	-0.00005	-0.00005		0.00006	37.1	0.0017	0.00004
32	E4 - Main Embankment Seepage Pond	11/11/2003 9:55	-0.005	0.013	0.027	55.3				5.5		0.0127	0.00016	0.0015	0.0443	-0.00005	-0.00005		0.00007	50.1	0.0048	0.00005
33	E4 - Main Embankment Seepage Pond	3/4/2004 10:00	0.017	0.022	0.045	40.4				7.8		0.0688	0.00012	0.0007	0.0324	-0.00005	-0.00005		0.00002	44.9	0.0034	0.00011
34	E4 - Main Embankment Seepage Pond	3/22/2004	0.007	0.016	0.042	50.7				5		0.0175	0.00011	0.0013	0.0426	-0.00005	-0.00005		0.00005	55.7	0.004	0.00024
35	E4 - Main Embankment Seepage Pond	3/22/2004 10:40	0.007	0.016	0.042	50.7				5		0.0175	0.00011	0.0013	0.0426	-0.00005	-0.00005		0.00005	55.7	0.004	0.00024
36	E4 - Main Embankment Seepage Pond	4/3/2004 10:00	0.017	0.022	0.045	40.4				7.8		0.0688	0.00012	0.0007	0.0324	-0.00005	-0.00005		0.00002	44.9	0.0034	0.00011
37	E4 - Main Embankment Seepage Pond	5/1/2004 13:32	-0.005	0.01	0.039	36.2				8		0.0094	0.00015	0.0011	0.0312	-0.00005	-0.00005		0.00004	40.2	-0.0002	0.00009
38	E4 - Main Embankment Seepage Pond	5/7/2004	-0.005	0.014	0.023	59.5				6.7		0.0084	0.00014	0.0016	0.0378	-0.00005	-0.00005		0.00006	42.5	-0.0002	0.00008
39	E4 - Main Embankment Seepage Pond	6/9/2004	-0.005	0.012	0.022	27.8				7.9		0.0342	0.00017	0.0011	0.0255	-0.00005	-0.00005		0.00005	34.3	-0.0002	0.00011
40	E4 - Main Embankment Seepage Pond	7/5/2004	-0.005	0.014	0.023	59.5				6.7		0.0084	0.00014	0.0016	0.0378	-0.00005	-0.00005		0.00006	42.5	-0.0002	0.00008
41	E4 - Main Embankment Seepage Pond	8/2/2004	-0.005	0.006	0.024	84.2				6.5		0.0069	0.00016	0.0022	0.0414	-0.00005	-0.00005		0.00009	44	-0.0002	0.00006
42	E4 - Main Embankment Seepage Pond	8/25/2004	0.005	0.013	0.029	96.4				7.1		0.0044	0.00012	0.003	0.0424	-0.00005	-0.00005		0.0001	44.4	-0.0002	0.00007
43	E4 - Main Embankment Seepage Pond	12/8/2004	0.007	0.019	0.028	77.5				6.7		0.0072	0.00012	0.0012	0.052	-0.00005	-0.00005		0.0001	52.7	-0.0002	0.00012
44	E4 - Main Embankment Seepage Pond	1/31/2005	0.02	0.021	0.027	48.2				7.1		0.0161	0.00013	0.0007	0.0367	-0.00005	-0.00005		0.00005	45.8	0.0003	0.0001
45	E4 - Main Embankment Seepage Pond	2/16/2005	0.008	0.03	0.055	120				5.8		0.0072	0.00017	0.0016	0.0688	-0.00005	-0.00005	0.09	0.00019	62.8	-0.0002	0.00035
46	E4 - Main Embankment Seepage Pond	3/16/2005	0.006	0.015	0.034	34.2				9		0.003	0.00016	0.0006	0.0461	-0.00005	-0.00005	0.019	0.00002	78.2	0.0003	0.00013
48	E4 - Main Embankment Seepage Pond	4/11/2005	0.003	0.017	0.037	90.8				5		0.0016	0.00018	0.0015	0.0551	-0.00005	-0.00005	0.073	0.00018	51.3	-0.0002	0.00015
49	E4 - Main Embankment Seepage Pond	5/4/2005	0.007	0.019	0.091	108				5		0.0017	0.00021	0.0022	0.0486	-0.00005	-0.00005	0.095	0.00024	52.2	-0.0002	0.00007
50	E4 - Main Embankment Seepage Pond	6/6/2005	0.003	0.021	0.028	117				3.6		0.0026	0.00021	0.0026	0.0579	-0.00005	-0.00005	0.102	0.00025	50	-0.0002	0.00015
52	E4 - Main Embankment Seepage Pond	8/11/2005	0.007	0.01	0.015	117				5.7		0.0036	0.00014	0.0021	0.0455	-0.00005	-0.00005	0.093	0.00011	49.7	-0.0002	0.00011
53	E4 - Main Embankment Seepage Pond	9/13/2005	0.013	0.023	0.037	121				5.3		0.0052	0.00016	0.0021	0.0566	-0.00005	-0.00005	0.099	0.00017	53.1	-0.0002	0.00008
55	E4 - Main Embankment Seepage Pond	11/8/2005	0.01	0.038	0.025	94.2				4.2		0.013	0.00021	0.0024	0.0664	-0.00005	-0.00005	0.109	0.00034	58.6	-0.0002	0.00007
56	E4 - Main Embankment Seepage Pond	12/14/2005	0.018	0.019	0.027	47.6				6.8		0.0032	0.00016	0.0013	0.0481	-0.00005	-0.00005	0.084	0.00011	56.8	-0.0002	0.00012
57	E4 - Main Embankment Seepage Pond	1/17/2006	0.019	0.065	0.077	113				4.4		0.0018	0.00023	0.002	0.068	-0.00005	-0.00005	0.091	0.00021	56.8	-0.0002	0.00028
58	E4 - Main Embankment Seepage Pond	2/8/2006	0.011	0.048	0.059	127			0.44	3.9		0.0028	0.00028	0.0028	0.0702	-0.00005	-0.00005	0.103	0.00029	54.3	0.0004	0.00032
59	E4 - Main Embankment Seepage Pond	3/6/2006 12:30	0.015	0.053	0.052	132			0.43	3.5		0.0036	0.00029	0.003	0.0755	-0.00005	-0.00005	0.106	0.00025	53.7	-0.0002	0.00032
60	E4 - Main Embankment Seepage Pond	4/11/2006 9:20	0.034	0.036	0.063	77.4			1	5.9		0.0103	0.00018	0.0017	0.0444	-0.00005	-0.00005	0.068	0.00013	42.1	0.0004	0.00021
61	E4 - Main Embankment Seepage Pond	5/9/2006	0.0014	-0.002		112			-0.5	4.86		0.0027	0.00034	0.00292	0.0617	-0.0005	-0.0005	0.09	-0.00005	51.8	0.00067	0.00012
62	E4 - Main Embankment Seepage Pond	6/14/2006	0.001	0.0122	0.0224	123			0.32	4.77		0.0026	0.00032	0.00279	0.0573	-0.0005	-0.0005	0.101	-0.00005	49.8	-0.0008	0.00012
63	E4 - Main Embankment Seepage Pond	7/4/2006	0.006	0.0229	0.0232	136			0.32	5.09		0.135	0.0003	0.00271	0.0568	-0.0005	-0.0005	0.11	-0.00005	48.1	0.00057	0.00017
64	E4 - Main Embankment Seepage Pond	8/3/2006	-0.001	0.0108	0.0317	136		0.214	0.214	4.4		0.0067	0.00027	0.00294	0.0477	-0.0005	-0.0005	0.114	-0.00005	42.4	-0.0025	-0.0001
66	E4 - Main Embankment Seepage Pond	10/12/2006	-0.001	0.0114	0.0323	156			0.31	3.69		0.0012	0.00024	0.00232	0.0749	-0.0005	-0.0005	0.108	-0.00005	62.5	-0.0005	-0.0001
67	E4 - Main Embankment Seepage Pond	11/15/2006	0.003	0.0136	0.0434	171			2.07	3.6		0.002	0.00028	0.00218	0.0919	-0.0005	-0.0005	0.103	-0.00005	71.6	-0.0005	0.00012
68	E4 - Main Embankment Seepage Pond	12/4/2006	-0.001	0.0149	0.0409	178			1.72	3.26		0.0024	0.0004	0.00236	0.0832	-0.0005	-0.0005	0.111	-0.00005	70.3	-0.0005	0.00026
72	E4 - Main Embankment Seepage Pond	2/5/2007 10:59	0.0011	0.0148	0.0561	163			0.64	3.35		0.0011	0.0004	0.00259	0.0796	-0.0005	-0.0005	0.12	-0.00004	66.5	-0.0005	0.0003
73	E4 - Main Embankment Seepage Pond	3/5/2007	-0.001	0.0151	0.0458	157			0.51	3.41		0.0017	0.00036	0.00266	0.0703	-0.0005	-0.0005	0.122	-0.00005	64.9	-0.0005	0.0003
74	E4 - Main Embankment Seepage Pond	4/11/2007 11:15	0.0023	0.0111	0.0584	107			2.85	6.58		0.0143	0.00018	0.00081	0.0387	-0.0005	-0.0005	0.048	0.000032	62.2	-0.0005	0.00016
75	E4 - Main Embankment Seepage Pond	5/7/2007 10:00	-0.001	0.0112	0.0478	192			3.02	4.45		0.0022	0.0003	0.00173	0.0809	-0.0005	-0.0005	0.103	-0.00005	84.6	-0.0005	0.00012
77	E4 - Main Embankment Seepage Pond	6/4/2007 10:34	0.0028	0.0131	0.0449	235			3.35	4.01		0.0039	0.00036	0.00202	0.076	-0.0005	-0.0005	0.119	-0.000017	86.6	-0.0005	-0.0001
79	E4 - Main Embankment Seepage Pond	6/11/2007 10:59	-0.001	0.0113	0.0246	233			3.23	3.86		0.0052	0.00032	0.00205	0.0756	-0.001	-0.001	0.126	0.000035	84.3	-0.001	-0.0002
80	E4 - Main Embankment Seepage Pond	6/18/2007 9:45	-0.001	0.0114	0.0321	215			3.01	4.06		0.0075	0.00033	0.00211	0.0671	-0.0005	-0.0005	0.119	-0.000017	83.5	-0.0005	-0.0001
81	E4 - Main Embankment Seepage Pond	6/25/2007 10:00	-0.001	0.01	0.0177	231			3.25	3.93		0.0046	0.00038	0.00216	0.0658	-0.0005	-0.0005	0.116	0.000046	81.7	-0.0005	0.00011
83	E4 - Main Embankment Seepage Pond	7/9/2007 13:30	-0.001	0.0111	0.0302	237			3.65	3.89		0.007	0.00032	0.0021	0.0657	-0.0005	-0.0005	0.113	0.000057	71.8	-0.0005	-0.0001
84	E4 - Main Embankment Seepage Pond	7/17/2007 10:59	-0.001	0.0117	0.0239	243			2.6	4.83		0.002	0.00029	0.00202	0.0615	-0.0005	-0.0005	0.117	0.000063	72.1	-0.0005	-0.0001
85	E4 - Main Embankment Seepage Pond	7/24/2007 14:19	0.0012	0.0108	0.0234	237			2.2	4.41		0.0045	0.00026	0.00204	0.0543	-0.0005	-0.0005	0.123	-0.00005	76.4	-0.0005	-0.0001
86	E4 - Main Embankment Seepage Pond	7/31/2007 14:44	-0.001	0.0094	0.019	227			2	4.06		0.0039	0.00029	0.0023	0.0546	-0.0005	-0.0005	0.124	-0.0004	61.6	-0.0005	-0.0001
87	E4 - Main Embankment Seepage Pond	8/2/2007 10:14	-0.001	0.0091	0.0198	228			1.8	4.11		-0.004	0.00026	0.00214	0.0538	-0.001	-0.001	0.129	0.000049	55.9	-0.001	-0.0002
88	E4 - Main Embankment Seepage Pond	8/14/2007 9:15	0.0011	0.0092	0.0172	226			1.6	3.92		-0.002	0.00024	0.00233	0.0522	-0.0005	-0.0005	0.121	0.000027	56.9	-0.0005	-0.0001
89	E4 - Main Embankment Seepage Pond	8/29/2007 15:15	-0.001	0.0096	0.0195	207			1.5	4.4		0.0017	0.00026	0.00251	0.0522	-0.0005	-0.0005	0.126	-0.000017	57	-0.0005	-0.0001
90	E4 - Main Embankment Seepage Pond	9/5/2007 11:30	-0.001	0.012	0.017	212			0.85	4.34		0.0012	0.00018	0.00258	0.0503	-0.0005	-0.0005	0.113	-0.0003	67.4	-0.0005	-0.0001
91	E4 - Main Embankment Seepage Pond	10/2/2007 15:00	0.0012	0.0091	0.0302	198			1.77	3.74		0.0022	0.00018	0.00207	0.0593	-0.0005	-0.0005	0.093	0.000041	73.2	-0.0005	-0.0001
92	E4 - Main Embankment Seepage Pond	11/5/2007 10:45	-0.001	0.0109	0.0324	225			4.18	5.26		0.0028	0.00019	0.00183	0.0655	-0.0005	-0.0005	0.092	0.000067	97.2	0.00144	-0.0001
94	E4 - Main Embankment Seepage Pond	12/27/2007	-0.001	0.0143	0.0364	241			4.23	3.38		-0.002	0.0004	0.00212	0.0755	-0.001	-0.001	0.128	-0.00008	95.8	-0.001	-0.0002
96	E4 - Main Embankment Seepage Pond	1/8/2008 14:15	-0.001	0.0113	0.0295	210			2.49	2.8		0.0011	0.00036	0.00188	0.0634	-0.0005	-0.0005	0.101	-0.0003	76.6	-0.0005	0.00016
97	E4 - Main Embankment Seepage Pond	1/15/2008 14:19	-0.001	0.0114	0.031	222			2.75	3.9		-0.002	0.00042	0.0022	0.073	-0.0005	-0.0005	0.107	-0.0004	87.5	-0.0005	0.00019
98	E4 - Main Embankment Seepage Pond	1/22/2008 10:50	0.0013	0.0143	0.0401	237			1.62	3.19		0.0014	0.00043	0.00235	0.0718	-0.0005	-0.0005	0.117	-0.00004	99.3	-0.0005	0.00021
100	E4 - Main Embankment Seepage Pond	2/6/2008 10:09	0.0011	0.0142	0.0416	234			1.6	3.15		-0.001	0.00041	0.00218	0.0659	-0.0005	-0.0005	0.104	-0.0003	80.5	-0.0005	0.00013
102	E4 - Main Embankment Seepage Pond	3/4/2008 10:09	0.03	0.0215	0.0737	230			1.43	3.23		0.0024	0.00038	0.00217	0.0596	-0.0005	-0.0005	0.102	-0.00009	80	-0.0005	0.00028
104	E4 - Main Embankment Seepage Pond	4/16/2008 10:14	-0.001	0.0071	0.0349	167			3.72	5.05		0.0102	0.00019	0.00088	0.0421	-0.0005	-0.0005	0.052	0.000036	70.5	-0.0005	-0.0001
105	E4 - Main Embankment Seepage Pond	5/13/2008 10:45	-0.001	0.0084	0.0293	294			6.5	5.1		-0.002	0.00026	0.00139	0.0656	-0.001	-0.001	0.093	-0.000034	106	-0.001	-0.0002
106	E4 - Main Embankment Seepage Pond	5/20/2008 13:50	-0.001	0.0083	0.0172	292			4.59	4.67		-0.002	0.00024	0.00161	0.0589	-0.0005	-0.0005	0.086	-0.00003	110	-0.0005	-0.0001
107	E4 - Main Embankment Seepage Pond	6/16/2008 10:00	-0.001	0.0077	0.0129	308			3.18	3.67		0.0022	0.0003	0.00172	0.0488	-0.0005	-0.0005	0.115	-0.00051	89.1	-0.0005	-0.0001
108	E4 - Main Embankment Seepage Pond	7/15/2008 9:00	0.001	0.0085	0.0191	307			1.29	4.18		0.117	0.00031	0.00192	0.0428	-0.0005	-0.0005	0.112	-0.00045	78.8	-0.0005	-0.0001
109	E4 - Main Embankment Seepage Pond	8/6/2008 9:24	0.0016	0.0072	0.0254	281			1.13	3.65		-0.02	-0.002	-0.002	0.0389	-0.01	-0.01	-0.2	-0.00034	66.3	-0.01	-0.002
110	E4 - Main Embankment Seepage Pond	9/9/2008 8:15	-0.001	0.007	0.0208	270			1.16	3.24		0.0069	0.00042	0.00239	0.0527	-0.0005	-0.0005	0.144	-0.0004	77.3	-0.0005	-0.0001
111	E4 - Main Embankment Seepage Pond	9/30/2008 11:39	-0.001	0.0081	0.0139	266			0.79	3.12		0.0011	0.00037	0.00249	0.0539	-0.0005	-0.0005	0.134	-0.0005	81.3	-0.0005	-0.0001
112	E4 - Main Embankment Seepage Pond	10/22/2008 11:39	0.0015	0.0154	0.0311	260			1.17	3.39		-0.001	0.00034	0.00243	0.0507	-0.0005	-0.0005	0.134	-0.000017	81.9	-0.0005	-0.0001
113	E4 - Main Embankment Seepage Pond	11/4/2008 13:39	-0.001	0.0101	0.0307	268			1.24	2.99		-0.002	0.00031	0.00226	0.0565	-0.001	-0.001	0.149	-0.0006	89.3	-0.001	-0.0002
114	E4 - Main Embankment Seepage Pond	12/2/2008 11:28	-0.001	0.0102	0.033	290			2.34	2.7		-0.003	0.00031	0.00229	0.0594	-0.0005	-0.0005	0.122	-0.0004	103	-0.0005	-0.0001
115	E4 - Main Embankment Seepage Pond	1/14/2009 14:05	-0.001	0.0124	0.223	282			1.35	3.13		0.0079	0.00032	0.00185	0.0581	-0.0005	-0.0005	0.144	-0.00041	96.2	-0.0005	0.0004
116	E4 - Main Embankment Seepage Pond	2/10/2009 12:00	0.0095	0.0248	0.0531	253			0.52	2.82		0.0055	0.00027	0.00247	0.0688	-0.001	-0.001	0.143	-0.0004	87.2	-0.001	0.00029
117	E4 - Main Embankment Seepage Pond	3/4/2009	-0.001	0.013	0.0419	257			0.78	3.19		0.0041	0.00031	0.00222	0.0583	-0.0005	-0.0005	0.135	-0.000017	90.4	-0.0005	0.00021
118	E4 - Main Embankment Seepage Pond	4/7/2009 13:39	-0.001	0.0116	0.0358	245			1.73	2.96		0.0026	0.00023	0.00172	0.0544	-0.0005	-0.0005	0.116	-0.00031	87.9	0.00116	0.00018
119	E4 - Main Embankment Seepage Pond	5/12/2009 10:14	-0.001	0.0062	0.0226	325			5.03	3.52		0.0035	0.00029	0.00155	0.0645	-0.001	-0.001	0.116	-0.0008	117	-0.001	-0.0002
120	E4 - Main Embankment Seepage Pond	6/9/2009 9:45	0.0015	0.0067	0.0153	354			2.73	3.57		0.002	0.00026	0.00185	0.0487	-0.0005	-0.0005	0.14	-0.0006	93	-0.0005	-0.0001
121	E4 - Main Embankment Seepage Pond	7/7/2009 10:00	-0.001	0.0068	0.0265	304			1.24	4.55		0.0034	0.00021	0.0019	0.0475	-0.0005	-0.0005	0.13	-0.0004	87.6	-0.0005	-0.0001
122	E4 - Main Embankment Seepage Pond	8/5/2009 10:39	-0.001	0.0068	0.0119	337			0.72	3.84		0.0014	0.00025	0.00213	0.0491	-0.0005	-0.0005	0.149	-0.00041	83.3	-0.0005	-0.0001
123	E4 - Main Embankment Seepage Pond	8/19/2009	-0.001	0.0065	0.0264	327			0.88	4.6		0.0027	0.00025	0.00229	0.052	-0.0005	-0.0005	0.145	-0.00043	86.2	-0.0005	-0.0001
124	E4 - Main Embankment Seepage Pond	9/2/2009 9:00	-0.001	0.0063	0.0151	327			0.55	3.92		0.0012	0.00022	0.00218	0.0532	-0.0005	-0.0005	0.144	-0.0004	92.3	0.00064	-0.0001
125	E4 - Main Embankment Seepage Pond	10/6/2009 9:49	-0.001	0.0082	0.0205	299			0.8	3.14		-0.002	0.0002	0.00198	0.065	-0.001	-0.001	0.149	-0.001	97.1	-0.001	-0.0002
126	E4 - Main Embankment Seepage Pond	10/29/2009 12:15	-0.001	0.0102	0.0282	286			0.92	2.83		0.0017	0.00017	0.00207	0.0612	-0.0005	-0.0005	0.142	-0.0005	93.2	0.00142	-0.0001
127	E4 - Main Embankment Seepage Pond	11/19/2009 9:18	-0.001	0.0095	0.0291	337			2.99	4.28		-0.002	-0.0002	0.00152	0.0677	-0.001	-0.001	0.125	-0.000034	122	-0.001	-0.0002
129	E4 - Main Embankment Seepage Pond	1/13/2010 14:05	-0.001	0.0063	0.0251	258			2.24	4.09		0.0022	-0.0002	0.00124	0.0475	-0.001	-0.001	0.115	0.000051	104	-0.001	-0.0002
130	E4 - Main Embankment Seepage Pond	2/10/2010 13:32	0.0035	0.0142	0.0555	339			1.18	4.64		-0.002	0.00028	0.00201	0.0718	-0.001	-0.001	0.121		114	-0.001	0.00034
131	E4 - Main Embankment Seepage Pond	3/3/2010 12:00	0.0013	0.0089	0.0426	173			1.47	3.85		-0.005	0.00013	0.00077	0.036	-0.0005	-0.0005	0.063	-0.000017	68.6	-0.0005	-0.0001
132	E4 - Main Embankment Seepage Pond	4/7/2010 13:20	0.0018	0.0112	0.0476	297			1.63	4.98		-0.002	0.00029	0.0018	0.0611	-0.001	-0.001	0.128	-0.00031	112	-0.001	-0.0002
133	E4 - Main Embankment Seepage Pond	5/11/2010	-0.001	0.0047	0.0119	409			2.21	3.43		0.0035	-0.0002	0.00076	0.0466	-0.001	-0.001	0.113	0.000048	178	-0.001	-0.0002
134	E4 - Main Embankment Seepage Pond	6/3/2010 8:40	-0.001	0.0089	0.0426	333			0.97	5		0.0023	0.00026	0.00188	0.0184	-0.0005	-0.0005	0.104	-0.0004	86	-0.0005	-0.0001
135	E4 - Main Embankment Seepage Pond	7/8/2010	-0.001	0.0078	0.0134	382			0.68	4.74		0.0014	0.00033	0.00204	0.0326	-0.0005	-0.0005	0.116	-0.00041	89.8	-0.0005	-0.0001
136	E4 - Main Embankment Seepage Pond	8/5/2010	0.0017	0.0087	0.0159	425			0.55	4.35		-0.002	0.00032	0.00213	0.0488	-0.001	-0.001	0.137	-0.0004	113	-0.001	-0.0002
138	E4 - Main Embankment Seepage Pond	10/7/2010	-0.001	0.007	0.0153	558			2.8	3.99		-0.003	0.00068	0.00183	0.0455	-0.0005	-0.0005	0.14	-0.00005	174	-0.0005	0.00011
139	E4 - Main Embankment Seepage Pond	11/4/2010	0.0021	0.0072	0.0124	680			4.34	5		-0.003	0.00118	0.00179	0.0561	-0.0005	-0.0005	0.131	-0.00015	219	-0.0005	0.00014
140	E4 - Main Embankment Seepage Pond	12/1/2010 9:50	0.0014	0.0107	0.0364	642			3.77	5.66		-0.003	0.00086	0.00154	0.0572	-0.0005	-0.0005	0.132	-0.00015	184	-0.0005	0.00015
141	E4 - Main Embankment Seepage Pond	1/10/2011 10:30	-0.001	0.009	0.0231	756			6.17	6.74		-0.003	0.00172	0.00168	0.0478	-0.0005	-0.0005	0.142	-0.0002	236	-0.0005	0.00026
144	E4 - Main Embankment Seepage Pond	4/5/2011 11:16	0.0041	0.0108	0.0993	475			4.14	4.73		0.0045	0.00064	0.001	0.0504	-0.0005	-0.0005	0.085	-0.0002	163	-0.0005	0.00015
145	E4 - Main Embankment Seepage Pond	5/12/2011 13:29	-0.001	0.0054	0.0397	427			5.03	4.64		0.009	0.0007	0.00111	0.0425	-0.0005	-0.0005	0.078	-0.00008	137	-0.0005	0.00015
146	E4 - Main Embankment Seepage Pond	6/9/2011 13:02	-0.001	0.0041	0.0077	513			6.55	4.66		0.0152	0.00102	0.00155	0.0352	-0.0001	-0.0005	0.098	-0.00008	152	-0.0005	-0.0001
147	E4 - Main Embankment Seepage Pond	7/13/2011 9:25	-0.001	0.004	0.0126	503			5.66	3.34		0.0037	0.00097	0.00166	0.0382	-0.0001	-0.0005	0.099	-0.00007	151	-0.0005	-0.0001

Index	Sample Point	Date	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Lithium (Li)-Total	Magnesium (Mg)-Total	Manganese (Mn)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Potassium (K)-Total	Selenium (Se)-Total	Silicon (Si)-Total	Silver (Ag)-Total	Sodium (Na)-Total	Strontium (Sr)-Total	Thallium (Tl)-Total	Tin (Sn)-Total
1	E4 - Main Embankment Seepage Pond	7/12/2001 13:30	0.0079	0.076	0.00012	0.0039	12.4	0.00612	-0.00005	0.056	-0.0005	6.92	0.0026	0.47	0.00001	48.5	0.563	-0.00005	0.00054
3	E4 - Main Embankment Seepage Pond	7/26/2001 8:00	0.0062	0.061	0.00005	0.003	12.9	0.0208	-0.00005	0.0368	-0.0005	5.44	0.0031	3.25	-0.00001	34.9	0.751	-0.00005	0.00023
4	E4 - Main Embankment Seepage Pond	8/3/2001	0.0077	0.068	0.00008	0.0031	12.7	0.00673	-0.00005	0.0399	-0.0005	5.42	0.0028	2.51	-0.00001	35.2	0.791	-0.00005	0.00025
5	E4 - Main Embankment Seepage Pond	8/10/2001 10:15	0.0054	0.058	0.00003	0.0037	13	0.00773	-0.00005	0.0514	-0.0005	6.36	0.0031	0.77	0.00001	43	0.842	-0.00005	0.00059
7	E4 - Main Embankment Seepage Pond	8/30/2001 14:25	0.0052	-0.005	-0.00002	0.0042	11.4	0.00365	-0.00005	0.0671	-0.0005	7.27	0.0024	1.13	-0.00001	49.5	0.512	-0.00005	0.00025
8	E4 - Main Embankment Seepage Pond	10/23/2001 14:30	0.0046	0.024	0.00005	0.0022	9.2	0.0233	-0.00005	0.0343	-0.0005	5.26	0.0011	3.6	-0.00001	29.5	0.447	-0.00005	0.00014
9	E4 - Main Embankment Seepage Pond	11/13/2001 8:45	0.0046	-0.005	0.00009	0.0032	12.3	0.135	-0.00005	0.0625	-0.0005	8.17	0.0022	5.7	-0.00001	50.9	0.728	-0.00005	0.00028
15	E4 - Main Embankment Seepage Pond	5/22/2002 12:30	0.0034	-0.005	-0.00002	0.0009	7.59	0.00046	-0.00005	0.0172	-0.0005	2.87	0.0013	3.18	-0.00001	13.7	0.308	-0.00005	0.00008
17	E4 - Main Embankment Seepage Pond	7/31/2002 9:10	0.0036	-0.005	0.00004	-0.0002	9.48	0.00015	-0.00005	0.0581	-0.0005	4.69	-0.0005	1.54	-0.00001	42.5	0.376	-0.00005	-0.00005
26	E4 - Main Embankment Seepage Pond	5/5/2003 14:50	0.0023	0.007	0.00003	0.0016	9.91	0.00225	-0.00005	0.0295	-0.0005	3.33	0.0005	4.56	-0.00001	24.4	0.38	-0.00005	0.00016
27	E4 - Main Embankment Seepage Pond	5/29/2003 10:30	0.0031	-0.005	-0.00002	0.0018	10.3	0.00926	-0.00005	0.0371	-0.0005	4.08	0.0007	3.96	-0.00001	28.5	0.398	-0.00005	0.00009
28	E4 - Main Embankment Seepage Pond	6/24/2003 7:00	0.0036	-0.005	0.00003	0.0017	11.1	0.00055	-0.00005	0.0468	-0.0005	4.03	-0.0005	3.34	-0.00001	36	0.363	-0.00005	0.00008
29	E4 - Main Embankment Seepage Pond	8/5/2003 14:30	0.0057	0.005	0.00002	0.0022	10.6	0.0025	-0.00005	0.0527	-0.0005	4.3	-0.0005	0.17	-0.00001	41.4	0.308	-0.00005	-0.00005
30	E4 - Main Embankment Seepage Pond	8/20/2003 10:00	0.0048	-0.005	0.00004	0.0021	10.3	0.0142	-0.00005	0.0511	-0.0005	3.26	-0.0005	0.14	-0.00001	42.8	0.283	-0.00005	0.00007
31	E4 - Main Embankment Seepage Pond	10/16/2003 16:00	0.0033	0.027	0.00004	0.0016	9.95	0.0172	-0.00005	0.0391	-0.0005	4	-0.0005	1.66	-0.00001	33.5	0.287	-0.00005	-0.00005
32	E4 - Main Embankment Seepage Pond	11/11/2003 9:55	0.0035	0.015	0.00004	0.0016	11.4	0.0129	-0.00005	0.031	-0.0005	4.43	0.0012	3.16	-0.00001	29.8	0.394	-0.00005	-0.00005
33	E4 - Main Embankment Seepage Pond	3/4/2004 10:00	0.0037	0.077	-0.00002	0.0007	8.22	0.138	-0.00005	0.0107	-0.0005	2.45	0.0017	4.82	-0.00001	10.3	0.279	-0.00005	0.00008
34	E4 - Main Embankment Seepage Pond	3/22/2004	0.0024	0.035	0.00002	0.0016	11.1	0.463	-0.00005	0.0226	-0.0005	3.25	0.0017	5.51	-0.00001	20	0.394	-0.00005	-0.00005
35	E4 - Main Embankment Seepage Pond	3/22/2004 10:40	0.0024	0.035	0.00002	0.0016	11.1	0.463	-0.00005	0.0226	-0.0005	3.25	0.0017	5.51	-0.00001	20	0.394	-0.00005	-0.00005
36	E4 - Main Embankment Seepage Pond	4/3/2004 10:00	0.0037	0.077	-0.00002	0.0007	8.22	0.138	-0.00005	0.0107	-0.0005	2.45	0.0017	4.82	-0.00001	10.3	0.279	-0.00005	0.00008
37	E4 - Main Embankment Seepage Pond	5/1/2004 13:32	0.0037	0.012	0.00002	0.0009	7.3	0.0287	-0.00005	0.019	-0.0005	2.29	0.0012	3.51	-0.00001	15.1	0.301	-0.00005	0.0001
38	E4 - Main Embankment Seepage Pond	5/7/2004	0.0039	0.012	0.00006	0.0013	9.06	0.0319	-0.00005	0.0342	-0.0005	4.53	-0.0005	2.58	-0.00001	26.3	0.369	-0.00005	-0.00005
39	E4 - Main Embankment Seepage Pond	6/9/2004	0.0063	0.029	0.00014	0.0009	7.51	0.0104	-0.00005	0.019	0.0007	2.41	0.0009	2.2	-0.00001	14.7	0.282	-0.00005	0.00008
40	E4 - Main Embankment Seepage Pond	7/5/2004	0.0039	0.012	0.00006	0.0013	9.06	0.0319	-0.00005	0.0342	-0.0005	4.53	-0.0005	2.58	-0.00001	26.3	0.369	-0.00005	-0.00005
41	E4 - Main Embankment Seepage Pond	8/2/2004	0.003	0.014	0.00006	0.0016	10.1	0.00219	-0.00005	0.0517	-0.0005	4.09	0.0007	3.87	-0.00001	32.3	0.441	-0.00005	-0.00005
42	E4 - Main Embankment Seepage Pond	8/25/2004	0.0032	0.011	-0.00002	0.0019	10.4	0.0602	-0.00005	0.0646	-0.0005	4.87	0.0008	5.27	-0.00001	40.7	0.495	-0.00005	-0.00005
43	E4 - Main Embankment Seepage Pond	12/8/2004	0.002	0.01	-0.00002	0.0018	10.3	0.309	-0.00005	0.0586	-0.0005	3.36	0.0011	5.18	-0.00001	30.1	0.447	-0.00005	-0.00005
44	E4 - Main Embankment Seepage Pond	1/31/2005	0.0031	0.019	0.00015	0.0013	8.02	0.134	-0.00005	0.0233	-0.0005	2.53	0.0012	4.36	-0.00001	14.1	0.291	-0.00005	-0.00005
45	E4 - Main Embankment Seepage Pond	2/16/2005	0.0011	0.015	-0.00002	0.0032	9.89	0.471		0.1	-0.0005	5.29	0.0012	6.06	-0.00001	42.8	0.526	-0.00005	0.00007
46	E4 - Main Embankment Seepage Pond	3/16/2005	0.002	-0.005	-0.00002	0.0009	16.3	0.316		0.00737	-0.0005	2.01	-0.0005	3.57	-0.00001	5.93	0.441	-0.00005	-0.00005
48	E4 - Main Embankment Seepage Pond	4/11/2005	0.0013	-0.005	-0.00002	0.003	9.26	0.077		0.106	-0.0005	5.25	0.0006	4.57	-0.00001	42.3	0.465	-0.00005	-0.00005
49	E4 - Main Embankment Seepage Pond	5/4/2005	-0.0001	-0.01	-0.00002	0.003	9.45	0.00142		0.118	-0.0005	4.19	0.0011	4.99	-0.00001	50.3	0.485	-0.00005	-0.00005
50	E4 - Main Embankment Seepage Pond	6/6/2005	0.0015	0.015	-0.00002	0.0032	9.57	0.225		0.124	0.0008	7.13	0.0012	4.71	-0.00001	55.4	0.528	-0.00005	-0.00005
52	E4 - Main Embankment Seepage Pond	8/11/2005	0.0002	0.024	0.00004	0.002	10.5	0.0159		0.0901	-0.0005	6	0.0006	4.19	-0.00001	54.6	0.452	-0.00005	-0.00005
53	E4 - Main Embankment Seepage Pond	9/13/2005	0.002	0.198	0.00002	0.0025	10.4	0.0491		0.101	-0.0005	6.54	0.0009	4.8	-0.00001	55.2	0.465	-0.00005	-0.00005
55	E4 - Main Embankment Seepage Pond	11/8/2005	0.003	0.013	0.00007	0.0032	10.8	0.0362		0.109	-0.0005	6.66	0.0013	5.17	-0.00001	54	0.45	-0.00005	0.00006
56	E4 - Main Embankment Seepage Pond	12/14/2005	0.0018	0.008	-0.00002	0.0019	13.2	0.178		0.0574	-0.0005	4.85	0.0009	6.44	-0.00001	35.3	0.459	-0.00005	-0.00005
57	E4 - Main Embankment Seepage Pond	1/17/2006	0.0009	0.008	0.00002	0.0034	10.3	0.521		0.106	-0.0005	6.66	0.0018	6.81	-0.00001	44.3	0.491	-0.00005	-0.00005
58	E4 - Main Embankment Seepage Pond	2/8/2006	0.0004	0.006	-0.00002	0.0038	10.7	0.439		0.11	-0.0005	7.02	0.0014	7.09	0.00001	49.8	0.548	-0.00005	-0.00005
59	E4 - Main Embankment Seepage Pond	3/6/2006 12:30	0.001	0.06	-0.00002	0.0037	10.3	0.433		0.118	-0.0005	6.98	0.0014	6.67	-0.00001	49.8	0.588	-0.00005	-0.00005
60	E4 - Main Embankment Seepage Pond	4/11/2006 9:20	0.0013	0.028	0.00007	0.0021	8.69	0.182		0.0504	0.0006	3.9	0.0012	4.84	-0.00001	27.9	0.358	-0.00005	-0.00005
61	E4 - Main Embankment Seepage Pond	5/9/2006	0.00138	-0.03	-0.00005	-0.005	11	0.0767		0.0918	-0.0005	6.34	0.0013	5.34	-0.00001	43	0.533	-0.0001	-0.0001
62	E4 - Main Embankment Seepage Pond	6/14/2006	0.00231	-0.03	-0.00005	-0.005	12.3	0.168		0.0953	-0.0005	6.5	0.0018	3.66	-0.00001	47.6	0.602	-0.0001	-0.0001
63	E4 - Main Embankment Seepage Pond	7/4/2006	0.00271	0.153	0.000061	-0.005	13	0.115		0.102	0.0006	7.14	-0.001	4.31	-0.00001	55.6	0.569	-0.0001	-0.0001
64	E4 - Main Embankment Seepage Pond	8/3/2006	0.00179	-0.03	-0.00005	-0.005	11.3	0.0785		0.103	-0.0005	6.86	0.0011	4.69	-0.00001	52.4	0.552	-0.0001	-0.0001
66	E4 - Main Embankment Seepage Pond	10/12/2006	0.0011	-0.03	-0.00005	-0.005	13.3	0.0503		0.112	-0.0005	7.82	0.0019	4.89	-0.00001	52	0.685	-0.0001	-0.0001
67	E4 - Main Embankment Seepage Pond	11/15/2006	0.00128	-0.03	-0.00005	-0.005	14.1	0.235		0.125	-0.0005	7.45	0.0049	6.78	-0.00001	48.1	1.13	-0.0001	-0.0001
68	E4 - Main Embankment Seepage Pond	12/4/2006	0.00098	-0.03	-0.00005	-0.005	14.3	0.476		0.12	0.00051	8.3	0.0052	6.92	0.000015	51.4	0.897	-0.0001	-0.0001
72	E4 - Main Embankment Seepage Pond	2/5/2007 10:59	0.00044	-0.03	-0.00005	-0.005	12.6	0.472		0.0984	-0.0005	9.18	0.0028	6.41	-0.00001	52.8	0.768	-0.0001	-0.0001
73	E4 - Main Embankment Seepage Pond	3/5/2007	0.00094	-0.03	-0.00005	-0.005	12.4	0.408		0.108	0.00076	9.39	0.0028	6.61	-0.00001	58.4	0.8	-0.0001	-0.0001
74	E4 - Main Embankment Seepage Pond	4/11/2007 11:15	0.00391	-0.03	-0.00005	-0.005	11.2	0.0731		0.0742	-0.0005	3.17	0.0053	4.05	-0.00001	17.3	0.769	-0.0001	-0.0001
75	E4 - Main Embankment Seepage Pond	5/7/2007 10:00	0.00141	-0.03	-0.00005	-0.005	14.9	0.069		0.122	-0.0005	6.76	0.0084	4.34	-0.00001	43.1	1.17	-0.0001	-0.0001
77	E4 - Main Embankment Seepage Pond	6/4/2007 10:34	0.00267	-0.03	-0.00005	-0.005	17.5	0.0176		0.126	-0.0005	8.45	0.011	3.35	-0.00001	59.1	1.1	-0.0001	-0.0001
79	E4 - Main Embankment Seepage Pond	6/11/2007 10:59	0.00277	-0.03	-0.0001	-0.01	16.2	0.0887		0.124	-0.001	7.89	0.0105	3.45	-0.00002	57.2	1.06	-0.0002	-0.0002
80	E4 - Main Embankment Seepage Pond	6/18/2007 9:45	0.00368	-0.03	-0.00005	-0.005	16.2	0.0748		0.123	-0.0005	8.02	0.0111	3.46	-0.00001	53.6	1.06	-0.0001	-0.0001
81	E4 - Main Embankment Seepage Pond	6/25/2007 10:00	0.00378	-0.03	-0.00005	-0.005	16.5	0.0643		0.132	-0.0005	7.67	0.0119	3.87	-0.00001	52.7	1.12	-0.0001	-0.0001
83	E4 - Main Embankment Seepage Pond	7/9/2007 13:30	0.00335	-0.03	-0.00005	-0.005	16.1	0.0421		0.127	-0.0005	7.63	0.0106	4.07	-0.00001	51.5	1.12	-0.0001	-0.0001
84	E4 - Main Embankment Seepage Pond	7/17/2007 10:59	0.00301	-0.03	-0.00005	-0.005	16.9	0.000558		0.123	-0.0005	7.72	0.0096	4.04	-0.00001	56.6			
85	E4 - Main Embankment Seepage Pond	7/24/2007 14:19	0.00349	-0.03	0.000063	-0.005	17.4	0.0149		0.117	-0.0005	7.79	0.0097	3.76	-0.00001	60.5	0.947	-0.0001	-0.0001
86	E4 - Main Embankment Seepage Pond	7/31/2007 14:44	0.00263	-0.03	-0.00005	-0.005	16.1	0.00092	-0.00001	0.118	-0.0005	8.1	0.0078	3.43	-0.00001	59.4	0.871	-0.0001	-0.0001
87	E4 - Main Embankment Seepage Pond	8/2/2007 10:14	0.00286	-0.03	-0.0001	-0.01	15.7	0.00056	-0.00001	0.119	-0.001	8.14	0.0074	2.75	-0.00002	61.2	0.898	-0.0002	-0.0002
88	E4 - Main Embankment Seepage Pond	8/14/2007 9:15	0.00224	-0.03	-0.00005	-0.005	15.3	0.000849	-0.00001	0.117	-0.0005	8.72	0.007	2.35	-0.00001	62.5	0.891	-0.0001	-0.0001
89	E4 - Main Embankment Seepage Pond	8/29/2007 15:15	0.00232	-0.03	0.000158	-0.005	14.8	0.000279		0.109	-0.0005	8.63	0.0054	2.64	-0.00001	59.6	0.858	-0.0001	-0.0001
90	E4 - Main Embankment Seepage Pond	9/5/2007 11:30	0.00236	-0.03	-0.00005	-0.005	14.3	0.0146	-0.00001	0.103	-0.0005	8.68	0.0045	3.07	-0.00001	59.4	0.878	-0.0001	-0.0001
91	E4 - Main Embankment Seepage Pond	10/2/2007 15:00	0.00199	-0.03	-0.00005	-0.005	15.2	0.0468		0.13	-0.0005	7.27	0.0047	3.97	-0.00001	48.4	1.05	-0.0001	-0.0001
92	E4 - Main Embankment Seepage Pond	11/5/2007 10:45	0.00273	-0.03	-0.00005	-0.005	16.8	0.0732		0.128	-0.0005	6.84	0.0105	5.39	-0.00001	41.2	1.2	-0.0001	-0.0001
94	E4 - Main Embankment Seepage Pond	12/27/2007	-0.002	-0.03	-0.0005	-0.01	16.4	0.144		0.11	-0.001	9.78	0.0075	6.83	-0.00002	59.1	1.05	-0.0002	-0.0002
96	E4 - Main Embankment Seepage Pond	1/8/2008 14:15	-0.0001	-0.03	-0.00005	-0.005	14.1	0.433		0.0881	-0.0005	8.63	0.0048	5.69	-0.00001	57.4	0.891	-0.0001	-0.0001
97	E4 - Main Embankment Seepage Pond	1/15/2008 14:19	-0.001	-0.03	-0.00005	-0.005	15.5	0.532		0.101	-0.0005	9.42	0.0052	6.69	-0.00001	60.5	1.06	-0.0001	-0.0001
98	E4 - Main Embankment Seepage Pond	1/22/2008 10:50	-0.0007	-0.03	-0.00005	0.0051	15.6	0.51		0.0999	-0.0005	10.5	0.0052	7.09	-0.00001	63.6	0.986	-0.0001	-0.0001
100	E4 - Main Embankment Seepage Pond	2/6/2008 10:09	0.00089	-0.03	-0.00005	-0.005	15.7	0.405		0.0935	-0.0005	10.2	0.0038	6.55	-0.00001	64	0.855	-0.0001	-0.0001
102	E4 - Main Embankment Seepage Pond	3/4/2008 10:09	0.00181	-0.03	-0.00005	-0.005	15	0.401		0.0952	-0.0005	9.93	0.0031	6.44	-0.00001	52.6	0.803	-0.0001	-0.0001
104	E4 - Main Embankment Seepage Pond	4/16/2008 10:14	0.00344	-0.03	-0.00005	-0.005	12.5	0.0843		0.105	-0.0005	3.9	0.006	3.83	-0.00001	22.1	0.895	-0.0001	-0.0001
105	E4 - Main Embankment Seepage Pond	5/13/2008 10:45	0.00185	-0.03	-0.0001	-0.01	17.3	0.00094		0.171	-0.001	7.05	0.0097	3.97	-0.00002	44	1.45	-0.0002	-0.0002
106	E4 - Main Embankment Seepage Pond	5/20/2008 13:50	-0.002	-0.03	-0.00005	-0.005	17.7	0.0137		0.158	-0.0005	7.21	0.0102	3.81	-0.00001	43.8	1.19	-0.0001	-0.0001
107	E4 - Main Embankment Seepage Pond	6/16/2008 10:00	0.00264	-0.03	-0.00005	-0.005	17.4	0.0344		0.145	-0.0005	8.29	0.0087	1.55	-0.00001	52	0.986	-0.0001	-0.0001
108	E4 - Main Embankment Seepage Pond	7/15/2008 9:00	0.00173	0.191	0.00006	-0.005	17	0.0316		0.129	-0.0005	7.89	0.0078	4.94	-0.00001	63.3	0.96	-0.0001	-0.0001
109	E4 - Main Embankment Seepage Pond	8/6/2008 9:24	-0.002	-0.03	-0.001	-0.1	15.7	-0.001		0.116	-0.01	9.7	-0.02	3.67	-0.0002	58.9	0.817	-0.002	-0.002
110	E4 - Main Embankment Seepage Pond	9/9/2008 8:15	0.00061	-0.03	-0.00005	0.005	14.7	0.0743		0.129	-0.0005	11	0.0051	3.45	-0.00001	63.8	0.932	-0.0001	-0.0001
111	E4 - Main Embankment Seepage Pond	9/30/2008 11:39	0.00086	-0.03	-0.00005	0.0052	14.6	0.000557		0.132	-0.0005	11.9	0.0045	3.77	-0.00001	69.6	0.834	-0.0001	-0.0001
112	E4 - Main Embankment Seepage Pond	10/22/2008 11:39	-0.0007	-0.03	-0.00005	0.0054	15.2	0.063		0.132	-0.0005	10.7	0.0044	4.97	-0.00001	67.9	0.935	-0.0001	-0.0001
113	E4 - Main Embankment Seepage Pond	11/4/2008 13:39	0.00076	-0.03	-0.0001	-0.01	15.2	0.132	-0.00001	0.134	-0.001	10.9	0.0041	5.27	-0.00002	68.8	1.02	-0.0002	-0.0002
114	E4 - Main Embankment Seepage Pond	12/2/2008 11:28	0.00086	-0.03	-0.00005	-0.005	17	0.253	-0.00001	0.142	-0.0005	10.2	0.005	6.48	-0.00001	60.1	1.14	-0.0001	-0.0001
115	E4 - Main Embankment Seepage Pond	1/14/2009 14:05	-0.0001	-0.03	0.000052	0.005	16.1	0.835		0.115	-0.0005	11.3	0.0035	7.18	-0.00001	68	0.923	-0.0001	-0.0001
116	E4 - Main Embankment Seepage Pond	2/10/2009 12:00	0.00038	-0.03	-0.0001	-0.01	14.6	0.858		0.106	-0.001	10.4	0.0024	6.79	-0.00002	68.1	1.12	-0.0002	-0.0002
117	E4 - Main Embankment Seepage Pond	3/4/2009	-0.0009	-0.03	-0.00005	-0.005	13.8	0.36		0.109	-0.0005	10.4	0.0027	6.97	-0.00001	62.5	1.01	-0.0001	-0.0001
118	E4 - Main Embankment Seepage Pond	4/7/2009 13:39	0.00108	-0.03	-0.00005	-0.005	14.4	0.274	-0.00001	0.106	0.0006	9.8	0.0055	5.74	-0.00001	55.4	1.03	-0.0001	-0.0001
119	E4 - Main Embankment Seepage Pond	5/12/2009 10:14	0.00368	-0.03	-0.0001	-0.01	18.6	0.0297		0.191	0.0012	8.2	0.0112	3.36	-0.00002	45.4	1.62	-0.0002	-0.0002
120	E4 - Main Embankment Seepage Pond	6/9/2009 9:45	0.00217	-0.03	-0.00005	0.0056	20.1	0.0585		0.15	-0.0005	10.4	0.0088	2.8	-0.00001	65	1.28	-0.0001	-0.0001
121	E4 - Main Embankment Seepage Pond	7/7/2009 10:00	0.00254	-0.03	-0.00005	-0.005	17.9	0.0141		0.132	-0.0005	9.89	0.0068	3.85	-0.00001	62.9	1.32	-0.0001	-0.0001
122	E4 - Main Embankment Seepage Pond	8/5/2009 10:39	0.00201	-0.03	-0.00005	0.0054	17.9	0.00127		0.133	0.00089	11.7	0.0055	1.52	-0.00001	72.3	1.22	-0.0001	-0.0001
123	E4 - Main Embankment Seepage Pond	8/19/2009	-0.004	-0.03	-0.00005	0.0061	17.8	0.0271		0.128	0.0006	13.5	0.0052	1.33	-0.00001	72.4	1.25	-0.0001	-0.0001
124	E4 - Main Embankment Seepage Pond	9/2/2009 9:00	-0.003	-0.03	-0.00005	-0.005	16.9	0.000728		0.116	-0.0005	11.4	0.0045	1.75	-0.00001	68	1.14	-0.0001	-0.0001
125	E4 - Main Embankment Seepage Pond	10/6/2009 9:49	0.00197	-0.03	0.00013	-0.01	16.8	0.0591		0.116	-0.001	11.7	0.0035	3.5	-0.00002	69.5	1.26	-0.0002	-0.0002
126	E4 - Main Embankment Seepage Pond	10/29/2009 12:15	0.00124	-0.03	-0.00005	-0.005	15.8	0.0806		0.119	-0.0005	10.7	0.0037	4.62	-0.00001	64.2	1.18	-0.0001	-0.0001
127	E4 - Main Embankment Seepage Pond	11/19/2009 9:18	0.00181	-0.03	-0.0001	-0.01	19.6	0.149		0.16	-0.001	9.59	0.008	5.41	-0.00002	56	1.49	-0.0002	-0.0002
129	E4 - Main Embankment Seepage Pond	1/13/2010 14:05	0.006	-0.03	-0.0001	-0.01	17.5	0.428		0.0866	-0.001	5.34	0.0046	6.23	-0.00002	46.4	1.14	-0.0002	-0.0002
130	E4 - Main Embankment Seepage Pond	2/10/2010 13:32	0.00167	-0.03	-0.0001	-0.01	18.6	0.575		0.112	-0.001	10.5	0.0051	6.58	-0.00002	59.5	1.3	-0.0002	-0.0002
131	E4 - Main Embankment Seepage Pond	3/3/2010 12:00	0.00472	-0.03	-0.00005	-0.005	11.1	0.0901		0.0522	-0.0005	4.34	0.0021	4.26	-0.00001	26	0.746	-0.0001	-0.0001
132	E4 - Main Embankment Seepage Pond	4/7/2010 13:20	0.00172	-0.03	-0.0001	-0.01	18.7	0.0954		0.118	-0.001	9.14	0.0058	4.56	-0.00002	57.1	1.37	-0.0002	-0.0002
133	E4 - Main Embankment Seepage Pond	5/11/2010	0.00403	-0.03	-0.0001	-0.01	24.7	0.0514		0.135	-0.001	2.5	0.0054	5.83	-0.00002	47.5	1.79	-0.0002	-0.0002
134	E4 - Main Embankment Seepage Pond	6/3/2010 8:40	0.00233	-0.03	-0.00005	-0.005	19.8	0.0431		0.101	-0.0005	8.86	0.0052	2.92	-0.00001	55.6	1.15	-0.0001	-0.0001
135	E4 - Main Embankment Seepage Pond	7/8/2010	0.00197	-0.03	-0.00005	-0.005	21.2	0.00218		0.109	-0.0005	10.7	0.0052	1.27	-0.00001	71.5	1.53	-0.0001	-0.0001
136	E4 - Main Embankment Seepage Pond	8/5/2010	-0.002	-0.03	-0.0001	-0.01	21.9	0.00087		0.11	-0.001	13	0.0045	0.402	-0.00002	76.9	1.67	-0.0002	-0.0002
138	E4 - Main Embankment Seepage Pond	10/7/2010	0.00158	-0.03	-0.00005	0.0073	24.8	0.155	-0.00005	0.156	-0.0005	13.6	0.0095	5.05	-0.00001	83.6	2.09	-0.0001	-0.0001
139	E4 - Main Embankment Seepage Pond	11/4/2010	0.00168	-0.03	-0.00005	0.0069	26.3	0.129		0.171	-0.0005	15	0.0149	5.52	-0.00001	88.8	2.4	-0.0001	-0.0001
140	E4 - Main Embankment Seepage Pond	12/1/2010 9:50	0.00388	-0.03	-0.00005	0.0065	27.2	0.119	-0.00005	0.139	0.00052	14.9	0.0094	4.34	-0.00001	83.6	1.97	-0.0001	-0.0001
141	E4 - Main Embankment Seepage Pond	1/10/2011 10:30	0.00457	-0.03	-0.00005	0.0104	29.6	0.243		0.221	-0.0005	15.2	0.0174	5.88	-0.00001	88.8	2.62	-0.0001	-0.0001
144	E4 - Main Embankment Seepage Pond	4/5/2011 11:16	0.00639	-0.03	-0.00005	-0.005	24.5	0.21	-0.00005	0.145	0.00059	8.19	0.0123	5.26	-0.00001	47.1	1.86	-0.0001	-0.0001
145	E4 - Main Embankment Seepage Pond	5/12/2011 13:29	0.00359	-0.03	-0.00005	0.0053	19.8	0.182	-0.00005	0.136	-0.0005	8.25	0.0111	4.66	-0.00001	51.9	1.52	-0.0001	-0.0001
146	E4 - Main Embankment Seepage Pond	6/9/2011 13:02	0.00507	-0.03	-0.00005	0.00558	23	0.0532	-0.00005	0.153	-0.0005	9.29	0.0172	3.72	-0.00001	62.4	1.6	-0.00001	-0.0001
147	E4 - Main Embankment Seepage Pond	7/13/2011 9:25	0.00352	-0.03	-0.00005	0.00574	21.8	0.0523	-0.00005	0.15	-0.0005	10.2	0.015	4.88	-0.00001	64	1.57	-0.00001	-0.0001

Index	Sample Point	Date	Titanium (Ti)-Total	Uranium (U)-Total	Vanadium (V)-Total	Zinc (Zn)-Total	Aluminum (Al)-Dissolved	Antimony (Sb)-Dissolved	Arsenic (As)-Dissolved	Barium (Ba)-Dissolved	Beryllium (Be)-Dissolved	Bismuth (Bi)-Dissolved	Boron (B)-Dissolved	Cadmium (Cd)-Dissolved	Calcium (Ca)-Dissolved	Chromium (Cr)-Dissolved	Cobalt (Co)-Dissolved	Copper (Cu)-Dissolved	Iron (Fe)-Dissolved	Lead (Pb)-Dissolved	Lithium (Li)-Dissolved	Magnesium (Mg)-Dissolved
1	E4 - Main Embankment Seepage Pond	7/12/2001 13:30	0.00183	0.00121	0.00116	0.0051	0.0176	0.00023	0.0011	0.104	-0.00005	0.00067		0.00005	39.7	0.0003	0.00119	0.0077	0.095	0.00025	0.0029	11.9
3	E4 - Main Embankment Seepage Pond	7/26/2001 8:00	0.00222	0.00102	0.00087	0.0027	0.147	0.00074	0.0017	0.0829	-0.00005	-0.00005		0.00009	61.9	0.0036	0.00035	0.0073	0.208	0.0141	0.0031	12.8
4	E4 - Main Embankment Seepage Pond	8/3/2001	0.00227	0.00108	0.00067	0.0056	0.0812	0.00027	0.0018	0.0697	-0.00005	-0.00005		0.00008	57.3	0.0008	0.00049	0.007	0.141	0.00005	0.0031	12
5	E4 - Main Embankment Seepage Pond	8/10/2001 10:15	0.00263	0.00116	0.00074	0.0031	0.0284	0.00043	0.0019	0.0704	-0.00005	0.00131		0.00012	51	0.0005	0.00024	0.0066	0.078	0.00011	0.004	12.6
7	E4 - Main Embankment Seepage Pond	8/30/2001 14:25	0.00355	0.00126	0.00057	0.0011	0.0154	0.00036	0.0022	0.0564	-0.00005	0.00018		0.00017	35.8	-0.0002	0.00027	0.0057	0.008	-0.00002	0.0041	10.6
8	E4 - Main Embankment Seepage Pond	10/23/2001 14:30	0.00213	0.00091	0.00057	0.0039	0.321	0.00019	0.0014	0.0429	-0.00005	0.00033		0.00009	41.7	0.0008	0.00035	0.0116	0.472	0.00023	0.0024	9.54
9	E4 - Main Embankment Seepage Pond	11/13/2001 8:45	0.00215	0.00142	0.001	0.002	0.068	0.00022	0.0024	0.0719	-0.00005	0.00025		0.00014	67.4	-0.0002	0.00032	0.0045	0.067	0.00007	0.0033	11.9
15	E4 - Main Embankment Seepage Pond	5/22/2002 12:30	0.0011	0.00071	0.00086	-0.0005	0.78	0.00016	0.0012	0.0414	-0.00005	-0.00005		0.00002	40.1	0.0014	0.00078	0.0077	1.03	0.00037	0.0014	7.41
17	E4 - Main Embankment Seepage Pond	7/31/2002 9:10	0.00158	0.001	0.0007	0.0058	0.0199	0.00016	0.0021	0.0265	-0.00005	-0.00005		0.00012	29.9	-0.0002	-0.00002	0.005	0.028	0.00006	-0.0002	9.46
26	E4 - Main Embankment Seepage Pond	5/5/2003 14:50	0.00219	0.00084	0.00125	0.0011	0.108	0.00015	0.0016	0.0418	-0.00005	-0.00005		0.00004	44.1	-0.0002	0.00027	0.0035	0.097	0.00013	0.0017	9.89
27	E4 - Main Embankment Seepage Pond	5/29/2003 10:30	0.00207	0.00093	0.001	0.0006	0.0211	0.00015	0.0017	0.0355	-0.00005	0.00005		0.00007	36.4	-0.0002	0.00011	0.0034	0.036	-0.00002	0.0018	10.3
28	E4 - Main Embankment Seepage Pond	6/24/2003 7:00	0.00223	0.00085	0.00076	0.0006	0.0224	0.00016	0.0024	0.0331	-0.00005	-0.00005		0.00009	33.3	0.0003	0.00012	0.0046	0.083	0.00006	0.0018	10.8
29	E4 - Main Embankment Seepage Pond	8/5/2003 14:30	0.00149	0.0007	0.00079	-0.0005	0.0205	0.00012	0.0034	0.0252	-0.00005	-0.00005		0.0001	21.8	0.0009	0.00009	0.0062	0.024	0.00004	0.0021	10.3
30	E4 - Main Embankment Seepage Pond	8/20/2003 10:00	0.00169	0.00064	0.00115	0.0026	0.108	0.00013	0.0033	0.0215	-0.00005	-0.00005		0.00012	18.2	0.0009	0.00016	0.0056	0.175	0.0001	0.0022	10.6
31	E4 - Main Embankment Seepage Pond	10/16/2003 16:00	0.00172	0.00077	0.00108	-0.0005	0.141	0.00014	0.0018	0.0364	-0.00005	-0.00005		0.00006	36.6	0.0018	0.00009	0.0042	0.187	0.0001	0.0018	10.1
32	E4 - Main Embankment Seepage Pond	11/11/2003 9:55	0.00178	0.00096	0.00192	0.0011	0.164	0.00017	0.0016	0.0475	-0.00005	-0.00005		0.00007	48.5	0.0039	0.00011	0.004	0.235	0.0001	0.0018	11.3
33	E4 - Main Embankment Seepage Pond	3/4/2004 10:00	0.00324	0.00071	0.00139	0.0044	0.244	0.00013	0.0006	0.0354	-0.00005	-0.00005		0.00003	42.7	0.0027	0.00019	0.0043	0.272	0.00011	0.0009	8.01
34	E4 - Main Embankment Seepage Pond	3/22/2004	0.00188	0.00104	0.0015	0.0068	0.0827	0.0001	0.0013	0.0426	-0.00005	-0.00005		0.00005	51.5	0.004	0.00027	0.0025	0.132	0.00004	0.0015	10.3
35	E4 - Main Embankment Seepage Pond	3/22/2004 10:40	0.00188	0.00104	0.0015	0.0068	0.0827	0.0001	0.0013	0.0426	-0.00005	-0.00005		0.00005	51.5	0.004	0.00027	0.0025	0.132	0.00004	0.0015	10.3
36	E4 - Main Embankment Seepage Pond	4/3/2004 10:00	0.00324	0.00071	0.00139	0.0044	0.244	0.00013	0.0006	0.0354	-0.00005	-0.00005		0.00003	42.7	0.0027	0.00019	0.0043	0.272	0.00011	0.0009	8.01
37	E4 - Main Embankment Seepage Pond	5/1/2004 13:32	0.00107	0.00072	0.00076	0.0012	0.149	0.00015	0.001	0.0351	-0.00005	-0.00005		0.00005	39.6	0.0005	0.00018	0.0045	0.263	0.00013	0.0011	7.25
38	E4 - Main Embankment Seepage Pond	5/7/2004	-0.0005	0.00086	0.00084	0.0007	0.0972	0.00014	0.0017	0.0409	-0.00005	-0.00005		0.00007	46	-0.0002	0.00013	0.0041	0.121	0.00008	0.0013	8.91
39	E4 - Main Embankment Seepage Pond	6/9/2004	0.00097	0.00077	0.00087	0.0038	0.119	0.00017	0.0011	0.028	-0.00005	-0.00005		0.00004	35.1	0.0003	0.00018	0.0063	0.171	0.00008	0.0009	7.57
40	E4 - Main Embankment Seepage Pond	7/5/2004	-0.0005	0.00086	0.00084	0.0007	0.0972	0.00014	0.0017	0.0409	-0.00005	-0.00005		0.00007	46	-0.0002	0.00013	0.0041	0.121	0.00008	0.0013	8.91
41	E4 - Main Embankment Seepage Pond	8/2/2004	-0.0005	0.001	0.00081	0.0007	0.028	0.00015	0.0023	0.044	-0.00005	-0.00005		0.00008	43.6	-0.0002	0.00009	0.0029	0.06	0.00002	0.0016	9.92
42	E4 - Main Embankment Seepage Pond	8/25/2004	-0.0005	0.0011	0.00078	-0.0005	0.069	0.00012	0.0032	0.0426	-0.00005	-0.00005		0.00009	43.1	-0.0002	0.00009	0.0024	0.074	-0.00002	0.0019	10.5
43	E4 - Main Embankment Seepage Pond	12/8/2004	-0.0005	0.00152	0.00047	0.0029	0.0929	0.00012	0.0013	0.0531	-0.00005	-0.00005		0.00011	56.6	0.0002	0.00016	0.0026	0.123	-0.00002	0.0021	10.2
44	E4 - Main Embankment Seepage Pond	1/31/2005	-0.0005	0.001	0.00046	0.0022	0.325	0.00013	0.0008	0.0416	-0.00005	-0.00005		0.00005	44.2	0.0007	0.00027	0.005	0.488	0.00017	0.0014	7.7
45	E4 - Main Embankment Seepage Pond	2/16/2005	-0.0005	0.00203	0.00051	0.0009	0.146	0.00018	0.0018	0.0677	-0.00005	-0.00005	0.088	0.0002	62	0.0004	0.00043	0.0029	0.225	0.0001	0.003	9.97
46	E4 - Main Embankment Seepage Pond	3/16/2005	-0.0005	0.00194	0.00026	0.0099	0.0799	0.00018	0.0006	0.0465	-0.00005	-0.00005	-0.008	0.00002	76.5	-0.0002	0.00019	0.003	0.136	0.00005	0.0007	15.6
48	E4 - Main Embankment Seepage Pond	4/11/2005	-0.0005	0.00152	0.00066	-0.0005	0.165	0.00018	0.0019	0.0608	-0.00005	-0.00005	0.078	0.00023	49.5	0.0012	0.00032	0.0027	0.243	0.00011	0.0033	9.14
49	E4 - Main Embankment Seepage Pond	5/4/2005	-0.0005	0.00143	0.001	-0.0005	0.632	0.00021	0.0024	0.0664	-0.00005	-0.00005	0.1	0.00028	54.7	0.0018	0.00068	0.0051	0.946	0.00035	0.0039	10.2
50	E4 - Main Embankment Seepage Pond	6/6/2005	0.0006	0.00139	0.00124	-0.0005	0.0376	0.00021	0.0024	0.0617	-0.00005	-0.00005	0.09	0.00024	46.2	-0.0002	0.00021	0.0025	0.088	0.00004	0.0033	8.91
52	E4 - Main Embankment Seepage Pond	8/11/2005	-0.0005	0.00092	0.00103	-0.0005	0.194	0.00016	0.0021	0.05	-0.00005	-0.00005	0.091	0.00013	50	0.0005	0.0002	0.0007	0.239	0.00009	0.0032	10.4
53	E4 - Main Embankment Seepage Pond	9/13/2005	-0.0005	0.00106	0.00108	0.002	0.111	0.00017	0.0023	0.0588	-0.00005	-0.00005	0.102	0.00015	54.7	-0.0002	0.00015	0.0026	0.429	0.0001	0.0028	10.9
55	E4 - Main Embankment Seepage Pond	11/8/2005	0.0007	0.00153	0.00091	0.0054	0.142	0.00022	0.0022	0.0655	-0.00005	-0.00005	0.098	0.00023	51.7	-0.0002	0.00029	0.0037	0.47	0.00022	0.0027	9.54
56	E4 - Main Embankment Seepage Pond	12/14/2005	-0.0005	0.00152	0.00055	0.0089	0.0692	0.00019	0.0017	0.0597	-0.00005	-0.00005	0.092	0.00014	56	0.0004	0.00029	0.0034	0.203	0.00013	0.0025	12.6
57	E4 - Main Embankment Seepage Pond	1/17/2006	-0.0005	0.00186	0.0005	0.0863	0.118	0.00028	0.003	0.0756	-0.00005	-0.00005	0.098	0.00022	57	-0.0002	0.0004	0.0122	0.423	0.00032	0.0033	10.7
58	E4 - Main Embankment Seepage Pond	2/8/2006	0.0011	0.00177	0.0008	0.0017	0.148	0.00028	0.0033	0.0745	-0.00005	-0.00005	0.102	0.00035	56	0.0008	0.0005	0.0028	0.31	0.00013	0.004	10.9
59	E4 - Main Embankment Seepage Pond	3/6/2006 12:30	0.0006	0.00179	0.00071	0.004	0.088	0.00031	0.0037	0.0791	-0.00005	-0.00005	0.109	0.00026	55.4	-0.0002	0.00041	0.0029	0.245	0.00012	0.0046	10.9
60	E4 - Main Embankment Seepage Pond	4/11/2006 9:20	0.0011	0.00106	0.00096	0.0006	1.77	0.00023	0.0027	0.0777	-0.00005	-0.00005	0.067	0.00015	45.1	0.004	0.00123	0.0088	2.34	0.00088	0.0036	9.28
61	E4 - Main Embankment Seepage Pond	5/9/2006	-0.01	0.00158	0.0019	-0.001	0.443	0.00038	0.00302	0.0685	-0.0005	-0.0005	0.09	-0.00005	51.3	0.00117	0.00047	0.00444	0.433	0.000261	-0.005	11.1
62	E4 - Main Embankment Seepage Pond	6/14/2006	-0.01	0.00135	0.0013	-0.001	0.112	0.00033	0.00291	0.0593	-0.0005	-0.0005	0.101	-0.00005	47.5	-0.0008	0.00021	0.00303	0.146	0.000052	-0.005	12.1
63	E4 - Main Embankment Seepage Pond	7/4/2006	-0.01	0.00125	0.0015	0.0014	0.0029	0.00029	0.00257	0.0533	-0.0005	-0.0005	0.108	-0.00005	47.7	-0.0005	-0.0001	0.00246	-0.03	-0.00005	-0.005	12.9
64	E4 - Main Embankment Seepage Pond	8/3/2006	-0.01	0.0011	-0.001	-0.001	0.102	0.0004	0.00286	0.0516	-0.0005	-0.0005	0.117	-0.00005	42.3	-0.0005	0.00013	0.00254	0.137	-0.00008	-0.005	11.3
66	E4 - Main Embankment Seepage Pond	10/12/2006	-0.01	0.00159	-0.001	-0.001	0.159	0.00024	0.00236	0.0772	-0.0005	-0.0005	0.108	-0.00005	62.9	-0.0005	0.00016	0.0023	0.231	0.000092	-0.005	13.6
67	E4 - Main Embankment Seepage Pond	11/15/2006	-0.01	0.00159	-0.001	0.0012	0.257	0.0003	0.00236	0.0972	-0.0005	-0.0005	0.105	0.000059	74	0.0006	0.0003	0.00261	0.25	0.000138	-0.005	14.6
68	E4 - Main Embankment Seepage Pond	12/4/2006	-0.01	0.00183	-0.001	0.0037	0.115	0.0004	0.00275	0.0901	-0.0005	-0.0005	0.112	-0.00005	69.9	0.00055	0.00036	0.00197	0.163	0.000081	-0.005	14.3
72	E4 - Main Embankment Seepage Pond	2/5/2007 10:59	-0.01	0.0017	-0.001	0.0013	0.188	0.00042	0.00344	0.0857	-0.0005	-0.0005	0.126	-0.00004	67.7	-0.0005	0.00046	0.00227	0.262	0.000096	0.0051	12.9
73	E4 - Main Embankment Seepage Pond	3/5/2007	-0.01	0.0016	-0.001	0.0022	0.157	0.00037	0.00341	0.0744	-0.0005	-0.0005	0.126	0.00005	66.6	0.00058	0.00046	0.00297	0.291	0.000115	0.0051	12.7
74	E4 - Main Embankment Seepage Pond	4/11/2007 11:15	-0.01	0.00112	-0.001	0.0018	0.924	0.0002	0.00128	0.0478	-0.0005	-0.0005	0.046	0.000083	59.7	0.00213	0.00088	0.011	1.43	0.00126	-0.005	11.4
75	E4 - Main Embankment Seepage Pond	5/7/2007 10:00	-0.01	0.00168	0.0012	0.0015	0.653	0.00032	0.0021	0.0877	-0.0005	-0.0005	0.108	-0.00005	82.3	0.00126	0.00059	0.00604	0.787	0.000473	-0.005	14.8
77	E4 - Main Embankment Seepage Pond	6/4/2007 10:34	-0.01	0.0019	0.0015	-0.001	0.067	0.00035	0.00199	0.0777	-0.0005	-0.0005	0.122	0.000026	83.1	-0.0005	0.00015	0.00358	0.088	-0.00008	-0.005	16.9
79	E4 - Main Embankment Seepage Pond	6/11/2007 10:59	-0.01	0.00161	-0.002	-0.002	0.175	0.00031	0.00213	0.0762	-0.001	-0.001	0.123	-0.000034	85.6	-0.001	0.00024	0.00367	0.189	0.00012	-0.01	16.2
80	E4 - Main Embankment Seepage Pond	6/18/2007 9:45	-0.01	0.00164	0.0011	-0.002	0.675	0.00033	0.00213	0.0701	-0.0005	-0.0005	0.114	0.000076	78.5	0.00144	0.00049	0.00657	0.783	0.000307	-0.005	15.5
81	E4 - Main Embankment Seepage Pond	6/25/2007 10:00	-0.01	0.00157	0.0013	-0.001	0.196	0.00056	0.00225	0.0687	-0.0005	-0.0005	0.12	0.000034	81.3	-0.0005	0.00019	0.00503	0.188	0.000134	-0.005	16.7
83	E4 - Main Embankment Seepage Pond	7/9/2007 13:30	-0.01	0.00147	0.0012	-0.001	0.32	0.00032	0.00226	0.0707	-0.0005	-0.0005	0.124	0.000037	70.8	0.00066	0.00025	0.00522	0.396	0.000194	0.0051	16.2
84	E4 - Main Embankment Seepage Pond	7/17/2007 10:59					0.202	0.00029	0.00219	0.0626	-0.0005	-0.0005	0.135	0.000028	83.9	-0.0005	0.00018	0.00499	0.247	0.0001	-0.005	17.9
85	E4 - Main Embankment Seepage Pond	7/24/2007 14:19	-0.01	0.00123	0.001	0.0011	0.175	0.00027	0.00212	0.0604	-0.0005	-0.0005	0.126	-0.00005	75.2	-0.0005	0.00013	0.00416	0.18	0.000097	-0.005	16.7
86	E4 - Main Embankment Seepage Pond	7/31/2007 14:44	-0.01	0.00127	0.0013	-0.001	0.193	0.00027	0.00223	0.0565	-0.0005	-0.0005	0.122	-0.0004	60.6	-0.0005	0.00017	0.00374	0.217	0.000085	-0.005	15.7
87	E4 - Main Embankment Seepage Pond	8/2/2007 10:14	-0.01	0.00134	-0.002	-0.002	0.113	0.00028	0.00224	0.0557	-0.001	-0.001	0.128	-0.000034	57	-0.001	-0.0002	0.00389	0.111	-0.0001	-0.01	16.2
88	E4 - Main Embankment Seepage Pond	8/14/2007 9:15	-0.01	0.00141	0.0012	-0.001	0.12	0.00025	0.00234	0.0532	-0.0005	-0.0005	0.119	0.000035	56.4	-0.0005	0.00013	0.00297	0.112	0.000068	-0.005	15.4
89	E4 - Main Embankment Seepage Pond	8/29/2007 15:15	-0.01	0.00136	0.001	0.0017	0.0619	0.00031	0.00262	0.0531	-0.0005	-0.0005	0.126	-0.000017	56.3	-0.0005	0.00011	0.00312	0.104	0.00048	-0.005	14.7
90	E4 - Main Embankment Seepage Pond	9/5/2007 11:30	-0.01	0.00133	0.0011	0.0011	0.0779	0.0002	0.0026	0.0515	-0.0005	-0.0005	0.114	-0.0003	66.7	-0.0005	0.00012	0.00328	0.114	0.000058	-0.005	14.3
91	E4 - Main Embankment Seepage Pond	10/2/2007 15:00	-0.01	0.0014	-0.001	-0.001	0.263	0.0002	0.0022	0.0624	-0.0005	-0.0005	0.095	0.000045	72.8	0.0006	0.00025	0.00454	0.308	0.000143	-0.005	14.9
92	E4 - Main Embankment Seepage Pond	11/5/2007 10:45	-0.01	0.00159	-0.001	0.0023	0.146	0.0002	0.00199	0.0686	-0.0005	-0.0005	0.09	0.000046	98.6	0.00171	0.00019	0.00396	0.158	0.000083	-0.005	17.2
94	E4 - Main Embankment Seepage Pond	12/27/2007	-0.01	0.00191	-0.002	0.003	0.0351	0.00043	0.00223	0.0791	-0.001	-0.001	0.127	-0.00009	93.6	-0.001	0.00024	0.0049	0.078	-0.0001	-0.01	16.3
96	E4 - Main Embankment Seepage Pond	1/8/2008 14:15	-0.01	0.0016	-0.001	-0.001	0.0223	0.00039	0.00203	0.0681	-0.0005	-0.0005	0.095	-0.0003	77.7	-0.0005	0.00028	-0.0007	0.048	0.000051	-0.005	14.3
97	E4 - Main Embankment Seepage Pond	1/15/2008 14:19	-0.01	0.00197	-0.001	0.002	0.029	0.00038	0.00236	0.0701	-0.0005	-0.0005	0.102	-0.0004	88	-0.0005	0.00031	0.00165	0.072	-0.00005	-0.005	15.5
98	E4 - Main Embankment Seepage Pond	1/22/2008 10:50	-0.01	0.00205	-0.001	-0.002	0.0201	0.00044	0.00284	0.0758	-0.0005	-0.0005	0.118	-0.00007	101	-0.0005	0.00034	0.00239	0.069	-0.00005	-0.005	15.6
100	E4 - Main Embankment Seepage Pond	2/6/2008 10:09	-0.01	0.00182	-0.001	0.0043	0.0346	0.00043	0.00264	0.0685	-0.0005	-0.0005	0.105	-0.0003	81.9	-0.0005	0.00033	0.00187	0.12	-0.00005	-0.005	15.5
102	E4 - Main Embankment Seepage Pond	3/4/2008 10:09	-0.01	0.00171	-0.001	0.0022	0.0121	0.00039	0.00242	0.0601	-0.0005	-0.0005	0.101	-0.00007	82.3	-0.0005	0.0003	0.00244	0.043	-0.00005	-0.005	15.2
104	E4 - Main Embankment Seepage Pond	4/16/2008 10:14	-0.01	0.00107	-0.001	0.0022	0.424	0.00023	0.00097	0.0453	-0.0005	-0.0005	0.053	0.000048	67.6	0.00102	0.00033	0.00675	0.515	0.000276	-0.005	12.2
105	E4 - Main Embankment Seepage Pond	5/13/2008 10:45	-0.01	0.00143	-0.002	-0.002	0.127	0.00026	0.00155	0.0679	-0.001	-0.001	0.09	-0.000034	108	-0.001	-0.0002	0.00289	0.123	-0.0001	-0.01	17.7
106	E4 - Main Embankment Seepage Pond	5/20/2008 13:50	-0.01	0.00139	-0.001	-0.001	0.0475	0.00026	0.00163	0.0609	-0.0005	-0.0005	0.089	-0.00004	110	-0.0005	0.0001	-0.003	0.06	0.000057	-0.005	17.6
107	E4 - Main Embankment Seepage Pond	6/16/2008 10:00	-0.01	0.00127	-0.001	-0.001	0.0758	0.0003	0.00179	0.0494	-0.0005	-0.0005	0.113	-0.00051	89.7	-0.0005	-0.0001	0.00274	0.103	0.000085	-0.005	17.6
108	E4 - Main Embankment Seepage Pond	7/15/2008 9:00	0.012	0.00102	0.0011	-0.001	0.103	0.00032	0.00195	0.0428	-0.0005	-0.0005	0.116	-0.0005	77.4	0.0006	-0.0001	0.00183	0.192	0.000061	-0.005	16.6
109	E4 - Main Embankment Seepage Pond	8/6/2008 9:24	-0.01	0.00111	-0.02	-0.02	0.405	-0.002	-0.002	0.0419	-0.01	-0.01	-0.2	-0.00034	61.5	-0.01	-0.002	0.0024	0.558	-0.001	-0.1	15.3
110	E4 - Main Embankment Seepage Pond	9/9/2008 8:15	-0.01	0.00125	-0.001	-0.001	0.0316	0.00039	0.00253	0.0534	-0.0005	-0.0005	0.14	-0.0004	78.5	-0.002	-0.0001	0.00094	0.057	-0.00005	-0.005	14.8
111	E4 - Main Embankment Seepage Pond	9/30/2008 11:39	-0.01	0.00131	-0.001	-0.001	0.0543	0.00037	0.00249	0.0558	-0.0005	-0.0005	0.138	-0.0005	78.7	-0.0005	0.00011	0.00139	0.086	0.000073	0.0055	14.6
112	E4 - Main Embankment Seepage Pond	10/22/2008 11:39	-0.01	0.00133	-0.001	-0.001	0.099	0.00033	0.00222	0.0532	-0.0005	-0.0005	0.135	-0.000017	79.7	-0.0005	0.00013	0.00333	0.124	0.000082	0.0059	14.9
113	E4 - Main Embankment Seepage Pond	11/4/2008 13:39	-0.01	0.00127	-0.002	-0.002	0.0791	0.00031	0.0023	0.0587	-0.001	-0.001	0.156	-0.0006	88.3	-0.001	-0.0002	0.0015	0.116	-0.0001	-0.01	15.1
114	E4 - Main Embankment Seepage Pond	12/2/2008 11:28	-0.01	0.0015	-0.001	-0.001	0.101	0.0003	0.00231	0.0601	-0.0005	-0.0005	0.122	-0.0006	101	-0.0005	0.00017	0.00198	0.163	0.000075	-0.005	16.5
115	E4 - Main Embankment Seepage Pond	1/14/2009 14:05	-0.01	0.00128	-0.001	0.02	1.58	0.00039	0.00327	0.0702	-0.0005	-0.0005	0.143	0.000118	95.3	0.00848	0.0017	0.0292	2.36	0.00146	0.0066	16.1
116	E4 - Main Embankment Seepage Pond	2/10/2009 12:00	-0.01	0.00114	-0.002	0.0035	0.139	0.00026	0.00289	0.0728	-0.001	-0.001	0.15	0.000117	88	-0.001	0.00036	0.00262	0.223	-0.0001	-0.01	14.6
117	E4 - Main Embankment Seepage Pond	3/4/2009	-0.01	0.000989	0.0013	-0.001	0.197	0.00031	0.00253	0.0599	-0.0005	-0.0005	0.137		88.8	-0.0005	0.00034	0.011	0.273	0.000134	-0.005	13.6
118	E4 - Main Embankment Seepage Pond	4/7/2009 13:39	-0.01	0.0011	-0.001	0.004	0.243	0.00022	0.00192	0.0543	-0.0005	-0.0005	0.11	0.000027	82.6	0.00076	0.00036	0.00503	0.291	0.000112	-0.005	13.9
119	E4 - Main Embankment Seepage Pond	5/12/2009 10:14	-0.01	0.00138	-0.002	-0.002	0.343	0.00028	0.00174	0.0687	-0.001	-0.001	0.118	0.000087	114	0.0015	0.00032	0.0139	0.422	0.00051	-0.01	18.4
120	E4 - Main Embankment Seepage Pond	6/9/2009 9:45	-0.01	0.00125	-0.001	-0.001	0.111	0.00026	0.00202	0.0521	-0.0005	-0.0005	0.146	0.000121	93.8	0.0007	0.00011	0.00406	0.152	0.000082	0.0055	20.4
121	E4 - Main Embankment Seepage Pond	7/7/2009 10:00	-0.01	0.00104	-0.001	-0.001	0.525	0.00021	0.0022	0.0544	-0.0005	-0.0005	0.129	0.000147	88.9	0.00126	0.00035	0.00524	0.536	0.000242	0.0055	18.3
122	E4 - Main Embankment Seepage Pond	8/5/2009 10:39	-0.01	0.00109	-0.001	-0.001	0.0173	0.00024	0.00217	0.0499	-0.0005	-0.0005	0.139	0.000096	84.4	-0.0005	-0.0001	0.0029	0.035	-0.00005	-0.005	18
123	E4 - Main Embankment Seepage Pond	8/19/2009	-0.01	0.00118	-0.001	0.0012	0.0513	0.00026	0.00232	0.0522	-0.0005	-0.0005	0.144	-0.00051	85.6	-0.0005	0.00011	-0.005	0.082	0.000074	0.0055	17.6
124	E4 - Main Embankment Seepage Pond	9/2/2009 9:00	-0.01	0.00107	-0.001	-0.001	0.086	0.00024	0.00235	0.0558	-0.0005	-0.0005	0.157	0.000046	91.1	-0.0005	0.00015	0.00737	0.133	0.000106	0.0054	16.8
125	E4 - Main Embankment Seepage Pond	10/6/2009 9:49	-0.01	0.00114	-0.002	-0.002	0.0902	0.00022	0.00219	0.0707	-0.001	-0.001	0.158	-0.001	97.2	-0.001	-0.0002	0.00377	0.119	-0.0001	-0.01	16.8
126	E4 - Main Embankment Seepage Pond	10/29/2009 12:15	-0.01	0.00115	-0.001	-0.001	0.0977	0.00019	0.00215	0.0655	-0.0005	-0.0005	0.147	0.000193	91.9	0.00144	0.00019	0.00415	0.136	0.00011	-0.005	15.8
127	E4 - Main Embankment Seepage Pond	11/19/2009 9:18	-0.01	0.00134	-0.002	-0.002	0.13	0.00021	0.00162	0.0715	-0.001	-0.001	0.128	-0.000034	120	-0.001	0.00021	0.00546	-0.18	0.00019	-0.01	19.6
129	E4 - Main Embankment Seepage Pond	1/13/2010 14:05	-0.01	0.0015	-0.002	0.0036	0.126	-0.0002	0.00135	0.0498	-0.001	-0.001	0.115	0.000091	102	-0.001	0.00029	0.00928	0.182	-0.0001	-0.01	17.3
130	E4 - Main Embankment Seepage Pond	2/10/2010 13:32	-0.01	0.00124	-0.002	0.0022	0.0759	0.00034	0.00225	0.0774	-0.001	-0.001	0.128	0.000038	108	-0.001	0.00047	0.00597	0.139	0.00014	-0.01	18.3
131	E4 - Main Embankment Seepage Pond	3/3/2010 12:00	-0.01	0.000868	-0.001	0.0011	0.129	0.00014	0.00086	0.037	-0.0005	-0.0005	0.056	-0.0002	67.9	-0.0005	0.00025	0.00681	0.214	0.000094	-0.005	11
132	E4 - Main Embankment Seepage Pond	4/7/2010 13:20	-0.01	0.00146	-0.002	-0.002	0.49	0.00029	0.00195	0.0667	-0.001	-0.001	0.128	0.00005	111	-0.001	0.00043	0.00587	0.543	0.00019	-0.01	18.7
133	E4 - Main Embankment Seepage Pond	5/11/2010	-0.01	0.00184	-0.002	-0.002	0.176	-0.0002	0.0008	0.0494	-0.001	-0.001	0.117	0.000069	166	-0.001	-0.0002	0.00637	0.249	-0.0001	-0.01	24.2
134	E4 - Main Embankment Seepage Pond	6/3/2010 8:40	-0.01	0.00117	-0.001	-0.001	0.0292	0.00026	0.00182	0.0204	-0.0005	-0.0005	0.111	-0.0004	86.1	-0.0005	-0.0001	0.00348	0.051	-0.00005	0.0053	19.9
135	E4 - Main Embankment Seepage Pond	7/8/2010	-0.01	0.00099	-0.001	-0.001	0.02	0.00033	0.00195	0.0337	-0.0005	-0.0005	0.118	-0.00002	86.3	-0.0005	0.00015	0.00257	0.04	-0.00005	0.0052	20.3
136	E4 - Main Embankment Seepage Pond	8/5/2010	-0.01	0.00109	-0.002	-0.002	0.0169	0.00036	0.00221	0.0518	-0.001	-0.001	0.145	-0.0006	114	-0.001	-0.0002	-0.004	0.04	-0.0001	-0.01	22.5
138	E4 - Main Embankment Seepage Pond	10/7/2010	-0.01	0.00132	-0.001	-0.003	0.0269	0.0007	0.00192	0.048	-0.0005	-0.0005	0.156	-0.00006	179	-0.0005	0.00013	0.00236	0.059	-0.00005	0.0075	25.8
139	E4 - Main Embankment Seepage Pond	11/4/2010	0.012	0.00143	-0.001	-0.003	0.0463	0.00118	0.00187	0.0586	-0.0005	-0.0005	0.138	0.000085	222	-0.0005	0.00018	0.00287	0.071	-0.00005	0.0072	26.7
140	E4 - Main Embankment Seepage Pond	12/1/2010 9:50	0.012	0.00111	-0.001	0.0076	0.175	0.00086	0.00166	0.0568	-0.0005	-0.0005	0.13	-0.00015	174	-0.0005	0.00029	0.00949	0.491	0.000247	0.0063	26
141	E4 - Main Embankment Seepage Pond	1/10/2011 10:30	-0.01	0.00126	-0.001	-0.003	0.0845	0.00185	0.00185	0.0497	-0.0005	-0.0005	0.127	-0.0002	240	-0.0005	0.00033	0.00726	0.102	0.000074	0.0087	30
144	E4 - Main Embankment Seepage Pond	4/5/2011 11:16	-0.01	0.00131	-0.001	0.0161	2.21	0.00075	0.00222	0.0707	-0.0005	-0.0005	0.085	0.000133	162	0.00516	0.00161	0.0309	3.34	0.00151	0.0073	24.8
145	E4 - Main Embankment Seepage Pond	5/12/2011 13:29	-0.01	0.00103	-0.001	-0.003	1.76	0.0007	0.00166	0.0559	-0.0005	-0.0005	0.081	0.000064	139	0.00345	0.00087	0.0119	1.75	0.000489	0.0067	20.5
146	E4 - Main Embankment Seepage Pond	6/9/2011 13:02	-0.01	0.0011	0.0011	-0.003	0.174	0.00102	0.00165	0.0404	-0.0001	-0.0005	0.115	0.000036	159	0.00057	0.00019	0.0137	0.15	0.000064	0.0071	24.4
147	E4 - Main Embankment Seepage Pond	7/13/2011 9:25	-0.01	0.00103	0.0011	-0.003	0.189	0.00096	0.00176	0.0394	-0.0001	-0.0005	0.106	0.000053	154	0.00053	0.00018	0.00562	0.195	0.000072	0.00624	22.1

Index	Sample Point	Date	Manganese (Mn)-Dissolved	Mercury (Hg)-Dissolved	Molybdenum (Mo)-Dissolved	Nickel (Ni)-Dissolved	Potassium (K)-Dissolved	Selenium (Se)-Dissolved	Silicon (Si)-Dissolved	Silver (Ag)-Dissolved	Sodium (Na)-Dissolved	Strontium (Sr)-Dissolved	Thallium (Tl)-Dissolved	Tin (Sn)-Dissolved	Titanium (Ti)-Dissolved	Uranium (U)-Dissolved	Vanadium (V)-Dissolved	Zinc (Zn)-Dissolved
1	E4 - Main Embankment Seepage Pond	7/12/2001 13:30	0.11	-0.00005	0.0181	-0.0005		0.0052	0.5	0.00003	45.4	1.09	-0.00005	0.00184	0.00227	0.00122	0.00109	0.0033
3	E4 - Main Embankment Seepage Pond	7/26/2001 8:00	0.0376	-0.00005	0.0378	-0.0005		0.0031	3.4	-0.00001	34.3	0.767	-0.00005	0.0002	0.00697	0.00101	0.00125	0.0031
4	E4 - Main Embankment Seepage Pond	8/3/2001	0.0153	-0.00005	0.038	-0.0005		0.0031	1.9	0.00001	30	0.766	-0.00005	0.0002	0.00523	0.00103	0.00106	0.0032
5	E4 - Main Embankment Seepage Pond	8/10/2001 10:15	0.0168	-0.00005	0.0548	-0.0005		0.0033	0.8	0.00005	40.5	0.879	0.00005	0.00187	0.00333	0.00123	0.0007	0.0031
7	E4 - Main Embankment Seepage Pond	8/30/2001 14:25	0.0255	-0.00005	0.0661	-0.0005		0.0023	1.1	-0.00001	45.3	0.51	-0.00005	0.00035	0.00377	0.00126	0.00076	0.001
8	E4 - Main Embankment Seepage Pond	10/23/2001 14:30	0.0423	-0.00005	0.0356	-0.0005		0.0009	3.8	0.00001	30.1	0.45	-0.00005	0.00032	0.0114	0.00094	0.00139	0.0059
9	E4 - Main Embankment Seepage Pond	11/13/2001 8:45	0.147	-0.00005	0.0614	-0.0005		0.0021	5.6	-0.00001	49.2	0.741	-0.00005	0.00035	0.00387	0.00139	0.00111	0.0015
15	E4 - Main Embankment Seepage Pond	5/22/2002 12:30	0.0516	-0.00005	0.0175	0.0008		0.0012	4.62	-0.00001	13	0.292	-0.00005	0.00011	0.0323	0.00072	0.00272	0.0043
17	E4 - Main Embankment Seepage Pond	7/31/2002 9:10	0.0292	-0.00005	0.0583	-0.0005		0.0007	1.52	-0.00001	43.2	0.386	-0.00005	-0.00005	0.0026	0.00091	0.00085	0.0114
26	E4 - Main Embankment Seepage Pond	5/5/2003 14:50	0.143	-0.00005	0.0299	-0.0005		0.0007	4.85	-0.00001	24.8	0.399	-0.00005	0.00008	0.0071	0.00084	0.0015	0.0017
27	E4 - Main Embankment Seepage Pond	5/29/2003 10:30	0.0237	-0.00005	0.0363	-0.0005		0.0006	3.84	-0.00001	28.5	0.398	-0.00005	0.00007	0.0026	0.00088	0.00101	0.0006
28	E4 - Main Embankment Seepage Pond	6/24/2003 7:00	0.0651	-0.00005	0.0475	-0.0005		0.0005	3.31	-0.00001	33.8	0.37	-0.00005	0.00005	0.0026	0.00079	0.0009	0.0007
29	E4 - Main Embankment Seepage Pond	8/5/2003 14:30	0.0138	-0.00005	0.0529	-0.0005		-0.0005	0.22	-0.00001	40.2	0.306	-0.00005	0.00006	0.0023	0.00063	0.00103	-0.0005
30	E4 - Main Embankment Seepage Pond	8/20/2003 10:00	0.037	-0.00005	0.0528	-0.0005		-0.0005	0.46	-0.00001	43.3	0.302	-0.00005	-0.00005	0.0055	0.00065	0.0014	0.0014
31	E4 - Main Embankment Seepage Pond	10/16/2003 16:00	0.0236	-0.00005	0.0406	-0.0005		-0.0005	1.84	-0.00001	34.8	0.295	-0.00005	-0.00005	0.0067	0.00079	0.0014	-0.0005
32	E4 - Main Embankment Seepage Pond	11/11/2003 9:55	0.0187	-0.00005	0.0312	-0.0005		0.0013	3.41	-0.00001	29.4	0.401	-0.00005	-0.00005	0.0073	0.00093	0.00199	0.0012
33	E4 - Main Embankment Seepage Pond	3/4/2004 10:00	0.147	-0.00005	0.0101	-0.0005		0.0012	5.01	-0.00001	9.61	0.267	-0.00005	-0.00005	0.0083	0.00071	0.00153	0.0049
34	E4 - Main Embankment Seepage Pond	3/22/2004	0.48	-0.00005	0.0232	-0.0005		0.0016	5.37	-0.00001	18.8	0.39	-0.00005	-0.00005	0.004	0.00103	0.00163	0.0065
35	E4 - Main Embankment Seepage Pond	3/22/2004 10:40	0.48	-0.00005	0.0232	-0.0005		0.0016	5.37	-0.00001	18.8	0.39	-0.00005	-0.00005	0.004	0.00103	0.00163	0.0065
36	E4 - Main Embankment Seepage Pond	4/3/2004 10:00	0.147	-0.00005	0.0101	-0.0005		0.0012	5.01	-0.00001	9.61	0.267	-0.00005	-0.00005	0.0083	0.00071	0.00153	0.0049
37	E4 - Main Embankment Seepage Pond	5/1/2004 13:32	0.0696	-0.00005	0.0194	-0.0005		0.0008	4.08	-0.00001	15	0.299	-0.00005	0.00009	0.006	0.0007	0.00107	0.0025
38	E4 - Main Embankment Seepage Pond	5/7/2004	0.05	-0.00005	0.0352	-0.0005		0.0005	2.66	-0.00001	24.4	0.387	-0.00005	-0.00005	0.0038	0.00084	0.00105	0.0007
39	E4 - Main Embankment Seepage Pond	6/9/2004	0.0358	-0.00005	0.0193	-0.0005		-0.0005	2.37	-0.00001	14.5	0.274	-0.00005	-0.00005	0.0045	0.00077	0.00114	0.0074
40	E4 - Main Embankment Seepage Pond	7/5/2004	0.05	-0.00005	0.0352	-0.0005		0.0005	2.66	-0.00001	24.4	0.387	-0.00005	-0.00005	0.0038	0.00084	0.00105	0.0007
41	E4 - Main Embankment Seepage Pond	8/2/2004	0.0521	-0.00005	0.0546	-0.0005		0.0009	3.87	-0.00001	33.3	0.459	-0.00005	-0.00005	0.0012	0.00099	0.00091	-0.0005
42	E4 - Main Embankment Seepage Pond	8/25/2004	0.0962	-0.00005	0.0634	-0.0005		0.0006	5.57	-0.00001	41.8	0.496	-0.00005	-0.00005	0.0027	0.00104	0.00093	-0.0005
43	E4 - Main Embankment Seepage Pond	12/8/2004	0.332	-0.00005	0.063	-0.0005		0.0013	5.12	-0.00001	29.2	0.458	-0.00005	-0.00005	0.0035	0.00153	0.00069	0.0036
44	E4 - Main Embankment Seepage Pond	1/31/2005	0.155	-0.00005	0.0234	0.0005		0.0011	4.95	-0.00001	13.6	0.298	-0.00005	-0.00005	0.0104	0.001	0.00113	0.004
45	E4 - Main Embankment Seepage Pond	2/16/2005	0.502		0.103	0.0006		0.0011	6.48	-0.00001	43.9	0.527	-0.00005	0.00016	0.0049	0.00188	0.00088	0.0015
46	E4 - Main Embankment Seepage Pond	3/16/2005	0.371		0.00696	-0.0005		-0.0005	3.55	-0.00001	5.56	0.444	-0.00005	-0.00005	0.0022	0.00192	0.00053	0.0099
48	E4 - Main Embankment Seepage Pond	4/11/2005	0.128		0.112	0.0012		0.0009	4.99	-0.00001	41.8	0.471	-0.00005	-0.00005	0.0079	0.00159	0.0013	0.0008
49	E4 - Main Embankment Seepage Pond	5/4/2005	0.278		0.131	0.0013		0.0008	6.16	-0.00001	55	0.568	-0.00005	0.00006	0.0277	0.00165	0.00285	0.0041
50	E4 - Main Embankment Seepage Pond	6/6/2005	0.302		0.136	0.001		0.001	4.54	-0.00001	51	0.579	-0.00005	-0.00005	0.002	0.0014	0.00143	-0.0005
52	E4 - Main Embankment Seepage Pond	8/11/2005	0.0373		0.0994	0.0008		0.0007	4.49	-0.00001	53	0.506	-0.00005	-0.00005	0.0065	0.00094	0.00146	0.001
53	E4 - Main Embankment Seepage Pond	9/13/2005	0.0704		0.102	-0.0005		0.0007	5.41	-0.00001	58.2	0.462	-0.00005	-0.00005	0.004	0.00107	0.00141	0.0011
55	E4 - Main Embankment Seepage Pond	11/8/2005	0.162		0.093	0.0006		0.0009	5.03	-0.00001	47.2	0.424	-0.00005	-0.00005	0.0058	0.00139	0.00152	0.0017
56	E4 - Main Embankment Seepage Pond	12/14/2005	0.31		0.0747	-0.0005		0.0008	6.03	-0.00001	38.8	0.504	-0.00005	-0.00005	0.0031	0.00158	0.00096	0.0109
57	E4 - Main Embankment Seepage Pond	1/17/2006	0.564		0.105	-0.0005		0.0017	7.19	-0.00001	45.2	0.541	-0.00005	-0.00005	0.0046	0.00167	0.00113	0.105
58	E4 - Main Embankment Seepage Pond	2/8/2006	0.461		0.121	0.0012		0.0012	7.42	-0.00001	49.9	0.558	-0.00005	-0.00005	0.0091	0.00178	0.00136	0.0025
59	E4 - Main Embankment Seepage Pond	3/6/2006 12:30	0.487		0.128	0.0006		0.0013	7.06	-0.00001	53	0.621	-0.00005	-0.00005	0.0036	0.00192	0.00107	0.005
60	E4 - Main Embankment Seepage Pond	4/11/2006 9:20	0.261		0.0568	0.0033		0.0011	8.37	0.00002	27.5	0.404	-0.00005	0.00007	0.0881	0.00115	0.00589	0.0073
61	E4 - Main Embankment Seepage Pond	5/9/2006	0.138		0.0927	0.00106		0.0011	5.91	-0.00001	43.2	0.551	-0.0001	-0.0001	0.012	0.00159	0.0031	0.0022
62	E4 - Main Embankment Seepage Pond	6/14/2006	0.18		0.0956	-0.0005		0.0019	3.8	-0.00001	47.5	0.602	-0.0001	-0.0001	-0.01	0.00134	0.0016	0.001
63	E4 - Main Embankment Seepage Pond	7/4/2006	0.0972		0.0986	-0.0005		-0.001	3.98	-0.00001	55.7	0.548	-0.0001	-0.0001	-0.01	0.00121	0.0011	0.0019
64	E4 - Main Embankment Seepage Pond	8/3/2006	0.0935		0.106	0.00057		-0.001	4.79	-0.00001	53.9	0.572	-0.0001	-0.0001	-0.01	0.00113	0.0012	-0.005
66	E4 - Main Embankment Seepage Pond	10/12/2006	0.0632		0.112	-0.0005		0.002	5.3	-0.00001	52.5	0.69	-0.0001	-0.0001	-0.01	0.00157	0.0012	0.0014
67	E4 - Main Embankment Seepage Pond	11/15/2006	0.281		0.124	-0.0005		0.0048	7.43	-0.00001	50.1	1.13	-0.0001	-0.0001	-0.01	0.00161	0.0012	0.0021
68	E4 - Main Embankment Seepage Pond	12/4/2006	0.507		0.122	0.00063		0.0051	7.01	-0.00001	50.9	0.906	-0.0001	-0.0001	-0.01	0.00187	-0.001	0.0028
72	E4 - Main Embankment Seepage Pond	2/5/2007 10:59	0.52		0.101	0.00063		0.0028	6.87	-0.00001	58	0.797	-0.0001	-0.0001	-0.01	0.00171	0.0012	0.0022
73	E4 - Main Embankment Seepage Pond	3/5/2007	0.436		0.109	0.00099		0.0028	7.05	-0.00001	59.5	0.819	-0.0001	-0.0001	-0.01	0.00162	0.0013	0.0029
74	E4 - Main Embankment Seepage Pond	4/11/2007 11:15	0.113		0.0575	-0.005		0.005	5.39	-0.00002	16.3	0.745	-0.0001	-0.0001	0.036	0.0011	0.003	0.0182
75	E4 - Main Embankment Seepage Pond	5/7/2007 10:00	0.173		0.127	0.00193		0.0083	5.4	-0.00001	44.7	1.22	-0.0001	-0.0001	0.03	0.0016	0.003	-0.007
77	E4 - Main Embankment Seepage Pond	6/4/2007 10:34	0.0452		0.126	0.00059		0.0096	3.25	-0.00001	56.3	1.1	-0.0001	-0.0001	-0.01	0.00183	0.0018	-0.006
79	E4 - Main Embankment Seepage Pond	6/11/2007 10:59	0.0988		0.121	-0.001		0.009	3.77	-0.00002	56.2	1.05	-0.0002	-0.0002	-0.01	0.00155	-0.002	-0.002
80	E4 - Main Embankment Seepage Pond	6/18/2007 9:45	0.105		0.112	0.00127		0.009	4.48	-0.00001	51.2	0.997	-0.0001	-0.0001	0.027	0.00151	0.003	-0.004
81	E4 - Main Embankment Seepage Pond	6/25/2007 10:00	0.0812		0.131	-0.0005		0.0125	4.32	-0.00001	53	1.11	-0.0001	-0.0001	-0.01	0.00157	0.0016	0.0018
83	E4 - Main Embankment Seepage Pond	7/9/2007 13:30	0.0585		0.137	0.00072		0.0094	4.68	-0.00001	55.8	1.12	-0.0001	-0.0001	0.015	0.0016	0.0021	0.0023
84	E4 - Main Embankment Seepage Pond	7/17/2007 10:59	0.0623		0.128	-0.0005		0.0092	4.45	-0.00001	60.8	1.06	-0.0001	-0.0001	0.011	0.00133	0.0018	0.0018
85	E4 - Main Embankment Seepage Pond	7/24/2007 14:19	0.0283		0.121	-0.0005		0.0088	3.98	-0.00001	61.7	1	-0.0001	-0.0001	0.01	0.00131	0.0014	0.0024
86	E4 - Main Embankment Seepage Pond	7/31/2007 14:44	0.0201	-0.00001	0.12	0.00074		0.0075	3.85	-0.00001	58	0.889	-0.0001	-0.0001	-0.01	0.0013	0.0017	-0.001
87	E4 - Main Embankment Seepage Pond	8/2/2007 10:14	0.0144	-0.00001	0.119	-0.001		0.0074	3.1	-0.00002	60.8	0.905	-0.0002	-0.0002	-0.01	0.00134	-0.002	-0.002
88	E4 - Main Embankment Seepage Pond	8/14/2007 9:15	0.0199	-0.00001	0.115	-0.0005		0.0072	2.52	-0.00001	61.6	0.88	-0.0001	-0.0001	-0.01	0.00138	0.0015	-0.001
89	E4 - Main Embankment Seepage Pond	8/29/2007 15:15	0.0301		0.111	-0.0005		0.0054	2.7	-0.00002	57.4	0.86	-0.0001	-0.0001	-0.01	0.00143	0.0013	0.0031
90	E4 - Main Embankment Seepage Pond	9/5/2007 11:30	0.0334	-0.00001	0.107	-0.0005		0.0046	3.23	-0.00001	59.8	0.888	-0.0001	-0.0001	-0.01	0.00133	0.0014	0.0029
91	E4 - Main Embankment Seepage Pond	10/2/2007 15:00	0.0807		0.13	0.00064		0.0048	4.44	-0.00001	47	1.05	-0.0001	-0.0001	0.011	0.0014	0.0014	0.002
92	E4 - Main Embankment Seepage Pond	11/5/2007 10:45	0.118		0.128	-0.0005		0.0108	5.78	-0.00001	41.7	1.22	-0.0001	-0.0001	-0.01	0.00156	0.001	0.0028
94	E4 - Main Embankment Seepage Pond	12/27/2007	0.481		0.11	0.0095		0.0071	6.74	-0.00002	60.6	1.06	-0.0002	-0.0002	-0.01	0.00198	-0.002	0.0082
96	E4 - Main Embankment Seepage Pond	1/8/2008 14:15	0.495		0.0844	-0.0005		0.0054	5.79	0.000022	54.3	0.888	-0.0001	-0.0001	-0.01	0.00158	-0.001	0.0012
97	E4 - Main Embankment Seepage Pond	1/15/2008 14:19	0.559		0.0898	-0.0005		0.0057	6.82	-0.00001	61.3	0.977	-0.0001	-0.0001	-0.01	0.00176	-0.001	0.0031
98	E4 - Main Embankment Seepage Pond	1/22/2008 10:50	0.585		0.101	-0.0005		0.0062	7.2	-0.00001	63.7	0.986	-0.0001	-0.0001	-0.01	0.00205	-0.001	0.0033
100	E4 - Main Embankment Seepage Pond	2/6/2008 10:09	0.49		0.0935	-0.0005			6.62	-0.00001	61.3		-0.0001	-0.0001	-0.01	0.00182	-0.001	0.0053
102	E4 - Main Embankment Seepage Pond	3/4/2008 10:09	0.404		0.0885	-0.0005			6.59	-0.00001	52.2		-0.0001	-0.0001	-0.01	0.00148	-0.001	0.0048
104	E4 - Main Embankment Seepage Pond	4/16/2008 10:14	0.13		0.102	0.00103			4.66	0.000014	23.2		-0.0001	-0.0001	0.022	0.00107	0.0015	0.0045
105	E4 - Main Embankment Seepage Pond	5/13/2008 10:45	0.0824		0.169	-0.001		0.0109	4.3	-0.00002	44	1.45	-0.0002	-0.0002	-0.01	0.00141	-0.002	0.0023
106	E4 - Main Embankment Seepage Pond	5/20/2008 13:50	0.0622		0.161	-0.0005		0.0105	3.84	-0.00001	44.3	1.19	-0.0001	-0.0001	-0.01	0.00142	0.001	-0.001
107	E4 - Main Embankment Seepage Pond	6/16/2008 10:00	0.0461		0.137	-0.0005		0.0094	1.66	-0.00001	51.8	0.968	-0.0001	-0.0001	-0.01	0.00129	-0.001	-0.001
108	E4 - Main Embankment Seepage Pond	7/15/2008 9:00	0.0306		0.132	-0.0005		0.0074	4.79	-0.00001	62.3	0.956	-0.0001	-0.0001	-0.01	0.00103	0.0011	-0.001
109	E4 - Main Embankment Seepage Pond	8/6/2008 9:24	0.0377		0.114	-0.01		-0.02	4.35	-0.0002	59.5	0.815	-0.002	-0.002	0.025	0.00113	-0.02	-0.02
110	E4 - Main Embankment Seepage Pond	9/9/2008 8:15	0.143		0.124	-0.0005		0.0054	3.52	-0.00001	62.5	0.903	-0.0001	-0.0001	-0.01	0.00119	0.001	0.0013
111	E4 - Main Embankment Seepage Pond	9/30/2008 11:39	0.0741		0.133	0.0005		0.0043	3.78	-0.00001	69	0.845	-0.0001	-0.0001	-0.01	0.00134	0.001	0.0017
112	E4 - Main Embankment Seepage Pond	10/22/2008 11:39	0.125		0.137	-0.0005		0.0035	5.05	-0.00001	68.2	0.985	-0.0001	-0.0001	0.011	0.00135	0.001	0.0013
113	E4 - Main Embankment Seepage Pond	11/4/2008 13:39	0.149	-0.00001	0.135	-0.001		0.0039	5.42	-0.00002	70.8	1.04	-0.0002	-0.0002	0.011	0.00129	-0.002	-0.002
114	E4 - Main Embankment Seepage Pond	12/2/2008 11:28	0.31	-0.00001	0.14	-0.0005		0.0045	6.5	-0.00001	61.2	1.13	-0.0001	-0.0001	0.014	0.00151	-0.001	-0.002
115	E4 - Main Embankment Seepage Pond	1/14/2009 14:05	0.919		0.111	0.00371		0.0032	10	0.00003	66.7	0.908	-0.0001	0.00013	0.08	0.00129	0.0057	0.0517
116	E4 - Main Embankment Seepage Pond	2/10/2009 12:00	0.89		0.109	-0.001		0.0023	7.05	-0.00002	68.3	1.13	-0.0002	-0.0002	-0.01	0.00118	-0.002	-0.006
117	E4 - Main Embankment Seepage Pond	3/4/2009	0.381	-0.00001	0.11	-0.0005		0.0028	7.21	-0.00001	63.2	1.01	-0.0001	-0.0001	0.013	0.000988	0.002	0.0058
118	E4 - Main Embankment Seepage Pond	4/7/2009 13:39	0.285	-0.00001	0.101	-0.001		0.0049	5.99	-0.00001	52.4	0.975	-0.0001	-0.0001	0.012	0.00105	0.0014	-0.007
119	E4 - Main Embankment Seepage Pond	5/12/2009 10:14	0.132		0.189	0.0026		0.0101	4.06	-0.00002	45.4	1.62	-0.0002	-0.0002	0.019	0.00138	-0.002	0.0137
120	E4 - Main Embankment Seepage Pond	6/9/2009 9:45	0.0786		0.16	0.00062		0.0091	3.05	-0.00001	67.3	1.36	-0.0001	-0.0001	-0.01	0.00131	0.0013	-0.003
121	E4 - Main Embankment Seepage Pond	7/7/2009 10:00	0.0913		0.128	0.00084		0.008	4.77	-0.00001	63	1.3	-0.0001	-0.0001	0.025	0.00103	0.0019	0.0023
122	E4 - Main Embankment Seepage Pond	8/5/2009 10:39	0.0387		0.129	0.001		0.0056	1.58	-0.00001	68	1.18	-0.0001	-0.0001	-0.01	0.00104	-0.001	-0.001
123	E4 - Main Embankment Seepage Pond	8/19/2009	0.0578		0.119	-0.0005		0.0052	1.47	-0.00001	74	1.17	-0.0001	-0.0001	0.011	0.00109	-0.001	0.0037
124	E4 - Main Embankment Seepage Pond	9/2/2009 9:00	0.12		0.119	0.00137		0.0047	1.87	-0.00001	70.3	1.18	-0.0001	-0.0001	0.011	0.00114	-0.001	-0.002
125	E4 - Main Embankment Seepage Pond	10/6/2009 9:49	0.095		0.127	-0.001		0.0038	3.69	-0.00002	72.9	1.35	-0.0002	-0.0002	-0.01	0.00123	-0.002	-0.002
126	E4 - Main Embankment Seepage Pond	10/29/2009 12:15	0.217		0.123	0.00068		0.0036	4.77	-0.00001	65.9	1.22	-0.0001	-0.0001	0.013	0.00116	-0.001	-0.001
127	E4 - Main Embankment Seepage Pond	11/19/2009 9:18	0.189		0.163	-0.001		0.0078	5.7	-0.00002	57.1	1.52	-0.0002	-0.0002	-0.01	0.00141	-0.002	0.0023
129	E4 - Main Embankment Seepage Pond	1/13/2010 14:05	0.473		0.0875	-0.001		0.0045	6.33	-0.00002	47.4	1.17	-0.0002	-0.0002	-0.01	0.00153	-0.002	0.0049
130	E4 - Main Embankment Seepage Pond	2/10/2010 13:32	0.648		0.119	-0.001		0.0049	6.51	-0.00002	64.1	1.4	-0.0002	-0.0002	-0.01	0.00132	-0.002	0.0059
131	E4 - Main Embankment Seepage Pond	3/3/2010 12:00	0.194		0.0453	0.00058		0.0023	4.52	-0.00001	23.8	0.693	-0.0001	-0.0001	0.01	0.000753	-0.001	0.0022
132	E4 - Main Embankment Seepage Pond	4/7/2010 13:20	0.192		0.118	0.0011		0.0052	5.54	-0.00002	57.6	1.36	-0.0002	-0.0002	0.016	0.00148	-0.002	0.0021
133	E4 - Main Embankment Seepage Pond	5/11/2010	0.086		0.137	-0.001		0.0056	6.1	-0.00002	49	1.83	-0.0002	-0.0002	0.015	0.00191	-0.002	0.0021
134	E4 - Main Embankment Seepage Pond	6/3/2010 8:40	0.0647		0.107	0.00067		0.0047	2.99	-0.00001	63.8	1.21	-0.0001	-0.0001	-0.01	0.00127	-0.001	-0.001
135	E4 - Main Embankment Seepage Pond	7/8/2010	0.0408		0.113	-0.0005		0.0047	1.27	-0.00001	72.7	1.61	-0.0001	-0.0001	-0.01	0.000998	-0.001	0.0013
136	E4 - Main Embankment Seepage Pond	8/5/2010	0.103		0.114	-0.001		0.0047	0.492	-0.00002	81.8	1.75	-0.0002	-0.0002	-0.01	0.00114	-0.002	-0.002
138	E4 - Main Embankment Seepage Pond	10/7/2010	0.165	-0.00005	0.164	-0.0005		0.01	5.31	-0.00001	84.4	2.19	-0.0001	-0.0001	-0.01	0.00135	-0.001	0.004
139	E4 - Main Embankment Seepage Pond	11/4/2010	0.141		0.18	-0.0006		0.0151	5.67	0.00002	92.6	2.49	-0.0001	-0.0001	0.015	0.00145	-0.001	0.0037
140	E4 - Main Embankment Seepage Pond	12/1/2010 9:50	0.137	-0.00005	0.134	0.00077		0.0091	4.51	-0.00001	81	1.9	-0.0001	-0.0001	0.021	0.00104	0.0011	0.01
141	E4 - Main Embankment Seepage Pond	1/10/2011 10:30	0.249		0.197	0.00059		0.0171	6.18	-0.00001	88.9	2.31	-0.0001	-0.0001	0.013	0.00106	-0.001	0.0049
144	E4 - Main Embankment Seepage Pond	4/5/2011 11:16	0.508	-0.00005	0.15	0.00464		0.0119	9.83	0.000015	48.6	1.92	-0.0001	0.00049	0.129	0.00139	0.0064	0.0435
145	E4 - Main Embankment Seepage Pond	5/12/2011 13:29	0.232	-0.00005	0.14	0.00283		0.0106	7.31	-0.00001	52.6	1.58	-0.0001	-0.0001	0.071	0.0011	0.0046	0.0065
146	E4 - Main Embankment Seepage Pond	6/9/2011 13:02	0.0883	-0.00005	0.166	0.00052		0.0214	4.23	-0.00001	71.1	1.75	-0.00001	-0.0001	0.018	0.00116	0.0017	0.0041
147	E4 - Main Embankment Seepage Pond	7/13/2011 9:25	0.0741	-0.00005	0.153	0.00057		0.0147	5.2	-0.00001	65.1	1.59	-0.00001	-0.0001	0.014	0.00104	0.0015	0.0073

Index	Sample Point	Date	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Alkalinity (CaCO3) (mg/L)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen N-WDGWA (mg/L)
148	E4 - Main Embankment Seepage Pond	8/4/2011 11:42		1188	9.2	16.7		63.5	1170	506	8	912	-3	1.61	0.0172	21.4		4.43	4.5	0.069	
149	E4 - Main Embankment Seepage Pond	9/8/2011 8:26		1201	8.17	13.9		81.9	1190	496	8.05	916	-3	1.11	0.031	21.7		2.9	2.99	0.095	
150	E4 - Main Embankment Seepage Pond	10/5/2011 11:20		1240	8.07	9.1		90.2	1200	493	8.05	914	-3	1.81	0.0417	22.6		2.64	2.71	0.066	
152	E4 - Main Embankment Seepage Pond	11/1/2011 10:43		1254	8.18	4.3		86.6	1230	491	8.05	911	-3	1.43	0.0228	22.8		3.29	3.36	0.075	
153	E4 - Main Embankment Seepage Pond	12/5/2011 10:49		1283	8.06	3.5		79.1	1210	497	7.97	903	4.7	3.31	0.032	22.7	0.67	3.3	3.35	0.053	
154	E4 - Main Embankment Seepage Pond	1/4/2012 13:23		1268	8.17	3.7		78.4	1220	488	8.03	907	37.3	23.3	0.0469	24.9	0.76	3.72	3.78	0.057	
155	E4 - Main Embankment Seepage Pond	2/8/2012 10:20		1298	8.11	2.3		75.9	1220	485	7.95	939	-3	2.66	0.0333	25.9	0.73	3.99	4.06	0.062	
156	E4 - Main Embankment Seepage Pond	3/14/2012 13:45		1288	7.61	2		80.8	1190	464	7.95	918	-3	4.04	0.041	24.6	0.69	3.71	3.77	0.057	
158	E4 - Main Embankment Seepage Pond	5/2/2012 11:29		1050	8.7	8		90.3	1010	420	8.35	737	8.5	6.14	0.0163	19.6	0.64	2.48	2.53	0.053	
159	E4 - Main Embankment Seepage Pond	6/7/2012 9:10	Actual Field Reading	1083	8.48	10.5		72.2	1010	422	7.84	796	5.2	4.01	0.0184	21.8	0.59	2.11	2.18	0.078	
160	E4 - Main Embankment Seepage Pond	7/5/2012 9:09	Actual field reading	1115	8.35	13.3		77.3	1070	443	8.02	908	-3	1.53	0.0204	19	0.57	2.56	2.64	0.083	
161	E4 - Main Embankment Seepage Pond	8/1/2012 11:03		1213	7.813	16.6		81.3	1140	470	7.99	956	-3	1.97	0.117	21.8	0.66	2.02	2.09	0.078	
162	E4 - Main Embankment Seepage Pond	9/6/2012 11:20		1214	8.389	13.4		72.1	1150	459	8.13	938	-3	1.67	0.0127	23.3	0.71	2.84	2.94	0.1	
163	E4 - Main Embankment Seepage Pond	10/3/2012 9:35		1220	8.07	7.8		92.3	922	456	8	930	-3	2.56	0.0112	27	0.75	2.26	2.36	0.104	
164	E4 - Main Embankment Seepage Pond	11/15/2012 12:54		1264	8.141	5.3		79.4	1170	492	7.99	936	-3	2.11	0.0184	24.2	0.67	3.04	3.11	0.076	
165	E4 - Main Embankment Seepage Pond	12/6/2012 10:20		1223	7.955	3.8		87.1	1130	453	8	893	-3	1.39	0.0196	23.2	0.71	2.75	2.83	0.073	
166	E4 - Main Embankment Seepage Pond	1/2/2013 14:27		1245	8	0.6		82.3	1170	468	7.98	920	-3	1.42	0.0169	23.2	0.79	3.69	3.78	0.088	
167	E4 - Main Embankment Seepage Pond	2/6/2013 9:20		1251	8.012	2.6		64.9	1170	484	7.83	908	-3	2.26	0.144	23.8	0.61	5.09	5.19	0.093	
169	E4 - Main Embankment Seepage Pond	3/13/2013 13:20	GH - sample	1201	8.07	5.1		76.8	1170	461	7.94	902	3.2	2.88	0.128	23.4	0.81	4.35	4.45	0.095	
170	E4 - Main Embankment Seepage Pond	4/4/2013 14:24	ok	1221	7.425	7.6		90	1210	515	7.74	916	-3	0.21	0.0446	22	0.77	3.09	3.27	0.174	
171	E4 - Main Embankment Seepage Pond	5/1/2013 9:12		1183	7.762	6.6	3.85	83.9	1170	476	7.94	822	6.2	3.85	0.0162	19	0.8	3.43	3.51	0.081	
172	E4 - Main Embankment Seepage Pond	6/6/2013 9:21		878	8.26	13	1.13	74.3	1160	447	8.02	787	-3	1.57	0.0448	21.3	0.63	3.59	3.79	0.2	
173	E4 - Main Embankment Seepage Pond	7/10/2013 10:11	Sample taken	944	8.49	15.5	1.02	94.1	1170	429	8.01	862	-3	0.39	0.0409	23.5	0.81	2.32	2.54	0.217	
174	E4 - Main Embankment Seepage Pond	8/8/2013 9:55		1176	8.059	16.4		69.2	1160	425	8.02	910	-3	0.89	0.0488	22.9	0.91	3.24	3.45	0.212	
175	E4 - Main Embankment Seepage Pond	9/5/2013 9:06	sample taken	1197	8.095	15		73.3	1170	440	7.89	920	4.6	2.41	0.0308	25.6	0.71	3.08	3.26	0.173	
176	E4 - Main Embankment Seepage Pond	10/3/2013 8:48	sample taken	1255	7.92	10.9		70.3	1230	500	8.05	921	-3	2.02	0.0463	23.3	0.59	4.78	4.99	0.209	
177	E4 - Main Embankment Seepage Pond	11/5/2013 10:26	crush washed in from the pump house, sample taken	1227	8.115	5.4		81.2	1220	486	8.01	905	-3	0.93	0.0132	23	0.62	4.68	4.81	0.137	
178	E4 - Main Embankment Seepage Pond	12/5/2013 11:55	sample taken	1142	8.21	3.4	1.61	87	1210	485	8	918	-3	1.26	0.0156	25.8	0.66	4.06	4.18	0.123	
179	E4 - Main Embankment Seepage Pond	1/7/2014 10:27	Sample taken	1240	7.838	3.6		81.9	1200	488	7.92	918	-3	1.02	0.0756	24.3	0.81	4.18	4.3	0.123	
180	E4 - Main Embankment Seepage Pond	2/11/2014 11:00	Sample taken	1252	7.306	3	0.82	70.3	1260	500	8	941	-3	0.94	0.0762	24.7	0.66	4.89	5.03	0.137	
181	E4 - Main Embankment Seepage Pond	3/4/2014 9:36	Had to break ice	1297	7.96	2.7	1.23	72.9	1240	484	8.02	944	-3	0.81	0.0851	24.4	0.79	4.98	5.12	0.136	
182	E4 - Main Embankment Seepage Pond	4/1/2014 11:35	duplicate taken	1238	7.942	4.1	3.77	83.9	1200	499	7.96	919	-3	2.44	0.0498	23.4	0.65	4.27	4.38	0.117	
183	E4 - Main Embankment Seepage Pond	5/1/2014 9:54	sample taken	989	8.34	9.2	5.25	80.5	890	382	8.07	682	8.4	5.6	0.0081	15.2	0.44	4.75	4.83	0.075	
184	E4 - Main Embankment Seepage Pond	6/3/2014 12:59	Sample taken	1166	8.657	12.9	1.37	67.3	1150	459	8.15	861	-3	1.14	0.015	21.4	0.59	5.44	5.58	0.138	
185	E4 - Main Embankment Seepage Pond	7/3/2014 12:52	Sample taken	1168	8.32	16.3		75.8	1170	489	8.03	883	-3	1.13	0.0343	19.2	0.58	5.21	5.35	0.149	
186	E4 - Main Embankment Seepage Pond	8/5/2014 8:25	Sample taken, water level seems to have risen ~50-60cm in depth and 1.5m to shore edge	1180	8.006	17.2		67.1	1170	480	7.98	901	3.9	0.89	0.0534	18.4	0.67	5.44	5.53	0.099	
187	E4 - Main Embankment Seepage Pond	9/2/2014 11:43	Sample taken	1148	7.934	14.4	0.82	66.4	1150	441	8.01	855	-3	0.72	0.0322	20.9	0.75	2.6	2.72	0.117	
188	E4 - Main Embankment Seepage Pond	10/1/2014 13:53	Sample taken.	1203	8.093	11.4	1.52	77.3	1170	477	7.91	878	-3	1.36	0.0135	24.3	0.84	1.97	2.03	0.063	
189	E4 - Main Embankment Seepage Pond	11/3/2014 11:15	Sample taken	1124	8.136	5.5	2.77	84.1	1120	446	8.14	811	-3	2.78	0.0126	21.1	0.61	2.25	2.31	0.061	
190	E4 - Main Embankment Seepage Pond	12/3/2014 11:58	Sample taken	1239	7.823	2.5	1.14	93	1180	451	8.14	900	-3	1.11	0.1	22.7	0.69	2.56	2.69	0.126	
191	E4 - Main Embankment Seepage Pond	1/8/2015 14:02	Sample taken.	1207	7.993	2.9	1.8	108	1170	431	8.12	842	-3	1.77	0.111	24.4	0.73	1.89	1.96	0.073	
192	E4 - Main Embankment Seepage Pond	2/2/2015 11:41	Sample taken.	1190	7.867	2	1.86	113	1120	429	8.07	821	-3	2.02	0.0948	21	0.65	1.81	1.88	0.0681	
197	East Main Toe Drain	4/15/2010 13:30		1098	7.89	8.4		114		655		946	-3	0.2	-0.005	22.1		3.96		0.0203	
198	East Main Toe Drain	7/8/2010		1010	7.48	8.4		120	892	318	8.07	693	32.5	4.73	0.11	25.1		0.259	0.278	0.019	
199	East Main Toe Drain	8/5/2010		1092	8.13	10		96.5		389		823	4.3	0.56	0.0326	29		0.683	0.75	0.067	
200	East Main Toe Drain	10/14/2010		1200	7.81	7.9		94.9		429		850	-3	-0.1	0.0988	28.6		1.06	1.14	0.082	
201	East Main Toe Drain	4/5/2011 14:06		1274	7.78	7.7		91.2	1230	472	8	972	24.2	10.7	0.0899	28.1		1.41	1.49	0.084	
202	East Main Toe Drain	5/11/2011 8:20		1295	7.79	7.5		88.1	1260	468	8.02	941	-3	0.12	0.0793	32.2		1.56	1.65	0.096	
203	East Main Toe Drain	5/18/2011 9:08		1303	7.68	7.3		88.5		459		961	-3	1.24	0.0743	29.3		1.51	1.6	0.093	
204	East Main Toe Drain	6/9/2011 10:53		1218	7.95	8.7		86.6	1200	461	7.68	933	-3	0.41	0.0798	28.9		1.44	1.48	0.042	
205	East Main Toe Drain	7/13/2011 9:50		1214	8.32	7.4		86.8	1190	432	7.99	890	-3	0.38	0.0802	27		1.6	1.68	0.085	
206	East Main Toe Drain	8/3/2011 9:21		791	8.25	7.1		155	770	206	8.27	509	-3	0.25	0.178	29.2		0.037	0.037	-0.005	
208	East Main Toe Drain	8/31/2011 10:58		1130	8.1	7.9		86.6	1130	408	8.01	836	-3	0.41	0.0684	27.3		1.64	1.78	0.14	
209	East Main Toe Drain	10/5/2011 11:51		940	8.09	7.3		133	912	259	8.23	644	-3	0.39	0.132	28.6		0.063	0.063	-0.01	
210	East Main Toe Drain	10/31/2011 14:42		907	8.16	6.8		140	875	250	8.25	598	-3	0.33	0.136	28.9		-0.05	-0.051	-0.01	
213	East Main Toe Drain	4/26/2012 10:28		1156	8.01	3.4		121	1080	389	7.52	760	-3	0.15	0.0938	28.3	0.95	0.864	1.03	0.164	
214	East Main Toe Drain	5/2/2012 10:30		1310	7.045	2.5		79.2	1220	423	7.98	910	-3	2.1	0.186	28.6	1.09	-0.05	-0.051	-0.01	
215	East Main Toe Drain	6/7/2012 10:39		1158	7.84	8.3		83.9	1100	391	7.99	830	-3	0.47	0.0697	27.4	0.96	1.22	1.37	0.152	
216	East Main Toe Drain	6/28/2012 14:15		1143	8.07	9.4		88.2	1110	384	7.87	804	3.8	3.41	0.0699	26.5	0.93	1.18	1.33	0.147	
217	East Main Toe Drain	7/5/2012 11:52		1158	8.2	7.7		84.6	1090	389	8.06	832	-3	2.05	0.0558	26.6	0.92	1.36	1.54	0.176	
218	East Main Toe Drain	11/15/2012 13:26		1160	8.142	6.5		83.2	1100	402	8.03	828	-3	0.54	0.059	26.7	0.91	1.33	1.56	0.233	
219	East Main Toe Drain	2/7/2013 9:16		1179	7.967	6.9		84.3	1110	380	7.94	843	-3	0.63	0.0619	25.7	0.97	1.2	1.41	0.216	
221	East Main Toe Drain	5/1/2013 12:32		1187	7.592	8.3	8.3	81.3	1190	408	7.85	848	-3	0.21	0.0565	26.1	1.19	1.5	1.72	0.219	
222	East Main Toe Drain	6/6/2013 11:40		797	8.07	8.5	0.13	82	1170	401	8.07	818	-3	0.27	0.0607	27.3	0.93	1.53	1.76	0.232	
223	East Main Toe Drain	7/10/2013 10:57	Sample taken	812	7.99	8.5	0.18	80.6	1180	396	8.03	837	-3	0.28	0.0546	26.5	0.82	1.34	1.6	0.263	
224	East Main Toe Drain	8/8/2013 9:32	Most of the flow diverted to ABR	1183	7.993	8.5		78.3	1160	394	8.08	902	-3	0.13	0.0567	26.7	1.1	1.34	1.63	0.283	
225	East Main Toe Drain	9/5/2013 8:57	sample taken	1181	8.03	8.3		78	1160	396	7.91	883	-3	0.12	0.0571	29.4	0.92	1.32	1.6	0.283	
226	East Main Toe Drain	10/3/2013 9:00	sample taken	1187	7.996	8		78.4	1170	413	8.05	863	-3	0.35	0.0579	25.5	0.87	1.35	1.63	0.283	
227	East Main Toe Drain	11/5/2013 10:31	sample taken, toxicity mixed 50/50	1201	8.112	7.2		84.8	1170	413	8.03	863	-3	0.14	0.0576	26.5	0.9	1.36	1.64	0.281	
228	East Main Toe Drain	11/12/2013 11:58	sample taken, toxicity Q changed due to data entry error 14.08 seconds per 10 litre bucket flow	1200	8.206	7.7		85.7	1160	410	7.99	891	-3	0.16	0.0502	25.7	0.9	1.34	1.61	0.269	
229	East Main Toe Drain	12/5/2013 11:20	sample taken	1210	7.931	7.4	0	79.8	1170	424	7.95	893	-3	0.12	0.0534	27.7	0.87	1.48	1.76	0.28	
231	East Main Toe Drain	2/11/2014 11:16	Sample taken	1239	7.742	7.2	0	69.2	1220	405	8.06	893	-3	0.16	0.0561	27.1	0.94	1.84	2.12	0.281	
233	East Main Toe Drain	3/4/2014 9:59		1252	7.91	7.2	0	78.3	1220	422	8.07	901	-3	0.13	0.0547	26.7	1.03	1.86	2.14	0.277	
234	East Main Toe Drain	4/3/2014 9:38		1245	8.114	7.2	0	78.2	1220	451	8.11	897	-3	0.12	0.055	26.8	0.89	1.92	2.2	0.286	
235	East Main Toe Drain	5/1/2014 10:15	sample taken	1259	7.97	7.2	0	71.7	1200	429	7.99	912	-3	0.11	0.0475	26.6	0.85	1.89	2.18	0.284	
236	East Main Toe Drain	6/3/2014 12:35	Sample taken	1215	7.981	8.1	0	73.7	1200	425	8.04	870	-3	0.2	0.0429	29.6	0.89	2.26	2.55	0.294	
238	East Main Toe Drain	12/8/2014 12:21	Sample taken. Strong odour in shack.	1179	8.065	7.4	0.05	74.8	1150	375	8.09	790	-3	0.21	0.0886	27.5	0.91	0.871	1.1	0.225	
239	East Main Toe Drain	2/5/2015 11:45	Sample taken from discharge shack. ABR-IN feed rerouted to main seepage pond for approximately 20 hrs before taking sample	1225	8.149	7.7	0.95	79.4	1190	417	8.1	903	-3	0.62	0.0495	26	0.86	0.33	0.597	0.267	
240	East Main Toe Drain	3/5/2015 9:40	Sample taken. Shut off feed to ABR-IN and opened up feed to East MTD. Let run for approx 20 hrs. Should be same results for ABR-IN	1208	8.072	7.6	0.13	80.3	1150	408	7.91	885	-3	0.11	0.0423	27.2	0.94	0.194	0.407	0.214	
241	East Main Toe Drain	4/9/2015 10:30	Sample Taken	1246	8.286	7.5	0.2	89.2	1190	421	8.14	834	-3	0.18	0.083	27.7	0.89	0.036	0.111	0.0752	
246	West Main Toe Drain	8/8/2013 9:22	Does not include water diverted to ABR	1108	8.032	8.1		80.3	1100	349	8.04	794	-3	0.1	0.05	25.7	1.14	1.3	1.57	0.269	
247	West Main Toe Drain	9/5/2013 8:58	sample taken	1108	8.066	7.9		82.7	1080	344	7.92	825	-3	0.13	0.0513	28.6	0.95	1.29	1.56	0.273	
248	West Main Toe Drain	10/3/2013 8:58	sample taken	1114	8.051	7.9		80.8	1100	368	8.07	809	-3	0.13	0.0529	25.7	0.9	1.38	1.66	0.277	
249	West Main Toe Drain	11/5/2013 10:37	sample taken, toxicity mixed 50/50	1130	8.069	8		90.6	1110	363	8.06	810	-3	0.31	0.054	26.2	0.91	1.42	1.68	0.263	
250	West Main Toe Drain	11/12/2013 12:05	sample taken, W MTD has much higher flow than E MTD. Toxicity	1134	7.985	8		84.9	1060	366	8.04	821	-3	0.2	0.0473	24.8	0.93	1.41	1.67	0.263	
251	West Main Toe Drain	12/5/2013 11:31	sample taken	1146	8.029	8.3	0	83.3	1110	373	7.98	841	-3	0.21	0.0486	27.2	0.92	1.55	1.82	0.27	
252	West Main Toe Drain	1/7/2014 10:36	Sample taken	1156	7.99	8.4		79.8	1120	386	8.02	829	-3	0.1	0.0452	31.8	0.93	1.74	2	0.263	
253	West Main Toe Drain	2/11/2014 11:24	Ecoli and Coliform taken at 11:27 Sample taken	1174	7.854	9	0	74.8	1170	380	8.08	834	-3	0.46	0.0513	26.1	0.98	1.84	2.12	0.282	
254	West Main Toe Drain	3/4/2014 9:51		1195	8.01	8.8	0.07	80.7	1140	382	8.1	855	-3	0.11	0.0515	26	1.16	1.86	2.14	0.284	
255	West Main Toe Drain	4/3/2014 9:35		1184	8.253	9	0	81.6	1160	414	8.13	839	-3	0.11	0.0518	28.1	0.93	1.83	2.11	0.278	
256	West Main Toe Drain	5/1/2014 10:24	sample taken	1193	7.99	9	0	77.1	1150	386	7.97	857	-3	0.1	0.0436	27.7	0.9	1.82	2.1	0.275	
257	West Main Toe Drain	6/3/2014 12:43	Sample taken	1187	8.044	8.7	0	88.4	1170	389	8.09	850	-3	0.16	0.0555	28.7	0.95	1.42	1.66	0.24	

Index	Sample Point	Date	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Sulphide as S (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	Aluminum (Al)-Total	Antimony (Sb)-Total	Arsenic (As)-Total	Barium (Ba)-Total	Beryllium (Be)-Total	Bismuth (Bi)-Total	Boron (B)-Total	Cadmium (Cd)-Total	Calcium (Ca)-Total	Chromium (Cr)-Total	Cobalt (Co)-Total
148	E4 - Main Embankment Seepage Pond	8/4/2011 11:42	-0.001	0.0048	0.0101	544			5.44	3.5		-0.003	0.00082	0.00157	0.0411	-0.0001	-0.0005	0.107	-0.00007	164	-0.0005	-0.0001
149	E4 - Main Embankment Seepage Pond	9/8/2011 8:26	-0.001		0.0123	535			4.27	3.98		0.0032	0.00071	0.00185	0.0424	-0.0001	-0.0005	0.119	-0.00015	160	-0.0005	-0.0001
150	E4 - Main Embankment Seepage Pond	10/5/2011 11:20	-0.001	0.0054	0.0145	537			3.12	3.82		-0.003	0.00051	0.00141	0.0533	-0.0001	-0.0005	0.11	-0.00006	159	-0.0005	-0.0001
152	E4 - Main Embankment Seepage Pond	11/1/2011 10:43	0.0025	0.0073	0.0114	536			4.68	2.99		-0.003	0.00058	0.00164	0.0458	-0.0001	-0.0005	0.131	-0.00008	160	-0.0005	0.00012
153	E4 - Main Embankment Seepage Pond	12/5/2011 10:49	0.003	0.0074	0.0157	545			4.92	3.29		0.0146	0.00063	0.00145	0.0403	-0.0001	-0.0005	0.11	-0.0002	163	-0.0005	0.00016
154	E4 - Main Embankment Seepage Pond	1/4/2012 13:23	0.002	0.0064	0.0418	549			5.05	3.39		0.0038	0.00073	0.00153	0.0424	-0.0001	-0.0005	0.123		162	-0.0005	0.00016
155	E4 - Main Embankment Seepage Pond	2/8/2012 10:20	0.0043	0.0098	0.017	553			7.14	4.6		0.0041	0.0007	0.0017	0.0401	-0.0001	-0.0005	0.121	-0.00013	159	-0.0005	0.00015
156	E4 - Main Embankment Seepage Pond	3/14/2012 13:45	0.003	0.0096	0.0196	536			5.03	4.92		0.0069	0.00069	0.00157	0.0417	-0.0001	-0.0005	0.116	-0.00015	154	-0.0005	0.00013
158	E4 - Main Embankment Seepage Pond	5/2/2012 11:29	-0.001	0.0074	0.0259	434			3.43	4.32		-0.003	0.00057	0.00148	0.0365	-0.0001	-0.0005	0.103	-0.0002	137	-0.0005	0.00015
159	E4 - Main Embankment Seepage Pond	6/7/2012 9:10	-0.001	0.0061	0.0149	446			2.66	4.06		0.0037	0.0007	0.00161	0.0322	-0.0001	-0.0005	0.115	-0.00015	138	-0.0005	0.00011
160	E4 - Main Embankment Seepage Pond	7/5/2012 9:09	-0.001	0.0062	0.0118	490			3.02	5.31		-0.003	0.00067	0.00147	0.0345	-0.0001	-0.0005	0.097	-0.0001	141	-0.0005	0.00011
161	E4 - Main Embankment Seepage Pond	8/1/2012 11:03	0.0014	0.0085	0.0157	513			2.28	4.22		-0.003	0.00077	0.00174	0.0491	-0.0001	-0.0005	0.117	-0.0001	152	-0.0005	0.00015
162	E4 - Main Embankment Seepage Pond	9/6/2012 11:20	0.0014	0.0083	0.0135	528			3.58	3.19		-0.003	0.00094	0.00179	0.0487	-0.0001	-0.0005	0.134	-0.0001	149	-0.0005	-0.0001
163	E4 - Main Embankment Seepage Pond	10/3/2012 9:35	0.0013	0.0137	0.0228	515			2.71	3.71		-0.003	0.00063	0.00172	0.0476	-0.0001	-0.0005	0.135	-0.00006	149	-0.0005	-0.0001
164	E4 - Main Embankment Seepage Pond	11/15/2012 12:54	0.0026	0.0059	0.0126	544			2.79	3.28		-0.003	0.00066	0.00175	0.0462	-0.0001	-0.0005	0.117	-0.0001	162	-0.0005	0.00012
165	E4 - Main Embankment Seepage Pond	12/6/2012 10:20	0.0029	0.009	0.0152	517			2.81	5.57		-0.003	0.00059	0.00169	0.0459	-0.0001	-0.0005	0.12	-0.00012	146	-0.0005	0.00012
166	E4 - Main Embankment Seepage Pond	1/2/2013 14:27	0.0028	0.0086	0.0173	512			3.3	2.97		-0.003	0.00073	0.0017	0.0416	-0.0001	-0.0005	0.106	-0.0001	153	-0.0005	0.00021
167	E4 - Main Embankment Seepage Pond	2/6/2013 9:20	0.0039	0.0073	0.0107	544			937	4.24												
169	E4 - Main Embankment Seepage Pond	3/13/2013 13:20	0.005	0.0114	0.017	522			4.39	5.01												
170	E4 - Main Embankment Seepage Pond	4/4/2013 14:24	0.0189	0.0311	0.0335	547			3.14	4.3												
171	E4 - Main Embankment Seepage Pond	5/1/2013 9:12	0.0019	0.007	0.0169	509			3.36	4.45												
172	E4 - Main Embankment Seepage Pond	6/6/2013 9:21	-0.001	0.006	0.0118	530				4.81												
173	E4 - Main Embankment Seepage Pond	7/10/2013 10:11	0.0186	0.0268	0.033	492			2.55	3.81												
174	E4 - Main Embankment Seepage Pond	8/8/2013 9:55	-0.001	0.0061	0.0116	542			4.74	3.37												
175	E4 - Main Embankment Seepage Pond	9/5/2013 9:06	0.0018	0.0058	0.0134	521			13.6	2.85												
176	E4 - Main Embankment Seepage Pond	10/3/2013 8:48	0.0057	0.0083	0.0132	543			4.82	2.42												
177	E4 - Main Embankment Seepage Pond	11/5/2013 10:26	0.0026	0.005	0.0111	544			4.47	2												
178	E4 - Main Embankment Seepage Pond	12/5/2013 11:55	-0.001	0.0063	0.0112	543			4.04	2.8		-0.003	0.0006	0.0016	0.0466	-0.0001	-0.0005	0.108	-0.00011	159	-0.0005	0.00014
179	E4 - Main Embankment Seepage Pond	1/7/2014 10:27	0.0103	0.018	0.0203	536				2.36												
180	E4 - Main Embankment Seepage Pond	2/11/2014 11:00	0.0117	0.0173	0.0221	555			4.77	3.11												
181	E4 - Main Embankment Seepage Pond	3/4/2014 9:36	0.0082	0.0145	0.0171	542			5.12	2.93												
182	E4 - Main Embankment Seepage Pond	4/1/2014 11:35	0.0081	0.0131	0.0191	534			4.48	3.61												
183	E4 - Main Embankment Seepage Pond	5/1/2014 9:54	-0.001	0.0058	0.0217	378			3.94	3.78												
184	E4 - Main Embankment Seepage Pond	6/3/2014 12:59	-0.001	0.0038	0.0135	507			5.43	3.05		-0.003	0.00079	0.00141	0.032	-0.0001	-0.0005	0.094	-0.0001	147	-0.0005	0.0001
185	E4 - Main Embankment Seepage Pond	7/3/2014 12:52	-0.001	0.0049	0.0168	532			5.27	3.99		-0.003	0.00086	0.00218	0.0325	-0.0001	-0.0005	0.115	-0.0001	157	-0.0005	-0.0001
186	E4 - Main Embankment Seepage Pond	8/5/2014 8:25	-0.001	0.0053	0.0167	531			5.44	2.79		-0.003	0.0009	0.00188	0.034	-0.0001	-0.0005	0.113	0.000028	152	-0.0005	-0.0001
187	E4 - Main Embankment Seepage Pond	9/2/2014 11:43	-0.001	0.0076	0.0132	508			2.84	3.01		-0.003	0.00074	0.00177	0.0368	-0.0001	-0.0005	0.118	0.00002	141	-0.0005	-0.0001
188	E4 - Main Embankment Seepage Pond	10/1/2014 13:53	-0.001	0.0062	0.0142	517			2.18	3.05		-0.003	0.0005	0.00179	0.042	-0.0001	-0.0005	0.112	-0.00001	150	-0.0005	-0.0001
189	E4 - Main Embankment Seepage Pond	11/3/2014 11:15	-0.001	0.0079	0.0166	474			2.46	3.54		-0.003	0.00033	0.00149	0.0457	-0.0001	-0.0005	0.099	-0.00001	140	-0.0005	-0.0001
190	E4 - Main Embankment Seepage Pond	12/3/2014 11:58	0.0081	0.0163	0.022	511			2.72	3.64		-0.003	0.00036	0.00192	0.0498	-0.0001	-0.0005	0.111	0.00003	142	-0.0005	0.00016
191	E4 - Main Embankment Seepage Pond	1/8/2015 14:02	0.01	0.0164	0.0176	485			2.12	4.21		-0.003	0.00026	0.00146	0.0594	-0.0001	-0.0005	0.118	-0.00005	134	-0.0005	0.00011
192	E4 - Main Embankment Seepage Pond	2/2/2015 11:41	0.0097	0.0184	0.0271	460			1.91	4.15		-0.003	0.00025	0.00142	0.056	-0.0001	-0.0005	0.109	0.00002	134	-0.0005	0.00018
197	East Main Toe Drain	4/15/2010 13:30	0.0332	0.0446	0.0473	499			6.73	3.03		-0.002	0.00029	0.00061	0.0632	-0.001	-0.001	0.104	-0.000034	215	-0.001	-0.0002
198	East Main Toe Drain	7/8/2010	0.0472	0.067	0.099	336			0.47	3.15		0.0032	0.00086	0.00204	0.102	-0.0005	-0.0005	0.141	-0.0005	100	-0.0005	0.00048
199	East Main Toe Drain	8/5/2010	0.0293	0.0401	0.0438	456			0.88	3.25		-0.002	0.00066	0.00157	0.0662	-0.001	-0.001	0.144	-0.0008	122	-0.001	0.00036
200	East Main Toe Drain	10/14/2010	0.0271	0.0378	0.0391	479			4.14	3.92		0.0041	0.00056	0.00166	0.0762	-0.0005	-0.0005	0.171	-0.00015	135	-0.0005	0.00038
201	East Main Toe Drain	4/5/2011 14:06	0.0254	0.0369	0.0989	545			1.89	4.04		-0.003	0.00056	0.0018	0.081	-0.0005	-0.0005	0.156	-0.0002	148	-0.0005	0.00056
202	East Main Toe Drain	5/11/2011 8:20	0.0249	0.0338	0.0345	562			2.63	4.24		-0.003	0.00045	0.00166	0.0638	-0.0005	-0.0005	0.147	-0.00012	147	-0.0005	0.00043
203	East Main Toe Drain	5/18/2011 9:08	0.0215	0.0376	0.0391	549			1.58	4.14		-0.003	0.00047	0.00167	0.0638	-0.0005	-0.0005	0.144	0.000105	145	-0.0005	0.00045
204	East Main Toe Drain	6/9/2011 10:53	0.0226	0.0382	0.039	545			2.43	4.7		0.0038	0.00044	0.00148	0.0621	-0.0005	-0.0005	0.139	-0.00015	145	-0.0005	0.00043
205	East Main Toe Drain	7/13/2011 9:50	0.0229	0.0328	0.0358	513			2.08	4.39		0.0031	0.00043	0.0016	0.0634	-0.0001	-0.0005	0.153	-0.0001	136	-0.0005	0.00042
206	East Main Toe Drain	8/3/2011 9:21	0.101	0.118	0.13	201			0.35	4.99		-0.003	-0.0001	0.00277	0.212	-0.0001	-0.0005	0.121	-0.00004	64.5	-0.0005	0.00054
208	East Main Toe Drain	8/31/2011 10:58	0.0241		0.0328	471			2.59	4.14		0.0075	0.00047	0.0016	0.0618	-0.0001	-0.0005	0.146	-0.00015	129	-0.0005	0.00037
209	East Main Toe Drain	10/5/2011 11:51	0.0692	0.0931	0.853	307			0.27	4.62		-0.003	-0.0001	0.00238	0.161	-0.0001	-0.0005	0.137	-0.00004	81.1	-0.0005	0.00049
210	East Main Toe Drain	10/31/2011 14:42	0.0776	0.092	0.104	279			0.11	4.83		-0.003	-0.0001	0.00256	0.179	-0.0001	-0.0005	0.131	-0.00005	78	-0.0005	0.00052
213	East Main Toe Drain	4/26/2012 10:28	0.0479	0.0596	0.064	448			0.92	4.05		-0.003	0.00037	0.00178	0.096	-0.0001	-0.0005	0.133	-0.00011	121	-0.0005	0.00049
214	East Main Toe Drain	5/2/2012 10:30	0.0202	0.0252	0.0616	554			0.23	3.61		-0.003	-0.0001	0.00418	0.091	-0.0001	-0.0005	0.169	-0.0002	132	-0.0005	0.00064
215	East Main Toe Drain	6/7/2012 10:39	0.0239	0.033	0.0346	475			1.53	3.95		0.0032	0.0004	0.00158	0.0571	-0.0001	-0.0005	0.124	-0.0002	123	-0.0005	0.00035
216	East Main Toe Drain	6/28/2012 14:15	0.0244	0.0325	0.038	471			1.44	4.04		0.0033	0.0004	0.00154	0.0622	-0.0001	-0.0005	0.145	-0.0001	121	-0.0005	0.00036
217	East Main Toe Drain	7/5/2012 11:52	0.0242	0.0361	0.0358	472			1.66	4.17		-0.003	0.00037	0.00159	0.0618	-0.0001	-0.0005	0.116	-0.00015	120	-0.0005	0.00034
218	East Main Toe Drain	11/15/2012 13:26	0.0222	0.0304	0.0342	481			2.03	3.37		-0.003	0.00048	0.00159	0.0562	-0.0001	-0.0005	0.129	-0.00012	127	-0.0005	0.00035
219	East Main Toe Drain	2/7/2013 9:16	0.0234	0.0362	0.0412	488			1.4	4.51												
221	East Main Toe Drain	5/1/2013 12:32	0.0239	0.033	0.0341	506			1.7	4.87		-0.003	0.00046	0.00155	0.0564	-0.0001	-0.0005	0.128	0.000095	128	-0.0005	0.00033
222	East Main Toe Drain	6/6/2013 10:40	0.0297	0.0337	0.0357	512			1.78	4.38		0.0036	0.00045	0.00157	0.0567	-0.0001	-0.0005	0.139	-0.0002	125	-0.0005	0.00034
223	East Main Toe Drain	7/10/2013 10:57	0.0191	0.0298	0.0335	499			1.66	4.65		-0.003	0.00043	0.00148	0.0605	-0.0001	-0.0005	0.126	-0.0001	125	-0.0005	0.00032
224	East Main Toe Drain	8/8/2013 9:32	0.0218	0.0315	0.0328	503			1.63	4		-0.003	0.00043	0.00153	0.0543	-0.0001	-0.0005	0.118	-0.00011	124	-0.0005	0.0003
225	East Main Toe Drain	9/5/2013 8:57	0.0219	0.0318	0.0358	501			3.45	3.93		-0.003	0.00043	0.0015	0.057	-0.0001	-0.0005	0.125	-0.00012	124	-0.0005	0.00031
226	East Main Toe Drain	10/3/2013 9:00	0.0219	0.0333	0.0339	500			1.6	3.86		0.0035	0.00044	0.00154	0.0547	-0.0001	-0.0005	0.122	-0.00013	130	-0.0005	0.0003
227	East Main Toe Drain	11/5/2013 10:31	0.0217	0.0303	0.0314	507			1.61	3.34		-0.003	0.00048	0.00158	0.0554	-0.0001	-0.0005	0.117	-0.00015	129	-0.0005	0.00033
228	East Main Toe Drain	11/12/2013 11:58	0.0206	0.0301	0.0308	504			1.67	3.44		-0.003	0.00046	0.00167	0.0574	-0.0001	-0.0005	0.145	-0.00015	129	-0.0005	0.00032
229	East Main Toe Drain	12/5/2013 11:20	0.0222	0.0327	0.0335	518			1.73	3.48		-0.003	0.00049	0.0016	0.0553	-0.0001	-0.0005	0.122	-0.00012	135	-0.0005	0.00031
231	East Main Toe Drain	2/11/2014 11:16	0.0215	0.0341	0.0353	532			2.05	3.47		0.0031	0.00049	0.00168	0.0564	-0.0001	-0.0005	0.147	-0.00011	126	-0.0005	0.00031
233	East Main Toe Drain	3/4/2014 9:59	0.0244	0.0316	0.0322	528			2.15	2.94		-0.003	0.00048	0.00154	0.0524	-0.0001	-0.0005	0.132	-0.00012	133	-0.0005	0.00032
234	East Main Toe Drain	4/3/2014 9:38	0.0213	0.03	0.0308	532			2.22	3.44		-0.003	0.00049	0.00153	0.0531	-0.0001	-0.0005	0.129	-0.0001	143	-0.0005	0.00031
235	East Main Toe Drain	5/1/2014 10:15	0.0213	0.0306	0.0326	523			2.11	2.98		-0.003	0.00047	0.00163	0.0541	-0.0001	-0.0005	0.13	-0.00022	135	-0.0005	0.00033
236	East Main Toe Drain	6/3/2014 12:35	0.0169	0.0259	0.0259	513			2.54	3.36		0.0032	0.0005	0.00172	0.0499	-0.0001	-0.0005	0.12	-0.0002	133	-0.0005	0.00031
238	East Main Toe Drain	12/8/2014 12:21	0.0289	0.0392	0.0415	488			1.1	3.67		-0.003	0.00044	0.00213	0.053	-0.0001	-0.0005	0.127	0.000049	118	-0.0005	0.00028
239	East Main Toe Drain	2/5/2015 11:45	0.0202	0.0344	0.0344	498			0.63	4.15		-0.003	0.00044	0.00185	0.056	-0.0001	-0.0005	0.132	0.000036	132	-0.0005	0.00029
240	East Main Toe Drain	3/5/2015 9:40	0.02	0.0306	0.0324	500			0.464	4.21		0.0097	0.00048	0.00208	0.056	-0.0001	-0.0005	0.136	0.000046	129	-0.0005	0.0003
241	East Main Toe Drain	4/9/2015 10:30	0.0382	0.052	0.0469	522			0.202	4.16		0.0054	0.0005	0.0024	0.056	-0.0001	-0.00005	0.121	0.0000423	135	-0.0005	0.00028
246	West Main Toe Drain	8/8/2013 9:22	0.0149	0.0253	0.0252	459			1.6	3.59		-0.003	0.00039	0.00178	0.0614	-0.0001	-0.0005	0.126	-0.0001	111	-0.0005	0.00035
247	West Main Toe Drain	9/5/2013 8:58	0.0139	0.0256	0.0253	452			3.26	3.32		0.0031	0.00039	0.00175	0.0628	-0.0001	-0.0005	0.136	-0.0001	109	-0.0005	0.00035
248	West Main Toe Drain	10/3/2013 8:58	0.0141	0.0248	0.025	456			1.61	3.49		-0.003	0.0004	0.00184	0.0595	-0.0001	-0.0005	0.133	-0.00013	117	-0.0005	0.00035
249	West Main Toe Drain	11/5/2013 10:37	0.0145	0.0225	0.0234	460			1.65	2.94		0.0033	0.00046	0.00188	0.0612	-0.0001	-0.0005	0.125	-0.00015	115	-0.0005	0.0004
250	West Main Toe Drain	11/12/2013 12:05	0.0127	0.0233	0.0242	463			1.63	3		0.0031	0.00041	0.00192	0.0624	-0.0001	-0.0005	0.152	-0.00012	116	-0.0005	0.00038
251	West Main Toe Drain	12/5/2013 11:31	0.0146	0.0245	0.0251	480			1.75	2.97		-0.003	0.00044	0.00179	0.0591	-0.0001	-0.0005	0.131	-0.0001	119	-0.0005	0.00036
252	West Main Toe Drain	1/7/2014 10:36	0.0137	0.0242	0.0241	481				3.03												
253	West Main Toe Drain	2/11/2014 11:24	0.0126	0.0253	0.0258	491			2.07	2.81		0.0031	0.00047	0.00197	0.0612	-0.0001	-0.0005	0.173	-0.00009	120	-0.0005	0.00036
254	West Main Toe Drain	3/4/2014 9:51	0.0154	0.0237	0.0247	486			2.17	2.51		-0.003	0.00043	0.00184	0.0561	-0.0001	-0.0005	0.133	-0.0001	121	-0.0005	0.00038
255	West Main Toe Drain	4/3/2014 9:35	0.0127	0.0256	0.0253	494			2.14	3.01		-0.003	0.00042	0.00192	0.0577	-0.0001	-0.0005	0.146	-0.00015	132	-0.0005	0.00038
256	West Main Toe Drain	5/1/2014 10:24	0.0136	0.0241	0.0245	482			2.03	2.58		0.0035	0.00042	0.00183	0.0579	-0.0001	-0.0005	0.14	-0.00008	122	-0.0005	0.00039
257	West Main Toe Drain	6/3/2014 12:43	0.0143	0.025	0.0262	488			1.69	3.11		0.0074	0.00035	0.00185	0.073	-0.0001	-0.0005	0.133	-0.0001	122	-0.0005	0.00045

Index	Sample Point	Date	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Lithium (Li)-Total	Magnesium (Mg)-Total	Manganese (Mn)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Potassium (K)-Total	Selenium (Se)-Total	Silicon (Si)-Total	Silver (Ag)-Total	Sodium (Na)-Total	Strontium (Sr)-Total	Thallium (Tl)-Total	Tin (Sn)-Total
148	E4 - Main Embankment Seepage Pond	8/4/2011 11:42	0.00334	-0.03	-0.00005	0.0064	23.3	0.0609	-0.00005	0.167	-0.0005	11.1	0.0147	5.09	-0.00001	63.8	1.75	-0.00001	-0.0001
149	E4 - Main Embankment Seepage Pond	9/8/2011 8:26	0.00244	-0.03	-0.00005	0.00695	23.5	0.000392		0.159	-0.0005	12.3	0.0126	3.81	-0.00001	74.8	1.67	-0.00001	-0.0001
150	E4 - Main Embankment Seepage Pond	10/5/2011 11:20	0.00213	-0.03	-0.00005	0.00504	23	0.0753		0.139	-0.0005	11.3	0.0106	5.06	-0.00001	74.5	1.59	-0.00001	-0.0001
152	E4 - Main Embankment Seepage Pond	11/1/2011 10:43	0.00242	-0.03	-0.00005	0.00641	22	0.121	-0.00005	0.165	-0.0005	12.2	0.0115	5.29	-0.00001	78.6	1.66	-0.00001	-0.0001
153	E4 - Main Embankment Seepage Pond	12/5/2011 10:49	0.00373	-0.03	-0.00005	0.00714	21.8	0.148		0.161	-0.0005	12.3	0.0122	5.78	-0.00001	81.8	1.74	-0.00001	-0.0001
154	E4 - Main Embankment Seepage Pond	1/4/2012 13:23	0.00267	-0.03	-0.00005	0.00628	20.4	0.197		0.16	-0.0005	12.3	0.0124	5.82	-0.00001	84.2	1.7	-0.00001	-0.0001
155	E4 - Main Embankment Seepage Pond	2/8/2012 10:20	0.00319	-0.03	-0.00005	0.00687	21.5	0.188	-0.00005	0.169	-0.0005	13	0.0133	5.9	-0.00001	85.9	1.62	0.000031	-0.0001
156	E4 - Main Embankment Seepage Pond	3/14/2012 13:45	0.00318	-0.03	-0.00005	0.00564	19.4	0.183		0.155	-0.0005	11.2	0.0116	5.64	-0.00001	80	1.55	0.000021	-0.0001
158	E4 - Main Embankment Seepage Pond	5/2/2012 11:29	0.00431	-0.03	-0.00005	0.00523	18.9	0.149	-0.00005	0.165	-0.0005	9.94	0.00999	3.58	-0.00001	62.3	1.67	-0.00001	-0.0001
159	E4 - Main Embankment Seepage Pond	6/7/2012 9:10	0.00374	-0.03	0.000152	0.0062	18.8	0.143		0.164	-0.0005	10.2	0.00942	3.09	-0.00001	66.7	1.7	-0.00001	-0.0001
160	E4 - Main Embankment Seepage Pond	7/5/2012 9:09	0.00362	-0.03	-0.00005	0.00568	22	0.158		0.164	-0.0005	9.63	0.011	3.71	-0.00001	67	1.92	-0.00001	-0.0001
161	E4 - Main Embankment Seepage Pond	8/1/2012 11:03	0.00213	-0.03	-0.00005	0.00711	21.9	0.269	-0.00001	0.17	-0.0005	11.6	0.00971	4.82	-0.00001	77.3	2.27	-0.00001	-0.0001
162	E4 - Main Embankment Seepage Pond	9/6/2012 11:20	0.00194	-0.03	-0.00005	0.00997	20.9	0.0706		0.192	-0.0005	15	0.0132	5.95	-0.00001	92.2	1.75	-0.00001	-0.0001
163	E4 - Main Embankment Seepage Pond	10/3/2012 9:35	0.00155	-0.03	-0.00005	0.00809	20.2	0.0929		0.188	-0.0005	13.6	0.0098	6.48	-0.00001	87.6	1.7	-0.00001	-0.0001
164	E4 - Main Embankment Seepage Pond	11/15/2012 12:54	0.002	-0.03	-0.00005	0.00872	21.2	0.109	-0.00001	0.187	-0.0005	12.1	0.0133	6.02	-0.00001	81	1.82	-0.00001	-0.0001
165	E4 - Main Embankment Seepage Pond	12/6/2012 10:20	0.00208	-0.03	-0.00005	0.0071	21.5	0.139		0.164	-0.0005	12.7	0.0118	6.02	-0.00001	79.5	1.77	-0.00001	-0.0001
166	E4 - Main Embankment Seepage Pond	1/2/2013 14:27	0.00284	-0.03	-0.00005	0.00785	20.9	0.239		0.183	-0.0005	12	0.0138	6.2	-0.00001	84.8	1.84	-0.00001	-0.0001
167	E4 - Main Embankment Seepage Pond	2/6/2013 9:20																	
169	E4 - Main Embankment Seepage Pond	3/13/2013 13:20																	
170	E4 - Main Embankment Seepage Pond	4/4/2013 14:24																	
171	E4 - Main Embankment Seepage Pond	5/1/2013 9:12																	
172	E4 - Main Embankment Seepage Pond	6/6/2013 9:21																	
173	E4 - Main Embankment Seepage Pond	7/10/2013 10:11																	
174	E4 - Main Embankment Seepage Pond	8/8/2013 9:55																	
175	E4 - Main Embankment Seepage Pond	9/5/2013 9:06																	
176	E4 - Main Embankment Seepage Pond	10/3/2013 8:48																	
177	E4 - Main Embankment Seepage Pond	11/5/2013 10:26																	
178	E4 - Main Embankment Seepage Pond	12/5/2013 11:55	0.00239	-0.03	-0.00005	0.00732	21.6	0.192		0.172	-0.0005	11.9	0.0152	6.49	-0.00001	79.1	1.72	-0.00001	-0.0001
179	E4 - Main Embankment Seepage Pond	1/7/2014 10:27																	
180	E4 - Main Embankment Seepage Pond	2/11/2014 11:00																	
181	E4 - Main Embankment Seepage Pond	3/4/2014 9:36																	
182	E4 - Main Embankment Seepage Pond	4/1/2014 11:35																	
183	E4 - Main Embankment Seepage Pond	5/1/2014 9:54																	
184	E4 - Main Embankment Seepage Pond	6/3/2014 12:59	0.00281	-0.03	-0.00005	0.00664	22.2	0.142		0.179	-0.0005	8.92	0.0224	4.27	-0.00001	68.1	1.77	-0.00001	-0.0001
185	E4 - Main Embankment Seepage Pond	7/3/2014 12:52	0.00279	-0.03	-0.00005	0.0083	23.5	0.000429		0.218	-0.0005	9.86	0.0235	4.72	-0.00001	70.7	2.03	-0.00001	-0.0001
186	E4 - Main Embankment Seepage Pond	8/5/2014 8:25	0.00369	-0.03	-0.00005	0.0089	24.4	0.0784		0.18	-0.0005	8.34	0.0243	5.14	-0.00001	59.2	2.11	-0.00001	-0.0001
187	E4 - Main Embankment Seepage Pond	9/2/2014 11:43	0.0018	-0.03	-0.00005	0.00795	21.6	0.201		0.175	-0.0005	10.4	0.011	5.89	-0.00001	71.7	1.81	-0.00001	-0.0001
188	E4 - Main Embankment Seepage Pond	10/1/2014 13:53	0.0023	-0.03	-0.00005	0.00747	24.6	0.125		0.162	-0.0005	11.2	0.00893	5.28	-0.00001	81.5	2.06	-0.00001	-0.0001
189	E4 - Main Embankment Seepage Pond	11/3/2014 11:15	0.00203	-0.03	-0.00005	0.00685	23.3	0.0643		0.145	-0.0005	10.6	0.0101	5.21	-0.00001	68.1	2.1	-0.00001	-0.0001
190	E4 - Main Embankment Seepage Pond	12/3/2014 11:58	0.0015	-0.03	-0.00005	0.00664	23.3	0.263		0.165	-0.0005	11.6	0.0108	5.85	-0.00001	77.8	2.32	-0.00001	-0.0001
191	E4 - Main Embankment Seepage Pond	1/8/2015 14:02	0.00122	-0.03	-0.00005	0.00637	23.1	0.44		0.141	-0.0005	11.8	0.00895	5.93	-0.00001	76	2.31	-0.00001	-0.0001
192	E4 - Main Embankment Seepage Pond	2/2/2015 11:41	0.00119	-0.03	-0.00005	0.00582	23	0.508		0.128	-0.0005	11.4	0.00809	6.09	-0.00001	70.9	2.11	-0.00001	-0.0001
197	East Main Toe Drain	4/15/2010 13:30	0.00317	-0.03	-0.0001	-0.01	29	0.0246		0.185	-0.001	6.44	0.0239	5.98	-0.00002	53	3.07	-0.0002	-0.0002
198	East Main Toe Drain	7/8/2010	0.019	-0.03	-0.00005	0.0055	16.6	1.05		0.14	-0.0005	13	0.0041	6.4	0.00003	86.1	1.24	-0.0001	-0.0001
199	East Main Toe Drain	8/5/2010	-0.008	-0.03	-0.0001	-0.01	20.2	0.623		0.15	-0.001	15.4	0.0025	5.9	-0.00002	86.3	1.76	-0.0002	-0.0002
200	East Main Toe Drain	10/14/2010	0.0022	-0.03	-0.00005	0.006	21.9	0.772		0.187	0.00068	16.8	0.0023	6.34	-0.00001	89.7	2.02	-0.0001	-0.0001
201	East Main Toe Drain	4/5/2011 14:06	0.0109	-0.03	-0.00005	0.0075	24.6	0.942		0.184	0.00069	16.5	0.00229	6.25	-0.00001	95.7	2.21	-0.0001	-0.0001
202	East Main Toe Drain	5/11/2011 8:20	0.00317	-0.03	-0.00005	0.0064	24.4	0.849		0.168	0.00071	16.6	0.00231	6.15	-0.00001	93.9	2.29	-0.0001	-0.0001
203	East Main Toe Drain	5/18/2011 9:08	0.00321	-0.03	-0.00005	0.0065	23.6	0.829		0.172	0.00099	16.5	0.00238	5.92	-0.00001	95.1	2.33	-0.0001	-0.0001
204	East Main Toe Drain	6/9/2011 10:53	0.00333	-0.03	-0.00005	0.0067	23.9	0.854		0.186	0.00163	16.5	0.00203	6.13	-0.00001	103	2.31	-0.0001	-0.0001
205	East Main Toe Drain	7/13/2011 9:50	0.00291	-0.03	-0.00005	0.00648	22.5	0.8		0.183	0.00072	15.5	0.00252	5.92	-0.00001	89.7	2.13	-0.00001	-0.0001
206	East Main Toe Drain	8/3/2011 9:21	-0.0005	-0.03	-0.00005	0.00344	11	1.88		0.18	-0.0005	11	-0.0005	6.39	-0.00001	76.8	0.817	-0.00001	-0.0001
208	East Main Toe Drain	8/31/2011 10:58	0.00268	-0.03	-0.00005	0.00688	21.1	0.72		0.176	0.00061	16.1	0.00257	6.09	-0.00001	90.7	2.04	-0.00001	-0.0001
209	East Main Toe Drain	10/5/2011 11:51	-0.0005	-0.03	-0.00005	0.00384	13.8	1.46		0.174	-0.0005	12.3	-0.0005	6.18	-0.00001	88.5	1.06	-0.00001	-0.0001
210	East Main Toe Drain	10/31/2011 14:42	-0.0005	-0.03	-0.00005	0.0034	13.3	1.75		0.172	-0.0005	12.9	-0.0005	6.4	-0.00001	93.2	0.991	-0.00001	-0.0001
213	East Main Toe Drain	4/26/2012 10:28	0.00264	-0.03	-0.00005	0.00661	21	1.13		0.195	0.00125	14.1	0.00159	6.13	-0.00001	89.6	1.67	-0.00001	-0.0001
214	East Main Toe Drain	5/2/2012 10:30	-0.0005	-0.03	-0.00005	0.0065	22.5	0.925		0.159	0.00061	15.7	-0.0005	5.9	-0.00001	108	1.62	-0.00001	-0.0001
215	East Main Toe Drain	6/7/2012 10:39	0.00306	-0.03	-0.00005	0.00657	20.4	0.685		0.176	0.00064	15	0.00317	5.99	-0.00001	87.9	1.72	-0.00001	-0.0001
216	East Main Toe Drain	6/28/2012 14:15	0.00308	-0.03	-0.00005	0.00745	20	0.686		0.193	0.00181	14.7	0.00368	5.96	-0.00001	89.1	1.88	-0.00001	-0.0001
217	East Main Toe Drain	7/5/2012 11:52	0.00264	-0.03	-0.00005	0.00566	21.6	0.673		0.16	0.00081	14.3	0.00409	6.21	-0.00001	89.1	1.53	-0.00001	-0.0001
218	East Main Toe Drain	11/15/2012 13:26	0.00324	-0.03	-0.00005	0.00743	20.2	0.617		0.203	0.00074	14.4	0.00416	6.09	-0.00001	86.9	1.95	-0.00001	-0.0001
219	East Main Toe Drain	2/7/2013 9:16																	
221	East Main Toe Drain	5/1/2013 12:32	0.00288	-0.03	-0.00005	0.00673	21.5	0.619		0.199	0.00052	15.2	0.00565	6.08	-0.00001	89.4	1.93	-0.00001	-0.0001
222	East Main Toe Drain	6/6/2013 11:40	0.00344	-0.03	-0.00005	0.00792	21.9	0.623		0.206	-0.0005	14.9	0.00579	6.18	-0.00001	90.1	2	-0.00001	-0.0001
223	East Main Toe Drain	7/10/2013 10:57	0.00301	-0.03	-0.00005	0.00703	20.5	0.637		0.203	-0.0005	15.5	0.00564	5.87	-0.00001	89.6	1.97	-0.00001	-0.0001
224	East Main Toe Drain	8/8/2013 9:32	0.00228	-0.03	-0.00005	0.00693	20.6	0.632		0.204	-0.0005	15.2	0.00544	5.74	-0.00001	91.3	1.9	-0.00001	-0.0001
225	East Main Toe Drain	9/5/2013 8:57	0.00281	-0.03	-0.00005	0.00668	20.7	0.611		0.208	-0.0005	14.7	0.00565	5.64	-0.00001	89.7	1.84	-0.00001	-0.0001
226	East Main Toe Drain	10/3/2013 9:00	0.00241	-0.03	-0.00005	0.00702	21.6	0.573		0.205	-0.0005	14.2	0.0057	6.19	-0.00001	86.4	1.94	-0.00001	-0.0001
227	East Main Toe Drain	11/5/2013 10:31	0.00251	-0.03	-0.00005	0.00737	21.8	0.614	-0.00001	0.225	-0.0005	14.7	0.00558	6.28	-0.00001	89.6	1.99	-0.00001	-0.0001
228	East Main Toe Drain	11/12/2013 11:58	0.00188	-0.03	-0.00005	0.00787	21.4	0.615		0.208	-0.0005	15.5	0.00573	5.99	-0.00001	87.3	1.95	-0.00001	-0.0001
229	East Main Toe Drain	12/5/2013 11:20	0.0027	-0.03	-0.00005	0.00735	21.3	0.594		0.207	-0.0005	15.6	0.00587	6.24	-0.00001	87.8	1.99	-0.00001	-0.0001
231	East Main Toe Drain	2/11/2014 11:16	0.00321	-0.03	-0.00005	0.00764	21.7	0.605		0.198	0.00052	16	0.00651	5.86	-0.00001	89.8	1.99	-0.00001	-0.0001
233	East Main Toe Drain	3/4/2014 9:59	0.00237	-0.03	-0.00005	0.00739	22	0.585		0.208	0.00058	14.6	0.00712	5.93	-0.00001	97	2.07	-0.00001	-0.0001
234	East Main Toe Drain	4/3/2014 9:38	0.00342	-0.03	-0.00005	0.00758	23.1	0.589		0.21	-0.0005	15.3	0.00763	6.14	-0.00001	92.2	2.19	-0.00001	-0.0001
235	East Main Toe Drain	5/1/2014 10:15	0.00292	-0.03	-0.00005	0.0075	22.6	0.611		0.208	-0.0005	16.9	0.00778	6.06	-0.00001	98.5	2.46	-0.00001	-0.0001
236	East Main Toe Drain	6/3/2014 12:35	0.0039	-0.03	-0.00005	0.00729	22.1	0.517		0.206	-0.0005	14.7	0.00817	6.08	-0.00001	87.6	2.1	-0.00001	-0.0001
238	East Main Toe Drain	12/8/2014 12:21	0.0013	-0.03	-0.00005	0.00687	19.6	0.555		0.193	-0.0005	15	0.00337	6.17	-0.00001	88.9	1.92	-0.00001	-0.0001
239	East Main Toe Drain	2/5/2015 11:45	0.00298	-0.03	-0.00005	0.00722	21.4	0.557		0.224	-0.0005	15.4	0.00259	6	-0.00001	92.6	2.13	-0.00001	-0.0001
240	East Main Toe Drain	3/5/2015 9:40	0.00549	0.036	-0.00005	0.00791	20.7	0.565		0.224	-0.0005	0.00255	5.98		-0.00001	92.5	2.15	-0.00001	-0.0001
241	East Main Toe Drain	4/9/2015 10:30	0.00349	0.046	-0.00005	0.0062	21.4	0.552		0.227	-0.0005	0.00165	6.44		-0.00001	82.2	2.17	-0.00001	-0.0001
246	West Main Toe Drain	8/8/2013 9:22	-0.0019	-0.03	-0.00005	0.00586	17.5	0.351		0.187	-0.0005	14.4	0.00451	6.02	-0.00001	87.6	1.82	-0.00001	-0.0001
247	West Main Toe Drain	9/5/2013 8:58	0.00204	-0.03	-0.00005	0.006	17.3	0.341		0.19	-0.0005	14.7	0.00479	5.83	-0.00001	90.2	1.78	-0.00001	-0.0001
248	West Main Toe Drain	10/3/2013 8:58	0.00182	-0.03	-0.00005	0.00655	18.6	0.325		0.191	0.00054	14	0.00479	6.51	-0.00001	86.4	1.92	-0.00001	-0.0001
249	West Main Toe Drain	11/5/2013 10:37	0.00226	-0.03	-0.00005	0.00702	18.4	0.362	-0.00001	0.204	-0.0005	14.7	0.00481	6.41	-0.00001	91.8	1.95	-0.00001	-0.0001
250	West Main Toe Drain	11/12/2013 12:05	0.00173	-0.03	-0.00005	0.00663	18.5	0.357		0.192	-0.0005	15.7	0.00507	6.28	-0.00001	89.3	1.88	-0.00001	-0.0001
251	West Main Toe Drain	12/5/2013 11:31	0.00235	-0.06	-0.00005	0.00658	18.1	0.35		0.193	-0.0005	15.5	0.0051	6.25	-0.00001	91.9	2.07	-0.00001	-0.0001
252	West Main Toe Drain	1/7/2014 10:36																	
253	West Main Toe Drain	2/11/2014 11:24	0.00233	-0.03	-0.00005	0.00803	19.8	0.369		0.179	-0.0005	16.8	0.00571	6.51	-0.00001	92.1	1.94	-0.00001	-0.0001
254	West Main Toe Drain	3/4/2014 9:51	0.00213	-0.03	-0.00005	0.00733	19.5	0.359		0.198	-0.0005	15.5	0.00631	6.39	-0.00001	98.1	2.1	-0.00001	-0.0001
255	West Main Toe Drain	4/3/2014 9:35	0.00256	-0.03	-0.00005	0.00759	20.5	0.365		0.186	-0.0005	16.1	0.00656	6.63	-0.00001	94.4	2.17	-0.00001	-0.0001
256	West Main Toe Drain	5/1/2014 10:24	0.00245	-0.03	-0.00005	0.00695	19.8	0.353		0.183	-0.0005	15.9	0.00661	6.47	-0.00001	90	2.15	-0.00001	-0.0001
257	West Main Toe Drain	6/3/2014 12:43	0.00166	-0.03	-0.00005	0.00711	20.2	0.365		0.172	-0.0005	15.9	0.00452	6.57	-0.00001	90.8	2.11	-0.00001	-0.0001

Index	Sample Point	Date	Titanium (Ti)-Total	Uranium (U)-Total	Vanadium (V)-Total	Zinc (Zn)-Total	Aluminum (Al)-Dissolved	Antimony (Sb)-Dissolved	Arsenic (As)-Dissolved	Barium (Ba)-Dissolved	Beryllium (Be)-Dissolved	Bismuth (Bi)-Dissolved	Boron (B)-Dissolved	Cadmium (Cd)-Dissolved	Calcium (Ca)-Dissolved	Chromium (Cr)-Dissolved	Cobalt (Co)-Dissolved	Copper (Cu)-Dissolved	Iron (Fe)-Dissolved	Lead (Pb)-Dissolved	Lithium (Li)-Dissolved	Magnesium (Mg)-Dissolved
148	E4 - Main Embankment Seepage Pond	8/4/2011 11:42	-0.01	0.00126	0.0012	-0.003	0.0705	0.0008	0.00172	0.0419	-0.0001	-0.0005	0.113	0.000047	169	-0.0005	0.00012	0.00485	0.089	-0.00005	0.00646	24.1
149	E4 - Main Embankment Seepage Pond	9/8/2011 8:26	-0.01	0.00117	0.001	-0.003	0.0417	0.00069	0.0019	0.0438	-0.0001	-0.0005	0.123	0.000062	160	-0.0005	0.00014	0.00457	0.062	0.000086	0.00705	23.7
150	E4 - Main Embankment Seepage Pond	10/5/2011 11:20	-0.01	0.000973	-0.001	-0.003	0.0693	0.00054	0.0014	0.0542	-0.0001	-0.0005	0.112	0.000027	161	-0.0005	0.00014	0.00404	0.083	0.000059	0.00523	23.3
152	E4 - Main Embankment Seepage Pond	11/1/2011 10:43	-0.01	0.00111	-0.001	-0.003	0.0634	0.00057	0.00171	0.0461	-0.0001	-0.0005	0.131	0.00005	157	-0.0005	0.00016	-0.004	0.078	-0.00005	0.00627	21.7
153	E4 - Main Embankment Seepage Pond	12/5/2011 10:49	-0.01	0.00109	-0.001	0.0037	0.136	0.00058	0.0016	0.0415	-0.0001	-0.0005	0.107	0.000085	162	-0.0005	0.00023	0.00629	0.171	0.000068	0.00655	21.6
154	E4 - Main Embankment Seepage Pond	1/4/2012 13:23	-0.01	0.00107	-0.001	0.0271	1.3	0.00072	0.00201	0.0515	-0.0001	-0.0005	0.126	0.000107	166	0.0027	0.00085	0.0106	1.62	0.000443	0.00781	21.3
155	E4 - Main Embankment Seepage Pond	2/8/2012 10:20	-0.01	0.000918	-0.001	-0.003	0.121	0.00073	0.0019	0.0418	-0.0001	-0.0005	0.128	0.000075	162	-0.0005	0.00022	0.00578	0.203	0.000076	0.00723	21.5
156	E4 - Main Embankment Seepage Pond	3/14/2012 13:45	0.011	0.000926	-0.001	-0.003	0.182	0.00065	0.00168	0.0427	-0.0001	-0.0005	0.118	0.000066	152	-0.0005	0.00024	0.00738	0.205	0.000196	0.00573	19.1
158	E4 - Main Embankment Seepage Pond	5/2/2012 11:29	-0.01	0.00104	-0.001	-0.003	0.209	0.00056	0.00164	0.0382	-0.0001	-0.0005	0.106	0.000052	136	0.00058	0.00028	0.00796	0.289	0.00011	0.00551	18.8
159	E4 - Main Embankment Seepage Pond	6/7/2012 9:10	0.015	0.00104	-0.001	-0.003	0.224	0.00072	0.00154	0.0304	-0.0001	-0.0005	0.115	-0.00004	141	0.00055	0.00021	0.00791	0.31	0.000125	0.00661	19.7
160	E4 - Main Embankment Seepage Pond	7/5/2012 9:09	-0.01	0.00115	0.0011	-0.003	0.0437	0.00059	0.00158	0.0327	-0.0001	-0.0005	0.099	-0.00005	142	-0.0005	0.00014	0.00519	0.067	-0.00005	0.00635	22.6
161	E4 - Main Embankment Seepage Pond	8/1/2012 11:03	-0.01	0.00107	0.0012	-0.003	0.0805	0.0008	0.00186	0.0515	-0.0001	-0.0005	0.123	-0.00004	156	-0.0005	0.0002	0.00394	0.132	-0.00005	0.00737	22.6
162	E4 - Main Embankment Seepage Pond	9/6/2012 11:20	-0.01	0.00101	0.0018	-0.003	0.0703	0.00091	0.00193	0.0497	-0.0001	-0.0005	0.141	0.000034	148	-0.0005	0.00012	0.00376	0.08	-0.00005	0.0103	20.8
163	E4 - Main Embankment Seepage Pond	10/3/2012 9:35	-0.01	0.00101	0.0013	-0.003	0.116	0.00063	0.00187	0.0492	-0.0001	-0.0005	0.141	0.000034	155	-0.0005	0.00016	0.0045	0.161	0.000058	0.00868	20.9
164	E4 - Main Embankment Seepage Pond	11/15/2012 12:54	0.013	0.00105	0.0014	-0.003	0.0722	0.00064	0.00179	0.0447	-0.0001	-0.0005	0.117	-0.0001	156	-0.0005	0.00018	0.005	0.105	0.000096	0.00876	20.6
165	E4 - Main Embankment Seepage Pond	12/6/2012 10:20	-0.01	0.00111	0.0011	-0.003	0.0541	0.00062	0.0018	0.0458	-0.0001	-0.0005	0.127	-0.00012	143	-0.0005	0.00019	0.00392	0.091	0.000052	0.00835	21.6
166	E4 - Main Embankment Seepage Pond	1/2/2013 14:27	0.012	0.00112	0.0011	0.0039	0.0389	0.00077	0.00178	0.0405	-0.0001	-0.0005	0.104	-0.0001	146	-0.0005	0.00022	0.00617	0.082	0.000151	0.00832	20.1
167	E4 - Main Embankment Seepage Pond	2/6/2013 9:20					0.0692	0.00104	0.00184	0.048	-0.0001	-0.0005	0.127	-0.00005	159	-0.0005	0.00021	0.00418	0.084	-0.00005	0.00974	20.8
169	E4 - Main Embankment Seepage Pond	3/13/2013 13:20					0.146	0.0011	0.00196	0.0537	-0.0001	-0.0005	0.119	-0.0001	152	-0.0005	0.00026	0.00614	0.163	-0.00005	0.00925	19.5
170	E4 - Main Embankment Seepage Pond	4/4/2013 14:24					0.0107	0.00043	0.00196	0.0648	-0.0001	-0.0005	0.125	-0.0007	165	-0.0005	0.00029	0.00282	0.031	-0.00005	0.00639	25.2
171	E4 - Main Embankment Seepage Pond	5/1/2013 9:12					0.25	0.00074	0.00167	0.045	-0.0001	-0.0005	0.101	-0.0001	155	0.00056	0.0003	0.0047	0.282	0.000081	0.00633	21.8
172	E4 - Main Embankment Seepage Pond	6/6/2013 9:21					0.0696	0.00087	0.00185	0.0379	-0.0001	-0.0005	0.119	-0.00012	143	-0.0005	0.00022	0.00569	0.088	-0.00005	0.00805	21.6
173	E4 - Main Embankment Seepage Pond	7/10/2013 10:11					0.0055	0.0004	0.0017	0.0638	-0.0001	-0.0005	0.124	0.000054	137	-0.0005	0.00035	0.00273	0.056	-0.00005	0.00627	20.9
174	E4 - Main Embankment Seepage Pond	8/8/2013 9:55					0.0353	0.00092	0.00165	0.0408	-0.0001	-0.0005	0.113	-0.00008	138	-0.0005	0.00016	0.00346	0.053	-0.00005	0.00804	19.6
175	E4 - Main Embankment Seepage Pond	9/5/2013 9:06					0.0923	0.00088	0.00185	0.0487	-0.0001	-0.0005	0.129	-0.0001	142	-0.0005	0.00016	0.00386	0.12	-0.00005	0.00818	20.8
176	E4 - Main Embankment Seepage Pond	10/3/2013 8:48					0.124	0.0011	0.00204	0.0379	-0.0001	-0.0005	0.122	-0.00015	165	-0.0005	0.00018	0.00584	0.154	0.000056	0.00988	21.5
177	E4 - Main Embankment Seepage Pond	11/5/2013 10:26					0.0373	0.00099	0.00204	0.038	-0.0001	-0.0005	0.102	-0.00015	159	-0.0005	0.00013	0.00499	0.052	-0.00005	0.00894	21.5
178	E4 - Main Embankment Seepage Pond	12/5/2013 11:55	0.018	0.00105	0.0011	-0.003	0.0794	0.00067	0.00179	0.0483	-0.0001	-0.0005	0.113	-0.00011	157	-0.0005	0.0002	0.00405	0.209	-0.00005	0.0078	22
179	E4 - Main Embankment Seepage Pond	1/7/2014 10:27					0.0465	0.00067	0.00185	0.0461	-0.0001	-0.0005	0.114	-0.00012	160	-0.0005	0.00023	0.0044	0.069	-0.00005	0.00699	21.8
180	E4 - Main Embankment Seepage Pond	2/11/2014 11:00					0.0206	0.00074	0.0018	0.0409	-0.0001	-0.0005	0.129	-0.00013	162	-0.0005	0.00019	0.00437	-0.03	-0.00005	0.00812	23.1
181	E4 - Main Embankment Seepage Pond	3/4/2014 9:36					0.038	0.00074	0.00154	0.0357	-0.0001	-0.0005	0.104	-0.00014	158	-0.0005	0.00023	0.00561	0.055	-0.00005	0.00756	22
182	E4 - Main Embankment Seepage Pond	4/1/2014 11:35					0.12	0.00061	0.00167	0.0435	-0.0001	-0.0005	0.109	-0.00012	162	-0.0005	0.00027	0.00445	0.177	-0.00005	0.00764	23.2
183	E4 - Main Embankment Seepage Pond	5/1/2014 9:54					0.32	0.00055	0.0013	0.0372	-0.0001	-0.0005	0.082	-0.00022	123	0.00071	0.00036	0.00694	0.363	0.000118	0.00534	18.4
184	E4 - Main Embankment Seepage Pond	6/3/2014 12:59	-0.01	0.00133	0.0012	-0.003	0.0404	0.00085	0.00154	0.0327	-0.0001	-0.0005	0.097	-0.0001	150	-0.0005	0.00014	0.0054	0.048	-0.00005	0.00701	22.4
185	E4 - Main Embankment Seepage Pond	7/3/2014 12:52	0.014	0.0016	0.0013	-0.003	0.258	0.00089	0.0023	0.0349	-0.0001	-0.0005	0.11	-0.0002	156	0.00057	0.00028	0.00746	0.308	0.000099	0.00784	23.6
186	E4 - Main Embankment Seepage Pond	8/5/2014 8:25	0.015	0.00167	0.0014	-0.003	0.0698	0.00096	0.00202	0.0355	-0.0001	-0.0005	0.117	0.000026	154	-0.0005	0.00014	0.00543	0.094	-0.00005	0.00888	25.3
187	E4 - Main Embankment Seepage Pond	9/2/2014 11:43	0.014	0.00126	0.0013	-0.003	0.0196	0.00074	0.00179	0.0375	-0.0001	-0.0005	0.124	-0.00001	142	-0.0005	-0.0001	0.00347	0.033	-0.00005	0.0084	21.8
188	E4 - Main Embankment Seepage Pond	10/1/2014 13:53	0.02	0.00124	0.0012	-0.003	0.0579	0.00055	0.0018	0.0435	-0.0001	-0.0005	0.123	-0.00005	147	-0.0005	0.00011	0.00335	0.087	-0.00005	0.00796	24.2
189	E4 - Main Embankment Seepage Pond	11/3/2014 11:15	-0.01	0.00117	-0.001	-0.003	0.11	0.00045	0.00169	0.049	-0.0001	-0.0005	0.107	0.000014	145	-0.0005	0.00018	0.00463	0.134	0.000081	0.0074	24.3
190	E4 - Main Embankment Seepage Pond	12/3/2014 11:58	0.019	0.0012	-0.001	-0.003	0.0485	0.00042	0.0021	0.0519	-0.0001	-0.0005	0.117	0.000043	142	-0.0005	0.0002	0.00294	0.077	-0.00005	0.00694	23.5
191	E4 - Main Embankment Seepage Pond	1/8/2015 14:02	0.014	0.00105	-0.001	-0.003	0.0625	0.00033	0.00162	0.0628	-0.0001	-0.0005	0.127	-0.00005	140	-0.0005	0.00026	0.00256	0.101	0.000062	0.007	24.2
192	E4 - Main Embankment Seepage Pond	2/2/2015 11:41	-0.01	0.00097	-0.001	-0.003	0.0697	0.00025	0.00162	0.0575	-0.0001	-0.0005	0.113	0.00002	138	-0.0005	0.00024	0.00239	0.119	-0.00005	0.00617	23.8
197	East Main Toe Drain	4/15/2010 13:30	-0.01	0.00259	-0.002	-0.002	0.0064	0.00062	0.00145	0.0645	-0.001	-0.001	0.152	0.000073	119	-0.001	0.00032	0.00342	-0.03	-0.0001	-0.01	19.1
198	East Main Toe Drain	7/8/2010	-0.01	0.0012	-0.001	-0.001	1.47	0.00202	0.00403	0.147	-0.0005	-0.0005	0.131	-0.0009	97.8	0.00096	0.00159	0.331	2.09	0.000667	0.0061	17
199	East Main Toe Drain	8/5/2010	-0.01	0.00119	-0.002	0.0036	0.012	0.00068	0.00162	0.0673	-0.001	-0.001	0.149	-0.0008	123	-0.001	0.00041	-0.006	-0.03	-0.0001	-0.01	20.3
200	East Main Toe Drain	10/14/2010	-0.01	0.000995	-0.001	-0.003	0.0099	0.00059	0.00172	0.0779	-0.0005	-0.0005	0.174	-0.00015	136	-0.0005	0.0004	0.00301	-0.03	0.000075	0.006	22.2
201	East Main Toe Drain	4/5/2011 14:06	-0.01	0.0013	-0.001	0.0047	0.636	0.00084	0.00422	0.105	-0.0005	-0.0005	0.158	-0.00038	146	0.00054	0.00107	0.503	1.64	0.00112	0.0077	24.3
202	East Main Toe Drain	5/11/2011 8:20	-0.01	0.00128	-0.001	0.0036	0.0066	0.00045	0.0017	0.0648	-0.0005	-0.0005	0.155	-0.00012	151	-0.0005	0.00046	0.00387	-0.03	0.000078	0.0063	24.6
203	East Main Toe Drain	5/18/2011 9:08	-0.01	0.0012	-0.001	0.0056	0.0077	0.00048	0.00177	0.0664	-0.0005	-0.0005	0.148	0.00012	149	-0.0005	0.00048	0.00419	-0.03	0.000197	0.0065	24.5
204	East Main Toe Drain	6/9/2011 10:53	-0.01	0.00117	-0.001	0.0057	0.0041	0.00048	0.00164	0.0616	-0.0005	-0.0005	0.148	-0.00015	151	-0.0005	0.00045	0.00413	0.031	0.000297	0.007	24.9
205	East Main Toe Drain	7/13/2011 9:50	-0.01	0.0012	-0.001	0.0038	0.0053	0.00046	0.00173	0.0656	-0.0001	-0.0005	0.168	-0.00012	137	-0.0005	0.00043	0.00637	0.034	0.000267	0.00679	22.9
206	East Main Toe Drain	8/3/2011 9:21	-0.01	0.000826	-0.001	-0.003	0.0047	-0.0001	0.00282	0.219	-0.0001	-0.0005	0.127	-0.00004	66.5	-0.0005	0.00055	0.00061	0.131	0.000296	0.00359	11.4
208	East Main Toe Drain	8/31/2011 10:58	-0.01	0.00104	-0.001	0.0188	0.0053	0.00048	0.00172	0.0616	-0.0001	-0.0005	0.148	-0.00015	129	-0.0005	0.00038	0.00363	-0.03	0.00006	0.00686	21.2
209	East Main Toe Drain	10/5/2011 11:51	-0.01	0.000794	-0.001	-0.003	0.0078	-0.0001	0.00245	0.167	-0.0001	-0.0005	0.125	-0.00004	80	-0.0005	0.00053	0.0017	0.102	0.000091	0.00337	13.7
210	East Main Toe Drain	10/31/2011 14:42	-0.01	0.000738	-0.001	-0.003	0.0059	-0.0001	0.00257	0.182	-0.0001	-0.0005	0.132	-0.00005	79.2	-0.0005	0.00053	0.00056	0.113	-0.00005	0.00331	13.5
213	East Main Toe Drain	4/26/2012 10:28	-0.01	0.0013	-0.001	0.0061	0.0044	0.00038	0.00183	0.0959	-0.0001	-0.0005	0.133	-0.00012	120	-0.0005	0.00049	0.00395	-0.03	0.000166	0.00665	20.8
214	East Main Toe Drain	5/2/2012 10:30	-0.01	0.00062	-0.001	0.0036	0.0051	-0.0001	0.00494	0.0924	-0.0001	-0.0005	0.178	-0.0002	131	-0.0005	0.00067	0.00087	0.307	0.00007	0.00673	27.7
215	East Main Toe Drain	6/7/2012 10:39	0.015	0.00101	-0.001	0.0299	0.0218	0.00047	0.00171	0.0585	-0.0001	-0.0005	0.145	-0.0002	126	-0.0005	0.00037	0.00454	0.054	0.000078	0.00759	21
216	East Main Toe Drain	6/28/2012 14:15	-0.01	0.00111	-0.001	0.0053	0.185	0.00042	0.0017	0.066	-0.0001	-0.0005	0.15	-0.0001	124	-0.0005	0.00046	0.00678	0.235	0.000293	0.00768	20.8
217	East Main Toe Drain	7/5/2012 11:52	-0.01	0.000912	-0.001	0.0033	0.0647	0.00037	0.00168	0.0642	-0.0001	-0.0005	0.124	-0.00015	120	-0.0005	0.00041	0.00491	0.09	0.000192	0.00618	21.8
218	East Main Toe Drain	11/15/2012 13:26	0.012	0.00115	-0.001	0.0048	0.0442	0.0005	0.00173	0.0576	-0.0001	-0.0005	0.131	-0.00012	131	-0.0005	0.00035	0.00522	0.068	0.000073	0.0077	20.9
219	East Main Toe Drain	2/7/2013 9:16					0.0373	0.0004	0.00176	0.0664	-0.0001	-0.0005	0.101	-0.0001	120	-0.0005	0.00037	0.0104	0.078	0.00011	0.00612	19.6
221	East Main Toe Drain	5/1/2013 12:32	-0.01	0.00114	-0.001	0.006	0.0184	0.00051	0.00172	0.0571	-0.0001	-0.0005	0.133	0.000091	131	-0.0005	0.00035	0.00473	0.056	0.000071	0.00701	21.9
222	East Main Toe Drain	6/6/2013 11:40	0.01	0.00106	-0.001	0.0087	0.006	0.00043	0.00158	0.056	-0.0001	-0.0005	0.132	-0.0002	125	-0.0005	0.00036	0.00487	0.322	-0.00005	0.00792	22.4
223	East Main Toe Drain	7/10/2013 10:57	-0.01	0.001	-0.001	0.008	0.0063	0.00045	0.00163	0.0582	-0.0001	-0.0005	0.132	-0.0001	123	-0.0005	0.00033	0.00558	0.153	-0.00005	0.00742	20.3
224	East Main Toe Drain	8/8/2013 9:32	-0.01	0.000987	-0.001	-0.003	0.0042	0.00045	0.00168	0.0552	-0.0001	-0.0005	0.126	-0.00011	129	-0.0005	0.00033	0.00371	-0.03	-0.00005	0.00733	21.2
225	East Main Toe Drain	9/5/2013 8:57	-0.01	0.000964	-0.001	-0.003	0.0041	0.00045	0.00165	0.0568	-0.0001	-0.0005	0.135	-0.00012	126	-0.0005	0.00032	0.00389	-0.03	-0.00005	0.00706	21.1
226	East Main Toe Drain	10/3/2013 9:00	-0.01	0.00104	-0.001	-0.003	0.0042	0.00048	0.00169	0.0561	-0.0001	-0.0005	0.131	-0.00013	131	-0.0005	0.00031	0.00676	-0.03	0.000156	0.0076	21.8
227	East Main Toe Drain	11/5/2013 10:31	-0.01	0.0011	-0.001	-0.003	0.0041	0.00058	0.00192	0.0572	-0.0001	-0.0005	0.12	-0.00015	131	-0.0005	0.00034	0.00394	-0.03	-0.00005	0.0076	22
228	East Main Toe Drain	11/12/2013 11:58	-0.01	0.00107	-0.001	-0.003	0.0039	0.00051	0.0018	0.0599	-0.0001	-0.0005	0.154	-0.00015	131	-0.0005	0.00032	0.00332	-0.03	-0.00005	0.00835	22.1
229	East Main Toe Drain	12/5/2013 11:20	0.016	0.00108	-0.001	-0.003	0.0051	0.0005	0.00164	0.0563	-0.0001	-0.0005	0.122	-0.00012	136	-0.0005	0.00032	0.00353	-0.03	-0.00005	0.00722	21.7
231	East Main Toe Drain	2/11/2014 11:16	0.011	0.00108	-0.001	-0.003	0.0037	0.00051	0.00164	0.0554	-0.0001	-0.0005	0.149	-0.00011	137	-0.0005	0.00034	0.00374	-0.03	-0.00005	0.00804	23.7
233	East Main Toe Drain	3/4/2014 9:59	0.012	0.00111	-0.001	-0.003	-0.003	0.0005	0.0016	0.0514	-0.0001	-0.0005	0.137	-0.00012	134	-0.0005	0.0003	0.0035	-0.03	-0.00005	0.00759	22.6
234	East Main Toe Drain	4/3/2014 9:38	-0.01	0.00111	-0.001	-0.003	0.0071	0.00049	0.0017	0.053	-0.0001	-0.0005	0.134	-0.0001	147	-0.0005	0.00032	0.0151	0.051	-0.00005	0.00791	23.9
235	East Main Toe Drain	5/1/2014 10:15	0.014	0.00111	-0.001	-0.003	0.0046	0.00049	0.00168	0.0554	-0.0001	-0.0005	0.137	-0.00035	135	-0.0005	0.00034	0.00362	-0.03	-0.00005	0.00762	22.5
236	East Main Toe Drain	6/3/2014 12:35	-0.01	0.00104	-0.001	-0.003	0.054	0.00052	0.00197	0.0491	-0.0001	-0.0005	0.131	-0.00013	133	-0.0005	0.00035	0.011	0.112	-0.00005	0.00809	22.2
238	East Main Toe Drain	12/8/2014 12:21	-0.01	0.00098	-0.001	-0.003	0.0078	0.00044	0.00233	0.0524	-0.0001	-0.0005	0.13	0.000058	119	-0.0005	0.00029	0.00414	0.126	-0.00005	0.00697	19.7
239	East Main Toe Drain	2/5/2015 11:45	0.011	0.00103	-0.001	-0.003	0.0243	0.00044	0.00193	0.0571	-0.0001	-0.0005	0.137	0.000036	131	-0.0005	0.0003	0.00419	0.052	-0.00005	0.00745	21.5
240	East Main Toe Drain	3/5/2015 9:40	0.01	0.00105	-0.001	-0.003	-0.003	0.00044	0.0019	0.0554	-0.0001	-0.0005	0.126	0.000037	129	-0.0005	0.00028	0.00297	-0.03	-0.00005	0.00741	20.6
241	East Main Toe Drain	4/9/2015 10:30	0.013	0.00107	0.00105	-0.003	-0.003	0.0005	0.00229	0.0554	-0.0001	-0.00005	0.123	0.0000415	133	-0.0005	0.00028	0.00167	-0.03	-0.00005	0.0066	21.3
246	West Main Toe Drain	8/8/2013 9:22	-0.01	0.000822	-0.001	-0.003	0.0038	0.00041	0.00195	0.0634	-0.0001	-0.0005	0.134	-0.0001	111	-0.0005	0.00036	0.00271	-0.03	-0.00005	0.00641	17.9
247	West Main Toe Drain	9/5/2013 8:58	-0.01	0.000812	-0.001	-0.003	0.0039	0.00038	0.00192	0.0642	-0.0001	-0.0005	0.147	-0.00012	112	-0.0005	0.00039	0.00287	-0.03	-0.00005	0.00667	17.5
248	West Main Toe Drain	10/3/2013 8:58	-0.01	0.000826	-0.001	-0.003	0.0054	0.00041	0.00185	0.0594	-0.0001	-0.0005	0.138	-0.00013	114	-0.0005	0.00036	0.00255	-0.03	-0.00005	0.00663	18
249	West Main Toe Drain	11/5/2013 10:37	-0.01	0.000902	-0.001	-0.003	0.0042	0.00048	0.00212	0.0599	-0.0001	-0.0005	0.131	-0.00015	118	-0.0005	0.00037	0.00311	-0.03	-0.00005	0.00701	19.1
250	West Main Toe Drain	11/12/2013 12:05	-0.01	0.000898	-0.001	-0.003	0.0046	0.00047	0.00204	0.0626	-0.0001	-0.0005	0.161	-0.00012	119	-0.0005	0.00039	0.00302	-0.03	-0.00005	0.007	19.3
251	West Main Toe Drain	12/5/2013 11:31	-0.02	0.000955	-0.001	-0.003	0.0042	0.00045	0.00205	0.0598	-0.0001	-0.0005	0.133	-0.00011	127	-0.0005	0.00037	0.00318	-0.06	-0.00005	0.00672	19.5
252	West Main Toe Drain	1/7/2014 10:36					0.004	0.00046	0.00206	0.0603	-0.0001	-0.0005	0.143	-0.0001	123	-0.0005	0.00041	0.00309	-0.03	-0.00005	0.00649	19.1
253	West Main Toe Drain	2/11/2014 11:24	0.01	0.000938	-0.001	-0.003	0.0035	0.00049	0.00215	0.0624	-0.0001	-0.0005	0.175	-0.0001	123	-0.0005	0.00038	0.00313	-0.03	-0.00005	0.00814	20.1
254	West Main Toe Drain	3/4/2014 9:51	0.012	0.000933	-0.001	-0.003	0.0031	0.00048	0.00194	0.0575	-0.0001	-0.0005	0.146	-0.0001	126	-0.0005	0.00038	0.00312	-0.03	-0.00005	0.00741	20.1
255	West Main Toe Drain	4/3/2014 9:35	-0.01	0.000942	-0.001	-0.003	0.0042	0.00045	0.00201	0.0588	-0.0001	-0.0005	0.154	-0.00015	130	-0.0005	0.00038	0.00377	-0.03	-0.00005	0.00814	20.3
256	West Main Toe Drain	5/1/2014 10:24	0.013	0.000904	-0.001	-0.003	0.0045	0.00044	0.00199	0.0583	-0.0001	-0.0005	0.148	-0.00024	121	-0.0005	0.0004	0.00345	-0.03	-0.00005	0.00731	19.6
257	West Main Toe Drain	6/3/2014 12:43	-0.01	0.00088	-0.001	-0.003	0.0034	0.00036	0.00193	0.0706	-0.0001	-0.0005	0.141	-0.0001	121	-0.0005	0.00047	0.00248	-0.03	-0.00005	0.00728	20.1

Index	Sample Point	Date	Manganese (Mn)-Dissolved	Mercury (Hg)-Dissolved	Molybdenum (Mo)-Dissolved	Nickel (Ni)-Dissolved	Potassium (K)-Dissolved	Selenium (Se)-Dissolved	Silicon (Si)-Dissolved	Silver (Ag)-Dissolved	Sodium (Na)-Dissolved	Strontium (Sr)-Dissolved	Thallium (Tl)-Dissolved	Tin (Sn)-Dissolved	Titanium (Ti)-Dissolved	Uranium (U)-Dissolved	Vanadium (V)-Dissolved	Zinc (Zn)-Dissolved
148	E4 - Main Embankment Seepage Pond	8/4/2011 11:42	0.076	-0.00005	0.165	-0.0005		0.0149	5.41	-0.00001	72.7	1.77	-0.00001	-0.0001	-0.01	0.00121	0.0014	0.0055
149	E4 - Main Embankment Seepage Pond	9/8/2011 8:26	0.156		0.16	-0.0005		0.0115	3.92	-0.00001	75.1	1.69	-0.00001	-0.0001	-0.01	0.00117	0.0013	0.004
150	E4 - Main Embankment Seepage Pond	10/5/2011 11:20	0.108		0.144	0.00052		0.0104	5.29	-0.00001	74.9	1.65	-0.00001	-0.0001	-0.01	0.00102	0.0011	-0.003
152	E4 - Main Embankment Seepage Pond	11/1/2011 10:43	0.125	-0.00005	0.161	-0.0005		0.011	5.29	-0.00001	78.5	1.63	-0.00001	-0.0001	-0.01	0.00108	0.0012	-0.003
153	E4 - Main Embankment Seepage Pond	12/5/2011 10:49	0.164		0.157	-0.0005		0.0111	5.92	-0.00001	84	1.7	-0.00001	-0.0001	0.01	0.00106	0.0014	0.0048
154	E4 - Main Embankment Seepage Pond	1/4/2012 13:23	0.24		0.168	0.00238		0.0122	8.18	-0.00001	89.3	1.8	0.000016	-0.0001	0.059	0.00114	0.0039	1.58
155	E4 - Main Embankment Seepage Pond	2/8/2012 10:20	0.203	-0.00005	0.176	-0.0005		0.0127	6.12	-0.00001	88.2	1.67	0.000031	-0.0001	0.014	0.000948	0.0013	0.0036
156	E4 - Main Embankment Seepage Pond	3/14/2012 13:45	0.2		0.155	0.00059		0.0114	5.85	-0.00001	79.4	1.54	0.000023	0.00017	0.018	0.000918	0.0012	0.0044
158	E4 - Main Embankment Seepage Pond	5/2/2012 11:29	0.175	-0.00005	0.164	0.00074		0.0102	4.24	-0.00001	62.1	1.66	-0.00001	-0.0001	0.013	0.00103	0.0018	-0.003
159	E4 - Main Embankment Seepage Pond	6/7/2012 9:10	0.165		0.169	0.00057		0.00999	3.83	-0.00001	59.4	1.73	-0.00001	-0.0001	0.032	0.00108	0.0016	0.0031
160	E4 - Main Embankment Seepage Pond	7/5/2012 9:09	0.168		0.146	-0.0005		0.0111	3.87	-0.00001	69.3	1.75	-0.00001	-0.0001	-0.01	0.00107	0.0013	-0.003
161	E4 - Main Embankment Seepage Pond	8/1/2012 11:03	0.286	-0.00001	0.176	-0.0005		0.0103	5.12	-0.00001	77.8	2.33	-0.00001	-0.0001	0.011	0.00109	0.0016	-0.003
162	E4 - Main Embankment Seepage Pond	9/6/2012 11:20	0.096		0.195	-0.0005		0.0135	6.06	-0.00001	93.9	1.79	-0.00001	-0.0001	0.011	0.000987	0.0021	-0.003
163	E4 - Main Embankment Seepage Pond	10/3/2012 9:35	0.11		0.192	-0.0005		0.0103	6.97	-0.00001	90	1.79	-0.00001	-0.0001	0.014	0.00103	0.0018	-0.003
164	E4 - Main Embankment Seepage Pond	11/15/2012 12:54	0.119	-0.00001	0.183	-0.0005		0.0137	5.99	-0.00001	80.4	1.83	-0.00001	-0.0001	0.017	0.00104	0.0018	-0.003
165	E4 - Main Embankment Seepage Pond	12/6/2012 10:20	0.181		0.17	-0.0005		0.0139	6.12	-0.00001	79.1	1.85	-0.00001	-0.0001	-0.01	0.0011	0.0014	-0.003
166	E4 - Main Embankment Seepage Pond	1/2/2013 14:27	0.25		0.181	-0.0005		0.0135	5.99	-0.00001	84.2	1.85	-0.00001	-0.0001	0.014	0.00112	0.0014	0.0046
167	E4 - Main Embankment Seepage Pond	2/6/2013 9:20	0.155	-0.00001	0.197	-0.0005		0.0183	6.15	-0.00001	87	1.78	-0.00001	-0.0001	-0.01	0.00101	0.002	-0.003
169	E4 - Main Embankment Seepage Pond	3/13/2013 13:20	0.233		0.178	-0.0005		0.0169	5.84	-0.00001	87.7	1.78	-0.00001	-0.0001	0.013	0.000884	0.0026	-0.003
170	E4 - Main Embankment Seepage Pond	4/4/2013 14:24	0.296		0.216	-0.0005		0.0149	6.2	0.000013	74	2.53	-0.00001	-0.0001	-0.01	0.00121	-0.001	-0.003
171	E4 - Main Embankment Seepage Pond	5/1/2013 9:12	0.177	-0.00001	0.183	0.00065		0.0157	5.43	-0.00001	73.3	1.81	-0.00001	-0.0001	0.018	0.00111	0.0019	-0.003
172	E4 - Main Embankment Seepage Pond	6/6/2013 9:21	0.257		0.193	-0.0005		0.0152	4.12	-0.00001	75.4	1.67	-0.00001	-0.0001	0.014	0.00105	0.0015	-0.003
173	E4 - Main Embankment Seepage Pond	7/10/2013 10:11	0.398		0.177	-0.0005		0.00919	6.2	-0.00001	84.2	2.05	-0.00001	-0.0001	-0.01	0.00102	-0.001	-0.003
174	E4 - Main Embankment Seepage Pond	8/8/2013 9:55	0.147	-0.00001	0.192	-0.0005		0.0135	6.09	-0.00001	79.5	1.57	-0.00001	-0.0001	-0.01	0.00103	0.0017	-0.003
175	E4 - Main Embankment Seepage Pond	9/5/2013 9:06	0.116		0.193	-0.0005		0.0143	6.37	-0.00001	82.9	1.59	-0.00001	-0.0001	0.011	0.00106	0.0023	-0.003
176	E4 - Main Embankment Seepage Pond	10/3/2013 8:48	0.0951		0.199	-0.0005		0.0198	7.56	0.000012	83	1.54	-0.00001	-0.0001	0.015	0.00114	0.0027	-0.003
177	E4 - Main Embankment Seepage Pond	11/5/2013 10:26	0.087		0.207	-0.0005		0.0183	6.61	-0.00001	81	1.61	-0.00001	-0.0001	0.01	0.00115	0.0022	-0.003
178	E4 - Main Embankment Seepage Pond	12/5/2013 11:55	0.22		0.181	-0.0005		0.0156	6.68	-0.00001	81.8	1.81	-0.00001	-0.0001	0.021	0.00112	0.0015	0.0053
179	E4 - Main Embankment Seepage Pond	1/7/2014 10:27	0.352		0.178	-0.0005		0.0163	6.2	-0.00001	84.2	1.79	-0.00001	-0.0001	-0.01	0.00116	0.0016	0.0063
180	E4 - Main Embankment Seepage Pond	2/11/2014 11:00	0.25		0.193	0.00059		0.0206	6.21	-0.00001	85.8	1.82	-0.00001	-0.0001	0.013	0.00123	0.0016	-0.003
181	E4 - Main Embankment Seepage Pond	3/4/2014 9:36	0.23		0.193	-0.0005		0.0193	5.76	-0.00001	87.6	1.68	-0.00001	-0.0001	0.015	0.0011	0.0014	-0.003
182	E4 - Main Embankment Seepage Pond	4/1/2014 11:35	0.275		0.168	-0.0005		0.0173	5.87	-0.00001	80.9	1.81	-0.00001	-0.0001	0.033	0.00104	0.0016	-0.003
183	E4 - Main Embankment Seepage Pond	5/1/2014 9:54	0.199		0.142	0.00122		0.0189	4.91	-0.00001	54.2	1.88	-0.00001	-0.0001	0.025	0.00101	0.0018	-0.003
184	E4 - Main Embankment Seepage Pond	6/3/2014 12:59	0.217		0.183	-0.0005		0.0231	4.35	-0.00001	69.6	1.86	-0.00001	-0.0001	-0.01	0.0013	0.0014	-0.003
185	E4 - Main Embankment Seepage Pond	7/3/2014 12:52	0.226		0.204	0.00063		0.0238	5.41	-0.00001	70.3	1.91	-0.00001	-0.0001	0.03	0.00167	0.0022	-0.003
186	E4 - Main Embankment Seepage Pond	8/5/2014 8:25	0.102		0.187	-0.0005		0.0255	5.41	-0.00001	60.6	2.16	-0.00001	-0.0001	0.018	0.0017	0.0017	-0.003
187	E4 - Main Embankment Seepage Pond	9/2/2014 11:43	0.211		0.178	-0.0005		0.0111	5.98	-0.00001	72.4	1.86	-0.00001	-0.0001	0.014	0.00132	0.0015	-0.003
188	E4 - Main Embankment Seepage Pond	10/1/2014 13:53	0.14		0.174	-0.0005		0.00911	5.36	0.000014	82.5	2.12	-0.00001	-0.0001	0.022	0.00136	0.0014	-0.003
189	E4 - Main Embankment Seepage Pond	11/3/2014 11:15	0.0939		0.155	-0.0005		0.0108	5.63	-0.00001	72.1	2.18	-0.00001	-0.0001	-0.01	0.00123	0.0013	-0.003
190	E4 - Main Embankment Seepage Pond	12/3/2014 11:58	0.284		0.17	-0.0005		0.0111	6.02	0.000028	79.9	2.4	-0.00001	-0.0001	0.021	0.00124	-0.001	-0.003
191	E4 - Main Embankment Seepage Pond	1/8/2015 14:02	0.564		0.15	-0.0005		0.00969	6.23	-0.00001	78	2.5	-0.00001	-0.0001	0.017	0.00115	0.0012	-0.003
192	E4 - Main Embankment Seepage Pond	2/2/2015 11:41	0.545		0.134	-0.0005		0.00821	6.43	-0.00001	72.6	2.22	-0.00001	-0.0001	0.011	0.00101	0.0011	-0.003
197	East Main Toe Drain	4/15/2010 13:30	0.585		0.147	-0.001		0.0045	6.14	-0.00002	81.8	1.82	-0.0002	-0.0002	-0.01	0.0013	-0.002	-0.002
198	East Main Toe Drain	7/8/2010	1.12		0.136	0.00154		0.0069	10.3	0.000012	87.9	1.26	-0.0001	-0.0001	0.084	0.00118	0.0057	0.0058
199	East Main Toe Drain	8/5/2010	0.674		0.153	-0.001		0.0024	5.94	-0.00002	88.9	1.78	-0.0002	-0.0002	-0.01	0.00123	-0.002	-0.002
200	East Main Toe Drain	10/14/2010	0.794		0.195	0.00068		0.0023	6.49	-0.00001	90.9	2.08	-0.0001	-0.0001	-0.01	0.00103	-0.001	0.005
201	East Main Toe Drain	4/5/2011 14:06	0.941		0.18	0.00126		0.00301	7.72	-0.00001	92.8	2.19	-0.0001	-0.0001	0.042	0.0013	0.0038	0.012
202	East Main Toe Drain	5/11/2011 8:20	0.867		0.171	0.00072		0.00246	6.23	-0.00001	96.8	2.31	-0.0001	-0.0001	-0.01	0.00132	-0.001	0.004
203	East Main Toe Drain	5/18/2011 9:08	0.872		0.181	0.00109		0.00242	6.16	-0.00001	99.8	2.43	-0.0001	-0.0001	-0.01	0.00128	-0.001	0.0065
204	East Main Toe Drain	6/9/2011 10:53	0.834		0.199	0.00143		0.00186	6.36	-0.00001	109	2.47	-0.0001	-0.0001	0.011	0.00123	-0.001	0.0085
205	East Main Toe Drain	7/13/2011 9:50	0.821		0.187	0.0008		0.00252	6.01	-0.00001	93.4	2.18	-0.00001	-0.0001	-0.01	0.00123	-0.001	0.0066
206	East Main Toe Drain	8/3/2011 9:21	1.96		0.188	-0.0005		-0.0005	6.58	-0.00001	80.3	0.852	-0.00001	-0.0001	-0.01	0.000851	-0.001	-0.003
208	East Main Toe Drain	8/31/2011 10:58	0.751		0.181	0.0006		0.00246	6.13	-0.00001	94.2	2.1	-0.00001	-0.0001	-0.01	0.00108	-0.001	0.0176
209	East Main Toe Drain	10/5/2011 10:50	1.53		0.163	-0.0005		-0.0005	6.14	-0.00001	91.2	0.992	-0.00001	-0.0001	-0.01	0.000745	-0.001	-0.003
210	East Main Toe Drain	10/31/2011 14:42	1.8		0.179	-0.0005		-0.0005	6.56	-0.00001	96.4	1.02	-0.00001	-0.0001	-0.01	0.000743	-0.001	-0.003
213	East Main Toe Drain	4/26/2012 10:28	1.13		0.196	0.00118		0.00157	6.09	-0.00001	88.8	1.69	-0.00001	-0.0001	-0.01	0.0013	-0.001	0.0068
214	East Main Toe Drain	5/2/2012 10:30	0.966		0.158	0.00064		-0.0005	5.93	-0.00001	107	1.61	-0.00001	-0.0001	-0.01	0.000627	-0.001	0.0061
215	East Main Toe Drain	6/7/2012 10:39	0.695		0.202	0.00067		0.00331	6.21	-0.00001	88.1	1.93	-0.00001	-0.0001	0.016	0.00113	-0.001	0.0171
216	East Main Toe Drain	6/28/2012 14:15	0.697		0.197	0.00202		0.00385	6.61	-0.00001	89.6	1.91	-0.00001	-0.0001	0.013	0.00116	0.0011	0.0077
217	East Main Toe Drain	7/5/2012 11:52	0.691		0.162	0.00094		0.00415	6.36	-0.00001	89.4	1.55	-0.00001	-0.0001	-0.01	0.000923	-0.001	0.0064
218	East Main Toe Drain	11/15/2012 13:26	0.628		0.214	0.00102		0.00424	6.35	-0.00001	89.6	1.98	-0.00001	-0.0001	0.013	0.00118	0.001	0.0056
219	East Main Toe Drain	2/7/2013 9:16	0.698	-0.00001	0.164	0.00066		0.00477	5.96	-0.00001	93.5	1.6	-0.00001	-0.0001	-0.01	0.000927	-0.001	0.009
221	East Main Toe Drain	5/1/2013 12:32	0.645		0.204	-0.0005		0.006	6.21	-0.00001	92	2.04	-0.00001	-0.0001	-0.01	0.00114	-0.001	0.0068
222	East Main Toe Drain	6/6/2013 11:40	0.63		0.203	0.00056		0.0057	6.27	-0.00001	90.3	2.05	-0.00001	-0.0001	0.011	0.00106	-0.001	0.0081
223	East Main Toe Drain	7/10/2013 10:57	0.617		0.2	-0.0005		0.00563	5.8	-0.00001	89.8	1.98	-0.00001	-0.0001	-0.01	0.000979	-0.001	0.0097
224	East Main Toe Drain	8/8/2013 9:32	0.632		0.206	-0.0005		0.00579	5.94	-0.00001	93.6	1.96	-0.00001	-0.0001	-0.01	0.000981	-0.001	-0.003
225	East Main Toe Drain	9/5/2013 8:57	0.629		0.216	-0.0005		0.00591	5.8	-0.00001	92.1	1.92	-0.00001	-0.0001	-0.01	0.001	-0.001	-0.003
226	East Main Toe Drain	10/3/2013 9:00	0.592		0.214	-0.0005		0.00586	6.24	-0.00001	89.6	2.02	-0.00001	-0.0001	-0.01	0.00107	-0.001	0.004
227	East Main Toe Drain	11/5/2013 10:31	0.634	-0.00001	0.224	0.00076		0.00567	6.34	-0.00001	93.8	2.05	-0.00001	-0.0001	-0.01	0.00113	0.0011	-0.003
228	East Main Toe Drain	11/12/2013 11:58	0.641		0.217	-0.0005		0.00576	6.17	-0.00001	89.9	2.04	-0.00001	-0.0001	-0.01	0.00109	-0.001	-0.003
229	East Main Toe Drain	12/5/2013 11:20	0.61		0.213	-0.0005		0.00607	6.43	-0.00001	90	2.03	-0.00001	-0.0001	0.017	0.00114	-0.001	-0.003
231	East Main Toe Drain	2/11/2014 11:16	0.632		0.215	0.00054		0.00736	6.44	-0.00001	92.1	2.15	-0.00001	-0.0001	0.011	0.00114	-0.001	-0.003
233	East Main Toe Drain	3/4/2014 9:59	0.599		0.223	0.00062		0.00729	6.09	-0.00001	96.6	2.19	-0.00001	-0.0001	0.013	0.00113	-0.001	-0.003
234	East Main Toe Drain	4/3/2014 9:38	0.592		0.21	-0.0005		0.00762	6.4	-0.00001	90.2	2.2	-0.00001	-0.0001	-0.01	0.00111	-0.001	-0.003
235	East Main Toe Drain	5/1/2014 10:15	0.62		0.215	-0.0005		0.00792	6.07	-0.00001	98.8	2.55	-0.00001	-0.0001	0.014	0.00116	-0.001	-0.003
236	East Main Toe Drain	6/3/2014 12:35	0.505		0.214	-0.0005		0.00881	6.16	-0.00001	87.7	2.2	-0.00001	-0.0001	-0.01	0.000996	0.0012	-0.003
238	East Main Toe Drain	12/8/2014 12:21	0.565		0.197	-0.0005		0.00355	6.2	-0.00001	92.6	2	-0.00001	-0.0001	-0.01	0.001	-0.001	-0.003
239	East Main Toe Drain	2/5/2015 11:45	0.567		0.228	-0.0005		0.00277	6.1	-0.00001	93.2	2.21	-0.00001	-0.0001	0.011	0.00104	-0.001	-0.003
240	East Main Toe Drain	3/5/2015 9:40	0.545		0.214	-0.0005		0.00249	5.92	-0.00001	89	2.06	-0.00001	-0.0001	-0.01	0.00103	-0.001	-0.003
241	East Main Toe Drain	4/9/2015 10:30	0.547		0.228	-0.0005		0.00222	6.33	-0.00001	83.6	2.17	-0.00001	-0.0001	0.013	0.00109	0.00087	-0.003
246	West Main Toe Drain	8/8/2013 9:22	0.37		0.194	-0.0005		0.00465	6.15	-0.00001	91.6	1.88	-0.00001	-0.0001	-0.01	0.000829	-0.001	-0.003
247	West Main Toe Drain	9/5/2013 8:58	0.363		0.196	-0.0005		0.00485	5.99	-0.00001	93.5	1.87	-0.00001	-0.0001	-0.01	0.000808	0.001	-0.003
248	West Main Toe Drain	10/3/2013 8:58	0.332		0.19	-0.0005		0.00479	6.32	-0.00001	88	1.9	-0.00001	-0.0001	-0.01	0.000828	-0.001	-0.003
249	West Main Toe Drain	11/5/2013 10:37	0.358	-0.00001	0.21	-0.0005		0.00502	6.63	-0.00001	92.8	2.01	-0.00001	-0.0001	-0.01	0.000915	0.0011	-0.003
250	West Main Toe Drain	11/12/2013 12:05	0.389		0.197	-0.0005		0.00522	6.52	-0.00001	91.7	1.98	-0.00001	-0.0001	-0.01	0.000892	-0.001	-0.003
251	West Main Toe Drain	12/5/2013 11:31	0.356		0.203	-0.0005		0.00649	6.77	0.000012	92.4	2.05	-0.00001	-0.0001	-0.02	0.000982	-0.001	-0.003
252	West Main Toe Drain	1/7/2014 10:36	0.372		0.195	-0.0005		0.00553	6.35	-0.00001	97	2.1	-0.00001	-0.0001	-0.01	0.001	-0.001	-0.003
253	West Main Toe Drain	2/11/2014 11:24	0.383	-0.00001	0.191	-0.0005		0.00612	6.68	-0.00001	95.6	2.04	-0.00001	-0.0001	0.011	0.000968	-0.001	-0.003
254	West Main Toe Drain	3/4/2014 9:51	0.367		0.197	-0.0005		0.00667	6.54	-0.00001	98.9	2.18	-0.00001	-0.0001	0.015	0.000969	-0.001	-0.003
255	West Main Toe Drain	4/3/2014 9:35	0.376		0.19	-0.0005		0.00648	6.54	-0.00001	95.3	2.18	-0.00001	-0.0001	-0.01	0.000951	-0.001	-0.003
256	West Main Toe Drain	5/1/2014 10:24	0.374		0.193	-0.0005		0.00689	6.44	-0.00001	99.8	2.51	-0.00001	-0.0001	0.013	0.000959	-0.001	-0.003
257	West Main Toe Drain	6/3/2014 12:43	0.378		0.178	-0.0005		0.00461	6.5	-0.00001	94.8	2.1	-0.00001	-0.0001	-0.01	0.000865	-0.001	-0.003

Index	Sample Point	Date	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Alkalinity (CaCO3) (mg/L)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen N-WDGWA (mg/L)
259	West Main Toe Drain	7/3/2014 12:03	Sample taken, no tss observed	1165	8.07	8.7		85	1140	376	8.03	827	-3	0.1	0.0542	26.8	0.97	1.39	1.62	0.228	
261	West Main Toe Drain	9/2/2014 12:03	Sample taken. No power in building.	1164	8.029	8.1	0	81.1	1130	374	8.11	795	-3	0.13	0.054	25.1	1.1	1.58	1.85	0.279	
263	West Main Toe Drain	10/1/2014 14:11	Sample taken.	1167	8.035	7.9	0	86.2	1130	385	8.02	849	-3	0.17	0.049	28.5	1.1	1.41	1.69	0.278	
264	West Main Toe Drain	11/3/2014 11:29	Sample taken + MOG + Ecoli/Coliform. No water from Fast MTD or FD's 1-5	1135	8.118	7.8	0.04	73.9	1130	371	8.12	791	-3	0.13	0.0521	29.9	0.86	1.07	1.36	0.293	
265	West Main Toe Drain	12/8/2014 12:25	Sample taken.	1207	8.072	7.8	0	91.2	1180	363	8.11	831	-3	0.12	0.0682	27.5	0.98	0.37	0.59	0.22	
266	West Main Toe Drain	1/13/2015 14:11	Sample taken.	1153	8.179	7.9	0	86.8	1150	369	8.06	840	-3	0.13	0.0491	27	0.99	0.385	0.619	0.234	
267	West Main Toe Drain	2/2/2015 12:06	Sample taken.	1184	8.11	8	0	86.9	1150	361	8.11	844	-3	0.13	0.0508	26.1	0.98	0.262	0.461	0.199	
268	West Main Toe Drain	3/5/2015 9:30	Sample taken.	1189	8.043	8.4	0.01	89.5	1140	370	7.96	872	-3	0.15	0.0555	27.7	1.01	0.107	0.251	0.144	
269	West Main Toe Drain	4/9/2015 10:47	Sample Taken	1227	8.177	8.3	0.11	90.9	1190	388	8.18	835	-3	0.13	0.0596	27.1	0.93	-0.025	0.076	0.0764	
273	Perimeter Toe Drain	7/7/2009 10:45		1094	7.9	8.5		104		372		777	16	4.55	0.0612	20.5		0.401		-0.005	
274	Perimeter Toe Drain	8/5/2009 11:42		1104	8.26	8.2		105		379		791	87.3	10.5	0.068	18.5		0.301		0.012	
275	Perimeter Toe Drain	9/1/2009 13:30		1118	8.24	9.4		101		394		787	12	2.05	0.0447	23.2		0.317		-0.01	
277	Perimeter Toe Drain	5/18/2011 9:29		1533	7.5	6.3		84		612		1180	-3	0.59	0.155	27.7		1.51	1.54	0.025	
278	Perimeter Toe Drain	7/13/2011 10:07		1407	8.06	6.6		79.9	1380	595	7.92	1120	-3	0.28	0.0584	23.6		1.85	1.88	0.033	
279	Perimeter Toe Drain	8/3/2011 9:57		1388	7.92	6.3		77.9	1360	572	7.98	1090	-3	0.15	0.163	24.6		2.12	2.21	0.095	
283	Perimeter Toe Drain	10/5/2011 13:55		1392	7.83	7.7		79	1350	561	8.03	1060	-3	0.33	0.125	22.6		1.65	1.74	0.09	
285	Perimeter Toe Drain	10/31/2011 13:24		1363	7.74	8		79.1	1350	571	8.02	1070	-3	0.16	0.148	22.3		1.52	1.61	0.086	
286	Perimeter Toe Drain	12/5/2011 12:18		1394	7.99	7.9		78.5	1350	562	8.03	1030	-3	0.42	0.129	22.6	0.91	1.17	1.25	0.078	
287	Perimeter Toe Drain	2/8/2012 11:15		1396	8.07	6.6		76	1330	548	7.95	1040	14.7	4.94	0.146	24.6	0.94	1.11	1.18	0.074	
288	Perimeter Toe Drain	4/3/2012 13:42		1343	8.03	7.4		86.9	1280	527	7.41	1000	5.7	2.08	0.111	22.8	0.85	1.64	1.7	0.066	
289	Perimeter Toe Drain	5/2/2012 9:52		1354	7.067	7.8		74.4	980	394	7.8	739	-3	2.07	0.103	16.9	0.7	0.839	0.888	0.05	
293	Perimeter Toe Drain	8/1/2012 11:36		1315	7.926	7.1		66.9	1230	508	7.94	1040	-3	0.16	0.145	24.1	0.9	1.36	1.49	0.134	
297	Perimeter Toe Drain	11/5/2012 10:11	Okay	1332	7.896	8.5		69.6	1250	509	7.89	1000	-3	0.28	0.137	24	1.03	1.65	1.79	0.148	
299	Perimeter Toe Drain	2/6/2013 9:55	Okay	1364	7.626	7.6		68.9	1280	528	7.79	1000	-3	0.53	0.0219	25.3	0.82	1.77	1.8	0.027	
301	Perimeter Toe Drain	5/1/2013 13:21		1322	7.534	7.3	2.42	61.4	1300	495	7.75	977	-3	0.17	0.121	24.3	1.12	2.17	2.42	0.256	
305	Perimeter Toe Drain	8/8/2013 11:16		1266	7.719	6.8		61.4	1240	455	7.92	977	-3	0.18	0.113	23.7	1.02	2.03	2.37	0.337	
307	Perimeter Toe Drain	11/5/2013 9:12		1299	7.961	8.5		69	1280	477	8.17	968	-3	0.16	0.121	25.8	0.83	2.02	2.33	0.311	
309	Perimeter Toe Drain	5/28/2014 11:15	Full suite sample	1286	7.88	8.3		59.3	1220	489	7.65	924	-3	0.22	0.106	24.1	0.78	3.2	3.51	0.307	
312	South Toe Drain	5/18/2011 8:19		1232	7.54	6.3		62.6		514		908	-3	0.26	0.0275	20.7		6.27	6.32	0.045	
313	South Toe Drain	7/14/2011 8:42		1166	8.1	12.8		59	1160	512	7.9	891	-3	0.62	0.0259	18		5.25	5.39	0.136	
314	South Toe Drain	8/3/2011 8:06		1232	7.85	13.5		58.7	1230	550	7.94	980	-3	0.22	0.079	21.7		5.66	5.79	0.133	
315	South Toe Drain	8/31/2011 11:13		1253	7.77	14.5		58.8	1240	546	7.84	997	-3	0.38	0.132	21.9		4.19	4.27	0.079	
318	South Toe Drain	10/12/2011 10:31		1345	7.63	12.2		64.1	1310	569	7.84	1050	-3	0.18	0.0682	21.5		4.04	4.09	0.05	
320	South Toe Drain	10/31/2011 13:05		1336	7.69	9.9		58.7	1300	556	7.91	1030	6.8	0.15	0.0478	23.4		4.87	4.9	0.029	
321	South Toe Drain	12/5/2011 10:35		1381	7.82	6.1		57.7	1320	559	7.86	1050	-3	0.32	0.0339	24.3	0.63	4.63	4.65	0.023	
322	South Toe Drain	2/7/2012 12:05		1382	8.12	3.1		51.8	1310	528	7.88	1030	-3	0.25	0.0424	26.4	0.66	5.54	5.57	0.03	
323	South Toe Drain	4/3/2012 13:24		1367	8.31	3.4		59.7	1270	510	7.09	982	-3	1.31	0.0481	27.7	0.65	4.58	4.66	0.086	
324	South Toe Drain	5/2/2012 10:47		1265	7.054	4.7		65.7	1190	478	7.91	911	-3	0.43	0.0351	24.6	0.69	3.63	3.7	0.069	
328	South Toe Drain	8/1/2012 10:05		1291	7.835	11.5		63.8	1190	485	7.88	1010	-3	0.13	0.0757	23.4	0.67	3.55	3.72	0.164	
334	South Toe Drain	11/5/2012 11:17	okay	1315	7.583	10.5		62.2	1240	508	7.81	982	-3	0.3	0.0709	24.3	0.75	3.96	4.07	0.105	
336	South Toe Drain	2/6/2013 9:00	Okay	1334	7.783	6		61.7	1240	530	7.81	997	-3	0.13	0.0795	25	0.57	5.26	5.34	0.08	
338	South Toe Drain	5/1/2013 9:02		1297	7.57	5.9	0.35	62.6	1280	511	7.55	967	-3	0.15	0.094	22.4	0.86	4.61	4.81	0.199	
342	South Toe Drain	8/8/2013 9:47		1213	7.758	13.2		61.8	1200	448	7.94	913	-3	-0.1	0.0958	20.9	0.77	4.99	5.37	0.388	
345	South Toe Drain	11/5/2013 10:00	full pipe, sample taken	1273	7.775	12.4		69	1250	491	7.75	946	-3	0.27	0.103	25	0.58	5.73	5.99	0.257	
348	South Toe Drain	5/28/2014 11:28	Full suite sample	1170	7.92	5.6		58	1120	435	7.75	854	-3	0.27	0.0873	21.7	0.54	5.82	6.01	0.189	
351	South Toe Drain	8/5/2014 8:35	Sample taken, fairly large flow	1188	7.747	11.5		69.7	1160	447	7.98	882	-3	0.29	0.089	20.7	0.69	5.09	5.34	0.252	
354	South Toe Drain	11/3/2014 11:03	Sample taken	1217	7.737	9.1	0.32	54.1	1210	461	7.91	876	-3	0.15	0.15	25.4	0.62	0.68	0.994	0.315	
365	E5 - Tailings Impoundment Main Embank Drain Comp	7/12/2001 13:15		1044	7.04	7.7		191		560			-4	0.76	0.009				68.4		
367	E5 - Tailings Impoundment Main Embank Drain Comp	7/26/2001 8:50		1465	6.9	8.7		120		638			-4	0.36	-0.005				127		
368	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2001		1226	7.01	8.2		128		571			-4	0.75	-0.005				111		
369	E5 - Tailings Impoundment Main Embank Drain Comp	8/10/2001 10:05		1290	6.98	8.8		151		645			-4	0.45	0.012				105		
371	E5 - Tailings Impoundment Main Embank Drain Comp	8/30/2001 14:40		982	7.13	9		179		477			4	0.73	0.019				65.2		
372	E5 - Tailings Impoundment Main Embank Drain Comp	10/24/2001 10:30		982	6.85	7.4		123		498			-4	0.53	-0.005				79.8		
374	E5 - Tailings Impoundment Main Embank Drain Comp	10/16/2003 18:10		566	8.49	11.5		81.5		162		298	-4	0.74	0.023					0.007	
375	E5 - Tailings Impoundment Main Embank Drain Comp	5/31/2005		617	7.63	7.1		145		180		392	1	0.4	0.005				0.617		
376	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2005		569	7.95	7.5		151		190		380	-1	0.4	-0.005				0.689		
377	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2005		577	7.49	7.4		139		170		354	1	0.4	-0.005						
378	E5 - Tailings Impoundment Main Embank Drain Comp	8/11/2005		585	7.74	9.8		149		160		384	-1	0.7	0.026						
379	E5 - Tailings Impoundment Main Embank Drain Comp	9/14/2005		601	8.53	9.4		143		150		372	-1	0.4	-0.005						
380	E5 - Tailings Impoundment Main Embank Drain Comp	10/11/2005		580	8.49	7.6		142		150		350	1	0.4	0.053						
381	E5 - Tailings Impoundment Main Embank Drain Comp	11/8/2005		607	8.37	8		142		170		358	-1	0.3	-0.005						
382	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/2005		644	8.2	6		144		180		386	-1	0.4	0.045						
383	E5 - Tailings Impoundment Main Embank Drain Comp	1/17/2006		668	7.3	1.6		139		190		408	-1	0.3	0.009						
384	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2006		650	7.33	8.3		136		180		396	-1	0.2	0.047						
385	E5 - Tailings Impoundment Main Embank Drain Comp	3/6/2006 13:00		642	7.88	8.1		139		170		392	1	0.2	0.044			0.41		0.021	
386	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2006 9:35		597	8	9.2		132		190		396	-4	0.6	0.005					0.026	
387	E5 - Tailings Impoundment Main Embank Drain Comp	5/9/2006		624	8.49	8.8		136		178		401	-3	0.25	-0.005						
388	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2006		635	7.03	8		137		182		394	-3		0.026			0.353		0.0183	
389	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2006		605	7.5	9.5		137		161		394	-3	0.73	0.032			0.304		0.0268	
390	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2006		631	6.43	9.2		136		156		400	-3	1.21	0.0233			0.119		0.0062	
391	E5 - Tailings Impoundment Main Embank Drain Comp	10/12/2006		655	7.56	8.6		151		174		411	-3	0.27	-0.005			0.48		-0.001	
392	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2006		709	7.33	7.6		138		212		448	-2.3	0.44	-0.005			1.3		0.0081	
393	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2006		753	7.75	6		144		201		471	-2.3	0.21	0.033			0.764		0.0088	
395	E5 - Tailings Impoundment Main Embank Drain Comp	2/5/2007 10:30		733	7.3	7.6		144		210		458	-3	0.22	0.0809			0.557		0.0066	
396	E5 - Tailings Impoundment Main Embank Drain Comp	3/5/2007		724	7.49	6.9		137		222		467	-3	0.65	0.0987			0.42		0.001	
397	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2007 10:59		849	7.58	6.9		124		312		574	-3	0.41	0.0316			6.38		0.0012	
398	E5 - Tailings Impoundment Main Embank Drain Comp	5/7/2007 9:29		789	7.38	7.2		131		248		520	-3	0.22	0.0558			3.04		0.0012	
399	E5 - Tailings Impoundment Main Embank Drain Comp	6/4/2007 10:50		782	7.77	7.7		129		267		519	-3	0.45	0.0338			3.76		0.0022	
400	E5 - Tailings Impoundment Main Embank Drain Comp	7/3/2007 11:08		765	7.7	8.1		126		223		489	-3	1.01	0.0613			1.88		0.0015	
401	E5 - Tailings Impoundment Main Embank Drain Comp	8/2/2007 10:30		769	7.92	8.4		130		248		520	-3	0.46	0.0416			2.77		0.0019	
402	E5 - Tailings Impoundment Main Embank Drain Comp	9/5/2007 10:05		756	7.32	7		132		234		510	3.1	0.38	-0.005			1.32		0.0024	
403	E5 - Tailings Impoundment Main Embank Drain Comp	10/2/2007 15:15		876	7.84	7.4		121		310		589	-3	0.34	0.0324			5.4		0.0025	
404	E5 - Tailings Impoundment Main Embank Drain Comp	11/5/2007 10:45		883	8.04	5.6		130		326		625	-3	0.92	0.0227			4.07		0.0022	
405	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2007 14:12		1010	7.65	6.8		137		404		704	-3	0.39	0.0731			9.07		-0.001	
406	E5 - Tailings Impoundment Main Embank Drain Comp	1/15/2008 14:33		855	8.35	6.3		127		267		570	-3	0.41	0.118			1.03		0.0159	
407	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2008 10:09		853	8.06	4.2		125		254		560	-3	0.35	0.128			0.781		0.0196	
408	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2008 10:09		830	7.914	6.9		121		261		578	-3	0.28	0.113			0.612		0.031	
409	E5 - Tailings Impoundment Main Embank Drain Comp	4/16/2008 9:45		1097	7.655	5.9		105		432		814	-3	1.2	0.0814			6.44		0.0015	
410	E5 - Tailings Impoundment Main Embank Drain Comp	5/13/2008 10:34		898	7.76	6.8		110		282		606	-3	0.29	0.116			1.67		-0.001	
411	E5 - Tailings Impoundment Main Embank Drain Comp	7/15/2008 9:15		787	7.989	18.2		47.3		254		396	46.5	19.1	0.0973			1.39		0.0172	
412	E5 - Tailings Impoundment Main Embank Drain Comp	8/6/2008 9:40		787	8.7	16.8		51		233		533	28.4	12	0.192			1.13		0.0158	
413	E5 - Tailings Impoundment Main Embank Drain Comp	8/12/2008 12:36		841	7.986	8.3		111		261		586	-3	0.29	0.0679			1.38		0.0278	
414	E5 - Tailings Impoundment Main Embank Drain Comp	9/9/2008 8:30		843	7.99	7.9		111		244		558	-3	0.34	0.0869			0.99		0.0274	
415	E5 - Tailings Impoundment Main Embank Drain Comp	9/30/2008 11:30		855	7.97	8.9		113		254		584	-3	0.25	0.125			0.961		0.0249	
416	E5 - Tailings Impoundment Main Embank Drain Comp	10/22/2008 11:50			8.038	7.6		122		269		613	5.9	2.21	0.0717			2.7		0.0085	
417	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2008 13:57		852	8.27	5.5		127		284		580	3.9	3.84	0.114			0.931		0.015	
418	E5 - Tailings Impoundment Main Embank Drain Comp	12/2/2008 11:55			8.37	3		156		321		604	4.1	4.22	0.0725			1.76		0.0215	
419	E5 - Tailings Impoundment Main Embank Drain Comp	1/14/2009 13:59		887	8.01	7.2		117		260		578	-3	0.34	0.103			0.748		-0.001	
420	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2009 11:39		884	7.94	7.3		115		261		597	-3	0.42	0.117			0.562		-0.001	
421	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2009		871	7.66	6.5		118		270		571	-3	0.29	0.108			0.54		-0.001	
422	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2009 13:14		941	7.53	8.3		110		335		677	-3	0.38	0.0525	19.4		2.57		-0.001	
423	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2009 12:45		931	8.07	8.1		126		301		650	-3	1.11	0.109	21.7		1.56		-0.001	
424	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2009 9:29		1010	7.8	8.4		119		351		704	-3	0.54	0.0865	21		2.68		0.0013	
425	E5 - Tailings Impoundment Main Embank Drain Comp	7/7/2009 10:14		928	7.78	10.7		116		301		627	-3	0.32	0.102	21.4		1.04		-0.001	
426	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2009 10:50		923	8.34	8.3		120		290		646	-3	0.35	0.086	21.8		0.93		0.0017	
427	E5 - Tailings Impoundment Main Embank Drain Comp	9/2/2009 9:15		903	8.39	8.5		112		290		613	-3	0.18	0.0952	24.4		0.931		-0.01	
428	E5 - Tailings Impoundment Main Embank Drain Comp	10/6/2009 9:49		909	8.44	7.6		115		296		623	-3	0.49	0.0941	22		0.828		0.0078	
429	E5 - Tailings Impoundment Main Embank Drain Comp	10/29/2009 12:29		920	8.46	6.1		115		286		627	-3	0.26	0.0999	22.3		0.891		-0.005	
430	E5 - Tailings Impoundment Main Embank Drain Comp	11/19/2009 9:26		987	8.28	6.1		125		318		658	-3	0.3	0.0946	23.1		1.09		-0.005	

Index	Sample Point	Date	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Sulphide as S (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	Aluminum (Al)-Total	Antimony (Sb)-Total	Arsenic (As)-Total	Barium (Ba)-Total	Beryllium (Be)-Total	Bismuth (Bi)-Total	Boron (B)-Total	Cadmium (Cd)-Total	Calcium (Ca)-Total	Chromium (Cr)-Total	Cobalt (Co)-Total
259	West Main Toe Drain	7/3/2014 12:03	0.0171	0.0275	0.029	483			1.64	3.76		-0.003	0.00033	0.00184	0.0665	-0.0001	-0.0005	0.154	-0.0002	118	-0.0005	0.00035
261	West Main Toe Drain	9/2/2014 12:03	0.0125	0.0267	0.0261	464			1.89	3.16		-0.003	0.00037	0.00196	0.0606	-0.0001	-0.0005	0.139	0.00005	118	-0.0005	0.00036
263	West Main Toe Drain	10/1/2014 14:11	0.0148	0.0282	0.0235	472			1.66	3.15		-0.003	0.00034	0.00199	0.0596	-0.0001	-0.0005	0.133	-0.00005	121	-0.0005	0.00038
264	West Main Toe Drain	11/3/2014 11:29	0.0163	0.0278	0.0253	467			1.41	3.44		-0.003	0.00035	0.0019	0.0593	-0.0001	-0.0005	0.131	0.000056	117	-0.0005	0.00039
265	West Main Toe Drain	12/8/2014 12:25	0.012	0.0257	0.0263	491			0.629	3.66		-0.003	0.00024	0.00171	0.0711	-0.0001	-0.0005	0.146	0.000058	113	-0.0005	0.00052
266	West Main Toe Drain	1/13/2015 14:11	0.0159	0.0281	0.0248	474			0.667	3.63		-0.003	0.00034	0.00195	0.0589	-0.0001	-0.0005	0.149	0.000046	116	-0.0005	0.00041
267	West Main Toe Drain	2/2/2015 12:06	0.0145	0.0294	0.029	475			0.501	3.57		-0.003	0.00031	0.00199	0.0587	-0.0001	-0.0005	0.154	0.000043	112	-0.0005	0.00039
268	West Main Toe Drain	3/5/2015 9:30	0.0157	0.0282	0.0285	477			0.354	4.01		0.0034	0.00035	0.00217	0.0606	-0.0001	-0.0005	0.154	0.000059	119	-0.0005	0.00042
269	West Main Toe Drain	4/9/2015 10:47	0.0161	0.0283	0.0268	487			0.212	3.8		0.0031	0.0003	0.00217	0.0606	-0.0001	-0.00005	0.14	0.0000475	123	-0.0005	0.00042
273	Perimeter Toe Drain	7/7/2009 10:45	0.0026	0.0051	0.0122	419			0.49	2.14		-0.003	0.00066	0.00134	0.041	-0.001	-0.001	0.169	0.000072	117	-0.001	-0.0002
274	Perimeter Toe Drain	8/5/2009 11:42	0.0015	0.0048	0.0962	420			0.43	2.04		-0.002	0.00066	0.00135	0.0397	-0.001	-0.001	0.174	-0.00051	120	-0.001	-0.0002
275	Perimeter Toe Drain	9/1/2009 13:30	0.0021	0.0044	0.0153	462			0.24	2.05		-0.002	0.00068	0.00133	0.0374	-0.001	-0.001	0.184	-0.0006	125	-0.001	-0.0002
277	Perimeter Toe Drain	5/18/2011 9:29	0.0091	0.0175		724			1.51	3.58		-0.006	0.00058	0.00144	0.0432	-0.001	-0.001	0.14	0.000143	197	-0.001	0.00108
278	Perimeter Toe Drain	7/13/2011 10:07	0.0107	0.0148		668			2.24	3.87		-0.003	0.00062	0.00141	0.043	-0.0001	-0.0005	0.119	-0.0001	194	-0.0005	0.00091
279	Perimeter Toe Drain	8/3/2011 9:57	0.0071	0.0092		652			2.68	4.05		-0.003	0.00059	0.00132	0.0412	-0.0001	-0.0005	0.131	-0.00012	185	-0.0005	0.00089
283	Perimeter Toe Drain	10/5/2011 13:55	0.006	0.009	0.0134	646			2.08	3.44		-0.006	0.00063	0.00134	0.0393	-0.0002	-0.001	0.134	-0.0001	182	-0.001	0.0007
285	Perimeter Toe Drain	10/31/2011 13:24	0.0111	0.0163	0.0161	654			1.57	3.55		-0.003	0.0007	0.00141	0.0412	-0.0001	-0.0005	0.143	-0.00015	186	-0.0005	0.00085
286	Perimeter Toe Drain	12/5/2011 12:18	0.006	0.0088	0.0126	636			1.46	3.56		-0.003	0.00068	0.00139	0.0411	-0.0001	-0.0005	0.134	-0.0002	182	-0.0005	0.0007
287	Perimeter Toe Drain	2/8/2012 11:15	-0.001	0.0073	0.0529	641			1.94	3.63		-0.003	0.00066	0.00141	0.0401	-0.0001	-0.0005	0.143	-0.00011	176	-0.0005	0.00062
288	Perimeter Toe Drain	4/3/2012 13:42	0.0058	0.0102	0.0194	593			1.94	4		-0.003	0.00062	0.00139	0.0395	-0.0001	-0.0005	0.135	-0.0002	171	-0.0005	0.00065
289	Perimeter Toe Drain	5/2/2012 9:52	0.0051	0.0126	0.0191	437			1.18	10.1		0.0679	0.00048	0.00114	0.0306	-0.0001	-0.0005	0.101	-0.0002	128	-0.0005	0.00053
293	Perimeter Toe Drain	8/1/2012 11:36	0.0087	0.0122	0.0129	585			1.67	4.15		-0.003	0.00068	0.0015	0.0384	-0.0001	-0.0005	0.13	-0.00015	165	-0.0005	0.00069
297	Perimeter Toe Drain	11/5/2012 10:11	0.005	0.0091	0.0132	600			2.24	3.79		-0.003	0.00077	0.00152	0.0355	-0.0001	-0.0005	0.148	-0.00011	165	-0.0005	0.00064
299	Perimeter Toe Drain	2/6/2013 9:55	0.0057	0.0105	0.0133	616			1.5	3.09												
301	Perimeter Toe Drain	5/1/2013 13:21	0.0053	0.0084	0.0116	592			2.51	5.33												
305	Perimeter Toe Drain	8/8/2013 11:16	0.0053	0.0104	0.0127	570			2.46	3.97		-0.003	0.00058	0.00166	0.0342	-0.0001	-0.0005	0.116	-0.00012	148	-0.0005	0.00054
307	Perimeter Toe Drain	11/5/2013 9:12	0.0072	0.0117	0.0143	586			2.38	3.08												
309	Perimeter Toe Drain	5/28/2014 11:15	0.0073	0.0089	0.0175	572			3.44	3.49		-0.003	0.00066	0.00194	0.0358	-0.0001	-0.0005	0.126	-0.00015	161	-0.0005	0.00045
312	South Toe Drain	5/18/2011 8:19	0.0021	0.0073	0.009	547			6.29	3.73		-0.003	0.00145	0.00152	0.0258	-0.0005	-0.0005	0.069	0.000187	170	-0.0005	0.00015
313	South Toe Drain	7/14/2011 8:42	0.0084	0.0104	0.0113	530			7.69	3.13		-0.003	0.00142	0.00202	0.0292	-0.0001	-0.0005	0.087	-0.00018	171	-0.0005	0.00014
314	South Toe Drain	8/3/2011 8:06	0.0061	0.0089	0.0121	583			6.76	3.27		0.0031	0.00119	0.00169	0.032	-0.0001	-0.0005	0.105	-0.0002	183	-0.0005	0.00012
315	South Toe Drain	8/31/2011 11:13	0.0068		0.0113	586			5.22	3.72		0.0044	0.00114	0.00168	0.0328	-0.0001	-0.0005	0.118	-0.0002	182	-0.0005	0.00013
318	South Toe Drain	10/12/2011 10:31	0.0073	0.0097	0.0108	579			5.96	2.65		0.0034	0.00109	0.00179	0.036	-0.0001	-0.0005	0.116	-0.00025	190	-0.0005	0.00019
320	South Toe Drain	10/31/2011 13:05	0.0067	0.0091	0.0101	618			5.98	2.45		-0.006	0.00092	0.00163	0.0325	-0.0001	-0.0005	0.112	-0.0002	186	-0.0005	0.00015
321	South Toe Drain	12/5/2011 10:35	0.0046	0.0069	0.0093	629			7.13	3.52		-0.003	0.00084	0.00143	0.0311	-0.0001	-0.0005	0.108	0.000178	188	-0.0005	0.00018
322	South Toe Drain	2/7/2012 12:05	0.0073	0.0096	0.0104	610			9.17	5.54		-0.003	0.00101	0.00177	0.0296	-0.0001	-0.0005	0.121	-0.0002	178	-0.0005	0.00016
323	South Toe Drain	4/3/2012 13:24	0.0084	0.0121	0.015	605			5.64	6.64		-0.003	0.00095	0.00156	0.028	-0.0001	-0.0005	0.107	-0.0003	173	-0.0005	0.00016
324	South Toe Drain	5/2/2012 10:47	0.005	0.01	0.0109	544			5.09	2.3		-0.003	0.00093	0.00165	0.0263	-0.0001	-0.0005	0.103	-0.0002	162	-0.0005	0.00017
328	South Toe Drain	8/1/2012 10:05	0.0097	0.0143	0.0147	566			4.32	3.32		-0.003	0.00126	0.00191	0.0306	-0.0001	-0.0005	0.124	-0.0002	163	-0.0005	0.00014
334	South Toe Drain	11/5/2012 11:17	0.0081	0.0114	0.0126	591			4.61	5.06		-0.003	0.00104	0.00166	0.0293	-0.0001	-0.0005	0.125	-0.00017	170	-0.0005	0.00024
336	South Toe Drain	2/6/2013 9:00	0.0078	0.0097	0.0106	596				4.07												
338	South Toe Drain	5/1/2013 9:02	0.0098	0.0123	0.0143	592			4.62	5.49												
342	South Toe Drain	8/8/2013 9:47	0.011	0.0155	0.0152	522			5.43	2.53		0.0035	0.00127	0.00194	0.0303	-0.0001	-0.0005	0.097	-0.00021	149	-0.0005	0.00027
345	South Toe Drain	11/5/2013 10:00	0.0124	0.0156	0.0152	564			5.74	1.91												
348	South Toe Drain	5/28/2014 11:28	0.0125	0.0124	0.0146	493			5.8	3.13		-0.003	0.00107	0.00151	0.0231	-0.0001	-0.0005	0.102	-0.0002	143	-0.0005	0.00021
351	South Toe Drain	8/5/2014 8:35	0.0142	0.0168	0.0168	510			5.17	2.53		0.003	0.00132	0.00162	0.0277	-0.0001	-0.0005	0.121	0.000147	147	-0.0005	0.00021
354	South Toe Drain	11/3/2014 11:03	0.0087	0.013	0.0128	559			1.16	4.44		-0.003	0.00098	0.00193	0.0269	-0.0001	-0.0005	0.107	0.000145	155	-0.0005	0.00025
365	E5 - Tailings Impoundment Main Embank Drain Comp	7/12/2001 13:15	0.127	0.141	0.083	84.4		0.32	68.7	2.1		0.0059	-0.00005	0.0007	0.124	-0.00005	-0.00005		0.00004	166	0.0057	0.00183
367	E5 - Tailings Impoundment Main Embank Drain Comp	7/26/2001 8:50	0.071	0.072	0.088	159		-0.1	127	6.7		0.0044	0.00016	0.0008	0.216	-0.00005	0.00008		0.00008	203	0.0008	0.00123
368	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2001	0.033	0.029	0.06	145		0.34	111	3.6		0.0108	0.00013	0.0007	0.153	-0.00005	-0.00005		0.00003	183	0.0007	0.00125
369	E5 - Tailings Impoundment Main Embank Drain Comp	8/10/2001 10:05	0.04	0.026	0.036	143		-0.1	105	2.6		0.0045	0.00015	0.0007	0.181	-0.00005	-0.00005		0.00004	221	0.0009	0.0008
371	E5 - Tailings Impoundment Main Embank Drain Comp	8/30/2001 14:40	0.03	0.025	0.042	92.3		0.12	65.3	2.8		0.0026	0.00016	0.001	0.117	-0.00005	-0.00005		0.00006	150	-0.0002	0.00079
372	E5 - Tailings Impoundment Main Embank Drain Comp	10/24/2001 10:30	0.036	0.07	0.08	107		0.44	80.2	2.7		0.0028	0.00017	0.0007	0.141	-0.00005	-0.00005		0.00003	153	0.0008	0.00086
374	E5 - Tailings Impoundment Main Embank Drain Comp	10/16/2003 18:10	0.019	0.02	0.026	124				2.5		0.0032	0.00206	0.0032	0.0462	-0.00005	-0.00005		0.00015	50.3	0.001	-0.00002
375	E5 - Tailings Impoundment Main Embank Drain Comp	5/31/2005	0.02	0.047	0.068	128				3.4		0.0027	0.00014	0.0022	0.074	-0.00005	-0.00005	0.104	0.0003	57.1	-0.0002	0.00033
376	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2005	0.006	0.033	0.048	131				2.6		0.0035	0.00017	0.0021	0.0775	-0.00005	-0.00005	0.099	0.00026	60.7	-0.0002	0.00031
377	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2005	0.022	0.05	0.063	120				4.5		0.0029	0.00013	0.002	0.0828	-0.00005	-0.00005	0.097	0.00022	52.6	-0.0002	0.00041
378	E5 - Tailings Impoundment Main Embank Drain Comp	8/11/2005	0.031	0.058	0.066	126				2.5		0.0053	0.00015	0.0019	0.0783	-0.00005	-0.00005	0.109	0.00016	51.6	-0.0002	0.00038
379	E5 - Tailings Impoundment Main Embank Drain Comp	9/14/2005	0.012	0.041	0.043	126				3.3		0.0045	0.00015	0.0022	0.075	-0.00005	-0.00005	0.111	0.00024	46	-0.0002	0.00031
380	E5 - Tailings Impoundment Main Embank Drain Comp	10/11/2005	0.045	0.053	0.063	109				4.3		0.0055	0.00016	0.0022	0.0765	-0.00005	-0.00005	0.107	0.00023	48.7	-0.0002	0.00031
381	E5 - Tailings Impoundment Main Embank Drain Comp	11/8/2005	0.01	0.03	0.031	116				3.4		0.0054	0.00026	0.0024	0.0776	-0.00005	-0.00005	0.104	0.00031	53.5	-0.0002	0.00034
382	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/2005	0.043	0.059	0.059	135				4.5		0.0057	0.00032	0.0022	0.0797	-0.00005	-0.00005	0.108	0.00025	56	-0.0002	0.00035
383	E5 - Tailings Impoundment Main Embank Drain Comp	1/17/2006	0.039	0.053	0.048	152				3.3		0.0031	0.00033	0.002	0.0824	-0.00005	-0.00005	0.107	0.00028	60.6	-0.0002	0.00034
384	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2006	0.033	0.05	0.054	160			0.57	4		0.0042	0.00036	0.0024	0.0832	-0.00005	-0.00005	0.11	0.00039	55.7	0.002	0.00036
385	E5 - Tailings Impoundment Main Embank Drain Comp	3/6/2006 13:00	0.033	0.054	0.053	151			0.55	2.7		0.0033	0.00035	0.0024	0.0882	-0.00005	-0.00005	0.105	0.00032	54	0.0003	0.00037
386	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2006 9:35	0.025	0.043	0.042	165			0.73	3.8		0.0036	0.00031	0.0022	0.0795	-0.00005	-0.00005	0.121	0.00031	57.7	0.0002	0.00035
387	E5 - Tailings Impoundment Main Embank Drain Comp	5/9/2006	0.0076	0.0311		143			0.44	3.43		0.0034	0.00042	0.00235	0.0835	-0.0005	-0.0005	0.104	-0.00005	54.9	0.00076	0.00034
388	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2006	0.002	0.0229	0.0367	139			0.33	-0.5		0.0051	0.00041	0.00235	0.085	-0.0005	-0.0005	0.117	-0.00005	56.1	-0.0005	0.00036
389	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2006	0.0158	0.031	0.0376	139		0.159	0.49	3.4		0.0032	0.00052	0.00226	0.0818	-0.0005	-0.0005	0.112	-0.00005	49	-0.0025	0.00033
390	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2006	0.0035	0.0345	0.043	140			0.35	3.4		0.0029	0.00046	0.0022	0.0828	-0.0005	-0.0005	0.146	-0.00005	47.1	-0.0005	0.00034
391	E5 - Tailings Impoundment Main Embank Drain Comp	10/12/2006	0.0146	0.0288	0.0372	150			0.52	3.4		0.0035	0.00032	0.00215	0.0825	-0.0005	-0.0005	0.11	-0.00005	52.7	-0.0005	0.00033
392	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2006	0.0111	0.0337	0.044	171			1.68	3.25		0.003	0.00054	0.00224	0.107	-0.0005	-0.0005	0.131	-0.00005	65.4	-0.0005	0.00034
393	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2006	0.0253	0.0434	0.0474	179			1.08	3.1		0.003	0.0006	0.00226	0.0916	-0.0005	-0.0005	0.127	-0.00005	61.5	-0.0005	0.00037
395	E5 - Tailings Impoundment Main Embank Drain Comp	2/5/2007 10:30	0.0244	0.041	0.0492	182			0.87	3.21		0.0026	0.00054	0.00219	0.0936	-0.0005	-0.0005	0.135	-0.00005	65.5	-0.0005	0.00037
396	E5 - Tailings Impoundment Main Embank Drain Comp	3/5/2007	0.0245	0.0417	0.0484	184			0.64	3.23		0.0033	0.00038	0.00243	0.0845	-0.0005	-0.0005	0.137	-0.00005	68.6	-0.0005	0.00036
397	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2007 10:59	0.0164	0.038	0.0449	247			7.48	2.93		0.0028	0.00026	0.00168	0.0885	-0.0005	-0.0005	0.115	-0.000017	98.3	-0.0005	0.00025
398	E5 - Tailings Impoundment Main Embank Drain Comp	5/7/2007 9:29	0.0195	0.036	0.0439	210			3.48	3.24		0.003	0.00029	0.00187	0.0906	-0.0005	-0.0005	0.133	-0.00005	77.8	-0.0005	0.00033
399	E5 - Tailings Impoundment Main Embank Drain Comp	6/4/2007 10:50	0.0164	0.0358	0.049	217			4.75	3.41		0.004	0.00031	0.00189	0.0859	-0.0005	-0.0005	0.122	0.000046	83.7	-0.0005	0.00033
400	E5 - Tailings Impoundment Main Embank Drain Comp	7/3/2007 11:08	0.0207	0.0418	0.0486	201			2.72	3		0.0026	0.00026	0.00192	0.0798	-0.0005	-0.0005	0.105	-0.000032	69.5	-0.0005	0.00025
401	E5 - Tailings Impoundment Main Embank Drain Comp	8/2/2007 10:30	0.0173	0.0322	0.0399	215			3.3	3.19		-0.004	0.00026	0.00185	0.087	-0.001	-0.001	0.136	0.000134	77.5	-0.001	0.00029
402	E5 - Tailings Impoundment Main Embank Drain Comp	9/5/2007 10:05	0.0025	0.0291	0.0332	209			1.31	3.28		0.0035	0.00027	0.00194	0.0823	-0.0005	-0.0005	0.114	-0.0004	74.1	-0.0005	0.00034
403	E5 - Tailings Impoundment Main Embank Drain Comp	10/2/2007 15:15	0.0235	0.0381	0.044	268			6.8	2.81		0.0023	0.00025	0.00159	0.0902	-0.0005	-0.0005	0.101	0.000046	96.4	-0.0005	0.00024
404	E5 - Tailings Impoundment Main Embank Drain Comp	11/5/2007 10:45	0.0057	0.0208	0.0478	278			5.16	3.37		0.0027	0.00026	0.0019	0.0925	-0.001	-0.001	0.127	0.000066	104	-0.001	0.00032
405	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2007 14:12	0.0275	0.0396	0.045	314			14.3	2.78		-0.002	0.00079	0.00136	0.0792	-0.001	-0.001	0.103	-0.00015	129	-0.001	-0.0002
406	E5 - Tailings Impoundment Main Embank Drain Comp	1/15/2008 14:33	0.0225			261			2.03	3.08		-0.008	0.00056	0.00185	0.0869	-0.001	-0.001	0.139	-0.0006	83.6	-0.001	0.0004
407	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2008 10:09	0.0231	0.0409	0.043	262			1.19	2.99		0.0015	0.00046	0.00177	0.0745	-0.0005	-0.0005	0.113	-0.0004	78.3	-0.0005	0.00033
408	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2008 10:09	0.0258	0.0374	0.0403	266			1.09	2.91		0.0031	0.00045	0.00179	0.0712	-0.0005	-0.0005	0.121	-0.00007	81	-0.0005	0.00037
409	E5 - Tailings Impoundment Main Embank Drain Comp	4/16/2008 9:45	0.0257	0.0319	0.0432	417			11.5	2.76		-0.003	0.00044	0.00141	0.101	-0.001	-0.001	0.114	-0.0001	138	-0.001	0.00023
410	E5 - Tailings Impoundment Main Embank Drain Comp	5/13/2008 10:34	0.0194	0.0362	0.0402	297			2.9	3.2		0.0034	0.00025	0.00171	0.091	-0.0005	-0.0005	0.127	-0.000017	88.8	-0.0005	0.00027
411	E5 - Tailings Impoundment Main Embank Drain Comp	7/15/2008 9:15	0.0011	0.0089	0.079	306			1.49	4.01		0.348	0.00036	0.00233	0.0487	-0.001	-0.001	0.126	-0.0003	72.9	-0.001	0.00025
412	E5 - Tailings Impoundment Main Embank Drain Comp	8/6/2008 9:40	0.01	0.0167	0.0768	291			1.68	4.15		-0.02	-0.002	0.0021	0.0409	-0.01	-0.01	-0.2	-0.00034	67.1	-0.01	-0.002
413	E5 - Tailings Impoundment Main Embank Drain Comp	8/12/2008 12:36	0.0168	0.0332	0.0401	274			2.83	2.78		0.0046	0.00063	0.00164	0.0684	-0.0005	-0.0005	0.128	-0.0005	82.2	-0.0005	0.00026
414	E5 - Tailings Impoundment Main Embank Drain Comp	9/9/2008 8:30	0.0203	0.0338	0.0366	272			1.42	2.71		0.0033	0.00058	0.002	0.0707	-0.0005	-0.0005	0.157	-0.0005	77	-0.0005	0.00029
415	E5 - Tailings Impoundment Main Embank Drain Comp	9/30/2008 11:30	0.0194	0.0345	0.0386	273			1.13	3.06		0.0039	0.00054	0.00187	0.0615	-0.0005	-0.0005	0.14	-0.0005	80.7	-0.0005	0.00028
416	E5 - Tailings Impoundment Main Embank Drain Comp	10/22/2008 11:50	0.0193	0.0303	0.0647	299			3.65	2.75		0.0034	0.00054	0.00198	0.0615	-0.0005	-0.0005	0.148	-0.00007	84.7	-0.0005	0.00023
417	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2008 13:57	0.0019	0.0102	0.0315	267			1.28	3.2		-0.002	0.00033	0.00227	0.0564	-0.001	-0.001	0.147	-0.0006	88.4	-0.001	-0.0002
418	E5 - Tailings Impoundment Main Embank Drain Comp	12/2/2008 11:55	-0.001	0.0105	0.0315	290			2.32	2.79		-0.001	0.0003	0.00219	0.0573	-0.0005	-0.0005	0.117	-0.0003	101	-0.0005	-0.0001
419	E5 - Tailings Impoundment Main Embank Drain Comp	1/14/2009 13:59	0.0213	0.0402	0.0439	283			1.14	2.72		0.0035	0.00029	0.00186	0.0597	-0.0005	-0.0005	0.161	-0.00041	82.3	-0.0005	0.00031
420	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2009 11:39	0.0224	0.0393	0.0404	275			0.66	2.74		0.0077	0.00027	0.00196	0.0738	-0.001	-0.001	0.162	-0.0004	83.1	-0.001	0.00026
421	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2009	0.0226	0.039	0.0424	287			0.68	3.03		0.0046	0.00026	0.00193	0.0689	-0.0005	-0.0005	0.152	-0.00003	85.9	-0.0005	0.00027
422	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2009 13:14	0.0248	0.031	0.0395	335			3.37	2.76		0.0033	0.00023	0.00169	0.0764	-0.001	-0.001	0.152	-0.00051	108	-0.001	0.00025
423	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2009 12:45	0.0231	0.0391	0.0412	313			2.15	2.63		0.0033	0.00021	0.00187	0.0819	-0.0005	-0.0005	0.154	0.000024	96.2	-0.0005	0.00022
424	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2009 9:29	0.0112	0.0354	0.0399	350			4.14	2.55		0.0028	0.00024	0.00159	0.0681	-0.001	-0.001	0.139	0.000065	112	-0.001	0.00026
425	E5 - Tailings Impoundment Main Embank Drain Comp	7/7/2009 10:14	0.0223	0.0336	0.0373	301			1.25	2.63		-0.004	0.00024	0.00182	0.077	-0.001	-0.001	0.144	0.000036	96.3	-0.001	0.00025
426	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2009 10:50	0.0213	0.0347	0.0371	312			0.82	2.89		0.0028	0.00033	0.0019	0.0756	-0.001	-0.001	0.154	0.000083	92.7	-0.001	0.00028
427	E5 - Tailings Impoundment Main Embank Drain Comp	9/2/2009 9:15	0.022	0.0349	0.0381	320			0.78	2.61		0.0027	0.00028	0.00187	0.0708	-0.0005	-0.0005	0.156	-0.0004	93	-0.0005	0.00027
428	E5 - Tailings Impoundment Main Embank Drain Comp	10/6/2009 9:49	0.0231	0.0399	0.0442	308			0.9	2.74		0.0032	0.00028	0.0019	0.0767	-0.001	-0.001	0.151	-0.000034	94.7	-0.001	0.00027
429	E5 - Tailings Impoundment Main Embank Drain Comp	10/29/2009 12:29	0.0213	0.0351	0.0385	306			0.98	2.51		0.004	0.00023	0.00187	0.0724	-0.0005	-0.0005	0.156	-0.0004	90.9	0.00062	0.00026
430	E5 - Tailings Impoundment Main Embank Drain Comp	11/19/2009 9:26	0.0205	0.0384	0.0402	331			1.48	2.83		0.0028	0.00025	0.00179	0.0772	-0.001	-0.001	0.157	-0.000034	102	-0.001	0.00026

Index	Sample Point	Date	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Lithium (Li)-Total	Magnesium (Mg)-Total	Manganese (Mn)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Potassium (K)-Total	Selenium (Se)-Total	Silicon (Si)-Total	Silver (Ag)-Total	Sodium (Na)-Total	Strontium (Sr)-Total	Thallium (Tl)-Total	Tin (Sn)-Total
259	West Main Toe Drain	7/3/2014 12:03	0.00163	-0.03	-0.00005	0.00766	19.5	0.343		0.214	-0.0005	16.8	0.00488	6.35	-0.00001	95.2	2.27	-0.00001	-0.0001
261	West Main Toe Drain	9/2/2014 12:03	0.00199	-0.03	-0.00005	0.00693	19.4	0.343		0.19	-0.0005	15.8	0.00544	6.3	-0.00001	89.8	2.11	-0.00001	-0.0001
263	West Main Toe Drain	10/1/2014 14:11	0.00065	-0.03	-0.00005	0.00705	20	0.352		0.184	-0.0005	15.7	0.00444	6.5	-0.00001	95.6	2.04	-0.00001	-0.0001
264	West Main Toe Drain	11/3/2014 11:29	0.00195	-0.03	-0.00005	0.00799	19.4	0.349		0.187	-0.0005	16.5	0.00348	6.17	-0.00001	92.9	1.96	0.000021	-0.0001
265	West Main Toe Drain	12/8/2014 12:25	0.0009	-0.03	-0.00005	0.00813	19.5	0.394		0.169	-0.0005	18	0.0013	6.58	-0.00001	100	2.11	-0.00001	-0.0001
266	West Main Toe Drain	1/13/2015 14:11	0.00188	-0.03	-0.00005	0.00723	19.1	0.342		0.18	-0.0005	16.5	0.00198	6.33	-0.00001	90.5	2.07	-0.00001	-0.0001
267	West Main Toe Drain	2/2/2015 12:06	0.00179	-0.03	-0.00005	0.00777	19.4	0.366		0.188	-0.0005	16.2	0.00179	6.36	-0.00001	95.7	2.07	-0.00001	-0.0001
268	West Main Toe Drain	3/5/2015 9:30	0.00218	-0.03	-0.00005	0.00749	19	0.381		0.189	-0.0005		0.00152	6.42	-0.00001	96.6	2.21	-0.00001	-0.0001
269	West Main Toe Drain	4/9/2015 10:47	0.00279	0.036	-0.00005	0.0063	19.9	0.381		0.196	-0.0005		0.00134	6.8	-0.00001	87.9	2.23	-0.00001	-0.0001
273	Perimeter Toe Drain	7/7/2009 10:45	0.00197	-0.03	-0.0001	0.011	19	0.157		0.158	-0.001	17.6	0.0025	5.1	-0.00002	83.5	3.68	-0.0002	-0.0002
274	Perimeter Toe Drain	8/5/2009 11:42	0.00199	-0.03	-0.0001	0.011	19	0.177		0.15	0.0015	17.8	0.0022	5.1	-0.00002	84.2	3.4	-0.0002	-0.0002
275	Perimeter Toe Drain	9/1/2009 13:30	-0.004	-0.03	-0.0001	0.012	20.1	0.0484		0.157	-0.001	19.2	-0.002	5.38	-0.00002	81.3	3.68	-0.0002	-0.0002
277	Perimeter Toe Drain	5/18/2011 9:29	0.0037	-0.03	-0.0001	0.012	29.3	0.957		0.178	0.001	21.6	0.0029	4.97	-0.00002	92.2	5.98	-0.0002	-0.0002
278	Perimeter Toe Drain	7/13/2011 10:07	0.00408	-0.03	-0.00005	0.0106	26.9	0.88		0.18	0.00069	20	0.00409	5.13	-0.00001	84.5	5.31	-0.00001	-0.0001
279	Perimeter Toe Drain	8/3/2011 9:57	0.00402	-0.03	-0.00005	0.0112	26.9	0.861		0.173	0.00069	20.8	0.00432	5.21	-0.00001	88.7	4.97	-0.00001	-0.0001
283	Perimeter Toe Drain	10/5/2011 13:55	0.0031	-0.03	-0.0001	0.0102	25.7	0.738		0.177	-0.001	19.2	0.0026	5.23	-0.00002	83.1	4.73	-0.00002	-0.0002
285	Perimeter Toe Drain	10/31/2011 13:24	0.00777	-0.03	-0.00005	0.0111	26.1	0.82		0.183	0.00069	21.5	0.0028	5.44	-0.00001	87.2	5.03	-0.00001	-0.0001
286	Perimeter Toe Drain	12/5/2011 12:18	0.00276	-0.03	-0.00005	0.0115	26.4	0.755		0.186	0.00061	21.3	0.00261	5.41	-0.00001	89.2	4.96	-0.00001	-0.0001
287	Perimeter Toe Drain	2/8/2012 11:15	0.00246	-0.03	-0.00005	0.0124	26.4	0.724	-0.00005	0.182	0.00058	20.6	0.0026	5.21	-0.00001	87	4.64	0.000022	-0.0001
288	Perimeter Toe Drain	4/3/2012 13:42	0.00307	-0.03	-0.00005	0.0103	24.4	0.706		0.176	0.00057	18.2	0.00398	5.19	-0.00001	79.3	4.56	-0.00001	-0.0001
289	Perimeter Toe Drain	5/2/2012 9:52	0.00627	0.031	-0.00005	0.00746	18.1	0.545		0.129	0.00091	13	0.00224	4.72	-0.00001	56.6	3.54	-0.00001	-0.0001
293	Perimeter Toe Drain	8/1/2012 11:36	0.00284	-0.03	-0.00005	0.00974	23.1	0.773		0.197	0.00058	17.4	0.00436	5.06	-0.00001	85.3	4.28	-0.00001	-0.0001
297	Perimeter Toe Drain	11/5/2012 10:11	0.00123	-0.03	-0.00005	0.0106	23.4	0.78		0.213	0.00052	17.1	0.00579	5.23	-0.00001	87.6	4.1	-0.00001	-0.0001
299	Perimeter Toe Drain	2/6/2013 9:55																	
301	Perimeter Toe Drain	5/1/2013 13:21																	
305	Perimeter Toe Drain	8/8/2013 11:16	-0.0018	-0.03	-0.00005	0.00923	20.8	0.685		0.229	-0.0005	15.1	0.00695	4.74	-0.00001	83.4	3.64	-0.00001	-0.0001
307	Perimeter Toe Drain	11/5/2013 9:12																	
309	Perimeter Toe Drain	5/28/2014 11:15	0.00261	-0.03	-0.00005	0.00987	21.3	0.616		0.222	0.00052	14.6	0.0113	5.28	-0.00001	83.5	3.27	-0.00001	-0.0001
312	South Toe Drain	5/18/2011 8:19	0.0179	-0.03	-0.00005	0.0063	21.7	0.0781		0.132	0.00057	9.84	0.0185	5.5	-0.00001	62.8	1.36	-0.0001	-0.0001
313	South Toe Drain	7/14/2011 8:42	0.0148	-0.03	-0.00005	0.00595	20.7	0.0969		0.155	-0.0005	10.4	0.0196	6.9	-0.00001	62.8	1.39	0.000014	-0.0001
314	South Toe Drain	8/3/2011 8:06	0.0146	-0.03	-0.00005	0.0083	22.7	0.103		0.175	-0.0005	11	0.0191	7.21	-0.00001	63.1	1.61	0.000015	-0.0001
315	South Toe Drain	8/31/2011 11:13	0.0119	-0.03	-0.00005	0.00858	22.3	0.11		0.168	-0.0005	13.4	0.0171	7.24	-0.00001	73.5	1.71	0.000014	-0.0001
318	South Toe Drain	10/12/2011 10:31	0.0127	-0.03	-0.00005	0.00792	22.7	0.123		0.173	-0.0005	13.4	0.0184	6.62	-0.00001	80.4	1.67	0.000014	-0.0001
320	South Toe Drain	10/31/2011 13:05	0.0101	-0.03	-0.00005	0.00713	21.9	0.0969		0.18	-0.0005	12.4	0.0191	6.53	-0.00001	82.7	1.66	0.000011	-0.0001
321	South Toe Drain	12/5/2011 10:35	0.0109	-0.03	-0.00005	0.00767	21.7	0.124		0.179	-0.0005	13.1	0.0176	5.84	-0.00001	89.4	1.68	0.00001	-0.0001
322	South Toe Drain	2/7/2012 12:05	0.00912	-0.03	-0.00005	0.00726	20.2	0.0836		0.197	-0.0005	13.1	0.02	5.81	-0.00001	91.7	1.52	0.000035	-0.0001
323	South Toe Drain	4/3/2012 13:24	0.00931	-0.03	-0.00005	0.00664	19.2	0.102		0.196	-0.0005	13.1	0.0104	5.58	-0.00001	88.3	1.53	-0.00001	-0.0001
324	South Toe Drain	5/2/2012 10:47	0.0113	-0.03	-0.00005	0.00682	18.2	0.0952		0.183	-0.0005	12	0.0139	5.68	-0.00001	80.5	1.46	-0.00001	-0.0001
328	South Toe Drain	8/1/2012 10:05	0.0119	-0.03	-0.00005	0.00928	19.1	0.127		0.215	-0.0005	14.1	0.0161	7.04	-0.00001	84.2	1.57	0.000011	-0.0001
334	South Toe Drain	11/5/2012 11:17	0.00933	-0.03	-0.00005	0.0101	20.4	0.146		0.19	-0.0005	12.2	0.0181	6.24	-0.00001	80	1.63	-0.00001	-0.0001
336	South Toe Drain	2/6/2013 9:00																	
338	South Toe Drain	5/1/2013 9:02																	
342	South Toe Drain	8/8/2013 9:47	0.0108	-0.03	-0.00005	0.00783	18.5	0.153		0.208	-0.0005	11	0.0208	6.89	-0.00001	75.2	1.32	0.000013	-0.0001
345	South Toe Drain	11/5/2013 10:00																	
348	South Toe Drain	5/28/2014 11:28	0.00877	-0.03	-0.00005	0.00807	18.6	0.144		0.186	-0.0005	8.44	0.0209	5.49	-0.00001	74.8	1.29	-0.00001	-0.0001
351	South Toe Drain	8/5/2014 8:35	0.0107	-0.03	-0.00005	0.0104	19.5	0.159		0.2	-0.0005	9.34	0.0193	6.7	-0.00001	66	1.42	-0.00001	-0.0001
354	South Toe Drain	11/3/2014 11:03	0.00698	-0.03	-0.00005	0.00942	18.1	0.196		0.209	-0.0005	10.3	0.0052	5.81	-0.00001	81.9	1.58	0.000014	-0.0001
365	E5 - Tailings Impoundment Main Embank Drain Comp	7/12/2001 13:15	0.0064	0.094	0.0007	0.0027	27.7	0.174	-0.00005	0.00202	-0.0005	2.99	0.0057	9.05	-0.00001	16.8	1.4	-0.00005	0.00008
367	E5 - Tailings Impoundment Main Embank Drain Comp	7/26/2001 8:50	0.006	0.066	0.00006	0.0027	31.3	0.168	-0.00005	0.00222	-0.0005	4.26	0.0075	8.08	0.00001	21	1.94	-0.00005	0.00039
368	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2001	0.0061	0.063	0.0001	0.0026	28.1	0.114	-0.00005	0.00161	-0.0005	3.52	0.0055	10.6	-0.00001	17.8	1.71	-0.00005	0.00024
369	E5 - Tailings Impoundment Main Embank Drain Comp	8/10/2001 10:05	0.0053	0.06	0.00002	0.0027	35.8	0.0497	-0.00005	0.00191	-0.0005	4.55	0.0087	7.73	-0.00001	20.6	2.21	-0.00005	0.0002
371	E5 - Tailings Impoundment Main Embank Drain Comp	8/30/2001 14:40	0.0045	-0.005	-0.00002	0.0023	24.8	0.0671	-0.00005	0.00266	-0.0005	2.86	0.005	8.24	-0.00001	17	1.05	-0.00005	0.00015
372	E5 - Tailings Impoundment Main Embank Drain Comp	10/24/2001 10:30	0.0041	-0.005	0.00002	0.0021	23.6	0.0923	-0.00005	0.002	-0.0005	4.04	0.0044	8.17	-0.00001	16.4	1.33	-0.00005	0.00009
374	E5 - Tailings Impoundment Main Embank Drain Comp	10/16/2003 18:10	0.0282	-0.005	0.00004	0.0053	8.73	0.0042	-0.00005	0.0746	-0.0005	4	0.0291	5.28	-0.00001	32.8	0.278	-0.00005	0.00016
375	E5 - Tailings Impoundment Main Embank Drain Comp	5/31/2005	0.0003	0.025	-0.00002	0.0032	9.18	0.371		0.147	-0.0005	7.7	0.0012	6.69	-0.00001	60.5	0.594	-0.00005	-0.00005
376	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2005	0.0007	0.042	-0.00002	0.0035	9.32	0.368		0.139	0.0006	7.54	0.0017	6.63	-0.00001	56.6	0.587	-0.00005	-0.00005
377	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2005	0.0003	0.036	-0.00002	0.003	8.33	0.359		0.131	-0.0005	7.01	0.0012	6.74	-0.00001	58.7	0.544	-0.00005	-0.00005
378	E5 - Tailings Impoundment Main Embank Drain Comp	8/11/2005	0.0008	0.063	-0.00002	0.0032	8.28	0.368		0.133	-0.0005	7.85	0.0007	6.67	-0.00001	65.8	0.504	-0.00005	-0.00005
379	E5 - Tailings Impoundment Main Embank Drain Comp	9/14/2005	0.0011	0.033	-0.00002	0.0034	7.48	0.344		0.149	-0.0005	7.38	0.0006	6.83	-0.00001	63.2	0.434	-0.00005	-0.00005
380	E5 - Tailings Impoundment Main Embank Drain Comp	10/11/2005	0.0012	0.052	-0.00002	0.0032	7.93	0.332		0.131	-0.0005	7.16	0.0008	7.14	-0.00001	60.5	0.437	-0.00005	-0.00005
381	E5 - Tailings Impoundment Main Embank Drain Comp	11/8/2005	0.0017	0.01	-0.00002	0.0039	8.67	0.286		0.123	-0.0005	7.67	0.0016	7.24	-0.00001	57	0.451	-0.00005	-0.00005
382	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/2005	0.0011	0.049	0.00002	0.0033	9.24	0.296		0.122	-0.0005	8.59	0.0013	7.71	-0.00001	57.2	0.521	-0.00005	-0.00005
383	E5 - Tailings Impoundment Main Embank Drain Comp	1/17/2006	0.0011	0.006	-0.00002	0.0042	9.62	0.335		0.145	-0.0005	8.59	0.0017	7.28	-0.00001	56.6	0.56	-0.00005	-0.00005
384	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2006	0.0006	0.039	-0.00002	0.0045	9.46	0.327		0.139	0.0006	8.49	0.0017	7.03	-0.00001	59.9	0.569	-0.00005	-0.00005
385	E5 - Tailings Impoundment Main Embank Drain Comp	3/6/2006 13:00	0.0014	-0.005	0.00003	0.0042	9.01	0.34		0.14	-0.0005	8.32	0.0013	6.49	-0.00001	54.5	0.625	-0.00005	-0.00005
386	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2006 9:35	0.0007	0.024	0.00002	0.0042	10.1	0.3		0.128	-0.0005	7.76	0.0019	6.56	-0.00001	59.2	0.588	-0.00005	-0.00005
387	E5 - Tailings Impoundment Main Embank Drain Comp	5/9/2006	0.00097	-0.03	-0.00005	0.005	9.94	0.358		0.133	-0.0005	8.87	0.0019	6.52	-0.00001	58.2	0.615	-0.0001	-0.0001
388	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2006	0.00094	0.042	-0.00005	-0.005	10.3	0.352		0.127	-0.0005	8.58	0.0027	6.25	-0.00001	60.1	0.608	-0.0001	-0.0001
389	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2006	0.00082	-0.03	-0.00005	-0.005	9.34	0.349		0.121	-0.0005	8.59	0.0021	6.17	-0.00001	54.9	0.563	-0.0001	-0.0001
390	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2006	0.00081	-0.03	-0.00005	-0.005	9.41	0.37		0.129	-0.0005	9.5	0.0014	5.89	-0.00001	62.4	0.601	-0.0001	-0.0001
391	E5 - Tailings Impoundment Main Embank Drain Comp	10/12/2006	0.00056	-0.03	-0.00005	-0.005	10.2	0.317		0.121	-0.0005	9.28	0.0017	5.76	-0.00001	56.7	0.572	-0.0001	-0.0001
392	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2006	0.0011	-0.03	-0.00005	0.0053	11.8	0.396		0.124	-0.0005	10.2	0.0039	7.77	-0.00001	68.8	0.904	-0.0001	-0.0001
393	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2006	0.00086	-0.03	-0.00005	0.0055	11.6	0.34		0.122	-0.0005	11.2	0.0039	6.85	-0.00001	63.9	0.77	-0.0001	-0.0001
395	E5 - Tailings Impoundment Main Embank Drain Comp	2/5/2007 10:30	0.0008	-0.03	-0.00005	0.0057	11.4	0.377		0.125	-0.0005	11.7	0.0031	6.16	-0.00001	63.8	0.823	-0.0001	-0.0001
396	E5 - Tailings Impoundment Main Embank Drain Comp	3/5/2007	0.00091	-0.03	0.0001	0.0054	12.2	0.342		0.137	0.00067	12	0.0032	6.95	-0.00001	72.6	0.841	-0.0001	-0.0001
397	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2007 10:59	0.00098	-0.03	-0.00005	-0.005	16.1	0.278		0.145	-0.0005	9.16	0.0116	6.37	-0.00001	53.9	1.04	-0.0001	-0.0001
398	E5 - Tailings Impoundment Main Embank Drain Comp	5/7/2007 9:29	0.0008	-0.03	-0.00005	-0.005	13.1	0.361		0.131	-0.0005	10.5	0.0072	5.61	-0.00001	63.2	1	-0.0001	-0.0001
399	E5 - Tailings Impoundment Main Embank Drain Comp	6/4/2007 10:50	0.00145	-0.03	-0.00005	-0.005	14.2	0.343		0.127	-0.0005	11	0.0088	5.37	-0.00001	66.7	0.904	-0.0001	-0.0001
400	E5 - Tailings Impoundment Main Embank Drain Comp	7/3/2007 11:08	0.00088	-0.03	-0.00005	-0.005	11.9	0.292		0.123	-0.0005	10.1	0.0057	6.24	-0.00001	65.1	0.818	-0.0001	-0.0001
401	E5 - Tailings Impoundment Main Embank Drain Comp	8/2/2007 10:30	0.00124	-0.03	-0.0001	-0.01	13.3	0.355		0.129	-0.001	11.2	0.007	5.95	-0.00002	69.6	0.974	-0.0002	-0.0002
402	E5 - Tailings Impoundment Main Embank Drain Comp	9/5/2007 10:05	0.00103	-0.03	-0.00005	-0.005	11.9	0.423		0.121	-0.0005	11.3	0.0038	6.07	-0.00001	66.1	0.909	-0.0001	-0.0001
403	E5 - Tailings Impoundment Main Embank Drain Comp	10/2/2007 15:15	0.00079	-0.03	-0.00005	-0.005	16.9	0.298		0.136	-0.0005	9.09	0.0114	6.54	-0.00001	54	1.19	-0.0001	-0.0001
404	E5 - Tailings Impoundment Main Embank Drain Comp	11/5/2007 10:45	0.00116	-0.03	-0.0001	-0.01	16.3	0.377		0.13	-0.001	11	0.0098	6.53	-0.00002	64	1.19	-0.0002	-0.0002
405	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2007 14:12	0.00456	-0.03	-0.0001	-0.01	19.9	0.239		0.103	-0.001	8.92	0.0162	6.88	-0.00002	49.6	1.22	-0.0002	-0.0002
406	E5 - Tailings Impoundment Main Embank Drain Comp	1/15/2008 14:33	0.00147	-0.03	-0.0001	-0.01	14.3	0.384		0.121	-0.001	13.2	0.0041	6.74	-0.00002	71.6	1.1	-0.0002	-0.0002
407	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2008 10:09	0.00117	-0.03	-0.00005	0.0051	14.2	0.327		0.111	-0.0005	12.4	0.003	6.24	-0.00001	77.5	0.863	-0.0001	-0.0001
408	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2008 10:09	0.0023	-0.03	-0.00005	0.0051	14.3	0.328		0.121	-0.0005	13.2	0.0026	6.58	-0.00001	66.8	0.886	-0.0001	-0.0001
409	E5 - Tailings Impoundment Main Embank Drain Comp	4/16/2008 9:45	0.00365	-0.03	-0.0001	-0.01	21.2	0.326		0.156	-0.001	10.4	0.0163	6.34	-0.00002	63	1.46	-0.0002	-0.0002
410	E5 - Tailings Impoundment Main Embank Drain Comp	5/13/2008 10:34	-0.0008	-0.03	-0.00005	0.0053	14.6	0.385		0.14	-0.0005	12	0.0041	6.1	-0.00001	75	1.2	-0.0001	-0.0001
411	E5 - Tailings Impoundment Main Embank Drain Comp	7/15/2008 9:15	0.00356	0.405	0.00027	-0.01	17.5	0.0682		0.137	-0.001	9.26	0.0084	4.81	-0.00002	63.4	0.982	-0.0002	-0.0002
412	E5 - Tailings Impoundment Main Embank Drain Comp	8/6/2008 9:40	-0.002	-0.03	-0.001	-0.1	16	0.0024		0.122	-0.01	10.2	-0.02	2.9	-0.0002	60.4	0.841	-0.002	-0.002
413	E5 - Tailings Impoundment Main Embank Drain Comp	8/12/2008 12:36	0.00952	-0.03	-0.00005	0.0053	13.6	0.357		0.145	-0.0005	12	0.0045	6.3	-0.00001	76.3	0.97	-0.0001	-0.0001
414	E5 - Tailings Impoundment Main Embank Drain Comp	9/9/2008 8:30	0.00104	-0.03	-0.00005	0.0056	12.6	0.31		0.144	-0.0005	12.8	0.0047	6.35	-0.00001	71.7	0.921	-0.0001	-0.0001
415	E5 - Tailings Impoundment Main Embank Drain Comp	9/30/2008 11:30	0.00135	-0.03	-0.00005	0.0057	12.8	0.276		0.146	-0.0005	13.6	0.004	6.44	-0.00001	77.1	0.818	-0.0001	-0.0001
416	E5 - Tailings Impoundment Main Embank Drain Comp	10/22/2008 11:50	0.00224	-0.03	-0.00005	0.0063	14	0.348		0.152	-0.0005	13.2	0.0041	6.55	-0.00001	74.9	0.984	-0.0001	-0.0001
417	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2008 13:57	0.00086	-0.03	-0.0001	-0.01	15.3	0.144		0.133	0.00011	10.9	0.0039	5.32	-0.00002	68.7	1.01	-0.0002	-0.0002
418	E5 - Tailings Impoundment Main Embank Drain Comp	12/2/2008 11:55	0.00094	-0.03	-0.00005	-0.005	16.7	0.244		0.138	-0.0005	9.64	0.0047	6.38	-0.00001	58.5	1.09	-0.0001	-0.0001
419	E5 - Tailings Impoundment Main Embank Drain Comp	1/14/2009 13:59	0.00015	-0.03	-0.00005	0.0055	13.2	0.34		0.133	-0.0005	14.8	0.0022	6.51	-0.00001	80	0.885	-0.0001	-0.0001
420	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2009 11:39	0.00073	-0.03	-0.0001	-0.01	13	0.377		0.131	-0.001	13.2	-0.002	6.53	-0.00002	77.2	1.12	-0.0002	-0.0002
421	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2009	-0.0005	-0.03	-0.00005	0.0056	13.3	0.332		0.139	-0.0005	13.1	0.0018	6.74	-0.00001	74.3	0.936	-0.0001	-0.0001
422	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2009 13:14	0.00065	-0.03	-0.0001	-0.01	15.9	0.298		0.166	-0.001	13.1	0.0079	6.3	-0.00002	71.5	1.19	-0.0002	-0.0002
423	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2009 12:45	-0.003	-0.03	-0.00005	0.0053	14.8	0.349		0.139	-0.0005	12.2	0.0046	6.36	-0.00001	67.5	1.25	-0.0001	-0.0001
424	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2009 9:29	0.00095	-0.03	-0.0001	-0.01	17.6	0.331		0.136	0.0011	12.4	0.0079	6.54	-0.00002	69.6	1.2	-0.0002	-0.0002
425	E5 - Tailings Impoundment Main Embank Drain Comp	7/7/2009 10:14	0.00109	-0.03	-0.0001	-0.01	14.7	0.397		0.14	-0.001	13.5	0.0044	6.51	-0.00002	75.9	1.31	-0.0002	-0.0002
426	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2009 10:50	0.00096	-0.03	-0.0001	-0.01	14.3	0.363		0.136	-0.001	13.3	0.0038	6.37	-0.00002	78.1	1.18	-0.0002	-0.0002
427	E5 - Tailings Impoundment Main Embank Drain Comp	9/2/2009 9:15	-0.003	-0.03	-0.00005	-0.005	14	0.362		0.131	-0.0005	13.3	0.0032	6.3	-0.00001	76.7	1.13	-0.0001	-0.0001
428	E5 - Tailings Impoundment Main Embank Drain Comp	10/6/2009 9:49	0.0011	-0.03	-0.0001	-0.01	14.5	0.372		0.136	-0.001	13.5	0.003	6.46	-0.00002	76.8	1.16	-0.0002	-0.0002
429	E5 - Tailings Impoundment Main Embank Drain Comp	10/29/2009 12:29	0.00101	-0.03	-0.00005	0.0051	14.3	0.357		0.14	-0.0005	13	0.0029	6.16	-0.00001	74.7	1.18	-0.0001	-0.0001
430	E5 - Tailings Impoundment Main Embank Drain Comp	11/19/2009 9:26	0.00125	-0.03	-0.0001	-0.01	15.7	0.349		0.15	-0.001	13.5	0.004	6.53	-0.00002	74.6	1.22	-0.0002	-0.0002

Index	Sample Point	Date	Titanium (Ti)-Total	Uranium (U)-Total	Vanadium (V)-Total	Zinc (Zn)-Total	Aluminum (Al)-Dissolved	Antimony (Sb)-Dissolved	Arsenic (As)-Dissolved	Barium (Ba)-Dissolved	Beryllium (Be)-Dissolved	Bismuth (Bi)-Dissolved	Boron (B)-Dissolved	Cadmium (Cd)-Dissolved	Calcium (Ca)-Dissolved	Chromium (Cr)-Dissolved	Cobalt (Co)-Dissolved	Copper (Cu)-Dissolved	Iron (Fe)-Dissolved	Lead (Pb)-Dissolved	Lithium (Li)-Dissolved	Magnesium (Mg)-Dissolved
259	West Main Toe Drain	7/3/2014 12:03	0.013	0.000806	-0.001	-0.003	0.0044	0.00034	0.00192	0.0682	-0.0001	-0.0005	0.156	-0.0002	118	-0.0005	0.00041	0.00257	-0.03	-0.00005	0.00765	19.4
261	West Main Toe Drain	9/2/2014 12:03	0.013	0.000828	-0.001	-0.003	0.0036	0.00038	0.0021	0.0601	-0.0001	-0.0005	0.145	0.000049	120	-0.0005	0.00037	0.00288	-0.03	-0.00005	0.00714	19.8
263	West Main Toe Drain	10/1/2014 14:11	0.017	0.0008	-0.001	-0.003	0.0032	0.00037	0.00195	0.0586	-0.0001	-0.0005	0.146	-0.00005	118	-0.0005	0.00037	0.00282	-0.03	-0.00005	0.00711	19.4
264	West Main Toe Drain	11/3/2014 11:29	-0.01	0.000823	-0.001	-0.003	0.0036	0.00038	0.00204	0.0606	-0.0001	-0.0005	0.14	0.000042	118	-0.0005	0.00038	0.00274	-0.03	-0.00005	0.00812	20.1
265	West Main Toe Drain	12/8/2014 12:25	-0.01	0.000793	-0.001	-0.003	0.0039	0.00023	0.0019	0.0728	-0.0001	-0.0005	0.154	0.000052	111	-0.0005	0.00053	0.00154	0.032	-0.00005	0.00835	19
266	West Main Toe Drain	1/13/2015 14:11	0.012	0.000833	-0.001	-0.003	0.0035	0.00033	0.0022	0.0596	-0.0001	-0.0005	0.154	0.000061	118	-0.0005	0.0004	0.00253	-0.03	-0.00005	0.00741	19.5
267	West Main Toe Drain	2/2/2015 12:06	-0.01	0.000812	-0.001	-0.003	0.0032	0.00041	0.00207	0.0593	-0.0001	-0.0005	0.158	0.000056	115	-0.0005	0.00039	0.00239	-0.03	-0.00005	0.00763	19.8
268	West Main Toe Drain	3/5/2015 9:30	-0.01	0.000854	-0.001	-0.003	-0.003	0.0003	0.002	0.0601	-0.0001	-0.0005	0.15	0.000062	117	-0.0005	0.00041	0.00181	-0.03	-0.00005	0.00742	18.6
269	West Main Toe Drain	4/9/2015 10:47	0.013	0.000866	0.00077	-0.003	-0.003	0.0003	0.00197	0.0626	-0.0001	-0.00005	0.141	0.000124	123	-0.0005	0.00042	0.00191	-0.03	-0.00005	0.0066	19.8
273	Perimeter Toe Drain	7/7/2009 10:45	0.011	0.00263	-0.002	-0.002	0.0938	0.00062	0.00135	0.042	-0.001	-0.001	0.158	0.000076	115	-0.001	0.00037	0.00384	0.12	0.00014	0.011	18.8
274	Perimeter Toe Drain	8/5/2009 11:42	0.01	0.00243	-0.002	-0.002	0.143	0.00071	0.00146	0.0423	-0.001	-0.001	0.181	-0.00051	117	-0.001	0.00036	0.00407	0.185	-0.0002	0.011	18.5
275	Perimeter Toe Drain	9/1/2009 13:30	-0.01	0.00244	-0.002	-0.002	0.555	0.00071	0.00157	0.0437	-0.001	-0.001	0.192	-0.0006	122	-0.001	0.00045	0.00835	0.337	0.00033	0.012	19.7
277	Perimeter Toe Drain	5/18/2011 9:29	-0.01	0.00222	-0.002	-0.006	0.0156	0.0006	0.00154	0.0436	-0.001	-0.001	0.142	0.00014	199	-0.001	0.00108	0.0047	-0.03	-0.0001	0.011	30.1
278	Perimeter Toe Drain	7/13/2011 10:07	-0.01	0.00198	-0.001	-0.003	0.0053	0.00063	0.00138	0.044	-0.0001	-0.0005	0.131	-0.00011	198	-0.0005	0.00095	0.00478	-0.03	-0.00005	0.0118	27.4
279	Perimeter Toe Drain	8/3/2011 9:57	-0.01	0.00184	-0.001	-0.003	0.0059	0.00061	0.00138	0.0417	-0.0001	-0.0005	0.138	-0.00012	186	-0.0005	0.00092	0.00468	-0.03	-0.00005	0.0117	27.4
283	Perimeter Toe Drain	10/5/2011 13:55	-0.01	0.00195	-0.002	-0.006	0.0278	0.00059	0.0014	0.0392	-0.0002	-0.001	0.14	-0.00012	181	-0.001	0.00076	0.0053	0.03	-0.0001	0.0101	25.6
285	Perimeter Toe Drain	10/31/2011 13:24	-0.01	0.00195	-0.001	0.0032	0.0091	0.00073	0.00149	0.0423	-0.0001	-0.0005	0.151	-0.00015	190	-0.0005	0.00088	0.00671	-0.03	-0.00005	0.0116	26.9
286	Perimeter Toe Drain	12/5/2011 12:18	-0.01	0.00192	-0.001	-0.003	0.0101	0.00065	0.00131	0.0399	-0.0001	-0.0005	0.139	-0.0002	177	-0.0005	0.00072	0.00361	-0.03	-0.00005	0.011	25.9
287	Perimeter Toe Drain	2/8/2012 11:15	-0.01	0.00171	-0.001	-0.003	0.0192	0.00064	0.00148	0.0411	-0.0001	-0.0005	0.145	-0.00012	176	-0.0005	0.00068	0.00395	-0.03	-0.00005	0.012	26.7
288	Perimeter Toe Drain	4/3/2012 13:42	0.013	0.0017	-0.001	-0.003	0.106	0.00062	0.00145	0.0406	-0.0001	-0.0005	0.137	-0.0002	168	-0.0005	0.0007	0.00601	0.105	0.000061	0.0104	24.3
289	Perimeter Toe Drain	5/2/2012 9:52	-0.01	0.00123	-0.001	-0.003	0.183	0.00051	0.00127	0.0334	-0.0001	-0.0005	0.114	-0.0002	132	-0.0005	0.00063	0.0107	0.143	0.000052	0.00824	19.1
293	Perimeter Toe Drain	8/1/2012 11:36	-0.01	0.00146	-0.001	-0.003	0.0502	0.0008	0.00182	0.0457	-0.0001	-0.0005	0.154	-0.00015	187	-0.0005	0.00087	0.00586	0.053	-0.0001	0.0115	26.3
297	Perimeter Toe Drain	11/5/2012 10:11	0.01	0.00167	-0.001	-0.003	0.0136	0.00074	0.00151	0.0355	-0.0001	-0.0005	0.15	-0.00011	163	-0.0005	0.00064	0.00337	-0.03	-0.00005	0.0105	23.5
299	Perimeter Toe Drain	2/6/2013 9:55					0.012	0.00058	0.00139	0.0318	-0.0001	-0.0005	0.125	-0.0001	173	-0.0005	0.00013	0.00197	-0.03	-0.00005	0.00935	23.7
301	Perimeter Toe Drain	5/1/2013 13:21					0.0064	0.00065	0.00175	0.0371	-0.0001	-0.0005	0.122	-0.0002	161	-0.0005	0.0006	0.00276	-0.03	-0.00005	0.00936	22.6
305	Perimeter Toe Drain	8/8/2013 11:16	-0.01	0.00134	-0.001	-0.003	0.0075	0.00063	0.00175	0.0342	-0.0001	-0.0005	0.109	-0.00011	149	-0.0005	0.00054	0.00263	-0.03	-0.00005	0.00834	21
307	Perimeter Toe Drain	11/5/2013 9:12					0.008	0.00068	0.00194	0.0363	-0.0001	-0.0005	0.122	-0.00015	155	-0.0005	0.00053	0.00294	-0.03	-0.00005	0.00979	21.6
309	Perimeter Toe Drain	5/28/2014 11:15	-0.01	0.00148	0.0011	-0.003	0.0241	0.00065	0.00225	0.0361	-0.0001	-0.0005	0.125	-0.00015	158	-0.0005	0.0005	0.00432	-0.03	0.000068	0.00982	21
312	South Toe Drain	5/18/2011 8:19	-0.01	0.000925	0.0011	-0.003	0.0123	0.00105	0.00167	0.0269	-0.0005	-0.0005	0.058	0.000202	174	-0.0005	0.00018	0.0207	-0.03	-0.00005	0.0055	22.4
313	South Toe Drain	7/14/2011 8:42	-0.01	0.00106	0.0017	-0.003	0.0085	0.00139	0.00191	0.0299	-0.0001	-0.0005	0.092	-0.00018	171	-0.0005	0.00016	0.0156	-0.03	-0.00005	0.00629	20.7
314	South Toe Drain	8/3/2011 8:06	-0.01	0.00123	0.0017	-0.003	0.0177	0.00119	0.00164	0.0325	-0.0001	-0.0005	0.112	-0.0002	182	-0.0005	0.00013	0.0158	-0.03	-0.00005	0.00931	22.8
315	South Toe Drain	8/31/2011 11:13	-0.01	0.00111	0.002	-0.003	0.008	0.00114	0.0017	0.033	-0.0001	-0.0005	0.125	-0.0002	182	-0.0005	0.00013	0.0131	-0.03	-0.00005	0.00888	22.4
318	South Toe Drain	10/12/2011 10:31	-0.01	0.00119	0.002	-0.003	0.0059	0.00092	0.00178	0.0354	-0.0001	-0.0005	0.105	-0.00025	189	-0.0005	0.0002	0.0132	-0.03	-0.00005	0.00702	22.7
320	South Toe Drain	10/31/2011 13:05	-0.01	0.00103	0.0017	-0.003	0.0043	0.00093	0.00163	0.0336	-0.0001	-0.0005	0.119	-0.0002	192	-0.0005	0.00015	0.0112	-0.03	-0.00005	0.00751	22.7
321	South Toe Drain	12/5/2011 10:35	-0.01	0.00111	0.0014	-0.003	0.0247	0.00084	0.0014	0.0299	-0.0001	-0.0005	0.115	0.000182	184	-0.0005	0.00019	0.0125	-0.03	-0.00005	0.00816	21.1
322	South Toe Drain	2/7/2012 12:05	0.01	0.000825	0.0013	-0.003	0.0062	0.001	0.00179	0.0294	-0.0001	-0.0005	0.123	-0.00022	181	-0.0005	0.00016	0.0101	-0.03	-0.00005	0.00737	20.5
323	South Toe Drain	4/3/2012 13:24	0.013	0.000745	0.0014	-0.003	0.0094	0.00097	0.00162	0.0282	-0.0001	-0.0005	0.111	-0.0003	171	-0.0005	0.00018	0.0103	-0.03	-0.00005	0.00663	19.5
324	South Toe Drain	5/2/2012 10:47	-0.01	0.000873	0.0016	-0.003	0.0127	0.00095	0.00184	0.0256	-0.0001	-0.0005	0.112	-0.00035	167	-0.0005	0.00018	0.0131	-0.03	-0.00005	0.00724	18.6
328	South Toe Drain	8/1/2012 10:05	-0.01	0.00107	0.0023	-0.003	0.01	0.00133	0.00197	0.0316	-0.0001	-0.0005	0.129	-0.0003	167	-0.0005	0.00015	0.0133	-0.03	-0.00005	0.00965	19.4
334	South Toe Drain	11/5/2012 11:17	-0.01	0.000983	0.0019	-0.003	0.0053	0.0011	0.00169	0.032	-0.0001	-0.0005	0.118	-0.00017	170	-0.0005	0.00024	0.0103	-0.03	-0.00005	0.00999	20.6
336	South Toe Drain	2/6/2013 9:00					0.0045	0.00109	0.00163	0.0333	-0.0001	-0.0005	0.129	-0.0002	177	-0.0005	0.0004	0.0116	-0.03	-0.00005	0.0105	21.2
338	South Toe Drain	5/1/2013 9:02					0.0083	0.00108	0.00176	0.0286	-0.0001	-0.0005	0.11	-0.00025	170	-0.0005	0.00037	0.011	-0.03	-0.00005	0.0085	21.1
342	South Toe Drain	8/8/2013 9:47	-0.01	0.00102	0.0027	-0.003	0.0048	0.00142	0.00195	0.0293	-0.0001	-0.0005	0.112	-0.00021	150	-0.0005	0.00024	0.012	-0.03	-0.00005	0.00964	18.6
345	South Toe Drain	11/5/2013 10:00					0.0042	0.00125	0.00205	0.0312	-0.0001	-0.0005	0.097	-0.00025	163	-0.0005	0.00023	0.0101	-0.03	-0.00005	0.00974	20.2
348	South Toe Drain	5/28/2014 11:28	0.015	0.0012	0.0015	-0.003	0.0038	0.00102	0.0017	0.0233	-0.0001	-0.0005	0.106	-0.0002	147	-0.0005	0.00022	0.01	-0.03	-0.00005	0.00788	18.1
351	South Toe Drain	8/5/2014 8:35	0.015	0.00153	0.0021	-0.003	0.0042	0.00135	0.00182	0.0278	-0.0001	-0.0005	0.126	0.000137	147	-0.0005	0.00022	0.0116	-0.03	-0.00005	0.0105	19.6
354	South Toe Drain	11/3/2014 11:03	-0.01	0.00111	0.0019	-0.003	0.0041	0.00095	0.00205	0.0276	-0.0001	-0.0005	0.115	0.000127	158	-0.0005	0.00023	0.00812	-0.03	-0.00005	0.00987	18.3
365	E5 - Tailings Impoundment Main Embank Drain Comp	7/12/2001 13:15	0.00185	0.00124	0.00089	0.0053	0.0061	-0.00005	0.0007	0.124	-0.00005	-0.00005		0.00004	176	0.0057	0.00186	0.0064	0.094	0.00008	0.0027	29.2
367	E5 - Tailings Impoundment Main Embank Drain Comp	7/26/2001 8:50	0.00371	0.00097	0.00055	0.0041	0.018	0.00021	0.0009	0.218	-0.00005	0.00092		0.00005	203	0.0009	0.0011	0.0063	0.081	0.00016	0.0026	31.8
368	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2001	0.00307	0.00097	0.00054	0.0029	0.0104	0.00017	0.0007	0.169	-0.00005	0.00014		0.00002	183	0.0008	0.00109	0.0056	0.073	0.00003	0.0025	27.6
369	E5 - Tailings Impoundment Main Embank Drain Comp	8/10/2001 10:05	0.00456	0.00157	0.00063	0.003	0.0095	0.00012	0.0009	0.144	-0.00005	-0.00005		0.00002	210	0.0006	0.00142	0.0075	0.075	0.00002	0.0027	29.3
371	E5 - Tailings Impoundment Main Embank Drain Comp	8/30/2001 14:40	0.00281	0.00137	0.00085	0.0021	0.0148	0.00017	0.001	0.115	-0.00005	-0.00005		0.00002	140	-0.0002	0.00084	0.0046	0.011	-0.00002	0.0022	22.5
372	E5 - Tailings Impoundment Main Embank Drain Comp	10/24/2001 10:30	0.00301	0.00084	0.00059	0.0016	0.0218	0.00019	0.0006	0.151	-0.00005	0.00033		0.00002	159	0.0009	0.00065	0.0051	0.098	0.00004	0.0022	24.4
374	E5 - Tailings Impoundment Main Embank Drain Comp	10/16/2003 18:10	0.00229	0.00121	0.00339	-0.0005	0.0194	0.00214	0.0032	0.0496	-0.00005	-0.00005		0.00017	50.2	0.0008	-0.00002	0.0338	0.029	0.00009	0.0057	9
375	E5 - Tailings Impoundment Main Embank Drain Comp	5/31/2005	-0.0005	0.00137	0.00062	-0.0005	0.0092	0.00016	0.0018	0.0754	-0.00005	-0.00005	0.107	0.00034	60.3	0.0007	0.00035	0.0017	0.073	0.0002	0.0041	9.28
376	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2005	0.001	0.00139	0.00059	-0.0005	0.0131	0.00016	0.0019	0.0822	-0.00005	-0.00005	0.092	0.00028	59	0.0002	0.00034	0.0022	0.081	-0.00002	0.0035	9.12
377	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2005	-0.0005	0.00137	0.00058	-0.0005	0.0145	0.00018	0.002	0.0861	-0.00005	-0.00005	0.1	0.00023	52.5	-0.0002	0.00044	0.0031	0.101	0.00002	0.0031	8.19
378	E5 - Tailings Impoundment Main Embank Drain Comp	8/11/2005	-0.0005	0.00136	0.00049	-0.0005	0.0406	0.00016	0.0021	0.0797	-0.00005	-0.00005	0.106	0.00019	53.3	0.0002	0.00044	0.0098	0.115	0.00014	0.0042	8.43
379	E5 - Tailings Impoundment Main Embank Drain Comp	9/14/2005	-0.0005	0.00127	0.00071	0.0007	0.0241	0.00017	0.0023	0.0858	-0.00005	-0.00005	0.113	0.00026	48.8	-0.0002	0.00034	0.0061	0.169	0.00008	0.0036	7.99
380	E5 - Tailings Impoundment Main Embank Drain Comp	10/11/2005	-0.0005	0.00138	0.00056	-0.0005	0.0207	0.00017	0.002	0.0774	-0.00005	-0.00005	0.109	0.00024	47.9	-0.0002	0.00031	0.0025	0.117	0.00003	0.0033	7.69
381	E5 - Tailings Impoundment Main Embank Drain Comp	11/8/2005	-0.0005	0.00184	0.0009	0.0011	0.0117	0.00028	0.0024	0.0803	-0.00005	-0.00005	0.11	0.00034	53.1	-0.0002	0.00037	0.0031	0.058	-0.00002	0.0038	8.52
382	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/2005	0.0006	0.00208	0.0012	0.0005	0.0132	0.00035	0.0025	0.0864	-0.00005	-0.00005	0.111	0.00028	56.7	-0.0002	0.00042	0.0055	0.077	0.0001	0.0036	9.45
383	E5 - Tailings Impoundment Main Embank Drain Comp	1/17/2006	-0.0005	0.00242	0.00086	0.0012	0.0102	0.00038	0.0023	0.0865	-0.00005	-0.00005	0.112	0.0003	60.1	-0.0002	0.00036	0.0035	0.054	0.00005	0.0043	9.76
384	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2006	0.0012	0.00219	0.00104	0.0006	0.0084	0.00037	0.0023	0.0867	-0.00005	-0.00005	0.108	0.00042	55.4	0.0005	0.00046	0.0027	0.043	-0.00002	0.0045	9.26
385	E5 - Tailings Impoundment Main Embank Drain Comp	3/6/2006 13:00	0.0007	0.00195	0.00094	-0.0005	0.0081	0.00035	0.0024	0.086	-0.00005	-0.00005	0.115	0.00034	56.1	-0.0002	0.00036	0.0077	0.061	0.00004	0.0048	9.5
386	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2006 9:35	0.0013	0.00192	0.00095	-0.0005	0.0363	0.0004	0.0021	0.0947	-0.00005	-0.00005	0.112	0.00032	59.5	0.0006	0.0004	0.0024	0.085	0.00006	0.0043	9.86
387	E5 - Tailings Impoundment Main Embank Drain Comp	5/9/2006	-0.01	0.00189	-0.001	-0.001	0.0063	0.00042	0.00239	0.0819	-0.0005	-0.0005	0.104	-0.00005	55.1	0.00064	0.00034	0.00276	0.038	-0.00005	-0.005	10.1
388	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2006	-0.01	0.00146	-0.001	0.001	0.0069	0.00044	0.00235	0.0858	-0.0005	-0.0005	0.118	0.000067	58.4	-0.0005	0.00036	0.00176	0.05	-0.00005	-0.005	10.6
389	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2006	-0.01	0.00149	-0.001	-0.001	0.0064	0.00053	0.00242	0.0844	-0.0005	-0.0005	0.114	-0.00005	49.1	-0.002	0.00033	0.00234	0.059	-0.00005	-0.005	9.38
390	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2006	-0.01	0.00151	-0.001	-0.001	0.0061	0.00049	0.00235	0.0843	-0.0005	-0.0005	0.142	-0.00005	46.8	-0.0005	0.00035	0.00183	0.074	-0.00005	0.0052	9.38
391	E5 - Tailings Impoundment Main Embank Drain Comp	10/12/2006	-0.01	0.00158	-0.001	-0.001	0.0583	0.00034	0.00233	0.0852	-0.0005	-0.0005	0.114	0.000462	56.6	-0.0005	0.00033	0.00154	0.064	-0.00005	-0.005	10.2
392	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2006	-0.01	0.0019	-0.001	-0.001	0.0114	0.00055	0.00229	0.107	-0.0005	-0.0005	0.128	-0.00005	64.8	-0.0005	0.00033	0.00222	0.075	-0.00005	0.0054	11.6
393	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2006	-0.01	0.00207	-0.001	0.0021	0.0052	0.00061	0.00226	0.0919	-0.0005	-0.0005	0.126	-0.00005	61.8	-0.0005	0.00039	0.00218	0.061	-0.00005	0.0057	11.7
395	E5 - Tailings Impoundment Main Embank Drain Comp	2/5/2007 10:30	-0.01	0.00201	-0.001	-0.001	0.0046	0.00054	0.00226	0.0933	-0.0005	-0.0005	0.136	-0.00004	68.5	-0.0005	0.00038	0.00217	0.047	-0.00005	0.0057	12
396	E5 - Tailings Impoundment Main Embank Drain Comp	3/5/2007	-0.01	0.00186	-0.001	0.0015	0.0058	0.00039	0.00248	0.0858	-0.0005	-0.0005	0.138	0.000055	66.9	-0.0005	0.00039	0.00256	0.073	-0.00005	0.0053	12.2
397	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2007 10:59	-0.01	0.00173	-0.001	0.0011	0.0061	0.0003	0.00174	0.0906	-0.0005	-0.0005	0.115	0.000069	97.5	-0.0005	0.00028	0.00356	0.052	-0.00005	-0.005	16
398	E5 - Tailings Impoundment Main Embank Drain Comp	5/7/2007 9:29	-0.01	0.00162	-0.001	-0.001	0.005	0.00032	0.00196	0.092	-0.0005	-0.0005	0.135	-0.00005	78.5	-0.0005	0.00034	0.00175	0.052	-0.00005	-0.005	13.3
399	E5 - Tailings Impoundment Main Embank Drain Comp	6/4/2007 10:50	-0.01	0.00175	-0.001	-0.001	0.0085	0.00032	0.00199	0.0864	-0.0005	-0.0005	0.125	0.00004	84.7	-0.0005	0.00034	0.00279	0.064	-0.00005	0.0052	14.7
400	E5 - Tailings Impoundment Main Embank Drain Comp	7/3/2007 11:08	-0.01	0.00145	-0.001	-0.001	0.0194	0.00027	0.00204	0.0819	-0.0005	-0.0005	0.109	-0.000019	69.8	-0.0005	0.00028	0.00185	0.062	-0.00005	-0.005	11.9
401	E5 - Tailings Impoundment Main Embank Drain Comp	8/2/2007 10:30	-0.01	0.00162	-0.002	-0.002	0.0105	0.00027	0.00188	0.088	-0.001	-0.001	0.135	0.000122	77.9	-0.001	0.00035	0.00177	0.053	-0.0001	-0.01	13.4
402	E5 - Tailings Impoundment Main Embank Drain Comp	9/5/2007 10:05	-0.01	0.00172	-0.001	0.0011	0.0068	0.00028	0.00195	0.0832	-0.0005	-0.0005	0.119	-0.0004	74.5	-0.0005	0.00034	0.00171	0.053	-0.00005	0.0051	12
403	E5 - Tailings Impoundment Main Embank Drain Comp	10/2/2007 15:15	-0.01	0.00153	-0.001	-0.001	0.0111	0.00024	0.0016	0.0916	-0.0005	-0.0005	0.102	0.000102	97.1	-0.0005	0.00026	0.00319	0.053	0.000166	-0.005	16.9
404	E5 - Tailings Impoundment Main Embank Drain Comp	11/5/2007 10:45	-0.01	0.00196	-0.002	-0.002	0.0057	0.00024	0.00196	0.0943	-0.001	-0.001	0.13	0.000058	106	-0.001	0.00032	0.00269	0.058	-0.0001	-0.01	16.7
405	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2007 14:12	-0.01	0.00202	-0.002	-0.002	0.004	0.00047	0.00155	0.0836	-0.001	-0.001	0.107	-0.000034	135	-0.001	0.00023	0.0102	0.05	-0.0001	-0.01	20.1
406	E5 - Tailings Impoundment Main Embank Drain Comp	1/15/2008 14:33	-0.01	0.00226	-0.002	-0.002	0.016	0.00053	0.00197	0.0841	-0.001	-0.001	0.137	-0.0006	82.2	-0.001	0.00038	0.00269	0.05	-0.0001	-0.01	14
407	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2008 10:09	-0.01	0.00203	-0.001	-0.001	0.0029	0.00049	0.00186	0.0738	-0.0005	-0.0005	0.113	-0.0004	78.4	-0.0005	0.00033	0.00185	0.036	-0.00005	0.0051	14.2
408	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2008 10:09	-0.01	0.00191	-0.001	-0.001	0.0141	0.00048	0.00195	0.0723	-0.0005	-0.0005	0.12	-0.00005	83.1	-0.0005	0.00037	0.00425	0.046	0.000051	0.0051	14.7
409	E5 - Tailings Impoundment Main Embank Drain Comp	4/16/2008 9:45	-0.01	0.00174	-0.002	-0.002	0.0379	0.0006	0.00148	0.103	-0.001	-0.001	0.119	-0.00015	135	-0.001	0.00025	0.0494	0.111	0.00015	-0.01	20.8
410	E5 - Tailings Impoundment Main Embank Drain Comp	5/13/2008 10:34	-0.01	0.0014	-0.001	-0.001	0.0047	0.00025	0.00194	0.0908	-0.0005	-0.0005	0.122	-0.000017	88.1	-0.0005	0.00027	-0.002	0.043	-0.00005	-0.005	14.5
411	E5 - Tailings Impoundment Main Embank Drain Comp	7/15/2008 9:15	-0.01	0.00102	-0.002	-0.002	0.613	0.00038	0.00247	0.0534	-0.001	-0.001	0.136	-0.0003	66.5	0.0014	0.00034	0.00617	0.791	0.00027	-0.01	16.3
412	E5 - Tailings Impoundment Main Embank Drain Comp	8/6/2008 9:40	-0.01	0.00121	-0.02	-0.02	0.208	-0.002	0.0022	0.044	-0.01	-0.01	-0.2	-0.00034	65.2	-0.01	-0.002	0.0029	0.297	-0.001	-0.1	15.7
413	E5 - Tailings Impoundment Main Embank Drain Comp	8/12/2008 12:36	-0.01	0.00135	-0.001	-0.001	0.0072	0.00068	0.0018	0.0703	-0.0005	-0.0005	0.125	-0.0005	83.2	-0.0005	0.00027	0.0122	0.078	-0.00005	0.0052	13.5
414	E5 - Tailings Impoundment Main Embank Drain Comp	9/9/2008 8:30	-0.01	0.00136	0.0011	-0.001	0.0047	0.00056	0.00215	0.07	-0.0005	-0.0005	0.154	-0.0005	78.1	-0.002	0.00028	0.00195	0.033	-0.00005	0.0058	12.8
415	E5 - Tailings Impoundment Main Embank Drain Comp	9/30/2008 11:30	-0.01	0.00134	-0.001	-0.001	0.0043	0.00054	0.00212	0.0602	-0.0005	-0.0005	0.138	-0.0005	84.3	-0.0005	0.00028	0.00212	0.042	-0.00005	0.0055	13
416	E5 - Tailings Impoundment Main Embank Drain Comp	10/22/2008 11:50	-0.01	0.00145	-0.001	-0.001	0.0261	0.00053	0.00223	0.0627	-0.0005	-0.0005	0.144	-0.00003	84.9	-0.0005	0.00026	0.00599	0.078	0.000124	0.0064	14.2
417	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2008 13:57	-0.01	0.0013	-0.002	-0.002	0.0745	0.00035	0.00237	0.0595	-0.001	-0.001	0.157	-0.0006	88.8	-0.001	-0.0002	0.00166	0.105	-0.0001	-0.01	15.7
418	E5 - Tailings Impoundment Main Embank Drain Comp	12/2/2008 11:55	-0.01	0.00144	-0.001	-0.001	0.0954	0.00029	0.00233	0.0605	-0.0005	-0.0005	0.125	-0.0004	99.2	-0.0005	0.00017	0.00172	0.155	0.000064	-0.005	16.8
419	E5 - Tailings Impoundment Main Embank Drain Comp	1/14/2009 13:59	-0.01	0.00134	-0.001	0.0031	0.0079	0.00028	0.0018	0.0571	-0.0005	-0.0005	0.156	-0.00041	77.7	-0.0005	0.00033	0.00204	0.054	-0.00005	0.0054	12.4
420	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2009 11:39	-0.01	0.00128	-0.002	-0.002	0.0096	0.00026	0.00203	0.0762	-0.001	-0.001	0.163	-0.0004	85	-0.001	0.00029	0.0016	0.054	-0.0001	-0.01	13.3
421	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2009	-0.01	0.00128	-0.001	-0.001	0.004	0.00026	0.00201	0.0667	-0.0005	-0.0005	0.148	-0.00003	87	-0.0005	0.00027	-0.0015	0.055	-0.00005	0.0051	13.4
422	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2009 13:14	-0.01	0.0013	-0.002	-0.002	0.0064	0.00023	0.00179	0.0761	-0.001	-0.001	0.157	-0.00051	111	-0.001	0.00027	0.00101	0.044	-0.0001	-0.01	16.2
423	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2009 12:45	-0.01	0.00121	-0.001	-0.001	0.0061	0.00022	0.0018	0.082	-0.0005	0.00068	0.157	0.000022	95.8	0.0005	0.00024	-0.004	0.069	0.00012	0.0058	14.6
424	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2009 9:29	-0.01	0.00126	-0.002	-0.002	0.0064	0.00026	0.00173	0.0724	-0.001	-0.001	0.148	0.000076	114	-0.001	0.00027	0.00185	0.054	-0.0001	-0.01	18.3
425	E5 - Tailings Impoundment Main Embank Drain Comp	7/7/2009 10:14	-0.01	0.00123	-0.002	-0.002	0.0055	0.00022	0.0019	0.0728	-0.001	-0.001	0.14	-0.000034	96.6	-0.001	0.00024	0.00162	0.044	-0.0001	-0.01	14.8
426	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2009 10:50	-0.01	0.00115	-0.002	-0.002	0.0043	0.00032	0.00199	0.0759	-0.001	-0.001	0.157	0.000099	92.9	0.0013	0.00027	0.0017	0.044	0.00013	-0.01	14.4
427	E5 - Tailings Impoundment Main Embank Drain Comp	9/2/2009 9:15	-0.01	0.00112	-0.001	-0.001	-0.007	0.00028	0.00191	0.0704	-0.0005	-0.0005	0.162	-0.0004	91.3	-0.0005	0.00027	-0.003	0.038	0.000093	0.0053	13.7
428	E5 - Tailings Impoundment Main Embank Drain Comp	10/6/2009 9:49	-0.01	0.00121	-0.002	-0.002	0.0334	0.0003	0.00197	0.0785	-0.001	-0.001	0.154	0.000036	93.7	-0.001	0.00031	0.00399	0.07	-0.0001	-0.01	14.5
429	E5 - Tailings Impoundment Main Embank Drain Comp	10/29/2009 12:29	-0.01	0.00111	-0.001	-0.001	0.0099	0.00025	0.00182	0.0736	-0.0005	-0.0005	0.157	-0.0004	89.5	-0.0005	0.00025	0.0031	0.054	0.00008	0.0055	14.2
430	E5 - Tailings Impoundment Main Embank Drain Comp	11/19/2009 9:26	-0.01	0.00119	-0.002	-0.002	-0.008	0.00034	0.00181	0.0788	-0.001	-0.001	0.162	-0.000034	100	-0.001	0.00028	0.00371	-0.09	-0.0001	-0.01	15.4

Index	Sample Point	Date	Manganese (Mn)-Dissolved	Mercury (Hg)-Dissolved	Molybdenum (Mo)-Dissolved	Nickel (Ni)-Dissolved	Potassium (K)-Dissolved	Selenium (Se)-Dissolved	Silicon (Si)-Dissolved	Silver (Ag)-Dissolved	Sodium (Na)-Dissolved	Strontium (Sr)-Dissolved	Thallium (Tl)-Dissolved	Tin (Sn)-Dissolved	Titanium (Ti)-Dissolved	Uranium (U)-Dissolved	Vanadium (V)-Dissolved	Zinc (Zn)-Dissolved
259	West Main Toe Drain	7/3/2014 12:03	0.347		0.212	-0.0005		0.00487	6.35	-0.00001	96.3	2.29	-0.00001	-0.0001	0.013	0.000802	-0.001	-0.003
261	West Main Toe Drain	9/2/2014 12:03	0.36		0.194	-0.0005		0.00557	6.41	-0.00001	92.6	2.15	-0.00001	-0.0001	0.013	0.000847	-0.001	-0.003
263	West Main Toe Drain	10/1/2014 14:11	0.35		0.19	-0.0005		0.00444	6.38	-0.00001	94.3	2.04	-0.00001	-0.0001	0.017	0.000822	-0.001	-0.003
264	West Main Toe Drain	11/3/2014 11:29	0.358		0.195	-0.0005		0.00345	6.38	-0.00001	94.3	2.03	-0.00001	-0.0001	-0.01	0.000836	-0.001	-0.003
265	West Main Toe Drain	12/8/2014 12:25	0.401		0.174	-0.0005		0.00137	6.42	-0.00001	105	2.19	-0.00001	-0.0001	-0.01	0.000791	-0.001	-0.003
266	West Main Toe Drain	1/13/2015 14:11	0.357		0.187	-0.0005		0.00199	6.49	-0.00001	93	2.14	-0.00001	-0.0001	0.012	0.000874	-0.001	-0.003
267	West Main Toe Drain	2/2/2015 12:06	0.369		0.195	-0.0005		0.00186	6.51	-0.00001	97.7	2.12	-0.00001	-0.0001	-0.01	0.00084	-0.001	-0.003
268	West Main Toe Drain	3/5/2015 9:30	0.368		0.185	-0.0005		0.00153	6.33	-0.00001	94.6	2.14	-0.00001	-0.0001	-0.01	0.000847	-0.001	-0.003
269	West Main Toe Drain	4/9/2015 10:47	0.37		0.196	-0.0005		0.00127	6.77	-0.00001	89.8	2.25	-0.00001	-0.0001	0.013	0.000885	0.0006	-0.003
273	Perimeter Toe Drain	7/7/2009 10:45	0.357		0.155	-0.001		0.002	5.14	-0.00002	80.5	3.68	-0.0002	-0.0002	0.013	0.00258	-0.002	-0.005
274	Perimeter Toe Drain	8/5/2009 11:42	0.288		0.151	0.0016		0.0022	5.2	-0.00002	83.8	3.43	-0.0002	-0.0002	0.017	0.00244	-0.002	-0.002
275	Perimeter Toe Drain	9/1/2009 13:30	0.252		0.159	-0.001		0.002	5.71	-0.00002	85.9	3.8	-0.0002	-0.0002	0.019	0.00257	-0.002	-0.003
277	Perimeter Toe Drain	5/18/2011 9:29	1.01		0.186	0.0028		0.0029	5.07	-0.00002	94.5	6.1	-0.0002	-0.0002	-0.01	0.00233	-0.002	-0.006
278	Perimeter Toe Drain	7/13/2011 10:07	0.923		0.192	0.00075		0.00397	5.24	-0.00001	88	5.59	-0.00001	-0.0001	-0.01	0.00203	-0.001	-0.003
279	Perimeter Toe Drain	8/3/2011 9:57	0.892		0.181	0.00076		0.00419	5.29	-0.00001	91.2	5.15	-0.00001	-0.0001	-0.01	0.00191	-0.001	-0.003
283	Perimeter Toe Drain	10/5/2011 13:55	0.743		0.177	-0.001		0.0027	5.23	-0.00002	82.1	4.73	-0.00002	-0.0002	-0.01	0.00193	-0.002	-0.006
285	Perimeter Toe Drain	10/31/2011 13:24	0.851		0.194	0.00066		0.00276	5.58	-0.00001	89.4	5.26	-0.00001	-0.0001	-0.01	0.00203	-0.001	-0.003
286	Perimeter Toe Drain	12/5/2011 12:18	0.749		0.188	0.00058		0.00239	5.35	-0.00001	87.9	4.99	-0.00001	-0.0001	-0.01	0.0019	-0.001	-0.003
287	Perimeter Toe Drain	2/8/2012 11:15	0.754	-0.00005	0.192	0.00056		0.00244	5.34	-0.00001	88.3	4.87	0.000025	-0.0001	-0.01	0.00177	-0.001	0.0033
288	Perimeter Toe Drain	4/3/2012 13:42	0.716		0.181	0.00066		0.00395	5.33	-0.00001	78.4	4.61	-0.00001	-0.0001	0.018	0.0017	0.0011	0.0037
289	Perimeter Toe Drain	5/2/2012 9:52	0.587		0.137	0.00102		0.00237	5.01	0.000011	59.9	3.79	-0.00001	-0.0001	-0.01	0.00132	0.0011	-0.003
293	Perimeter Toe Drain	8/1/2012 11:36	0.907		0.232	0.00067		0.00515	5.84	-0.00001	98.8	4.96	-0.00001	-0.0001	0.012	0.00174	0.0012	-0.003
297	Perimeter Toe Drain	11/5/2012 10:11	0.772		0.224	0.00053		0.00589	5.24	-0.00001	86.9	4.29	-0.00001	-0.0001	0.011	0.00168	-0.001	-0.003
299	Perimeter Toe Drain	2/6/2013 9:55	0.267		0.233	-0.0005		0.00551	5.36	-0.00001	91.4	4.07	-0.00001	-0.0001	-0.01	0.00141	-0.001	0.0121
301	Perimeter Toe Drain	5/1/2013 13:21	0.78		0.237	-0.0005		0.00763	5.01	0.000013	89.6	3.99	-0.00001	-0.0001	-0.01	0.0014	0.001	-0.003
305	Perimeter Toe Drain	8/8/2013 11:16	0.701		0.226	-0.0005		0.00752	4.73	-0.00001	81.6	3.57	-0.00001	-0.0001	-0.01	0.00126	0.0011	-0.003
307	Perimeter Toe Drain	11/5/2013 9:12	0.695		0.249	-0.0005		0.00658	5.42	-0.00001	84.8	3.44	-0.00001	-0.0001	-0.01	0.00144	0.0014	-0.003
309	Perimeter Toe Drain	5/28/2014 11:15	0.687		0.214	0.00053		0.0112	5.23	-0.00001	82.9	3.32	-0.00001	-0.0001	-0.01	0.00148	0.0014	-0.003
312	South Toe Drain	5/18/2011 8:19	0.0851		0.11	0.0007		0.0184	5.69	-0.00001	65.1	1.12	-0.0001	-0.0001	-0.01	0.000715	0.00112	-0.003
313	South Toe Drain	7/14/2011 8:42	0.0984		0.155	-0.0005		0.0196	6.89	-0.00001	63	1.38	0.000013	-0.0001	-0.01	0.00105	0.0017	0.003
314	South Toe Drain	8/3/2011 8:06	0.106		0.176	-0.0005		0.0186	7.24	0.000042	63.9	1.64	0.000013	-0.0001	-0.01	0.00122	0.0019	-0.003
315	South Toe Drain	8/31/2011 11:13	0.113		0.174	-0.0005		0.0171	7.29	-0.00001	75	1.73	0.000015	-0.0001	-0.01	0.00111	0.002	-0.003
318	South Toe Drain	10/12/2011 10:31	0.126		0.153	-0.0005		0.0174	6.67	-0.00001	82.4	1.47	0.000013	-0.0001	-0.01	0.00104	0.002	-0.003
320	South Toe Drain	10/31/2011 13:05	0.103		0.189	-0.0005		0.0189	6.73	-0.00001	87.5	1.74	0.000012	-0.0001	-0.01	0.00109	0.0019	-0.003
321	South Toe Drain	12/5/2011 10:35	0.126		0.181	-0.0005		0.0161	5.74	-0.00001	89.5	1.7	-0.00001	-0.0001	-0.01	0.0011	0.0015	0.0034
322	South Toe Drain	2/7/2012 12:05	0.0874		0.206	-0.0005		0.0198	5.89	-0.00001	94.4	1.59	0.000036	-0.0001	0.011	0.000866	0.0014	0.003
323	South Toe Drain	4/3/2012 13:24	0.105		0.201	-0.0005		0.0149	5.65	-0.00001	90.2	1.56	-0.00001	-0.0001	0.013	0.00077	0.0015	0.0033
324	South Toe Drain	5/2/2012 10:47	0.103		0.185	-0.0005		0.0143	5.85	-0.00001	83.3	1.51	-0.00001	-0.0001	-0.01	0.000892	0.002	-0.003
328	South Toe Drain	8/1/2012 10:05	0.131		0.222	-0.0005		0.0166	7.15	0.000015	86	1.61	0.000011	-0.0001	-0.01	0.00109	0.0025	-0.003
334	South Toe Drain	11/5/2012 11:17	0.147		0.191	-0.0005		0.0186	6.29	-0.00001	81.5	1.65	0.000011	-0.0001	0.011	0.00101	0.002	-0.003
336	South Toe Drain	2/6/2013 9:00	0.198		0.215	-0.0005		0.0189	5.87	-0.00001	90.4	1.73	-0.00001	-0.0001	-0.01	0.00111	0.0018	-0.003
338	South Toe Drain	5/1/2013 9:02	0.216		0.221	-0.0005		0.0207	5.7	-0.00001	84.5	1.64	-0.00001	-0.0001	-0.01	0.00108	0.0019	-0.003
342	South Toe Drain	8/8/2013 9:47	0.154		0.211	-0.0005		0.0201	6.87	-0.00001	79.6	1.28	-0.00001	-0.0001	-0.01	0.00109	0.0027	-0.003
345	South Toe Drain	11/5/2013 10:00	0.164		0.221	-0.0005		0.0229	6.98	-0.00001	82.1	1.45	-0.00001	-0.0001	-0.01	0.00117	0.0026	-0.003
348	South Toe Drain	5/28/2014 11:28	0.146		0.186	-0.0005		0.0211	5.44	-0.00001	78.1	1.27	-0.00001	-0.0001	-0.01	0.00119	0.0018	-0.003
351	South Toe Drain	8/5/2014 8:35	0.163		0.202	-0.0005		0.0199	6.73	-0.00001	67.3	1.44	-0.00001	-0.0001	0.014	0.00153	0.0022	-0.003
354	South Toe Drain	11/3/2014 11:03	0.206		0.217	-0.0005		0.00527	5.91	-0.00001	87.3	1.66	-0.00001	-0.0001	-0.01	0.00119	0.002	-0.003
365	E5 - Tailings Impoundment Main Embank Drain Comp	7/12/2001 13:15	0.172	-0.00005	0.00218	-0.0005		0.0055	8.9	-0.00001	17.1	1.38	-0.00005	0.00009	0.00191	0.00126	0.00096	0.0053
367	E5 - Tailings Impoundment Main Embank Drain Comp	7/26/2001 8:50	0.113	-0.00005	0.00279	-0.0005		0.0078	7.9	0.00002	21.8	1.95	-0.00005	0.00082	0.00437	0.00112	0.00058	0.0035
368	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2001	0.0945	-0.00005	0.00203	-0.0005		0.006	7.4	0.00001	15.3	1.69	-0.00005	0.00047	0.00339	0.00114	0.00068	0.0022
369	E5 - Tailings Impoundment Main Embank Drain Comp	8/10/2001 10:05	0.127	-0.00005	0.00211	-0.0005		0.0055	7.9	-0.00001	16.7	1.82	-0.00005	0.00009	0.00318	0.00111	0.00062	0.0035
371	E5 - Tailings Impoundment Main Embank Drain Comp	8/30/2001 14:40	0.0723	-0.00005	0.00354	-0.0005		0.0048	7.9	-0.00001	15.3	1.04	-0.00005	0.00015	0.00287	0.00129	0.00093	0.0025
372	E5 - Tailings Impoundment Main Embank Drain Comp	10/24/2001 10:30	0.0662	-0.00005	0.00349	-0.0005		0.0047	7	-0.00001	15.5	1.43	-0.00005	0.00044	0.00359	0.00094	0.00048	0.0021
374	E5 - Tailings Impoundment Main Embank Drain Comp	10/16/2003 18:10	0.00509	-0.00005	0.0803	-0.0005		0.0299	5.26	-0.00001	34.6	0.293	-0.00005	-0.00005	0.0031	0.00126	0.0036	0.0007
375	E5 - Tailings Impoundment Main Embank Drain Comp	5/31/2005	0.402		0.159	-0.0005		0.0009	6.86	-0.00001	62.1	0.654	-0.00005	-0.00005	0.0005	0.00146	0.0007	-0.0005
376	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2005	0.382		0.154	0.0008		0.0012	6.62	-0.00001	56	0.637	-0.00005	-0.00005	0.0007	0.00148	0.00063	-0.0005
377	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2005	0.362		0.142	-0.0005		0.0008	6.65	0.00002	57.9	0.565	-0.00005	-0.00005	-0.0005	0.00136	0.00061	-0.0005
378	E5 - Tailings Impoundment Main Embank Drain Comp	8/11/2005	0.402		0.137	-0.0005		0.001	6.63	0.00002	61.9	0.547	-0.00005	0.00011	0.0016	0.00131	0.00072	0.0014
379	E5 - Tailings Impoundment Main Embank Drain Comp	9/14/2005	0.377		0.158	-0.0005		0.0008	6.79	-0.00001	65.7	0.499	-0.00005	-0.00005	0.0006	0.00137	0.00078	0.001
380	E5 - Tailings Impoundment Main Embank Drain Comp	10/11/2005	0.341		0.136	-0.0005		0.0008	6.87	-0.00001	57.6	0.454	-0.00005	-0.00005	0.0005	0.00142	0.00064	0.0019
381	E5 - Tailings Impoundment Main Embank Drain Comp	11/8/2005	0.289		0.128	-0.0005		0.0014	6.99	-0.00001	56.5	0.453	-0.00005	-0.00005	0.0006	0.00185	0.0009	-0.0005
382	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/2005	0.344		0.138	-0.0005		0.0016	6.78	-0.00001	58.4	0.587	-0.00005	-0.00005	0.0011	0.00229	0.00124	-0.0005
383	E5 - Tailings Impoundment Main Embank Drain Comp	1/17/2006	0.361		0.149	-0.0005		0.0021	7.15	-0.00001	57.3	0.621	-0.00005	-0.00005	-0.0005	0.00232	0.00098	0.0024
384	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2006	0.357		0.156	0.0009		0.0015	6.78	-0.00001	57.7	0.614	-0.00005	-0.00005	0.0017	0.0022	0.00117	-0.0005
385	E5 - Tailings Impoundment Main Embank Drain Comp	3/6/2006 13:00	0.368		0.148	-0.0005		0.0013	6.74	-0.00001	58.4	0.639	-0.00005	-0.00005	0.0008	0.00222	0.00098	0.001
386	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2006 9:35	0.306		0.134	0.0005		0.0013	6.89	-0.00001	56.9	0.629	-0.00005	-0.00005	0.0023	0.00205	0.00103	-0.0005
387	E5 - Tailings Impoundment Main Embank Drain Comp	5/9/2006	0.351		0.132	-0.0005		0.0017	6.61	-0.00001	58.5	0.61	-0.0001	-0.0001	-0.01	0.00192	-0.001	-0.001
388	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2006	0.356		0.128	-0.0005		0.0027	6.55	-0.00001	60.4	0.611	-0.0001	-0.0001	-0.01	0.00148	-0.001	-0.001
389	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2006	0.351		0.121	-0.0005		0.0024	6.25	-0.00001	55.8	0.569	-0.0001	-0.0001	-0.01	0.00149	-0.001	-0.001
390	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2006	0.372		0.13	-0.0005		0.0013	5.85	-0.00001	62.5	0.601	-0.0001	-0.0001	-0.01	0.00154	-0.001	-0.001
391	E5 - Tailings Impoundment Main Embank Drain Comp	10/12/2006	0.325		0.123	-0.0005		0.0017	5.83	0.000068	58.7	0.585	-0.0001	-0.0001	-0.01	0.00162	-0.001	-0.001
392	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2006	0.39		0.121	-0.0005		0.0041	7.56	-0.00001	66.9	0.888	-0.0001	-0.0001	-0.01	0.00187	-0.001	-0.001
393	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2006	0.333		0.121	-0.0005		0.0038	7.01	-0.00001	62	0.763	-0.0001	-0.0001	-0.01	0.00211	-0.001	-0.001
395	E5 - Tailings Impoundment Main Embank Drain Comp	2/5/2007 10:30	0.382		0.124	-0.0005		0.0031	6.47	-0.00001	67	0.815	-0.0001	-0.0001	-0.01	0.002	-0.001	-0.001
396	E5 - Tailings Impoundment Main Embank Drain Comp	3/5/2007	0.35		0.138	0.00062		0.003	6.86	-0.00001	74.1	0.851	-0.0001	-0.0001	-0.01	0.00188	-0.001	0.0017
397	E5 - Tailings Impoundment Main Embank Drain Comp	4/11/2007 10:59	0.279		0.147	-0.0005		0.0118	6.35	-0.00001	55.1	1.05	-0.0001	-0.0001	-0.01	0.00179	-0.001	0.0012
398	E5 - Tailings Impoundment Main Embank Drain Comp	5/7/2007 9:29	0.367		0.133	-0.0005		0.0074	5.61	-0.00001	64.4	1.01	-0.0001	-0.0001	-0.01	0.00166	-0.001	-0.001
399	E5 - Tailings Impoundment Main Embank Drain Comp	6/4/2007 10:50	0.349		0.127	-0.0005		0.0092	5.49	-0.00001	68.3	0.908	-0.0001	-0.0001	-0.01	0.00181	-0.001	-0.001
400	E5 - Tailings Impoundment Main Embank Drain Comp	7/3/2007 11:08	0.297		0.124	-0.0005		0.0059	6.22	-0.00001	65.7	0.833	-0.0001	-0.0001	-0.01	0.00148	-0.001	-0.001
401	E5 - Tailings Impoundment Main Embank Drain Comp	8/2/2007 10:30	0.376		0.127	-0.001		0.0071	6.01	-0.00002	68	0.958	-0.0002	-0.0002	-0.01	0.00158	-0.002	-0.002
402	E5 - Tailings Impoundment Main Embank Drain Comp	9/5/2007 10:05	0.405		0.12	-0.0005		0.0038	6.18	-0.00001	66.7	0.897	-0.0001	-0.0001	-0.01	0.0017	-0.001	-0.001
403	E5 - Tailings Impoundment Main Embank Drain Comp	10/2/2007 15:15	0.298		0.14	-0.0005		0.0109	6.54	-0.00001	54.9	1.2	-0.0001	-0.0001	-0.01	0.00152	-0.001	-0.001
404	E5 - Tailings Impoundment Main Embank Drain Comp	11/5/2007 10:45	0.387		0.133	-0.001		0.0103	6.69	-0.00002	64.7	1.22	-0.0002	-0.0002	-0.01	0.002	-0.002	-0.002
405	E5 - Tailings Impoundment Main Embank Drain Comp	12/4/2007 14:12	0.266		0.107	-0.001		0.018	7.06	-0.00002	51.6	1.26	-0.0002	-0.0002	-0.01	0.00209	-0.002	-0.002
406	E5 - Tailings Impoundment Main Embank Drain Comp	1/15/2008 14:33	0.378		0.117	-0.001		0.0041	6.8	-0.00002	70.1	1.07	-0.0002	-0.0002	-0.01	0.00216	-0.002	-0.002
407	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2008 10:09	0.338		0.111	-0.0005		0.0031	6.24	-0.00001	76.4	0.865	-0.0001	-0.0001	-0.01	0.00197	-0.001	-0.001
408	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2008 10:09	0.334		0.114	0.00056		0.003	6.77	-0.00001	66	0.9	-0.0001	-0.0001	-0.01	0.00187	-0.001	0.0014
409	E5 - Tailings Impoundment Main Embank Drain Comp	4/16/2008 9:45	0.335		0.16	-0.001		0.0154	6.24	-0.00002	64	1.48	-0.0002	-0.0002	-0.01	0.00179	-0.002	-0.002
410	E5 - Tailings Impoundment Main Embank Drain Comp	5/13/2008 10:34	0.382		0.136	-0.0005		0.0046	6.14	-0.00001	80.5	1.2	-0.0001	-0.0001	-0.01	0.00142	-0.001	-0.001
411	E5 - Tailings Impoundment Main Embank Drain Comp	7/15/2008 9:15	0.0821		0.151	0.0012		0.0079	5.37	-0.00002	69.2	1.03	-0.0002	-0.0002	0.027	0.00111	0.0025	-0.004
412	E5 - Tailings Impoundment Main Embank Drain Comp	8/6/2008 9:40	0.0491		0.125	-0.01		-0.02	3.32	-0.0002	62.9	0.868	-0.002	-0.002	0.015	0.00125	-0.02	-0.02
413	E5 - Tailings Impoundment Main Embank Drain Comp	8/12/2008 12:36	0.349		0.143	-0.0005		0.0052	6.35	-0.00001	75.8	0.973	-0.0001	-0.0001	-0.01	0.00132	-0.001	-0.001
414	E5 - Tailings Impoundment Main Embank Drain Comp	9/9/2008 8:30	0.309		0.141	-0.0005		0.0047	6.41	-0.00001	70.7	0.914	-0.0001	-0.0001	-0.01	0.00134	0.0012	-0.001
415	E5 - Tailings Impoundment Main Embank Drain Comp	9/30/2008 11:30	0.271		0.142	-0.0005		0.0049	6.6	-0.00001	77.8	0.786	-0.0001	-0.0001	-0.01	0.00127	0.0012	-0.001
416	E5 - Tailings Impoundment Main Embank Drain Comp	10/22/2008 11:50	0.351		0.151	-0.0005		0.0044	6.61	-0.00001	73.3	0.972	-0.0001	-0.0001	-0.01	0.00142	-0.001	-0.001
417	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2008 13:57	0.166		0.138	0.0013			5.55	-0.00001	71.9	1.06	-0.0002	-0.0002	-0.01	0.00132	-0.002	-0.003
418	E5 - Tailings Impoundment Main Embank Drain Comp	12/2/2008 11:55	0.317		0.141	-0.0005		0.0046	6.61	-0.00001	61.6	1.14	-0.0001	-0.0001	0.014	0.0015	-0.001	-0.002
419	E5 - Tailings Impoundment Main Embank Drain Comp	1/14/2009 13:59	0.329		0.127	-0.0005		0.0019	6.16	-0.00001	74.9	0.846	-0.0001	-0.0001	-0.01	0.00127	-0.001	-0.002
420	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2009 11:39	0.384		0.134	-0.001		0.002	6.72	-0.00002	77.4	1.13	-0.0002	-0.0002	-0.01	0.00128	-0.002	-0.002
421	E5 - Tailings Impoundment Main Embank Drain Comp	3/4/2009	0.322		0.133	-0.0005		0.0019	6.82	-0.00001	72.1	0.905	-0.0001	-0.0001	-0.01	0.00122	-0.001	-0.001
422	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2009 13:14	0.298		0.166	-0.001		0.0081	6.46	-0.00002	71.3	1.18	-0.0002	-0.0002	-0.01	0.00131	-0.002	-0.002
423	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2009 12:45	0.38		0.141	0.00095		0.0043	6.32	-0.00001	68.9	1.28	-0.0001	-0.0001	-0.01	0.00122	-0.001	-0.001
424	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2009 9:29	0.359		0.146	0.0013		0.0085	6.77	-0.00002	74.3	1.26	-0.0002	-0.0002	-0.01	0.00133	-0.002	-0.002
425	E5 - Tailings Impoundment Main Embank Drain Comp	7/7/2009 10:14	0.375		0.135	-0.001		0.0041	6.56	-0.00002	71.9	1.24	-0.0002	-0.0002	-0.01	0.00117	-0.002	-0.002
426	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2009 10:50	0.368		0.134	0.0013		0.0041	6.4	-0.00002	78	1.18	-0.0002	-0.0002	-0.01	0.00112	-0.002	-0.002
427	E5 - Tailings Impoundment Main Embank Drain Comp	9/2/2009 9:15	0.373		0.132	-0.0005		0.0034	6.15	-0.00001	78.4	1.15	-0.0001	-0.0001	-0.01	0.00113	-0.001	-0.001
428	E5 - Tailings Impoundment Main Embank Drain Comp	10/6/2009 9:49	0.388		0.143	-0.001		0.003	6.47	-0.00002	79.7	1.2	-0.0002	-0.0002	-0.01	0.00127	-0.002	-0.002
429	E5 - Tailings Impoundment Main Embank Drain Comp	10/29/2009 12:29	0.366		0.139	-0.0005		0.0027	6.13	-0.00001	75.8	1.2	-0.0001	-0.0001	-0.01	0.00115	-0.001	-0.001
430	E5 - Tailings Impoundment Main Embank Drain Comp	11/19/2009 9:26	0.367		0.15	-0.001		0.0039	6.41	-0.00002	77.4	1.29	-0.0002	-0.0002	-0.01	0.00122	-0.002	-0.002

Index	Sample Point	Date	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Alkalinity (CaCO3) (mg/L)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen N-WDGWA (mg/L)
432	E5 - Tailings Impoundment Main Embank Drain Comp	1/13/2010 13:50		999	7.87	7.5		126		323		674	-3	0.3	0.082	21.1		1.67		0.0016	
433	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2010 13:20		1054	7.69	8		123		373		778	-3	0.24	0.0848	21.6		2		-0.001	
434	E5 - Tailings Impoundment Main Embank Drain Comp	3/3/2010 12:24		1060	7.85	8.4		128		399		745	-3	0.24	0.0902	22.1		2.69		0.019	
435	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2010 14:05		1059	7.79	7.8		118		381		734	-3	0.22	0.0929	23.6		1.45		0.0218	
436	E5 - Tailings Impoundment Main Embank Drain Comp	5/11/2010		856	8.23	11.4		120		406		749	-3	0.3	0.0896	24.3		2.01	2.04	0.028	
438	E5 - Tailings Impoundment Main Embank Drain Comp	7/8/2010		1030	7.49	7.8		118	950	364	8	751	56.7	6.56	0.0706	24.4		1.04	1.06	0.026	
439	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2010		1035	8.06	8.8		115		384		760	-3	0.25	0.0378	25.5		1.65	1.68	0.037	
441	E5 - Tailings Impoundment Main Embank Drain Comp	10/7/2010		1128	7.28	7.9		104	1120	391	8.11	816	-3	0.31	0.0931	27		1.16	1.22	0.067	
442	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2010		1107	7.26	7.8		118	1090	414	8	805	-3	0.3	0.0795	24.8		1.74	1.79	0.059	
443	E5 - Tailings Impoundment Main Embank Drain Comp	12/1/2010 10:20		1089	7.83	7.5		115	1110	422	8.06	787	-3	0.4	0.074	26.7		1.83	1.89	0.059	
444	E5 - Tailings Impoundment Main Embank Drain Comp	1/10/2011 10:13		1133	7.6	7.3		111	1120	425	7.94	839	-3	0.4	0.072	26.5		1.63	1.7	0.076	
446	E5 - Tailings Impoundment Main Embank Drain Comp	3/7/2011 10:15		1155	7.58	7.4		112	1140	413	8.06	851	-3	0.26	0.0778	25.9		1.59	1.65	0.06	
447	E5 - Tailings Impoundment Main Embank Drain Comp	4/5/2011 10:44		1314	7.65	6.2		89.5	1260	547	7.92	1010	-3	0.55	0.0694	20.8		3.71	3.78	0.07	
448	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2011 13:08		1160	7.51	7.5		97.5	1120	452	7.93	846	-3	0.4	0.0495	22.9		3.54	3.6	0.054	
449	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2011 13:25		1288	7.85	8.4		100	1210	504	7.73	945	-3	0.19	0.0611	24	0.84	3.03	3.07	0.048	
450	E5 - Tailings Impoundment Main Embank Drain Comp	7/13/2011 9:02		1212	7.96	7.5		102	1210	514	8.07	917	-3	0.41	0.0194	22		3.34	3.43	0.098	
451	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2011 8:46		1219	7.88	7.7		93	1200	479	7.94	930	-3	0.26	0.0651	24.8		3.44	3.55	0.111	
453	E5 - Tailings Impoundment Main Embank Drain Comp	10/5/2011 11:10		1139	7.8	7.9		97.4	1120	411	7.99	842	-3	0.28	0.0561	23.1		2.29	2.44	0.147	
454	E5 - Tailings Impoundment Main Embank Drain Comp	11/1/2011 10:32		1155	7.81	7		100	1120	422	8.02	840	-3	0.61	0.0608	23.4		2.46	2.62	0.153	
455	E5 - Tailings Impoundment Main Embank Drain Comp	12/5/2011 11:00		1149	7.92	7		98	1090	399	8.06	787	-3	0.31	0.0571	23.4	0.95	1.89	2.06	0.173	
456	E5 - Tailings Impoundment Main Embank Drain Comp	1/4/2012 13:40		1136	7.98	7.7		96.4	1110	405	8.12	808	-3	0.94	0.0591	24.9	1.03	1.73	1.9	0.171	
457	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2012 9:50		1140	7.95	7.8		98.1	1100	404	8.05	805	-3	0.4	0.0598	23.7	0.96	1.67	1.84	0.174	
458	E5 - Tailings Impoundment Main Embank Drain Comp	3/14/2012 14:10		1163	7.8	6.7		98.7	1110	408	8.04	829	-3	0.19	0.0654	23.9	0.92	1.83	2	0.17	
460	E5 - Tailings Impoundment Main Embank Drain Comp	5/2/2012 11:05		1183	7.84	7.3		95.7	1120	453	8.04	835	-3	0.45	0.051	23.1	0.94	2.62	2.76	0.145	
461	E5 - Tailings Impoundment Main Embank Drain Comp	6/7/2012 9:15	Actual Field Reading	1137	7.88	9.2		94.3	1070	458	7.93	834	-3	1.46	0.0555	22.5	0.83	2.84	2.95	0.103	
462	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2012 8:47		1211	7.71	9		93.8	1150	478	7.96	974	-3	0.18	0.0355	20.1	0.83	3.68	3.8	0.118	
463	E5 - Tailings Impoundment Main Embank Drain Comp	8/1/2012 10:24		1177	7.895	7.7		87.9	1070	412	8.02	903	3	3.95	0.0505	23.8	0.93	2.18	2.32	0.141	
464	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2012 11:05		1100	8.239	8.4		93.3	1060	388	8.05	819	-3	0.29	0.0573	24	0.93	1.81	1.98	0.169	
465	E5 - Tailings Impoundment Main Embank Drain Comp	10/3/2012 9:30		1106	8.02	7		97.9	989	392	8	831	5.9	3.03	0.0572	31.2	0.95	1.71	1.9	0.193	
466	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2012 13:07		1101	8.12	7.6		97.4	1060	408	8.01	800	-3	0.54	0.047	23	0.88	1.91	2.09	0.171	
467	E5 - Tailings Impoundment Main Embank Drain Comp	12/6/2012 10:11		1149	7.646	7.9		93.1	1070	399	7.94	828	3.1	0.22	0.0506	24.3	0.92	1.87	2.06	0.19	
468	E5 - Tailings Impoundment Main Embank Drain Comp	1/2/2013 14:04		1159	7.797	8		95.2	1090	395	8.05	830	-3	0.25	0.0244	23.8	1.01	1.85	2.05	0.202	
469	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2013 9:30		1162	7.792	8.3		92.7	1080	410	7.88	810	-3	0.26	0.0542	23.6	0.89	2.19	2.39	0.199	
470	E5 - Tailings Impoundment Main Embank Drain Comp	3/13/2013 13:05	GH - sample	1170	7.846	8		101	1130	404	7.89	857	3.7	0.35	0.0528	24.3	1.06	2	2.2	0.205	
471	E5 - Tailings Impoundment Main Embank Drain Comp	4/4/2013 14:45	ok	1021	7.858	7		97.8	1020	440	7.87	748	15	11.6	0.0469	18.8	0.48	3.03	3.1	0.07	
472	E5 - Tailings Impoundment Main Embank Drain Comp	5/1/2013 9:18	PH did not stabilize	1238	9.028	7.5	0.07	90.1	1240	486	7.92	936	-3	0.28	0.0409	21.8	1.1	3.16	3.33	0.175	
473	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2013 9:05	Lid was of sampling well.	783	7.75	8.4	1.95	90.2	1150	421	8.1	781	-3	0.4	0.048	24.7	0.91	2.36	2.55	0.198	
474	E5 - Tailings Impoundment Main Embank Drain Comp	7/10/2013 10:02	Sample taken	795	7.79	8	0.05	62.7	1130	422	8.13	845	-3	1.59	0.0282	21.7	0.58	3.51	3.73	0.223	
475	E7 - Perimeter Pond	8/3/2001		563	8.13	17		249		108			-4	4.78	0.09				20.3		
476	E7 - Perimeter Pond	8/10/2001 10:30		592	8.21	18.1		111		240			-4	1.65	0.055				22.7		
478	E7 - Perimeter Pond	8/30/2001 14:15		577	8.28	19.9		107		252			4	3.08	0.036				17.8		
479	E7 - Perimeter Pond	10/23/2001 15:00		560	7.85	4.1		104		257			36	32.2	0.008				17.4		
480	E7 - Perimeter Pond	11/13/2001 8:30		731	7.98	2.6		142		355			8	4.66	0.013				20.2		
485	E7 - Perimeter Pond	5/22/2002 9:15		500	7.4	11		72		160		260	11	20.4	0.025				4.76		5.41
487	E7 - Perimeter Pond	7/31/2002 16:15		620	7.35	16.4		170		319		446	-4	2.84	0.015				0.1		0.53
496	E7 - Perimeter Pond	5/5/2003 16:20		258	9.08	13.6		136		255		316	4	2.81	0.022				0.52	0.012	
497	E7 - Perimeter Pond	5/29/2003 9:10		450	9.17	17.2		150		261		360	-4	1.99	0.011					0.005	
498	E7 - Perimeter Pond	6/24/2003 6:30		46	8.35	20.9		182		324		412	5	3.55	0.044					-0.005	
499	E7 - Perimeter Pond	8/5/2003 14:05		601	8.69	23.5		183		330		438	20	5.27	-0.005					-0.005	
500	E7 - Perimeter Pond	8/20/2003 10:30		588	8.14	20.2		179		314		428	-4	0.99	-0.005					-0.005	
501	E7 - Perimeter Pond	10/16/2003 15:10		704	8.06	9.5		163		306		388	5	1.74	0.012					0.005	
502	E7 - Perimeter Pond	5/1/2004 14:53		542	7.88	13.8		165		312		408	-4	1.85	0.065				0.08	0.008	
503	E7 - Perimeter Pond	7/5/2004		546	7.51	22.6		179		311		430	-4	7.09	-0.005				-0.02	-0.005	
505	E7 - Perimeter Pond	8/25/2004			7.58	16.6		173		308		422	-4	1.69	-0.005				-0.02	-0.005	
506	E7 - Perimeter Pond	10/17/2004		568	7.99	8.2		208		357		448	9	11.1	-0.005				-0.02	-0.005	
507	E7 - Perimeter Pond	12/8/2004		344	8.85	0.3		128		233		324	9	5.96	0.008				1.53	0.036	
508	E7 - Perimeter Pond	1/27/2005		268	7.7	0.6		84.3		146		192	9	32.8	0.066				2.54	0.017	
509	E7 - Perimeter Pond	3/16/2005		376	7.97	3		113		180		210	35.4	43.4	0.016				1.78		
511	E7 - Perimeter Pond	4/11/2005		465	7.18	5.9		152		230		288	12.8	15.3	0.027				1.44		
512	E7 - Perimeter Pond	5/4/2005		500	8.04	12.5		140		240		308	5	2.3	0.029				1.41		
513	E7 - Perimeter Pond	9/6/2006		776	7.2	18.6		577		745		906	-3	0.54	0.008			3.61		0.0174	
515	E7 - Perimeter Pond	11/15/2006		897	7.6	1.4		138				550	2.3	1.6	0.0513			7.71		0.0198	
516	E7 - Perimeter Pond	2/13/2007		1060	7.24	4.1		240		597		756	17.4	14.5	0.185			10.3		0.0247	
517	E7 - Perimeter Pond	3/27/2007		971	7.45	4.7		129		515		711	29.5	22.2	0.0205			58		0.0331	
518	E7 - Perimeter Pond	4/17/2007 10:07		609	7.6	0.6		86.8		335		475	10.1	13.5	0.0083			5.8		0.0041	
519	E7 - Perimeter Pond	5/8/2007 8:48		485	8.02	10.8		129		645		941	3.5	3.42	0.0135			9.3		0.0112	
520	E7 - Perimeter Pond	6/11/2007 12:09		1117	7.88	15		138		602		862	-3	2	0.0155			6.32		0.041	
521	E7 - Perimeter Pond	7/3/2007 10:14		996	8.14	19.5		121		526		752	-3	3.13	0.035			5.15		0.0319	
522	E7 - Perimeter Pond	8/8/2007 9:18		963	8.19	18.5		64.5		483		731	-3	1.13	0.0168			3.78		0.0257	
523	E7 - Perimeter Pond	9/6/2007 11:48		994	7.96	15		90.4		498		719	-3	1	0.0223			1.67		0.0194	
524	E7 - Perimeter Pond	10/2/2007 14:46		1047	7.96	7.9		131		463		742	4	3.2	0.141			2.05		0.0088	
525	E7 - Perimeter Pond	11/5/2007 12:49		1180	8.13	0.8		129		547		869	3.8	3.18	-0.005			4.83		0.0046	
526	E7 - Perimeter Pond	1/14/2008 11:39		927	8.37	0		108		383		752	-3	1.19	-0.005			1.44		0.0036	
527	E7 - Perimeter Pond	6/16/2008 10:50		936	8.529	15.7		91		370		687	3.2	1.62	0.0183			1.71		0.0106	
528	E7 - Perimeter Pond	4/22/2009 14:44		339	6.83	9.3		47.6		157		252	16.5	28.7	-0.005	0.6		2.99		0.0046	
529	E7 - Perimeter Pond	6/8/2011 10:17		1393	7.99	13.1		95.4	1380	772	8.06	1170	12	4.34	0.0061	6		10	10	0.014	
530	E7 - Perimeter Pond	8/3/2011 9:34		1339	8.16	15.6		100	1310	722	8.08	1160	14	7.35	-0.005	7.7		7.69	7.69	-0.01	
531	E7 - Perimeter Pond	9/8/2011 10:25		1348	8.2	14.4		130	1350	725	8.16	1130	8.3	4.95	0.0173	6.1		7.76	7.8	0.043	
532	E7 - Perimeter Pond	10/5/2011 13:40		1388	7.86	8.2		91.9	1360	618	8.07	1100	4.2	2.64	0.005	17.7		3.77	3.78	0.01	
533	E7 - Perimeter Pond	11/1/2011 11:48		1245	8.17	2.9		109	1180	618	8.12	955	-3	4.24	0.005	8.6		6.68	6.69	0.015	
534	E7 - Perimeter Pond	2/8/2012 10:45		1203	8.14	2.6		121	1140	557	8.09	901	4.7	5.12	0.0544	11.1	0.72	4.42	4.45	0.026	
535	E7 - Perimeter Pond	5/2/2012 10:19		985	7.043	5		83.6	922	500	8	730	49.2	36.4	0.0215	-5	0.3	4.97	4.97	-0.01	
538	E7 - Perimeter Pond	8/1/2012 11:26		1304	7.969	16.4		102	1220	684	8.05	1140	5.4	4.41	0.022	6.7	0.46	8.3	8.32	0.026	
541	E7 - Perimeter Pond	11/15/2012 13:39	okay	1131	8.281	0.1		92.2	1080	632	8.01	886	4	4.43	0.0095	7.4	0.26	7.23	7.24	0.011	
542	E7 - Perimeter Pond	12/6/2012 11:02		1307	7.795	3.6		120	1220	620	8.06	1030	3.1	1.73	0.0113	9.2	0.69	5.58	5.59	0.014	
543	E7 - Perimeter Pond	1/2/2013 14:40		1239	8.199	0		139	1170	675	8.13	976	3.9	3.75	-0.005	-5	0.66	7.68	7.69	0.011	
544	E7 - Perimeter Pond	2/6/2013 10:13		1112	8.034	0.1		109	1040	622	7.99	851	-3	3.04	0.0071	-5	0.31	8.88	8.88	-0.01	
545	E7 - Perimeter Pond	5/1/2013 13:28		1250	7.793	5.9	5.9	74	1240	679	7.89	979	11.1	3.85	-0.005	5.5	0.44	10.2	10.2	-0.01	
546	E7 - Perimeter Pond	8/8/2013 11:24		1493	8.21	18.5		71.9	1490	757	8.02	1230	9.7	2.7	0.0065	13.5	0.74	6.91	6.94	0.028	
547	E7 - Perimeter Pond	11/5/2013 9:20	Had to scrape slush from pond, sample taken	1316	8.231	2.2		121	1250	659	7.85	1050	-3	5.31	0.079	10.9	0.61	6.91	6.97	0.06	
548	E7 - Perimeter Pond	12/5/2013 12:20	sample taken	1251	8.443	1.6	14.8	153	1540	852	8.07	1230	12.3	15.9	0.279	13.3	0.71	10.8	10.9	0.178	
549	E7 - Perimeter Pond	12/10/2013 13:52	Sample Taken	1162	7.678			106	1130	579	7.83	892	19.8	38.7	0.309	7.6	0.63	9.37	9.54	0.177	
550	E7 - Perimeter Pond	12/12/2013 11:44	Sample taken	1147	7.306	3.3		109	1140	597	8.02	900	26.5	27.6	0.211	8.1	0.51	8.72	8.89	0.171	
551	E7 - Perimeter Pond	12/16/2013 13:36	Sample taken	1050	7.585	2		107	1040	512	8.02	806	20.9	30.1	0.329	10.8	0.44	8.67	8.93	0.262	
552	E7 - Perimeter Pond	12/19/2013 8:23	Sample taken	1347	8.141	3.7		113	1270	663	8.06	1000	5.7	6.07	0.0845	11.6	0.68	6.49	6.63	0.142	
553	E7 - Perimeter Pond	1/7/2014 11:37	Sample taken beside pump, very hazardous conditions	1010	7.845	1.6		91	985	494	8.04	743	81.3	91.8	0.555	11.4	0.52	8.1	8.33	0.232	
555	E7 - Perimeter Pond	1/27/2014 13:44	Sample taken Filtered D-Metals	1211	7.127	5.3		105	1160	589	8.15	678	22.1	31.4	0.175	10.8	0.56	5.21	5.34	0.135	
556	E7 - Perimeter Pond	1/28/2014 14:01	Sample taken Filtered D-Metals	1270	7.91	5.3		109	1200	622	8.06	977	20.5	20.2	0.0968	12.1	0.72	5.25	5.38	0.128	
557	E7 - Perimeter Pond	1/29/2014 14:37	Sample taken Filtered D-Metals	1258	8.123	5.5		108	1190	626	8.06	945	19.7	20.3	0.123	10.1	0.72	5.42	5.55	0.131	
558	E7 - Perimeter Pond	1/30/2014 13:48		1205	8.067	3.2		105	1160	606	8.11	703	27.6	28.8	0.206	12.1	0.62	6.37	6.54	0.17	
559	E7 - Perimeter Pond	2/11/2014 14:01	sample taken	1185	7.573	0.1	6.7	87.9	1170	557	8.1	891	-3	7.75	0.226	11.1	0.57	6.45	6.64	0.193	
560	E7 - Perimeter Pond	3/4/2014 8:54	Had to break ice. Took 3L sample for metallurgy	1390	8.38	0.5	15.7	102	1300	602	8.11	850	6.9	7.77	0.81	16.5	0.68	9.4	9.87	0.475	
561	E7 - Perimeter Pond	4/1/2014 11:20		797	8.009	1.9	38.3	89.3	773	395	8.01	576	27.8	31.3	0.732	7.1	0.2	9.09	9.37	0.278	
562	E7 - Perimeter Pond	5/1/2014 11:12	sample taken	960	7.91	7.8	20.5	75.5	890	485	7.93	739	32.5	29.4	0.0655	5.3	0.28	6.92	6.96	0.049	
563	E7 - Perimeter Pond	6/3/2014 11:11	Sample taken, water level in the yellow, duplicate taken	1186	8.091	14	4.15	85.9	1180	582	8.07	928	4.3	4.1	-0.005	12.9	0.41	9.34	9.37	0.033	
564	E7 - Perimeter Pond	7/3/2014 8:38	Sample taken, waterstriders on pond	1410	8.21	15.6		83.3	1400	754	8.06	1150	6.8	6.15	0.0243	11.9	0.51	9.35	9.38	0.034	
565	E7 - Perimeter Pond	9/2/2014 11:22	Sample taken	1178	7.959	15.3	3.47	69.4	1150	466	7.97	885	6.9	3.81	0.0363	19.1	0.73	3.61	3.72	0.11	

Index	Sample Point	Date	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Sulphide as S (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	Aluminum (Al)-Total	Antimony (Sb)-Total	Arsenic (As)-Total	Barium (Ba)-Total	Beryllium (Be)-Total	Bismuth (Bi)-Total	Boron (B)-Total	Cadmium (Cd)-Total	Calcium (Ca)-Total	Chromium (Cr)-Total	Cobalt (Co)-Total
432	E5 - Tailings Impoundment Main Embank Drain Comp	1/13/2010 13:50	0.0196	0.0316	0.0405	349			2.42	2.81		0.0023	0.00038	0.00177	0.0737	-0.001	-0.001	0.164	-0.000034	102	-0.001	0.00031
433	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2010 13:20	0.0177	0.0318	0.0394	388			2.33	3.25		0.0021	0.00038	0.00155	0.0718	-0.001	-0.001	0.136	-0.0004	119	-0.001	0.0003
434	E5 - Tailings Impoundment Main Embank Drain Comp	3/3/2010 12:24	0.0214	0.0321	0.0385	451			3.92	2.32		-0.003	0.00042	0.0015	0.0716	-0.001	-0.001	0.139	-0.000034	129	-0.001	0.00027
435	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2010 14:05	0.0234	0.0352	0.0403	379			1.67	-5		0.0025	0.00036	0.0016	0.0768	-0.001	-0.001	0.161	-0.00041	122	-0.001	0.00034
436	E5 - Tailings Impoundment Main Embank Drain Comp	5/11/2010	0.0191	0.0334	0.0383	395			2.45	3.01		0.0023	0.00034	0.00156	0.0741	-0.001	-0.001	0.144	-0.000034	132	-0.001	0.00024
438	E5 - Tailings Impoundment Main Embank Drain Comp	7/8/2010	0.0242	0.0379	0.116	377			1.25	3.14		0.0027	0.00083	0.0016	0.0902	-0.001	-0.001	0.139	-0.00071	115	-0.001	0.00044
439	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2010	0.0198	0.0308	0.0371	404			1.9	2.8		-0.002	0.00041	0.00152	0.0753	-0.001	-0.001	0.138	-0.0006	123	-0.001	0.00033
441	E5 - Tailings Impoundment Main Embank Drain Comp	10/7/2010	0.0238	0.036	0.0387	432			1.58	3.55		-0.003	0.00047	0.00177	0.0732	-0.0005	-0.0005	0.168	-0.00008	123	-0.0005	0.00039
442	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2010	0.0203	0.0285	0.0383	418			1.89	6.66		-0.003	0.00038	0.00162	0.081	-0.0005	-0.0005	0.143	-0.00006	133	-0.0005	0.00039
443	E5 - Tailings Impoundment Main Embank Drain Comp	12/1/2010 10:20	0.0193	0.0294	0.0357	451			2.11	3.45		-0.003	0.00039	0.00165	0.0767	-0.0005	-0.0005	0.146	-0.0001	136	-0.0005	0.0004
444	E5 - Tailings Impoundment Main Embank Drain Comp	1/10/2011 10:13	0.0147	0.0278	0.0337	453			1.66	4.38		-0.003	0.00038	0.00161	0.0727	-0.0005	-0.0005	0.15	-0.00006	136	-0.0005	0.00041
446	E5 - Tailings Impoundment Main Embank Drain Comp	3/7/2011 10:15	0.0158	0.0255	0.0315	458			1.63	3.63		-0.003	0.00038	0.00175	0.0766	-0.0005	-0.0005	0.139	-0.00008	132	-0.0005	0.00046
447	E5 - Tailings Impoundment Main Embank Drain Comp	4/5/2011 10:44	0.023	0.0305	0.0404	577			7.24	2.69		-0.003	0.00053	0.00146	0.0724	-0.0005	-0.0005	0.125	-0.0003	176	-0.0005	0.00037
448	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2011 13:08	0.0223	0.0318	0.0351	484			4.73	3.55		-0.003	0.00033	0.00145	0.07	-0.0005	-0.0005	0.125	-0.00009	144	-0.0005	0.00031
449	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2011 13:25	0.0179	0.0278	0.0328	547			5.32	3.76		-0.003	0.00035	0.0016	0.0774	-0.0001	-0.0005	0.135	-0.00009	163	-0.0005	0.00039
450	E5 - Tailings Impoundment Main Embank Drain Comp	7/13/2011 9:02	0.0187	0.0284	0.0336	520			4.92	3.55		-0.003	0.00035	0.00148	0.0735	-0.0001	-0.0005	0.12	-0.00006	167	-0.0005	0.00038
451	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2011 8:46	0.0143	0.0231	0.0259	526			4.03	3.92		-0.003	0.00044	0.00153	0.0646	-0.0001	-0.0005	0.137	-0.00008	152	-0.0005	0.00038
453	E5 - Tailings Impoundment Main Embank Drain Comp	10/5/2011 11:10	0.0177	0.0276	0.0315	440			2.91	4.18		-0.003	0.00042	0.00161	0.0607	-0.0001	-0.0005	0.127	-0.00007	131	-0.0005	0.00036
454	E5 - Tailings Impoundment Main Embank Drain Comp	11/1/2011 10:32	0.0158	0.0253	0.0302	469			3.32	3.42		0.003	0.00043	0.00161	0.0614	-0.0001	-0.0005	0.146	-0.00007	134	-0.0005	0.00038
455	E5 - Tailings Impoundment Main Embank Drain Comp	12/5/2011 11:00	0.0152	0.0258	0.0285	456			2.68	3.2		0.0035	0.00044	0.00162	0.06	-0.0001	-0.0005	0.131	-0.00009	126	-0.0005	0.00035
456	E5 - Tailings Impoundment Main Embank Drain Comp	1/4/2012 13:40	0.0137	0.0236	0.0265	459			2.37	2.77		0.003	0.00044	0.00163	0.0603	-0.0001	-0.0005	0.144	-0.00008	130	-0.0005	0.00036
457	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2012 9:50	0.0132	0.0244	0.027	458			2.83	3.11		0.0036	0.00043	0.00158	0.0604	-0.0001	-0.0005	0.141	-0.00008	128	-0.0005	0.00034
458	E5 - Tailings Impoundment Main Embank Drain Comp	3/14/2012 14:10	0.0137	0.0256	0.0288	462			2.57	3.23		0.0032	0.00042	0.00153	0.0615	-0.0001	-0.0005	0.139	-0.0001	131	-0.0005	0.00035
460	E5 - Tailings Impoundment Main Embank Drain Comp	5/2/2012 11:05	0.02	0.0301	0.0343	482			3.83	3.19		0.0035	0.00039	0.00156	0.0652	-0.0001	-0.0005	0.124	-0.00025	145	-0.0005	0.00034
461	E5 - Tailings Impoundment Main Embank Drain Comp	6/7/2012 9:15	0.0213	0.0309	0.0364	471			3.64	2.94		0.0035	0.00037	0.00137	0.0617	-0.0001	-0.0005	0.129	-0.0002	149	-0.0005	0.00028
462	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2012 8:47	0.0201	0.029	0.0348	518			4.32	5.65		-0.003	0.00031	0.00139	0.0647	-0.0001	-0.0005	0.115	-0.00011	151	-0.0005	0.00028
463	E5 - Tailings Impoundment Main Embank Drain Comp	8/1/2012 10:24	0.021	0.0324	0.036	464			2.53	3.56		0.0036	0.00041	0.00161	0.0654	-0.0001	-0.0005	0.132	-0.0001	131	-0.0005	0.00032
464	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2012 11:05	0.0189	0.0286	0.0324	440			2.37	3.35		0.003	0.00039	0.00166	0.0671	-0.0001	-0.0005	0.143	-0.00012	124	-0.0005	0.00035
465	E5 - Tailings Impoundment Main Embank Drain Comp	10/3/2012 9:30	0.0165	0.0297	0.0306	450			2.02	4.36		-0.003	0.0004	0.00164	0.067	-0.0001	-0.0005	0.137	-0.00009	125	-0.0005	0.00035
466	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2012 13:07	0.0162	0.0227	0.028	445			1.8	3.03		-0.003	0.00037	0.00157	0.0684	-0.0001	-0.0005	0.128	-0.0001	131	-0.0005	0.00034
467	E5 - Tailings Impoundment Main Embank Drain Comp	12/6/2012 10:11	0.0174	0.0281	0.0315	472			1.92	2.65		-0.003	0.00048	0.00157	0.0623	-0.0001	-0.0005	0.131	-0.0001	126	-0.0005	0.00029
468	E5 - Tailings Impoundment Main Embank Drain Comp	1/2/2013 14:04	0.0128	0.0205	0.0287	457			1.89	3.15		-0.003	0.00046	0.00171	0.059	-0.0001	-0.0005	0.105	-0.0001	126	-0.0005	0.00035
469	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2013 9:30	0.0153	0.0234	0.0275	460			947	3.06												
470	E5 - Tailings Impoundment Main Embank Drain Comp	3/13/2013 13:05	0.0152	0.0237	0.0285	476			2.1	3.14												
471	E5 - Tailings Impoundment Main Embank Drain Comp	4/4/2013 14:45	0.0051	0.0134	0.0411	428			3.07	5.51												
472	E5 - Tailings Impoundment Main Embank Drain Comp	5/1/2013 9:18	0.0207	0.0289	0.0344	542			3.32	3.68												
473	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2013 9:05	0.0173	0.029	0.0319	502			2.45	3.58												
474	E5 - Tailings Impoundment Main Embank Drain Comp	7/10/2013 10:02	-0.001	0.0055	0.0118	496			3.86	4.21												
475	E7 - Perimeter Pond	8/3/2001	0.017	0.031		75.1		0.63	20.9	6.1		0.0122	0.00043	0.0009	0.0524	-0.00005	-0.00005	6.1	0.00006	81.1	0.0008	0.00038
476	E7 - Perimeter Pond	8/10/2001 10:30	0.019	0.017	0.017	85		0.71	23.4	5.2		0.0117	0.00047	0.0012	0.0521	-0.00005	-0.00005		0.00004	80	0.0006	0.00038
478	E7 - Perimeter Pond	8/30/2001 14:15	0.009	0.023	0.021	94.4		0.29	18.1	5.8		0.0083	0.00047	0.0008	0.0554	-0.00005	0.00044		0.00005	76.8	-0.0002	0.0003
479	E7 - Perimeter Pond	10/23/2001 15:00	0.029	0.02	0.077	93		0.82	18.2	6		0.0219	0.00028	0.0004	0.0575	-0.00005	-0.00005		0.00004	80.5	0.0006	0.00014
480	E7 - Perimeter Pond	11/13/2001 8:30	0.022	0.03	0.048	138		1.25	21.5	7.2		0.0102	0.00033	0.0006	0.0743	-0.00005	0.00064		0.00003	115	-0.0002	0.00018
485	E7 - Perimeter Pond	5/22/2002 9:15	0.006	0.015	0.035	83.6		0.65		0.6		0.0233	0.00031	0.001	0.03	-0.00005	-0.00005		0.00003	53.7	-0.0002	0.00009
487	E7 - Perimeter Pond	7/31/2002 16:15	-0.005	0.009	0.014	182		0.43		5.4		0.018	0.00018	0.0008	0.0473	-0.00005	-0.00005		0.00002	98.2	-0.0002	-0.00002
496	E7 - Perimeter Pond	5/5/2003 16:20	-0.005	0.007	0.012	114				7.9		0.0042	0.00024	0.0007	0.032	-0.00005	-0.00005		-0.00001	79.6	-0.0002	0.00015
497	E7 - Perimeter Pond	5/29/2003 9:10	-0.005	0.032	0.031	127				8.5		0.0013	0.00026	0.0009	0.0229	-0.00005	-0.00005		0.00002	78.8	-0.0002	0.0001
498	E7 - Perimeter Pond	6/24/2003 6:30	-0.005	-0.005	0.01	151				10.3		0.0019	0.00025	0.0012	0.0287	-0.00005	-0.00005		0.00002	97.5	0.0005	0.00024
499	E7 - Perimeter Pond	8/5/2003 14:05	-0.005	0.012	0.019	151				11.4		0.0021	0.00023	0.0013	0.0344	-0.00005	-0.00005		0.00003	96.8	-0.0002	0.00011
500	E7 - Perimeter Pond	8/20/2003 10:30	-0.005	0.006	0.011	147				9.4		0.002	0.00021	0.0012	0.0329	-0.00005	-0.00005		0.00002	91.1	0.0032	0.00009
501	E7 - Perimeter Pond	10/16/2003 15:10	-0.005	-0.005	0.009	152				6		0.0022	0.00019	0.0007	0.0396	-0.00005	-0.00005		0.00002	92.4	0.0019	-0.00002
502	E7 - Perimeter Pond	5/1/2004 14:53	-0.005	-0.005	0.019	156				5		0.0082	0.00033	0.0007	0.0586	-0.00005	-0.00005		0.00004	99.3	-0.0002	0.00021
503	E7 - Perimeter Pond	7/5/2004	-0.005	-0.005	0.013	148				6.2		0.0097	0.00025	0.0008	0.0434	-0.00005	-0.00005		0.00002	96.4	-0.0002	0.00005
505	E7 - Perimeter Pond	8/25/2004	-0.005	-0.005	0.009	148				6.1		0.0021	0.00019	0.001	0.035	-0.00005	-0.00005		0.00003	95	-0.0002	0.00003
506	E7 - Perimeter Pond	10/17/2004	-0.005	0.005	0.033	148				6.3		0.005	0.00027	0.001	0.0528	-0.00005	-0.00005		0.00004	112	-0.0002	0.00033
507	E7 - Perimeter Pond	12/8/2004	0.007	0.015	0.036	109				5.5		0.0036	0.00028	0.0005	0.0444	-0.00005	-0.00005		0.00003	73.9	0.0003	0.0001
508	E7 - Perimeter Pond	1/27/2005	-0.005	0.015	0.04	55				4		0.0177	0.00027	0.0004	0.0391	-0.00005	-0.00005		0.00004	47.7	-0.0002	0.00022
509	E7 - Perimeter Pond	3/16/2005	0.004	0.009	0.043	54.4				2.5		0.0165	0.00024	0.0004	0.0425	-0.00005	-0.00005	0.03	0.00004	58.7	-0.0002	0.00013
511	E7 - Perimeter Pond	4/11/2005	0.002	-0.005	0.025	66.4				3.3		0.0037	0.00023	0.0006	0.0502	-0.00005	-0.00005	0.02	0.00004	73.7	-0.0002	0.00018
512	E7 - Perimeter Pond	5/4/2005	0.003	-0.01	0.014	94.6				4.5		0.0064	0.00033	0.0008	0.0473	-0.00005	-0.00005	0.028	0.00005	74.8	-0.0002	0.00008
513	E7 - Perimeter Pond	9/6/2006	0.0151	0.0206	0.0224	192			4.09	6.95		-0.005	-0.0005	0.00055	0.0795	-0.0025	-0.0025	-0.05	-0.00025	236	0.0042	0.00104
515	E7 - Perimeter Pond	11/15/2006	-0.001	0.0044	0.0253	247			8.79	4.19			0.00028	0.00059	0.0576	-0.001	-0.001	0.039	-0.0001	133	-0.001	-0.0002
516	E7 - Perimeter Pond	2/13/2007	0.0065	0.0097	0.0319	282			15	4.14		0.0027	0.00032	0.00065	0.0791	-0.0005	-0.001	0.076	-0.000034	191	-0.0005	0.00028
517	E7 - Perimeter Pond	3/27/2007	0.0075	0.0116	0.0405	1660			16.2	3.68		0.0362	0.00031	0.00049	0.063	-0.001	-0.001	0.076	0.000098	167	-0.001	-0.0002
518	E7 - Perimeter Pond	4/17/2007 10:07	0.0041	0.0075	0.0284	241			6.7	5.54		0.0175	0.00026	0.00038	0.0435	-0.001	-0.001	0.034	0.000058	109	-0.001	-0.0002
519	E7 - Perimeter Pond	5/8/2007 8:48	-0.001	0.0045	0.0149	464			12.4	4.03		-0.005	-0.0005	-0.0005	0.0834	-0.0025	-0.0025	0.101	-0.000085	208	-0.0025	-0.0005
520	E7 - Perimeter Pond	6/11/2007 12:09	-0.001	0.0053	0.0159	435			7.94	4.27		-0.002	0.00048	0.00057	0.0741	-0.001	-0.001	0.104	0.000086	187	-0.001	-0.0002
521	E7 - Perimeter Pond	7/3/2007 10:14	-0.001	0.0039	0.0137	379			7.55	4.58		0.0035	0.00042	0.00066	0.0626	-0.001	-0.001	0.078	-0.000034	160	-0.001	-0.0002
522	E7 - Perimeter Pond	8/8/2007 9:18	-0.001	0.0037	0.0111	410			4.5	4.56		-0.002	0.00044	0.00068	0.0536	-0.001	-0.001	0.087	0.000004	139	-0.001	-0.0002
523	E7 - Perimeter Pond	9/6/2007 11:48	-0.001	0.0047	0.0108	309			2.39	4.35		0.0024	0.00084	0.00084	0.0631	-0.001	-0.001	0.096	0.000052	149	-0.001	-0.0002
524	E7 - Perimeter Pond	10/2/2007 14:46	0.0018	0.005	0.0138	371			2.38	3.32		-0.002	0.00113	0.00074	0.0684	-0.001	-0.001	0.109	0.000171	143	-0.001	-0.0002
525	E7 - Perimeter Pond	11/5/2007 12:49	-0.001	0.0025	0.0111	465			6.3	3.5		-0.002	0.00103	0.00077	0.0679	-0.001	-0.001	0.123	0.000079	176	-0.001	-0.0002
526	E7 - Perimeter Pond	1/14/2008 11:39	0.0011	0.005	0.0108	401			2.75	2.43		0.0388	0.00119	0.00085	0.0518	-0.001	-0.001	0.135	-0.0004	123	-0.001	-0.0002
527	E7 - Perimeter Pond	6/16/2008 10:50	-0.001	0.0031	0.0113	351			2.35	2.41		0.0028	0.00084	0.00082	0.0432	-0.001	-0.001	0.152	-0.0004	118	-0.001	-0.0002
528	E7 - Perimeter Pond	4/22/2009 14:44	0.0053	0.0109	0.0426	99.1			5.06	13		0.0946	-0.0001	0.00035	0.0219	-0.0005	-0.0005	0.013	0.000056	47.5	-0.0005	0.00014
529	E7 - Perimeter Pond	6/8/2011 10:17	0.0012	0.0031	0.0145	701			14.8	4.44		0.0063	0.00057	0.00063	0.0549	-0.0005	-0.0005	0.142	-0.0001	242	-0.0005	0.00015
530	E7 - Perimeter Pond	8/3/2011 9:34	0.0018	0.0049	0.0404	652			8.07	5.14		0.024	0.00051	0.00053	0.0593	-0.0002	-0.001	0.166	-0.00007	224	-0.001	-0.0002
531	E7 - Perimeter Pond	9/8/2011 10:25	-0.001		0.0129	644			11.9	3.21		-0.006	0.00103	0.00083	0.0455	-0.0002	-0.001	0.381	-0.0002	230	-0.001	0.00054
532	E7 - Perimeter Pond	10/5/2011 13:40	0.0025	0.006	0.0128	629			5.41	3.25		-0.006	0.00057	0.00092	0.0428	-0.0002	-0.001	0.154	-0.00008	198	-0.001	-0.0002
533	E7 - Perimeter Pond	11/1/2011 11:48	0.0024	0.005	0.0107	552			9.52	4.34		0.0052	0.00055	0.00073	0.0423	-0.0001	-0.0005	0.191	-0.0001	192	-0.0005	0.00031
534	E7 - Perimeter Pond	2/8/2012 10:45	0.0045	0.0083	0.0148	504			8.21	2.51		-0.003	0.00086	0.0009	0.0392	-0.0001	-0.0005	0.242	-0.00013	178	-0.0005	0.00029
535	E7 - Perimeter Pond	5/2/2012 10:19	0.0035	0.0084	0.075	425			6.79	7.18		0.0248	0.00037	0.0005	0.0351	-0.0001	-0.0005	0.106	-0.0002	156	-0.0005	0.00016
538	E7 - Perimeter Pond	8/1/2012 11:26	-0.001	0.0045	0.0126	589			10.7	5.17		0.0065	0.00072	0.00067	0.0558	-0.0001	-0.0005	0.17	-0.0001	214	-0.0005	0.00025
541	E7 - Perimeter Pond	11/15/2012 13:39	0.0026	0.0026	0.0129	515			8.06	4.68		-0.003	0.00031	0.00046	0.0445	-0.0001	-0.0005	0.071	-0.00006	193	-0.0005	0.00011
542	E7 - Perimeter Pond	12/6/2012 11:02	0.0044	0.0085	0.0113	591			5.55	4.3		-0.003	0.0008	0.00078	0.0405	-0.0001	-0.0005	0.251	-0.00025	199	-0.0005	0.0006
543	E7 - Perimeter Pond	1/2/2013 14:40	0.0026	0.0049	0.0099	531			7.15	3.07		-0.003	0.00077	0.0007	0.038	-0.0001	-0.0005	0.249	-0.00025	216	-0.0005	0.00084
544	E7 - Perimeter Pond	2/6/2013 10:13	0.0028	0.0047	0.0084	479			8.15	4.33												
545	E7 - Perimeter Pond	5/1/2013 13:28	0.003	0.0058	0.015	595			9.94	5.28												
546	E7 - Perimeter Pond	8/8/2013 11:24	-0.001	0.0041	0.0134	761			6.66	3.33												
547	E7 - Perimeter Pond	11/5/2013 9:20	0.0022	0.0041	0.0112	595			6.58	2.87		0.003	0.00076	0.00075	0.0492	-0.0001	-0.0005	0.222	-0.0003	211	-0.0005	0.00056
548	E7 - Perimeter Pond	12/5/2013 12:20	0.0036	0.0072	0.031	731			10.1	4.8		0.0047	0.0014	0.00113	0.0576	-0.0001	-0.0005	0.305	-0.00027	272	-0.0005	0.00088
549	E7 - Perimeter Pond	12/10/2013 13:52	0.0025	0.0065	0.0513	493			9.65	3.07		0.0035	0.00173	0.00093	0.0437	-0.0001	-0.0005	0.253	-0.00016	181	-0.0005	0.0006
550	E7 - Perimeter Pond	12/12/2013 11:44	0.0029	0.007	0.044	514			8.92	3.1		-0.003	0.00131	0.0009	0.0437	-0.0001	-0.0005	0.235	-0.00017	188	-0.0005	0.00054
551	E7 - Perimeter Pond	12/16/2013 13:36	-0.001	0.0057	0.0558	448			8.81	4.06		-0.003	0.00136	0.00103	0.0437	-0.0001	-0.0005	0.174	-0.0001	159	-0.0005	0.00041
552	E7 - Perimeter Pond	12/19/2013 8:23	0.0038	0.0065	0.0167	585			6.5	2.94		-0.003	0.00084	0.00112	0.0404	-0.0001	-0.0005	0.248	-0.00023	216	-0.0005	0.0008
553	E7 - Perimeter Pond	1/7/2014 11:37	-0.001	0.0073	0.113	407				3.43		0.0224	0.00219	0.0012	0.0436	-0.0001	-0.0005	0.138	-0.00007	153	-0.0005	0.00031
555	E7 - Perimeter Pond	1/27/2014 13:44	0.0041	0.0078	0.0494	526			5.52	3.45		-0.003	0.00108	0.00108	0.0392	-0.0001	-0.0005	0.264	-0.0002	193	-0.0005	0.00064
556	E7 - Perimeter Pond	1/28/2014 14:01	0.005	0.0083	0.0389	572			5.31	3.11		-0.003	0.00087	0.00108	0.0396	-0.0001	-0.0005	0.285	-0.00025	202	-0.0005	0.00072
557	E7 - Perimeter Pond	1/29/2014 14:37	0.0061	0.0096	0.0428	571			5.59	3.35		-0.003	0.00092	0.00102	0.0393	-0.0001	-0.0005	0.262	-0.00021	204	-0.0005	0.0007
558	E7 - Perimeter Pond	1/30/2014 13:48	0.0046	0.0081	0.0462	522			6.47	2.57		-0.003	0.00145	0.00101	0.0373	-0.0001	-0.0005	0.243	-0.00017	194	-0.0005	0.00059
559	E7 - Perimeter Pond	2/11/2014 14:01	0.0063	0.0102	0.0239	518			6.7	4.04		-0.003	0.00153	0.00129	0.0402	-0.0001	-0.0005	0.211	-0.00012	175	-0.0005	0.00014
560	E7 - Perimeter Pond	3/4/2014 8:54	0.0036	0.0078	0.0196	581			10.7	4.07		-0.003	0.00211	0.0018	0.0495	-0.0001	-0.0005	0.167	-0.0001	185	-0.0005	0.00056
561	E7 - Perimeter Pond	4/1/2014 11:20	0.0014	0.0048	0.0437	291			9.44	4.97		0.036	0.00296	0.00113	0.0433	-0.0001	-0.0005	0.109	-0.00006	118	-0.0005	0.00025
562	E7 - Perimeter Pond	5/1/2014 11:12	0.0037	0.0091	0.0495	429			6.6	5.25		0.0499	0.00061	0.00052	0.0373	-0.0001	-0.0005	0.081	-0.00014	149	-0.0005	0.00064
563	E7 - Perimeter Pond	6/3/2014 11:11	-0.001	0.003	0.0149	522			9	4.91		0.0154	0.00051	0.00076	0.0478	-0.0001	-0.0005	0.078	-0.0001	178	-0.0005	0.00021
564	E7 - Perimeter Pond	7/3/2014 8:38	-0.001	0.0036	0.0167	709			8.52	3.81		0.0069	0.00063	0.00085	0.0501	-0.0001	-0.0005	0.117	-0.0001	233	-0.0005	-0.0001
565	E7 - Perimeter Pond	9/2/2014 11:22	-0.001	0.0059	0.0146	506			3.72	3.34		-0.003	0.00077	0.00166	0.0391	-0.0001	-0.0005	0.117	0.000019	148	-0.0005	-0.0001

Index	Sample Point	Date	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Lithium (Li)-Total	Magnesium (Mg)-Total	Manganese (Mn)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Potassium (K)-Total	Selenium (Se)-Total	Silicon (Si)-Total	Silver (Ag)-Total	Sodium (Na)-Total	Strontium (Sr)-Total	Thallium (Tl)-Total	Tin (Sn)-Total
432	E5 - Tailings Impoundment Main Embank Drain Comp	1/13/2010 13:50	0.00153	-0.03	-0.0001	-0.01	16.3	0.332		0.133	-0.001	12.8	0.0066	6.65	-0.00002	76.4	1.35	-0.0002	-0.0002
433	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2010 13:20	-0.004	-0.03	-0.0001	-0.01	18.2	0.336		0.13	-0.001	12.6	0.0069	6.58	-0.00002	70	1.37	-0.0002	-0.0002
434	E5 - Tailings Impoundment Main Embank Drain Comp	3/3/2010 12:24	0.00186	-0.03	-0.0001	-0.01	18.7	0.325		0.146	-0.001	12.6	0.0077	6.32	-0.00002	68.8	1.47	-0.0002	-0.0002
435	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2010 14:05	0.0019	-0.03	-0.0001	-0.01	18.6	0.345		0.138	-0.001	13.2	0.005	6.55	-0.00002	78.9	1.46	-0.0002	-0.0002
436	E5 - Tailings Impoundment Main Embank Drain Comp	5/11/2010	0.00202	-0.03	-0.0001	-0.01	18.6	0.25		0.137	-0.001	12.3	0.0064	6.96	-0.00002	73.1	1.45	-0.0002	-0.0002
438	E5 - Tailings Impoundment Main Embank Drain Comp	7/8/2010	0.00875	-0.03	-0.0001	-0.01	18.7	0.76		0.144	-0.001	13.1	0.0096	6.62	-0.00002	76.6	1.54	-0.0002	-0.0002
439	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2010	-0.0018	-0.03	-0.0001	-0.01	18.8	0.299		0.13	-0.001	13.3	0.0057	6.29	-0.00002	72.6	1.52	-0.0002	-0.0002
441	E5 - Tailings Impoundment Main Embank Drain Comp	10/7/2010	0.00245	-0.03	-0.00005	0.0062	20.4	0.494		0.155	0.00057	15.1	0.0033	6.54	-0.00001	83.5	1.72	-0.0001	-0.0001
442	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2010	0.00117	-0.03	-0.00005	0.0051	19.9	0.35		0.148	-0.0005	13.8	0.0057	6.91	-0.00001	80.8	1.78	-0.0001	-0.0001
443	E5 - Tailings Impoundment Main Embank Drain Comp	12/1/2010 10:20	0.00161	-0.03	-0.00005	0.0051	19.9	0.352		0.153	-0.0005	14.1	0.0056	6.62	-0.00001	77.9	1.74	-0.0001	-0.0001
444	E5 - Tailings Impoundment Main Embank Drain Comp	1/10/2011 10:13	0.00102	-0.03	-0.00005	0.0057	20.5	0.357		0.152	-0.0005	14.6	0.0054	6.9	-0.00001	78.7	1.88	-0.0001	-0.0001
446	E5 - Tailings Impoundment Main Embank Drain Comp	3/7/2011 10:15	0.00155	-0.03	-0.00005	0.0057	20.2	0.396		0.154	0.00097	15.5	0.00476	6.74	-0.00001	85.3	1.81	-0.0001	-0.0001
447	E5 - Tailings Impoundment Main Embank Drain Comp	4/5/2011 10:44	0.00615	-0.03	-0.00005	0.0051	26.1	0.388		0.201	-0.0005	12.9	0.0136	6.27	-0.00001	63.9	2.3	-0.0001	-0.0001
448	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2011 13:08	0.00157	-0.03	-0.00005	0.0051	22.2	0.293		0.185	-0.0005	11.7	0.0114	6.22	-0.00001	66.6	2	-0.0001	-0.0001
449	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2011 13:25	0.0017	-0.03	-0.00005	0.005	23.9	0.363		0.179	-0.0005	13.5	0.0109	6.59	-0.00001	79.8	2.1	-0.00001	-0.0001
450	E5 - Tailings Impoundment Main Embank Drain Comp	7/13/2011 9:02	0.00154	-0.03	-0.00005	0.00462	23.5	0.327		0.176	-0.0005	13.1	0.0106	6.6	-0.00001	77	2.05	-0.00001	-0.0001
451	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2011 8:46	0.00184	-0.03	-0.00005	0.00577	23.8	0.435		0.191	-0.0005	13.2	0.00912	6.36	-0.00001	73.2	2.08	-0.00001	-0.0001
453	E5 - Tailings Impoundment Main Embank Drain Comp	10/5/2011 11:10	0.00185	-0.03	-0.00005	0.00539	20.6	0.46		0.17	-0.0005	13.5	0.00574	6.36	-0.00001	82.1	1.79	-0.00001	-0.0001
454	E5 - Tailings Impoundment Main Embank Drain Comp	11/1/2011 10:32	0.00089	-0.03	-0.00005	0.00595	21	0.452		0.174	0.00059	14	0.00564	6.34	-0.00001	82.1	1.82	-0.00001	-0.0001
455	E5 - Tailings Impoundment Main Embank Drain Comp	12/5/2011 11:00	0.00128	-0.03	-0.00005	0.00674	20.2	0.377		0.172	-0.0005	15.9	0.005	6.48	-0.00001	89.9	1.92	-0.00001	-0.0001
456	E5 - Tailings Impoundment Main Embank Drain Comp	1/4/2012 13:40	0.00198	-0.03	-0.00005	0.00637	19.7	0.381		0.173	-0.0005	15.3	0.00494	6.46	-0.00001	88.3	1.97	-0.00001	-0.0001
457	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2012 9:50	0.00175	-0.03	-0.00005	0.00709	20.7	0.374		0.172	-0.0005	15.1	0.00493	6.42	-0.00001	84.7	1.9	0.000023	-0.0001
458	E5 - Tailings Impoundment Main Embank Drain Comp	3/14/2012 14:10	0.00186	-0.03	-0.00005	0.006	19.8	0.355		0.17	0.00051	13.3	0.00562	6.41	-0.00001	81.5	1.86	0.000016	-0.0001
460	E5 - Tailings Impoundment Main Embank Drain Comp	5/2/2012 11:05	0.00137	-0.03	-0.00005	0.0057	22.1	0.442		0.193	-0.0005	13.3	0.00895	6.15	-0.00001	74.5	2.01	-0.00001	-0.0001
461	E5 - Tailings Impoundment Main Embank Drain Comp	6/7/2012 9:15	0.00156	-0.03	-0.00005	0.00537	21	0.274		0.188	-0.0005	11.5	0.00935	6.08	-0.00001	66.3	1.99	-0.00001	-0.0001
462	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2012 8:47	0.00132	-0.03	-0.00005	0.00534	24.7	0.284		0.186	-0.0005	12.2	0.0121	6.32	-0.00001	70.9	2.04	-0.00001	-0.0001
463	E5 - Tailings Impoundment Main Embank Drain Comp	8/1/2012 10:24	0.00184	-0.03	-0.00005	0.006	20.8	0.4		0.195	-0.0005	13	0.00646	6.24	-0.00001	81.5	2.04	-0.00001	-0.0001
464	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2012 11:05	0.0019	-0.03	-0.00005	0.00659	19.3	0.435		0.18	-0.0005	14.4	0.00631	6.21	-0.00001	90.4	1.86	-0.00001	-0.0001
465	E5 - Tailings Impoundment Main Embank Drain Comp	10/3/2012 9:30	0.00194	-0.03	-0.00005	0.00576	19.2	0.432		0.181	-0.0005	14.1	0.00517	6.58	-0.00001	87.1	1.73	-0.00001	-0.0001
466	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2012 13:07	0.00091	-0.03	-0.00005	0.00629	19.6	0.361		0.188	-0.0005	13.2	0.00624	6.41	-0.00001	79.1	1.99	-0.00001	-0.0001
467	E5 - Tailings Impoundment Main Embank Drain Comp	12/6/2012 10:11	0.00201	-0.03	-0.00005	0.00608	20.8	0.436		0.184	-0.0005	13.9	0.00619	6.39	-0.00001	83.8	1.98	-0.00001	-0.0001
468	E5 - Tailings Impoundment Main Embank Drain Comp	1/2/2013 14:04	0.00088	-0.03	-0.00005	0.00514	19.6	0.482		0.181	-0.0005	14.5	0.00619	6.34	-0.00001	88.2	1.86	-0.00001	-0.0001
469	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2013 9:30																	
470	E5 - Tailings Impoundment Main Embank Drain Comp	3/13/2013 13:05																	
471	E5 - Tailings Impoundment Main Embank Drain Comp	4/4/2013 14:45																	
472	E5 - Tailings Impoundment Main Embank Drain Comp	5/1/2013 9:18																	
473	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2013 9:05																	
474	E5 - Tailings Impoundment Main Embank Drain Comp	7/10/2013 10:02																	
475	E7 - Perimeter Pond	8/3/2001	0.0087	0.059	0.00004	0.0018	13.2	0.0143	-0.00005	0.00915	-0.0005	3.77	0.0055	4.61	-0.00001	12.8	0.745	-0.00005	0.00014
476	E7 - Perimeter Pond	8/10/2001 10:30	0.0082	0.058	-0.00002	0.0019	13.8	0.0189	-0.00005	0.00892	-0.0005	3.75	0.0065	3.3	-0.00001	13.4	0.826	-0.00005	0.00018
478	E7 - Perimeter Pond	8/30/2001 14:15	0.0094	-0.005	0.00002	0.0021	14.7	0.0233	-0.00005	0.00844	-0.0005	3.79	0.0057	2.57	-0.00001	15.2	0.569	-0.00005	0.00078
479	E7 - Perimeter Pond	10/23/2001 15:00	0.0081	0.012	0.00006	0.0014	12.7	0.0491	-0.00005	0.00629	-0.0005	3.53	0.0055	4.39	-0.00001	10.5	0.642	-0.00005	0.00012
480	E7 - Perimeter Pond	11/13/2001 8:30	0.0076	-0.005	0.00004	0.0018	17.9	0.0649	-0.00005	0.0085	-0.0005	3.81	0.0074	4.76	-0.00001	15.6	0.876	-0.00005	0.00052
485	E7 - Perimeter Pond	5/22/2002 9:15	0.0107	0.022	0.00003	0.0008	8.3	0.0006	-0.00005	0.00947	-0.0005	2.24	0.0116	3.02	-0.00001	7.16	0.301	-0.00005	0.00024
487	E7 - Perimeter Pond	7/31/2002 16:15	0.0042	-0.005	0.00008	-0.0002	18	0.146	-0.00005	0.00663	-0.0005	3.3	0.0017	1.24	-0.00001	20	0.643	-0.00005	0.00007
496	E7 - Perimeter Pond	5/5/2003 16:20	0.0038	0.008	0.00003	0.0015	13.7	0.0362	-0.00005	0.00624	-0.0005	2.38	0.0026	1.59	-0.00001	10.8	0.443	-0.00005	0.00009
497	E7 - Perimeter Pond	5/29/2003 9:10	0.004	-0.005	-0.00002	0.0016	15.6	0.0509	-0.00005	0.00676	-0.0005	2.81	0.0026	0.8	-0.00001	11.8	0.523	-0.00005	0.00007
498	E7 - Perimeter Pond	6/24/2003 6:30	0.0028	-0.005	0.00003	0.0016	19.5	0.438	-0.00005	0.00686	-0.0005	2.8	0.0018	1.54	-0.00001	14	0.58	-0.00005	0.00013
499	E7 - Perimeter Pond	8/5/2003 14:05	0.0022	-0.005	0.00003	0.0021	21.5	0.102	-0.00005	0.00612	-0.0005	2.77	0.0013	1.74	-0.00001	15.5	0.636	-0.00005	0.00009
500	E7 - Perimeter Pond	8/20/2003 10:30	0.0024	-0.005	-0.00002	0.0019	21.1	0.0286	-0.00005	0.00579	-0.0005	2.29	0.0012	2.01	-0.00001	15.7	0.641	-0.00005	0.00006
501	E7 - Perimeter Pond	10/16/2003 15:10	0.0036	0.006	0.00003	0.0017	18.4	0.0352	-0.00005	0.00483	-0.0005	3	0.0021	2.9	-0.00001	12.6	0.446	-0.00005	-0.00005
502	E7 - Perimeter Pond	5/1/2004 14:53	0.0046	0.01	0.00004	0.0018	15.6	0.415	-0.00005	0.0119	-0.0005	2.78	0.0078	3.15	-0.00001	10.8	0.555	-0.00005	0.0001
503	E7 - Perimeter Pond	7/5/2004	0.0044	0.024	0.00007	0.0016	17.1	0.0535	-0.00005	0.00779	-0.0005	3.65	0.0034	2.66	-0.00001	13.2	0.563	-0.00005	-0.00005
505	E7 - Perimeter Pond	8/25/2004	0.0026	0.027	-0.00002	0.0019	17.2	0.178	-0.00005	0.00785	-0.0005	3.06	0.0032	3.69	-0.00001	12.8	0.602	-0.00005	-0.00005
506	E7 - Perimeter Pond	10/17/2004	0.0025	0.028	-0.00002	0.0018	18.9	0.612	-0.00005	0.00974	-0.0005	2.83	0.0114	5.67	-0.00001	13.6	0.553	-0.00005	-0.00005
507	E7 - Perimeter Pond	12/8/2004	0.003	-0.005	-0.00002	0.0013	11.7	0.111	-0.00005	0.0104	-0.0005	2.15	0.0115	4.72	-0.00001	9.72	0.439	-0.00005	-0.00005
508	E7 - Perimeter Pond	1/27/2005	0.0067	0.026	0.00002	0.0007	6.58	0.112	-0.00005	0.00551	-0.0005	2.35	0.0069	3.45	-0.00001	5.95	0.273	-0.00005	-0.00005
509	E7 - Perimeter Pond	3/16/2005	0.0023	0.01	-0.00002	0.0011	7.9	0.189		0.0148	-0.0005	2.59	0.0051	3.89	-0.00001	12.7	0.32	-0.00005	-0.00005
511	E7 - Perimeter Pond	4/11/2005	0.0033	-0.005	-0.00002	0.0013	11.7	0.197		0.0104	-0.0005	2	0.0066	3.66	-0.00001	10.1	0.388	-0.00005	-0.00005
512	E7 - Perimeter Pond	5/4/2005	0.0044	-0.01	0.00006	0.0016	13.8	0.0138		0.0161	-0.0005	1.93	0.0104	2.91	-0.00001	12.6	0.486	-0.00005	0.00006
513	E7 - Perimeter Pond	9/6/2006	0.00422	-0.03	-0.00025	-0.025	37.9	1.54		0.00763	0.0031	3.69	-0.005	8.98	-0.00005	17.3	1.18	-0.0005	-0.0005
515	E7 - Perimeter Pond	11/15/2006	0.00599	0.035	-0.0001	-0.01	21.4	0.026		0.1	-0.001	2.42	0.0239	4.23	-0.00002	11.8	1.62	-0.0002	-0.0002
516	E7 - Perimeter Pond	2/13/2007	0.00232	-0.03	-0.0001	-0.01	29.3	0.636		0.074	-0.001	3.09	0.0285	6.68	-0.00002	18.1	1.52	-0.0002	-0.0002
517	E7 - Perimeter Pond	3/27/2007	0.00477	0.044	-0.0001	-0.01	23.6	0.0771		0.136	-0.001	2.86	0.0306	4.71	-0.00002	12.2	1.78	-0.0002	-0.0002
518	E7 - Perimeter Pond	4/17/2007 10:07	0.00703	-0.03	-0.0001	-0.01	15.1	0.0348		0.0943	-0.001	1.74	0.0185	3.19	-0.00002	7.19	1.09	-0.0002	-0.0002
519	E7 - Perimeter Pond	5/8/2007 8:48	0.0065	-0.03	-0.00025	-0.025	30.2	0.0515		0.284	-0.0025	3.82	0.0294	3.44	-0.00005	18.2	2.66	-0.0005	-0.0005
520	E7 - Perimeter Pond	6/11/2007 12:09	0.00546	-0.03	-0.0001	-0.01	32.7	0.00193		0.228	-0.001	3.66	0.0263	1.63	-0.00002	20.3	2.24	-0.0002	-0.0002
521	E7 - Perimeter Pond	7/3/2007 10:14	0.0046	-0.03	-0.0001	-0.01	30.8	0.00262		0.193	-0.001	2.68	0.0217	1.92	-0.00002	17.9	2.06	-0.0002	-0.0002
522	E7 - Perimeter Pond	8/8/2007 8:18	0.00347	-0.03	-0.0001	-0.01	32.9	0.00142		0.153	-0.001	2.52	0.0205	1.47	-0.00002	25.4	2.11	-0.0002	-0.0002
523	E7 - Perimeter Pond	9/6/2007 11:48	0.00391	-0.03	-0.0001	-0.01	30.7	0.0183		0.174	-0.001	4.97	0.0145	2.24	-0.00002	38.7	2.54	-0.0002	-0.0002
524	E7 - Perimeter Pond	10/2/2007 14:46	0.0032	-0.03	-0.0001	-0.01	25.8	0.00889		0.209	-0.001	6.86	0.0123	4.14	-0.00002	42.9	2.57	-0.0002	-0.0002
525	E7 - Perimeter Pond	11/5/2007 12:49	0.00407	-0.03	-0.0001	-0.01	25.9	0.0167		0.241	-0.001	8.13	0.0182	4.91	-0.00002	50.3	3.22	-0.0002	-0.0002
526	E7 - Perimeter Pond	1/14/2008 11:39	0.00308	-0.03	-0.0001	-0.01	18.8	0.0232		0.188	-0.001	12	0.0092	4.77	-0.00002	71.5	2.92	-0.0002	-0.0002
527	E7 - Perimeter Pond	6/16/2008 10:50	0.00263	-0.03	-0.0001	-0.01	18.6	0.00023		0.198	-0.001	11.4	0.0068	3.15	-0.00002	54.5	1.79	-0.0002	-0.0002
528	E7 - Perimeter Pond	4/22/2009 14:44	0.0151	0.085	-0.00005	-0.005	9.4	0.0289		0.0209	0.00089	1.24	0.0058	3.98	0.000011	4.02	0.355	-0.0001	-0.0001
529	E7 - Perimeter Pond	6/8/2011 10:17	0.0077	-0.03	-0.00005	0.0053	40.9	0.0479		0.213	0.0007	5.54	0.0532	5.05	-0.00001	30.3	4.48	-0.00001	-0.0001
530	E7 - Perimeter Pond	8/3/2011 9:34	0.007	-0.03	-0.0001	0.0053	39.3	0.032		0.162	-0.001	6	0.029	5	-0.00002	31.3	4.35	-0.00002	-0.0002
531	E7 - Perimeter Pond	9/8/2011 10:25	0.0044	-0.03	-0.0001	0.0078	36.6	0.139		0.176	-0.001	5.28	0.0122	6.54	-0.00002	37.8	5.16	-0.00002	-0.0002
532	E7 - Perimeter Pond	10/5/2011 13:40	0.0037	-0.03	-0.0001	0.0085	30.1	0.0199		0.166	-0.001	15.1	0.012	4.95	-0.00002	68.1	4.68	-0.00002	-0.0002
533	E7 - Perimeter Pond	11/1/2011 11:48	0.00654	-0.03	-0.00005	0.0059	33.6	0.0966		0.122	0.00065	7.71	0.0139	5.57	-0.00001	38.6	3.58	-0.00001	-0.0001
534	E7 - Perimeter Pond	2/8/2012 10:45	0.00379	-0.03	-0.00005	0.00793	27.2	0.101		0.135	-0.0005	8.35	0.0089	6.41	-0.00001	45.2	4.16	0.000028	-0.0001
535	E7 - Perimeter Pond	5/2/2012 10:19	0.00951	-0.03	-0.00005	0.00298	27.2	0.0431		0.112	0.00073	3.62	0.0246	5.12	-0.00001	19.4	2.65	-0.00001	-0.0001
538	E7 - Perimeter Pond	8/1/2012 11:26	0.00707	-0.03	-0.00005	0.00468	36.4	0.0794		0.143	0.00067	4.91	0.0308	5.39	-0.00001	32.1	4.03	-0.00001	-0.0001
541	E7 - Perimeter Pond	11/15/2012 13:39	0.00545	-0.03	-0.00005	0.00289	36.4	0.0332		0.0836	0.00051	3.89	0.0281	5.21	-0.00001	22.2	2.56	-0.00001	-0.0001
542	E7 - Perimeter Pond	12/6/2012 11:02	0.00473	-0.03	-0.00005	0.0063	29.8	0.177		0.149	0.00056	6.35	0.0124	6.64	-0.00001	44.4	5	-0.00001	-0.0001
543	E7 - Perimeter Pond	1/2/2013 14:40	0.0072	-0.03	-0.00005	0.00424	33	0.22		0.125	0.00066	2.09	0.0182	7.46	-0.00001	23.8	4.59	-0.00001	-0.0001
544	E7 - Perimeter Pond	2/6/2013 10:13																	
545	E7 - Perimeter Pond	5/1/2013 13:28																	
546	E7 - Perimeter Pond	8/8/2013 11:24																	
547	E7 - Perimeter Pond	11/5/2013 9:20	0.00441	-0.03	-0.00005	0.00701	32.3	0.188		0.16	0.00069	5.67	0.0162	6.82	-0.00001	43	4.83	-0.00001	-0.0001
548	E7 - Perimeter Pond	12/5/2013 12:20	0.00714	-0.03	-0.00005	0.0086	42.1	0.385		0.189	0.00086	7.09	0.0291	9.99	-0.00001	51.1	5.04	-0.00001	-0.0001
549	E7 - Perimeter Pond	12/10/2013 13:52	0.00561	-0.03	0.000107	0.00657	31.1	0.269	-0.00001	0.124	0.00057	4.33	0.0313	7.05	-0.00001	34.8	3.12	-0.00001	-0.0001
550	E7 - Perimeter Pond	12/12/2013 11:44	0.00733	-0.03	0.000098	0.00617	31	0.243		0.122	0.00051	4.7	0.0286	7.22	-0.00001	36	3.21	-0.00001	-0.0001
551	E7 - Perimeter Pond	12/16/2013 13:36	0.00601	-0.03	-0.00005	0.00636	27.7	0.274		0.122	0.00051	5.48	0.0248	6.86	-0.00001	38.2	2.33	-0.00001	-0.0001
552	E7 - Perimeter Pond	12/19/2013 8:23	0.00579	-0.03	0.000058	0.00695	30.3	0.362		0.143	0.0007	5.94	0.0165	7.18	-0.00001	40.6	4.15	0.00001	-0.0001
553	E7 - Perimeter Pond	1/7/2014 11:37	0.00357	-0.03	-0.00005	0.00507	27.3	0.282		0.108	-0.0005	5.95	0.0244	7	-0.00001	37.6	1.72	-0.00001	-0.0001
555	E7 - Perimeter Pond	1/27/2014 13:44	0.00522	-0.03	0.000284	0.0066	25.7	0.355		0.133	0.00189	5.5	0.0173	6.76	-0.00001	39.9	3.72	-0.00001	-0.0001
556	E7 - Perimeter Pond	1/28/2014 14:01	0.00776	-0.03	0.000162	0.00715	28.6	0.365		0.152	0.00515	6.31	0.0149	6.89	-0.00001	44.8	4.18	-0.00001	-0.0001
557	E7 - Perimeter Pond	1/29/2014 14:37	0.00515	-0.03	0.000051	0.00703	28.4	0.342		0.148	0.00062	5.77	0.0156	6.97	-0.00001	39.2	4.09	-0.00001	-0.0001
558	E7 - Perimeter Pond	1/30/2014 13:48	0.00459	-0.03	-0.00005	0.00727	29.5	0.305		0.137	0.00095	4.49	0.0181	7.46	-0.00001	39.3	3.57	-0.00001	-0.0001
559	E7 - Perimeter Pond	2/11/2014 14:01	0.00427	-0.03	-0.00005	0.00705	28.8	0.211		0.13	-0.0005	6.63	0.0217	6.8	-0.00001	45.2	2.75	-0.00001	-0.0001
560	E7 - Perimeter Pond	3/4/2014 8:54	0.00604	-0.03	-0.00005	0.00883	33.8	0.393		0.178	0.00058	9.2	0.0276	7.31	-0.00001	64	2.69	-0.00001	-0.0001
561	E7 - Perimeter Pond	4/1/2014 11:20	0.0073	0.032	-0.00005	0.00463	24.2	0.158		0.0622	-0.0005	1.91	0.0372	6.57	-0.00001	18.4	0.711	0.000012	-0.0001
562	E7 - Perimeter Pond	5/1/2014 11:12	0.036	-0.03	-0.00005	0.00304	27.4	0.113		0.119	0.00105	2.01	0.0383	4.96	-0.00001	15	2.44	-0.00001	-0.0001
563	E7 - Perimeter Pond	6/3/2014 11:11	0.014	-0.03	-0.00005	0.00494	33.3	0.0561		0.135	0.00074	6.44	0.0393	5.08	-0.00001	37.1	2.44	-0.00001	-0.0001
564	E7 - Perimeter Pond	7/3/2014 8:38	0.00737	-0.03	-0.00005	0.00823	41.7	0.000902		0.194	0.00056	7.22	0.0398	4.85	-0.00001	44.3	3.56	-0.00001	-0.0001
565	E7 - Perimeter Pond	9/2/2014 11:22	0.00481	-0.03	-0.00005	0.00798	23	0.0754		0.171	-0.0005	9.77	0.0148	5.65	-0.00001	66.4	1.95	-0.00001	-0.0001

Index	Sample Point	Date	Titanium (Ti)-Total	Uranium (U)-Total	Vanadium (V)-Total	Zinc (Zn)-Total	Aluminum (Al)-Dissolved	Antimony (Sb)-Dissolved	Arsenic (As)-Dissolved	Barium (Ba)-Dissolved	Beryllium (Be)-Dissolved	Bismuth (Bi)-Dissolved	Boron (B)-Dissolved	Cadmium (Cd)-Dissolved	Calcium (Ca)-Dissolved	Chromium (Cr)-Dissolved	Cobalt (Co)-Dissolved	Copper (Cu)-Dissolved	Iron (Fe)-Dissolved	Lead (Pb)-Dissolved	Lithium (Li)-Dissolved	Magnesium (Mg)-Dissolved
432	E5 - Tailings Impoundment Main Embank Drain Comp	1/13/2010 13:50	-0.01	0.00139	-0.002	-0.002	-0.007	0.00038	0.00185	0.0744	-0.001	-0.001	0.167	-0.000034	100	-0.001	0.00033	0.00282	0.063	-0.0001	-0.01	16.2
433	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2010 13:20	-0.01	0.00131	-0.002	-0.002	-0.008	0.0004	0.0018	0.0777	-0.001	-0.001	0.143	-0.0004	114	-0.001	0.00034	-0.004	0.064	-0.0001	-0.01	17.9
434	E5 - Tailings Impoundment Main Embank Drain Comp	3/3/2010 12:24	-0.01	0.00145	-0.002	-0.002	0.0047	0.00043	0.00161	0.075	-0.001	-0.001	0.15	-0.000034	126	-0.001	0.00031	0.00279	0.059	-0.0001	-0.01	18.6
435	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2010 14:05	-0.01	0.00141	-0.002	-0.002	0.0057	0.00036	0.0018	0.08	-0.001	-0.001	0.174	-0.00041	124	-0.001	0.00035	0.00276	0.056	-0.0001	-0.01	18.8
436	E5 - Tailings Impoundment Main Embank Drain Comp	5/11/2010	-0.01	0.00134	-0.002	-0.002	0.0125	0.00034	0.00163	0.0746	-0.001	-0.001	0.145	0.000063	118	-0.001	0.00029	0.00318	0.065	-0.0001	-0.01	17.7
438	E5 - Tailings Impoundment Main Embank Drain Comp	7/8/2010	-0.01	0.00123	-0.002	-0.002	1.53	0.00136	0.00348	0.138	-0.001	-0.001	0.139	-0.00087	112	0.0016	0.00175	0.27	1.92	0.00062	-0.01	18.7
439	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2010	-0.01	0.00135	-0.002	-0.002	0.0053	0.0004	0.00166	0.0795	-0.001	-0.001	0.141	-0.0006	124	-0.001	0.00038	-0.004	0.062	-0.0001	-0.01	19.1
441	E5 - Tailings Impoundment Main Embank Drain Comp	10/7/2010	-0.01	0.00122	-0.001	-0.003	0.02	0.00047	0.00181	0.0755	-0.0005	-0.0005	0.166	-0.00015	125	-0.0005	0.00041	0.00508	0.05	-0.00005	0.0062	20.7
442	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2010	-0.01	0.00141	-0.001	-0.003	0.0053	0.0004	0.00182	0.086	-0.0005	-0.0005	0.151	-0.00008	135	-0.0005	0.00042	0.00288	0.07	-0.00005	0.0052	20.4
443	E5 - Tailings Impoundment Main Embank Drain Comp	12/1/2010 10:20	-0.01	0.0015	-0.001	-0.003	0.0066	0.0004	0.0019	0.0793	-0.0005	-0.0005	0.151	-0.0001	137	-0.0005	0.00041	0.00387	0.063	-0.00005	-0.005	20.2
444	E5 - Tailings Impoundment Main Embank Drain Comp	1/10/2011 10:13	-0.01	0.00132	-0.001	-0.003	0.0044	0.00042	0.00169	0.0718	-0.0005	-0.0005	0.168	-0.00006	137	-0.0005	0.00039	0.00263	0.063	-0.00005	0.006	21.1
446	E5 - Tailings Impoundment Main Embank Drain Comp	3/7/2011 10:15	0.012	0.00132	-0.001	-0.003	0.0061	0.00037	0.00198	0.0788	-0.0005	-0.0005	0.143	-0.00009	137	-0.0005	0.0005	0.0029	0.06	-0.00005	0.0057	21.1
447	E5 - Tailings Impoundment Main Embank Drain Comp	4/5/2011 10:44	-0.01	0.0013	-0.001	-0.003	0.0243	0.00056	0.00161	0.0675	-0.0005	-0.0005	0.126	-0.00035	168	-0.0005	0.00036	0.052	0.193	0.000229	-0.005	25.4
448	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2011 13:08	-0.01	0.00129	-0.001	-0.003	0.0104	0.00033	0.00145	0.0692	-0.0005	-0.0005	0.124	-0.00009	143	-0.0005	0.00033	0.00293	0.045	-0.00005	-0.005	22
449	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2011 13:25	0.011	0.00136	-0.001	-0.003	0.0046	0.00036	0.00168	0.0789	-0.0001	-0.0005	0.142	-0.0001	163	-0.0005	0.00041	0.00275	0.046	-0.00005	0.00545	24.1
450	E5 - Tailings Impoundment Main Embank Drain Comp	7/13/2011 9:02	-0.01	0.00129	-0.001	-0.003	0.0052	0.00035	0.0016	0.0749	-0.0001	-0.0005	0.129	-0.00007	168	-0.0005	0.00036	0.00236	0.053	-0.00005	0.0049	23.6
451	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2011 8:46	-0.01	0.00142	-0.001	-0.003	0.007	0.00045	0.00161	0.066	-0.0001	-0.0005	0.141	-0.00009	155	-0.0005	0.00038	0.00302	0.05	-0.00005	0.00606	24.5
453	E5 - Tailings Impoundment Main Embank Drain Comp	10/5/2011 11:10	-0.01	0.0013	-0.001	-0.003	0.006	0.00041	0.00164	0.0607	-0.0001	-0.0005	0.13	-0.00007	131	-0.0005	0.00038	0.00327	0.039	0.000055	0.00578	20.7
454	E5 - Tailings Impoundment Main Embank Drain Comp	11/1/2011 10:32	-0.01	0.00127	-0.001	-0.003	0.0085	0.00043	0.00167	0.0624	-0.0001	-0.0005	0.148	-0.00008	136	-0.0005	0.0004	-0.0035	0.05	-0.00005	0.006	21.2
455	E5 - Tailings Impoundment Main Embank Drain Comp	12/5/2011 11:00	-0.01	0.00126	-0.001	-0.003	0.0051	0.00042	0.0016	0.0567	-0.0001	-0.0005	0.118	-0.00008	123	-0.0005	0.00035	0.0029	0.043	-0.00005	0.00583	19.5
456	E5 - Tailings Impoundment Main Embank Drain Comp	1/4/2012 13:40	-0.01	0.00119	-0.001	-0.003	0.0058	0.00044	0.0017	0.0615	-0.0001	-0.0005	0.146	-0.00008	129	-0.0005	0.00037	0.00295	0.047	-0.00005	0.0064	20.3
457	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2012 9:50	-0.01	0.00117	-0.001	-0.003	0.0055	0.00044	0.00179	0.0613	-0.0001	-0.0005	0.144	-0.00009	129	-0.0005	0.00036	0.00282	0.047	-0.00005	0.00721	21.2
458	E5 - Tailings Impoundment Main Embank Drain Comp	3/14/2012 14:10	-0.01	0.00116	-0.001	-0.003	-0.012	0.0004	0.00159	0.0586	-0.0001	-0.0005	0.138	-0.0001	126	-0.0005	0.00033	0.00257	0.042	-0.00005	0.0059	19
460	E5 - Tailings Impoundment Main Embank Drain Comp	5/2/2012 11:05	-0.01	0.00123	-0.001	-0.003	0.0176	0.00041	0.00171	0.067	-0.0001	-0.0005	0.141	-0.00025	147	-0.0005	0.00035	0.00274	0.04	-0.00005	0.00624	22.5
461	E5 - Tailings Impoundment Main Embank Drain Comp	6/7/2012 9:15	0.015	0.00121	-0.001	-0.003	0.101	0.00037	0.00158	0.0626	-0.0001	-0.0005	0.131	-0.0002	152	-0.0005	0.00036	0.00689	0.132	0.000058	0.00565	21.6
462	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2012 8:47	-0.01	0.00123	-0.001	-0.003	0.0049	0.00034	0.00157	0.0727	-0.0001	-0.0005	0.126	-0.0001	154	-0.0005	0.00031	0.00235	0.05	-0.00005	0.00567	25.3
463	E5 - Tailings Impoundment Main Embank Drain Comp	8/1/2012 10:24	-0.01	0.00113	-0.001	-0.003	0.216	0.00042	0.00177	0.0688	-0.0001	-0.0005	0.137	-0.0001	131	-0.0005	0.00042	0.00698	0.207	-0.0001	0.00619	20.8
464	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2012 11:05	-0.01	0.00101	-0.001	-0.003	0.0316	0.0004	0.0018	0.067	-0.0001	-0.0005	0.15	-0.00012	120	-0.0005	0.00038	0.00349	0.063	-0.00005	0.00689	19.6
465	E5 - Tailings Impoundment Main Embank Drain Comp	10/3/2012 9:30	-0.01	0.00109	-0.001	-0.003	0.192	0.00042	0.00189	0.0679	-0.0001	-0.0005	0.145	-0.0001	127	-0.0005	0.00049	0.0205	0.299	0.000119	0.00639	19.7
466	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2012 13:07	0.012	0.00118	-0.001	-0.003	0.0077	0.00041	0.00184	0.0699	-0.0001	-0.0005	0.132	-0.0001	131	-0.0005	0.00036	0.00417	0.06	-0.00005	0.00634	19.7
467	E5 - Tailings Impoundment Main Embank Drain Comp	12/6/2012 10:11	-0.01	0.00121	-0.001	-0.003	0.0043	0.00049	0.00161	0.0551	-0.0001	-0.0005	0.141	-0.0001	124	-0.0005	0.00032	0.0033	0.051	-0.00005	0.00665	20.4
468	E5 - Tailings Impoundment Main Embank Drain Comp	1/2/2013 14:04	0.011	0.00124	-0.001	-0.003	0.0256	0.0005	0.00202	0.0562	-0.0001	-0.0005	0.102	-0.0005	123	-0.0005	0.00037	0.0391	0.121	-0.00005	0.00539	19.4
469	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2013 9:30					0.0084	0.0005	0.00181	0.0612	-0.0001	-0.0005	0.137	-0.00015	131	-0.0005	0.00036	0.0029	0.054	-0.00005	0.00636	20
470	E5 - Tailings Impoundment Main Embank Drain Comp	3/13/2013 13:05					0.0053	0.00044	0.00184	0.0594	-0.0001	-0.0005	0.138	-0.0001	130	-0.0005	0.00035	0.00426	0.05	-0.00005	0.00717	19.3
471	E5 - Tailings Impoundment Main Embank Drain Comp	4/4/2013 14:45					0.599	0.00072	0.0021	0.0517	-0.0001	-0.0005	0.09	-0.0001	141	0.00125	0.00049	0.00694	0.718	0.000176	0.0066	21.1
472	E5 - Tailings Impoundment Main Embank Drain Comp	5/1/2013 9:18					0.0078	0.00042	0.00164	0.0645	-0.0001	-0.0005	0.126	-0.0001	155	-0.0005	0.00032	0.00276	0.051	-0.00005	0.00557	24.1
473	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2013 9:05					0.0075	0.00038	0.00178	0.0619	-0.0001	-0.0005	0.133	-0.0002	133	-0.0005	0.00035	0.00277	0.046	-0.00005	0.00675	21.8
474	E5 - Tailings Impoundment Main Embank Drain Comp	7/10/2013 10:02					0.0407	0.00086	0.00181	0.0314	-0.0001	-0.0005	0.114	-0.0001	137	-0.0005	0.00016	0.00437	0.061	-0.00005	0.00823	19.7
475	E7 - Perimeter Pond	8/3/2001	0.00202	0.00118	0.00085	0.0037	0.175	0.00044	0.0009	0.0551	-0.00005	-0.00005		0.00003	79	0.0009	0.00044	0.01	0.242	0.00013	0.002	12.5
476	E7 - Perimeter Pond	8/10/2001 10:30	0.00211	0.0012	0.00103	0.0033	0.0916	0.00041	0.0012	0.0552	-0.00005	-0.00005		0.00003	75	0.0008	0.00048	0.0096	0.138	0.00009	0.0021	12.8
478	E7 - Perimeter Pond	8/30/2001 14:15	0.00299	0.00149	0.00111	0.0024	0.105	0.00049	0.001	0.0577	-0.00005	0.00078		0.00003	73.8	-0.0002	0.00039	0.0106	0.118	0.00007	0.0022	13.8
479	E7 - Perimeter Pond	10/23/2001 15:00	0.00304	0.00112	0.00063	0.002	0.619	0.00028	0.0008	0.0706	-0.00005	0.00018		0.00003	81.8	0.0013	0.00072	0.0284	0.759	0.00072	0.0017	12.9
480	E7 - Perimeter Pond	11/13/2001 8:30	0.00318	0.00167	0.00079	0.0037	0.205	0.00041	0.0006	0.0801	-0.00005	0.00124		0.00004	113	-0.0002	0.00035	0.011	0.207	0.00018	0.0019	17.7
485	E7 - Perimeter Pond	5/22/2002 9:15	0.00206	0.00065	0.00065	0.0093	0.512	0.00032	0.0011	0.0344	-0.00005	0.00024		0.00003	50.8	0.0009	0.00064	0.0179	0.675	0.00041	0.001	8.04
487	E7 - Perimeter Pond	7/31/2002 16:15	0.00325	0.00156	0.00034	0.0124	0.0539	0.00018	0.0009	0.0493	-0.00005	-0.00005		0.00002	97.4	-0.0002	-0.00002	0.0048	0.072	0.00008	-0.0002	18.3
496	E7 - Perimeter Pond	5/5/2003 16:20	0.00421	0.00138	0.00105	0.0008	0.0848	0.00024	0.0008	0.0362	-0.00005	-0.00005		0.00004	74.8	-0.0002	0.00022	0.0049	0.08	0.00011	0.0016	13.1
497	E7 - Perimeter Pond	5/29/2003 9:10	0.00445	0.00157	0.0007	0.0012	0.0454	0.00025	0.0009	0.0238	-0.00005	-0.00005		0.00002	77.9	-0.0002	0.00013	0.0046	0.085	0.00006	0.0017	15.2
498	E7 - Perimeter Pond	6/24/2003 6:30	0.00484	0.0018	0.00072	0.0067	0.0579	0.00026	0.0012	0.0306	-0.00005	-0.00005		0.00004	92.7	0.0008	0.00031	0.0035	0.178	0.00012	0.0017	19.7
499	E7 - Perimeter Pond	8/5/2003 14:05	0.00427	0.00193	0.00054	0.002	0.0347	0.00025	0.0014	0.0372	-0.00005	-0.00005		0.00002	96.3	0.0017	0.00013	0.0026	0.069	0.00008	0.0022	21.2
500	E7 - Perimeter Pond	8/20/2003 10:30	0.00424	0.00175	0.00153	0.0017	0.0367	0.00022	0.0011	0.0356	-0.00005	-0.00005		0.00002	91.8	0.0003	0.00013	0.0037	0.069	0.00009	0.0021	21.4
501	E7 - Perimeter Pond	10/16/2003 15:10	0.00301	0.00153	0.00087	0.0016	0.0557	0.00022	0.0009	0.042	-0.00005	-0.00005		0.00001	90.8	0.0017	-0.00002	0.0043	0.126	0.0001	0.0017	18.8
502	E7 - Perimeter Pond	5/1/2004 14:53	0.00337	0.00173	0.00031	0.007	0.0681	0.0003	0.0007	0.0607	-0.00005	-0.00005		0.00003	100	0.0003	0.00027	0.0031	0.164	0.00009	0.0016	16
503	E7 - Perimeter Pond	7/5/2004	0.00101	0.00204	0.00059	0.0015	0.149	0.00028	0.0009	0.0469	-0.00005	-0.00005		0.00002	106	-0.0002	0.00014	0.006	0.236	0.00016	0.0018	17.1
505	E7 - Perimeter Pond	8/25/2004	-0.0005	0.00197	0.0004	0.0016	0.0258	0.00019	0.001	0.0367	-0.00005	-0.00005		0.00003	94	-0.0002	0.00005	0.0031	0.038	0.00003	0.0022	17.8
506	E7 - Perimeter Pond	10/17/2004	-0.0005	0.00265	0.0005	0.0013	0.291	0.00028	0.0011	0.0585	-0.00005	-0.00005		0.00004	109	0.0003	0.00051	0.0038	0.486	0.0001	0.002	18.6
507	E7 - Perimeter Pond	12/8/2004	-0.0005	0.00148	0.00034	0.0006	0.109	0.00033	0.0007	0.0486	-0.00005	-0.00005		0.00004	78.8	0.0007	0.0002	0.0048	0.166	0.00032	0.0014	11.5
508	E7 - Perimeter Pond	1/27/2005	0.00075	0.00069	0.00036	0.0026	0.419	0.00028	0.0007	0.0552	-0.00005	-0.00005		0.00003	48.2	0.0006	0.00067	0.0272	1.33	0.00068	0.0011	6.98
509	E7 - Perimeter Pond	3/16/2005	-0.0005	0.00092	0.00039	-0.0005	1.04	0.00024	0.0007	0.0587	-0.00005	-0.00005	0.026	0.00004	56.5	0.0017	0.00104	0.0146	2.91	0.00072	0.0019	8.32
511	E7 - Perimeter Pond	4/11/2005	-0.0005	0.00162	0.00023	-0.0005	0.596	0.00025	0.0011	0.0614	-0.00005	-0.00005	0.023	0.00004	70.7	0.0018	0.00065	0.021	0.733	0.00046	0.0018	11.7
512	E7 - Perimeter Pond	5/4/2005	-0.0005	0.00194	0.00044	0.0032	0.12	0.00035	0.0008	0.0508	-0.00005	-0.00005	0.034	0.00004	75.9	0.001	0.00017	0.0073	0.15	0.00008	0.0017	14.3
513	E7 - Perimeter Pond	9/6/2006	-0.01	0.0132	-0.005	-0.005	-0.005	-0.0005	0.00062	0.0794	-0.0025	-0.0025	-0.05	-0.00025	239	0.0054	0.00099	0.00449	-0.03	-0.00025	-0.025	37.2
515	E7 - Perimeter Pond	11/15/2006	-0.01	0.00268	-0.002	0.0047	0.0177	0.00028	0.00052	0.0558	-0.001	-0.001	0.039	0.00011	131	-0.001	-0.0002	0.00525	-0.03	-0.0001	-0.01	21.3
516	E7 - Perimeter Pond	2/13/2007	-0.01	0.00393	-0.002	0.009	0.347	0.00034	0.00096	0.0853	-0.0005	-0.001	0.078	0.000094	191	0.00087	0.00057	0.0103	0.581	0.00029	-0.01	29.7
517	E7 - Perimeter Pond	3/27/2007	-0.01	0.0023	-0.002	0.0078	0.973	0.00035	0.0009	0.076	-0.001	-0.001	0.08	0.000093	147	-0.003	-0.0008	0.0128	1.17	-0.0005	-0.01	24.2
518	E7 - Perimeter Pond	4/17/2007 10:07	-0.01	0.00134	-0.002	0.0035	0.689	0.00031	0.00071	0.0524	-0.001	-0.001	0.038	0.000092	110	0.0013	0.00049	0.0194	0.743	0.00035	-0.01	15.2
519	E7 - Perimeter Pond	5/8/2007 8:48	-0.01	0.00305	-0.005	-0.005	0.112	-0.0005	0.00054	0.0848	-0.0025	-0.0025	0.106	0.000088	201	-0.0025	-0.0005	0.00895	0.136	-0.00025	-0.025	29.4
520	E7 - Perimeter Pond	6/11/2007 12:09	-0.01	0.00496	-0.002	0.0032	0.0343	0.00051	0.0006	0.0698	-0.001	-0.001	0.096	0.000117	182	-0.001	-0.0002	0.00597	0.037	-0.0001	-0.01	32.5
521	E7 - Perimeter Pond	7/3/2007 10:14	-0.01	0.00411	-0.002	-0.002	0.0538	0.00041	0.00071	0.0633	-0.001	-0.001	0.08	0.000077	161	-0.001	-0.0002	0.0056	0.057	-0.0001	-0.01	31.1
522	E7 - Perimeter Pond	8/8/2007 9:18	-0.01	0.0048	-0.002	-0.002	0.0201	0.00048	0.00075	0.0554	-0.001	-0.001	0.089	-0.000034	138	-0.001	-0.0002	0.00396	-0.03	-0.0001	-0.01	33
523	E7 - Perimeter Pond	9/6/2007 11:48	-0.01	0.00625	-0.002	0.0026	0.0167	0.00091	0.0008	0.0637	-0.001	-0.001	0.099	-0.000034	146	-0.001	-0.0002	0.00441	-0.03	-0.0001	-0.01	29.9
524	E7 - Perimeter Pond	10/2/2007 14:46	-0.01	0.00554	-0.002	0.0045	0.0832	0.00113	0.00074	0.0696	-0.001	-0.001	0.109	0.000111	141	-0.001	-0.0002	0.00421	0.092	-0.0001	-0.01	24.9
525	E7 - Perimeter Pond	11/5/2007 12:49	-0.01	0.00508	-0.002	0.023	0.116	0.0011	0.00082	0.0716	-0.001	-0.001	0.129	0.000175	175	-0.001	-0.0002	0.0074	0.14	0.00014	-0.01	26.1
526	E7 - Perimeter Pond	1/14/2008 11:39	-0.01	0.00394	-0.002	0.0451	0.0403	0.0012	0.0009	0.0521	-0.001	-0.001	0.133	-0.0004	125	-0.001	-0.0002	0.00413	0.046	-0.0001	0.01	19
527	E7 - Perimeter Pond	6/16/2008 10:50	-0.01	0.0027	-0.002	0.0043	0.143	0.00088	0.00094	0.0449	-0.001	-0.001	0.152	-0.0004	116	-0.001	-0.0002	0.00778	0.176	0.00028	-0.01	18.5
528	E7 - Perimeter Pond	4/22/2009 14:44	-0.01	0.000205	-0.001	0.0012	1.66	0.00011	0.00082	0.0364	-0.0005	-0.0005	0.014	0.0001	47	0.00313	0.00095	0.0286	1.63	0.000482	-0.005	9.99
529	E7 - Perimeter Pond	6/8/2011 10:17	0.014	0.00243	-0.001	-0.003	0.234	0.00054	0.00064	0.0589	-0.0005	-0.0005	0.143	-0.00011	245	0.00051	0.00029	0.0123	0.215	0.000078	0.0052	42
530	E7 - Perimeter Pond	8/3/2011 9:34	-0.01	0.0023	-0.002	-0.006	0.319	0.00049	0.00064	0.0625	-0.0002	-0.001	0.151	-0.00008	228	-0.001	0.00027	0.011	0.299	-0.0001	0.0048	40.2
531	E7 - Perimeter Pond	9/8/2011 10:25	-0.01	0.00473	-0.002	-0.006	0.191	0.00104	0.0009	0.0498	-0.0002	-0.001	0.405	-0.00025	232	-0.001	0.00087	0.0095	0.193	-0.0001	0.0083	37.4
532	E7 - Perimeter Pond	10/5/2011 13:40	-0.01	0.00211	-0.002	-0.006	0.0964	0.00053	0.00089	0.0421	-0.0002	-0.001	0.152	-0.00008	193	-0.001	-0.0002	0.0066	0.107	-0.0001	0.0083	29.8
533	E7 - Perimeter Pond	11/1/2011 11:48	-0.01	0.00212	-0.001	0.0053	0.263	0.00052	0.00076	0.0446	-0.0001	-0.0005	0.187	-0.0001	188	0.00057	0.00043	0.0121	0.229	-0.00005	0.00589	32.9
534	E7 - Perimeter Pond	2/8/2012 10:45	-0.01	0.00282	-0.001	0.009	0.279	0.00088	0.00104	0.0426	-0.0001	-0.0005	0.257	-0.00013	182	0.00064	0.00044	0.0065	0.294	0.000128	0.00862	27.9
535	E7 - Perimeter Pond	5/2/2012 10:19	-0.01	0.0013	-0.001	0.003	1.68	0.00043	0.00122	0.0564	-0.0001	-0.0005	0.11	-0.0002	155	0.00269	0.00123	0.0463	1.9	0.000565	0.0045	27.9
538	E7 - Perimeter Pond	8/1/2012 11:26	-0.01	0.00203	-0.001	-0.003	0.245	0.0008	0.00081	0.0587	-0.0001	-0.0005	0.179	-0.0001	221	0.00053	0.0004	0.0124	0.258	-0.0002	0.00521	37.3
541	E7 - Perimeter Pond	11/15/2012 13:39	0.014	0.000956	-0.001	0.0039	0.207	0.0003	0.00059	0.0456	-0.0001	-0.0005	0.07	-0.00006	188	-0.0005	0.00021	0.00896	0.236	0.000091	0.00313	35.8
542	E7 - Perimeter Pond	12/6/2012 11:02	-0.01	0.00295	-0.001	0.0075	0.0837	0.00086	0.00075	0.0368	-0.0001	-0.0005	0.251	-0.00025	204	-0.0005	0.00058	0.00614	0.107	-0.00005	0.00697	31.7
543	E7 - Perimeter Pond	1/2/2013 14:40	0.015	0.00347	-0.001	0.007	0.116	0.00081	0.00077	0.0374	-0.0001	-0.0005	0.256	-0.00025	220	-0.0005	0.00095	0.0105	0.309	0.000054	0.00489	33.9
544	E7 - Perimeter Pond	2/6/2013 10:13					0.132	0.00047	0.00059	0.0422	-0.0001	-0.0005	0.119	-0.0001	188	-0.0005	0.00019	0.00757	0.13	0.00008	0.00312	37
545	E7 - Perimeter Pond	5/1/2013 13:28					0.47	0.00042	0.00067	0.0475	-0.0001	-0.0005	0.078	-0.0002	207	0.00062	0.00047	0.0357	0.388	0.000105	0.0033	39.5
546	E7 - Perimeter Pond	8/8/2013 11:24					0.182	0.00062	0.00088	0.0466	-0.0001	-0.0005	0.119	-0.00011	236	-0.0005	0.00016	0.00948	0.167	0.000058	0.00707	40.6
547	E7 - Perimeter Pond	11/5/2013 9:20	-0.01	0.00284	-0.001	0.0048	0.326	0.00088	0.00127	0.0645	-0.0001	-0.0005	0.231	-0.0003	217	0.00064	0.00094	0.00969	0.278	0.000107	0.00779	32.9
548	E7 - Perimeter Pond	12/5/2013 12:20	0.022	0.00502	0.0012	0.0056	1.01	0.00138	0.00148	0.0633	-0.0001	-0.0005	0.295	-0.00027	256	0.00139	0.00135	0.0184	1.01	0.000271	0.00893	39.9
549	E7 - Perimeter Pond	12/10/2013 13:52	0.017	0.0048	-0.001	0.007	3.03	0.00177	0.00173	0.0601	-0.0001	-0.0005	0.28	-0.00021	178	0.0037	0.00175	0.0284	2.76	0.002	0.0089	30.8
550	E7 - Perimeter Pond	12/12/2013 11:44	-0.01	0.00367	-0.001	0.0054	1.53	0.00131	0.00148	0.0554	-0.0001	-0.0005	0.254	-0.00018	178	0.00231	0.00128	0.0242	1.73	0.00103	0.00787	30.2
551	E7 - Perimeter Pond	12/16/2013 13:36	0.016	0.004	0.0011	0.0062	2.02	0.00142	0.00163	0.0606	-0.0001	-0.0005	0.194	-0.00012	161	0.00269	0.00197	0.0213	1.9	0.000896	0.00811	28.3
552	E7 - Perimeter Pond	12/19/2013 8:23	0.012	0.00312	-0.001	0.0072	0.457	0.00084	0.00126	0.0422	-0.0001	-0.0005	0.26	-0.00024	211	0.00074	0.00105	0.00988	0.443	0.00023	0.00736	29.8
553	E7 - Perimeter Pond	1/7/2014 11:37	-0.01	0.00368	0.0013	0.0041	4.01	0.00234	0.00313	0.0758	-0.0001	-0.0005	0.142	-0.00011	158	0.00649	0.00272	0.0404	5.7	0.00138	0.00846	29.3
555	E7 - Perimeter Pond	1/27/2014 13:44	0.01	0.00327	-0.001	0.0123	1.44	0.00111	0.00174	0.0506	-0.0001	-0.0005	0.273	-0.0002	190	0.00218	0.0015	0.0234	1.91	0.00115	0.00767	26.4
556	E7 - Perimeter Pond	1/28/2014 14:01	0.013	0.00276	-0.001	0.0221	1.01	0.00087	0.00158	0.0475	-0.0001	-0.0005	0.296	-0.00025	194	0.00176	0.00132	0.0173	1.25	0.000691	0.00822	26.6
557	E7 - Perimeter Pond	1/29/2014 14:37	0.011	0.00313	-0.001	0.0048	1.16	0.00095	0.00149	0.0486	-0.0001	-0.0005	0.277	-0.00022	189	0.00189	0.00133	0.0177	1.45	0.000585	0.00838	26.9
558	E7 - Perimeter Pond	1/30/2014 13:48	0.011	0.00425	0.0011	0.006	1.33	0.00139	0.00159	0.0468	-0.0001	-0.0005	0.254	-0.00019	189	0.00223	0.00139	0.0217	1.7	0.00196	0.00863	27.6
559	E7 - Perimeter Pond	2/11/2014 14:01	0.011	0.00372	0.0011	0.005	0.434	0.00154	0.0016	0.0429	-0.0001	-0.0005	0.215	-0.00012	169	0.00072	0.00075	0.0396	0.538	0.000237	0.0072	28.3
560	E7 - Perimeter Pond	3/4/2014 8:54	0.014	0.00463	0.0014	-0.003	0.377	0.0022	0.00201	0.053	-0.0001	-0.0005	0.164	-0.00011	189	0.0006	0.0008	0.0138	0.468	0.000137	0.0096	34.3
561	E7 - Perimeter Pond	4/1/2014 11:20	0.024	0.00605	0.0015	-0.003	1.7	0.00293	0.00189	0.0592	-0.0001	-0.0005	0.112	-0.00007	119	0.00252	0.00121	0.028	2.18	0.000566	0.00598	24.8
562	E7 - Perimeter Pond	5/1/2014 11:12	0.014	0.00171	-0.001	0.004	1.5	0.00065	0.0011	0.0479	-0.0001	-0.0005	0.083	-0.00017	148	0.00219	0.00141	0.0716	1.42	0.000419	0.00381	27.9
563	E7 - Perimeter Pond	6/3/2014 11:11	-0.01	0.00129	-0.001	-0.003	0.235	0.00055	0.00093	0.0495	-0.0001	-0.0005	0.081	-0.0001	181	-0.0005	0.00036	0.0211	0.242	0.000098	0.00542	33.8
564	E7 - Perimeter Pond	7/3/2014 8:38	0.017	0.00184	-0.001	-0.003	0.388	0.00063	0.00113	0.0538	-0.0001	-0.0005	0.111	-0.0001	226	0.00051	0.00038	0.0195	0.39	0.00013	0.0075	40.9
565	E7 - Perimeter Pond	9/2/2014 11:22	0.014	0.00153	0.0014	-0.003	0.196	0.00079	0.00178	0.0423	-0.0001	-0.0005	0.125	0.000025	150	-0.0005	0.00024	0.0113	0.222	0.000095	0.009	23.5

Index	Sample Point	Date	Manganese (Mn)-Dissolved	Mercury (Hg)-Dissolved	Molybdenum (Mo)-Dissolved	Nickel (Ni)-Dissolved	Potassium (K)-Dissolved	Selenium (Se)-Dissolved	Silicon (Si)-Dissolved	Silver (Ag)-Dissolved	Sodium (Na)-Dissolved	Strontium (Sr)-Dissolved	Thallium (Tl)-Dissolved	Tin (Sn)-Dissolved	Titanium (Ti)-Dissolved	Uranium (U)-Dissolved	Vanadium (V)-Dissolved	Zinc (Zn)-Dissolved
432	E5 - Tailings Impoundment Main Embank Drain Comp	1/13/2010 13:50	0.359		0.134	-0.001		0.0061	6.53	-0.00002	77.5	1.36	-0.0002	-0.0002	-0.01	0.00141	-0.002	-0.002
433	E5 - Tailings Impoundment Main Embank Drain Comp	2/10/2010 13:20	0.37		0.138	-0.001		0.0076	6.39	-0.00002	83.6	1.49	-0.0002	-0.0002	-0.01	0.00142	-0.002	-0.002
434	E5 - Tailings Impoundment Main Embank Drain Comp	3/3/2010 12:24	0.352		0.151	-0.001			6.26	-0.00002	73.6		-0.0002	-0.0002	-0.01	0.00153	-0.002	-0.002
435	E5 - Tailings Impoundment Main Embank Drain Comp	4/7/2010 14:05	0.356		0.144	-0.001		0.0045	6.61	-0.00002	82.7	1.52	-0.0002	-0.0002	-0.01	0.00146	-0.002	-0.002
436	E5 - Tailings Impoundment Main Embank Drain Comp	5/11/2010	0.294		0.136	-0.001		0.0063	6.61	-0.00002	71.9	1.48	-0.0002	-0.0002	-0.01	0.00133	-0.002	-0.002
438	E5 - Tailings Impoundment Main Embank Drain Comp	7/8/2010	0.843		0.144	0.0016		0.01	10.3	-0.00002	76.5	1.59	-0.0002	-0.0002	0.092	0.0013	0.0065	0.0044
439	E5 - Tailings Impoundment Main Embank Drain Comp	8/5/2010	0.323		0.137	-0.001		0.0057	6.39	-0.00002	76.9	1.62	-0.0002	-0.0002	-0.01	0.0014	-0.002	-0.002
441	E5 - Tailings Impoundment Main Embank Drain Comp	10/7/2010	0.509		0.16	0.00055		0.0034	6.62	-0.00001	84.3	1.75	-0.0001	-0.0001	-0.01	0.00122	-0.001	-0.003
442	E5 - Tailings Impoundment Main Embank Drain Comp	11/4/2010	0.379		0.157	-0.0005		0.0059	7.07	-0.00001	86.4	1.88	-0.0001	-0.0001	-0.01	0.00146	-0.001	-0.003
443	E5 - Tailings Impoundment Main Embank Drain Comp	12/1/2010 10:20	0.371		0.158	-0.0005		0.0056	6.71	-0.00001	80.9	1.78	-0.0001	-0.0001	-0.01	0.0014	-0.001	-0.003
444	E5 - Tailings Impoundment Main Embank Drain Comp	1/10/2011 10:13	0.355		0.176	-0.0005		0.00549	7.01	-0.00001	77	2.12	-0.0001	-0.0001	-0.01	0.00149	-0.001	-0.003
446	E5 - Tailings Impoundment Main Embank Drain Comp	3/7/2011 10:15	0.415		0.16	-0.0005		0.00488	7	-0.00001	89.6	1.88	-0.0001	-0.0001	0.012	0.00135	-0.001	-0.003
447	E5 - Tailings Impoundment Main Embank Drain Comp	4/5/2011 10:44	0.368		0.187	-0.0005		0.0131	6.13	-0.00001	60.5	2.27	-0.0001	-0.0001	-0.01	0.0013	-0.001	-0.003
448	E5 - Tailings Impoundment Main Embank Drain Comp	5/12/2011 13:08	0.298		0.187	-0.0005		0.0108	6.2	-0.00001	67.1	1.98	-0.0001	-0.0001	-0.01	0.00129	-0.001	-0.003
449	E5 - Tailings Impoundment Main Embank Drain Comp	6/9/2011 13:25	0.384		0.187	-0.0005		0.0103	6.62	-0.00001	84.6	2.17	-0.0001	-0.0001	0.011	0.0014	-0.001	-0.003
450	E5 - Tailings Impoundment Main Embank Drain Comp	7/13/2011 9:02	0.331		0.181	-0.0005		0.0102	6.62	-0.00001	77.9	2.11	-0.00001	-0.0001	-0.01	0.00133	-0.001	-0.003
451	E5 - Tailings Impoundment Main Embank Drain Comp	8/3/2011 8:46	0.452		0.192	-0.0005		0.00888	6.55	-0.00001	75	2.12	-0.00001	-0.0001	-0.01	0.00145	-0.001	0.0035
453	E5 - Tailings Impoundment Main Embank Drain Comp	10/5/2011 11:10	0.465		0.176	-0.0005		0.00558	6.4	0.000024	82.3	1.86	-0.00001	-0.0001	-0.01	0.00133	-0.001	-0.003
454	E5 - Tailings Impoundment Main Embank Drain Comp	11/1/2011 10:32	0.467		0.178	-0.0005		0.00536	6.37	-0.00001	84.2	1.84	-0.00001	-0.0001	-0.01	0.00128	-0.001	-0.003
455	E5 - Tailings Impoundment Main Embank Drain Comp	12/5/2011 11:00	0.363		0.161	-0.0005		0.00459	6.22	-0.00001	85.5	1.8	-0.00001	-0.0001	-0.01	0.00115	-0.001	-0.003
456	E5 - Tailings Impoundment Main Embank Drain Comp	1/4/2012 13:40	0.397		0.182	-0.0005		0.00474	6.5	-0.00001	90.7	2.07	-0.00001	-0.0001	-0.01	0.00123	-0.001	0.004
457	E5 - Tailings Impoundment Main Embank Drain Comp	2/8/2012 9:50	0.395		0.181	-0.0005		0.00481	6.55	-0.00001	89.1	1.95	0.000022	-0.0001	-0.01	0.00124	-0.001	-0.003
458	E5 - Tailings Impoundment Main Embank Drain Comp	3/14/2012 14:10	0.356		0.17	-0.0005		0.00518	6.15	-0.00001	80.1	1.83	0.000015	-0.0001	-0.01	0.00115	-0.001	-0.003
460	E5 - Tailings Impoundment Main Embank Drain Comp	5/2/2012 11:05	0.452		0.209	-0.0005		0.00921	6.24	-0.00001	75.8	2.19	-0.00001	-0.0001	-0.01	0.00129	0.001	-0.003
461	E5 - Tailings Impoundment Main Embank Drain Comp	6/7/2012 9:15	0.289		0.188	-0.0005		0.00974	6.45	-0.00001	69.1	1.99	-0.00001	-0.0001	0.02	0.00119	0.001	-0.003
462	E5 - Tailings Impoundment Main Embank Drain Comp	7/5/2012 8:47	0.318		0.191	-0.0005		0.013	6.48	-0.00001	73.1	2.05	-0.00001	-0.0001	-0.01	0.00123	-0.001	-0.003
463	E5 - Tailings Impoundment Main Embank Drain Comp	8/1/2012 10:24	0.414		0.198	0.00053		0.00661	6.78	0.000012	84.8	2.08	-0.00001	-0.0001	0.018	0.00113	0.0012	-0.003
464	E5 - Tailings Impoundment Main Embank Drain Comp	9/6/2012 11:05	0.437		0.182	-0.0005		0.00614	6.26	-0.00001	93.1	1.86	-0.00001	-0.0001	-0.01	0.00104	-0.001	-0.003
465	E5 - Tailings Impoundment Main Embank Drain Comp	10/3/2012 9:30	0.441		0.184	0.00065		0.00542	7.04	-0.00001	90.3	1.79	-0.00001	-0.0001	0.017	0.00111	0.0013	-0.003
466	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2012 13:07	0.371		0.191	-0.0005		0.00651	6.48	-0.00001	81.8	1.98	-0.00001	-0.0001	0.012	0.00116	0.001	-0.003
467	E5 - Tailings Impoundment Main Embank Drain Comp	12/6/2012 10:11	0.425		0.183	-0.0005		0.00674	6.28	-0.00001	77.4	1.97	-0.00001	-0.0001	-0.01	0.00124	-0.001	-0.003
468	E5 - Tailings Impoundment Main Embank Drain Comp	1/2/2013 14:04	0.459		0.185	-0.0005		0.00594	6.26	-0.00001	87.5	1.92	-0.00001	-0.0001	0.012	0.00124	0.001	-0.003
469	E5 - Tailings Impoundment Main Embank Drain Comp	2/6/2013 9:30	0.367	-0.00001	0.187	-0.0005		0.00732	6.65	-0.00001	87.5	2.09	-0.00001	-0.0001	-0.01	0.00116	-0.001	-0.003
470	E5 - Tailings Impoundment Main Embank Drain Comp	3/13/2013 13:05	0.367		0.176	-0.0005		0.00734	6.33	-0.00001	88.1	2.02	-0.00001	-0.0001	-0.01	0.00107	-0.001	-0.003
471	E5 - Tailings Impoundment Main Embank Drain Comp	4/4/2013 14:45	0.285		0.159	0.00123		0.0128	6.71	-0.00001	59.1	1.71	-0.00001	-0.0001	0.043	0.00106	0.0029	0.0038
472	E5 - Tailings Impoundment Main Embank Drain Comp	5/1/2013 9:18	0.373		0.194	-0.0005		0.0133	6.34	-0.00001	78.4	2.31	-0.00001	-0.0001	-0.01	0.00119	-0.001	-0.003
473	E5 - Tailings Impoundment Main Embank Drain Comp	6/6/2013 9:05	0.378		0.185	-0.0005		0.00903	6.49	-0.00001	83.2	2.17	-0.00001	-0.0001	0.011	0.00105	-0.001	-0.003
474	E5 - Tailings Impoundment Main Embank Drain Comp	7/10/2013 10:02	0.185		0.181	-0.0005		0.0147	4.42	-0.00001	74.8	1.6	-0.00001	-0.0001	-0.01	0.000971	0.0018	-0.003
475	E7 - Perimeter Pond	8/3/2001	0.0279	-0.00005	0.00903	-0.0005		0.0058	3.5	0.00001	10.7	0.742	-0.00005	0.00012	0.00748	0.00114	0.00139	0.004
476	E7 - Perimeter Pond	8/10/2001 10:30	0.0243	-0.00005	0.00872	-0.0005		0.0061	3.1	-0.00001	12.1	0.802	-0.00005	0.00026	0.00494	0.00125	0.0012	0.0035
478	E7 - Perimeter Pond	8/30/2001 14:15	0.0297	-0.00005	0.00849	-0.0005		0.0058	2.6	-0.00001	13.9	0.574	-0.00005	0.00048	0.00629	0.00148	0.00136	0.0033
479	E7 - Perimeter Pond	10/23/2001 15:00	0.0866	-0.00005	0.0061	-0.0005		0.0047	4.7	0.00001	10.4	0.636	-0.00005	0.00026	0.0147	0.0012	0.00233	0.0094
480	E7 - Perimeter Pond	11/13/2001 8:30	0.0956	-0.00005	0.00814	-0.0005		0.0072	5	0.00002	15.2	0.886	-0.00005	0.00099	0.00924	0.00165	0.00146	0.0067
485	E7 - Perimeter Pond	5/22/2002 9:15	0.0395	-0.00005	0.00948	-0.0005		0.0102	3.65	0.00002	6.8	0.293	-0.00005	0.0001	0.02	0.00065	0.0019	0.0268
487	E7 - Perimeter Pond	7/31/2002 16:15	0.159	-0.00005	0.00665	-0.0005		0.0018	1.38	-0.00001	21.3	0.638	-0.00005	-0.00005	0.0054	0.0016	0.00065	0.009
496	E7 - Perimeter Pond	5/5/2003 16:20	0.114	-0.00005	0.00653	-0.0005		0.0028	1.87	-0.00001	10.4	0.481	-0.00005	0.00007	0.008	0.00141	0.00136	0.003
497	E7 - Perimeter Pond	5/29/2003 9:10	0.0832	-0.00005	0.00703	-0.0005		0.0027	0.88	-0.00001	11.5	0.537	-0.00005	0.00005	0.0064	0.00161	0.00084	0.0024
498	E7 - Perimeter Pond	6/24/2003 6:30	0.528	-0.00005	0.00661	-0.0005		0.0019	1.76	-0.00001	14.1	0.59	-0.00005	0.00008	0.007	0.00178	0.00111	0.01
499	E7 - Perimeter Pond	8/5/2003 14:05	0.134	-0.00005	0.00606	-0.0005		0.0015	1.81	-0.00001	15.3	0.628	-0.00005	0.00008	0.0056	0.00193	0.00128	0.0026
500	E7 - Perimeter Pond	8/20/2003 10:30	0.0658	-0.00005	0.00571	-0.0005		0.0007	2.07	-0.00001	15.6	0.677	-0.00005	0.00007	0.0054	0.00178	0.0008	0.0031
501	E7 - Perimeter Pond	10/16/2003 15:10	0.0565	-0.00005	0.00499	-0.0005		0.0026	2.98	-0.00001	13	0.47	-0.00005	-0.00005	0.0052	0.0016	0.001	0.0021
502	E7 - Perimeter Pond	5/1/2004 14:53	0.458	-0.00005	0.0113	-0.0005		0.007	3.35	-0.00001	9.57	0.551	-0.00005	0.00007	0.005	0.00171	0.00068	0.0052
503	E7 - Perimeter Pond	7/5/2004	0.121	-0.00005	0.00754	-0.0005		0.0033	2.93	-0.00001	12.3	0.565	-0.00005	-0.00005	0.0077	0.00206	0.00093	0.0024
505	E7 - Perimeter Pond	8/25/2004	0.238	-0.00005	0.00739	-0.0005		0.0032	3.88	-0.00001	13.4	0.607	-0.00005	-0.00005	0.0012	0.00187	0.00046	0.0014
506	E7 - Perimeter Pond	10/17/2004	0.701	-0.00005	0.00988	-0.0005		0.0107	6.21	-0.00001	13.2	0.569	-0.00005	-0.00005	0.0097	0.00269	0.00121	0.0027
507	E7 - Perimeter Pond	12/8/2004	0.152	-0.00005	0.0103	-0.0005		0.0123	4.73	-0.00001	9.29	0.448	-0.00005	-0.00005	0.0037	0.00139	0.00059	0.0033
508	E7 - Perimeter Pond	1/27/2005	0.153	-0.00005	0.00481	0.0007		0.0075	6.34	-0.00001	5.9	0.291	-0.00005	-0.00005	0.0097	0.00074	0.00154	0.0038
509	E7 - Perimeter Pond	3/16/2005	0.295		0.0114	0.0015		0.005	7.76	-0.00001	10.8	0.328	-0.00005	-0.00005	0.0206	0.00102	0.00298	0.0047
511	E7 - Perimeter Pond	4/11/2005	0.235		0.0106	0.0019		0.0065	4.69	-0.00001	9.98	0.404	-0.00005	-0.00005	0.023	0.00159	0.00175	0.0023
512	E7 - Perimeter Pond	5/4/2005	0.0428		0.0144	-0.0005		0.01	3.15	-0.00001	13.2	0.501	-0.00005	-0.00005	0.0044	0.00198	0.00072	0.0017
513	E7 - Perimeter Pond	9/6/2006	1.55		0.00755	0.0032		-0.005	9.21	-0.00005	17.4	1.2	-0.0005	-0.0005	-0.01	0.0132	-0.005	-0.005
515	E7 - Perimeter Pond	11/15/2006	0.0228		0.0993	-0.001		0.0235	4.2	-0.00002	11.5	1.6	-0.0002	-0.0002	-0.01	0.00277	-0.002	0.0037
516	E7 - Perimeter Pond	2/13/2007	0.671		0.0724	0.00083		0.0282	7.19	-0.00002	18.5	1.5	-0.0002	-0.0002	0.012	0.00401	0.0017	0.0169
517	E7 - Perimeter Pond	3/27/2007	0.107		0.14	-0.002		0.0302	6.85	-0.00002	12.6	1.82	-0.0002	-0.0002	0.036	0.00236	0.0031	0.0181
518	E7 - Perimeter Pond	4/17/2007 10:07	0.0604		0.0989	-0.001		0.0184	4.52	0.000047	7.64	1.15	-0.0002	-0.0002	0.028	0.00142	0.0026	-0.008
519	E7 - Perimeter Pond	5/8/2007 8:48	0.0669		0.286	-0.0025		0.0294	3.53	-0.00005	18.2	2.74	-0.0005	-0.0005	-0.01	0.00305	-0.005	-0.005
520	E7 - Perimeter Pond	6/11/2007 12:09	0.0376		0.212	-0.001		0.0245	1.7	-0.00002	18.5	2.07	-0.0002	-0.0002	-0.01	0.00455	-0.002	0.0025
521	E7 - Perimeter Pond	7/3/2007 10:14	0.0118		0.192	-0.001		0.022	2.02	-0.00002	17.8	2.05	-0.0002	-0.0002	-0.01	0.00404	-0.002	-0.002
522	E7 - Perimeter Pond	8/8/2007 9:18	0.0047		0.153	-0.001		0.0212	1.51	-0.00002	25.9	2.15	-0.0002	-0.0002	-0.01	0.00485	-0.002	-0.002
523	E7 - Perimeter Pond	9/6/2007 11:48	0.0308		0.174	-0.001		0.0145	2.22	-0.00002	38.3	2.57	-0.0002	-0.0002	-0.01	0.00621	-0.002	0.0023
524	E7 - Perimeter Pond	10/2/2007 14:46	0.0136		0.21	-0.001		0.0126	4.22	-0.00002	43.4	2.59	-0.0002	-0.0002	-0.01	0.00558	-0.002	0.0053
525	E7 - Perimeter Pond	11/5/2007 12:49	0.0265		0.248	-0.001		0.0175	5.09	-0.00002	52.5	3.33	-0.0002	-0.0002	-0.01	0.00523	-0.002	0.0265
526	E7 - Perimeter Pond	1/14/2008 11:39	0.0243		0.187	-0.001		0.0093	4.78	-0.00002	70	2.96	-0.0002	-0.0002	-0.01	0.00396	-0.002	0.0547
527	E7 - Perimeter Pond	6/16/2008 10:50	0.0325		0.199	-0.001		0.0069	3.42	-0.00002	54.2	1.79	-0.0002	-0.0002	0.011	0.00271	-0.002	0.0124
528	E7 - Perimeter Pond	4/22/2009 14:44	0.0573		0.0223	0.00383		0.0058	7.11	0.00002	4.25	0.38	-0.0001	-0.0001	0.066	0.000256	0.0047	0.0061
529	E7 - Perimeter Pond	6/8/2011 10:17	0.059		0.212	0.00105		0.0487	5.58	-0.00001	32.6	4.48	-0.00001	-0.0001	0.022	0.00236	0.0011	0.0037
530	E7 - Perimeter Pond	8/3/2011 9:34	0.0438		0.146	-0.001		0.0282	5.7	0.00004	31.8	3.87	-0.00002	-0.0002	0.023	0.00202	-0.002	-0.006
531	E7 - Perimeter Pond	9/8/2011 10:25	0.241		0.18	0.0011		0.0119	7.04	-0.00002	38.7	5.3	-0.00002	-0.0002	0.011	0.00485	-0.002	0.0088
532	E7 - Perimeter Pond	10/5/2011 13:40	0.0262		0.155	-0.001		0.0125	5.05	-0.00002	66.6	4.48	-0.00002	-0.0002	-0.01	0.00201	-0.002	-0.006
533	E7 - Perimeter Pond	11/1/2011 11:48	0.101		0.12	0.0009		0.013	6.02	-0.00001	37.9	3.47	-0.00001	-0.0001	0.018	0.00202	0.0012	0.0071
534	E7 - Perimeter Pond	2/8/2012 10:45	0.113		0.141	0.00076		0.00867	7.18	-0.00001	47.6	4.3	0.000031	-0.0001	0.021	0.00289	0.0013	0.0119
535	E7 - Perimeter Pond	5/2/2012 10:19	0.095		0.111	0.00327		0.0251	8.37	0.000025	19.7	2.64	-0.00001	-0.0001	0.075	0.00132	0.0051	0.011
538	E7 - Perimeter Pond	8/1/2012 11:26	0.0986		0.15	0.001		0.0312	6.07	0.000011	33.1	4.21	-0.00001	-0.0001	0.018	0.0022	0.0013	0.0042
541	E7 - Perimeter Pond	11/15/2012 13:39	0.0379		0.086	0.00083		0.0288	5.46	-0.00001	22.7	2.53	-0.00001	-0.0001	0.023	0.000929	0.0012	0.0046
542	E7 - Perimeter Pond	12/6/2012 11:02	0.169		0.148	0.00067		0.0136	7.12	-0.00001	41.4	5.03	-0.00001	-0.0001	0.011	0.00298	-0.001	0.0076
543	E7 - Perimeter Pond	1/2/2013 14:40	0.23		0.125	0.00086		0.0182	7.92	-0.00001	24.4	4.86	-0.00001	-0.0001	0.022	0.00359	0.0011	0.0084
544	E7 - Perimeter Pond	2/6/2013 10:13	0.0451		0.0771	0.00063		0.0217	6.65	-0.00001	20	3.14	-0.00001	-0.0001	-0.01	0.00136	-0.001	0.0038
545	E7 - Perimeter Pond	5/1/2013 13:28	0.0684		0.152	0.00129		0.0519	5.65	-0.00001	24.7	2.89	-0.00001	-0.0001	0.025	0.00109	0.0014	0.0077
546	E7 - Perimeter Pond	8/8/2013 11:24	0.0261	-0.00001	0.276	0.0006		0.0308	4.58	-0.00001	54.6	4.35	-0.00001	-0.0001	0.016	0.00185	0.0012	-0.003
547	E7 - Perimeter Pond	11/5/2013 9:20	0.245		0.166	0.00112		0.0169	7.65	0.000012	51.4	5.08	-0.00001	-0.0001	0.022	0.0029	0.002	0.009
548	E7 - Perimeter Pond	12/5/2013 12:20	0.4		0.18	0.00171		0.028	11.9	0.00002	47.8	4.68	0.000015	-0.0001	0.075	0.00486	0.0038	0.0104
549	E7 - Perimeter Pond	12/10/2013 13:52	0.317		0.137	0.00339		0.0302	14.7	0.000022	36.2	3.25	0.000018	-0.0001	0.179	0.00502	0.0069	0.0154
550	E7 - Perimeter Pond	12/12/2013 11:44	0.275		0.124	0.00217		0.0258	10.2	0.000018	37.6	3.32	0.000015	-0.0001	0.08	0.00367	0.005	0.0184
551	E7 - Perimeter Pond	12/16/2013 13:36	0.317		0.126	0.00225		0.0255	12.5	0.000034	41.8	2.42	0.00002	-0.0001	0.135	0.00425	0.0059	0.0135
552	E7 - Perimeter Pond	12/19/2013 8:23	0.376		0.154	0.00109		0.016	8.05	-0.00001	41.5	4.37	0.000017	-0.0001	0.036	0.00326	0.0021	0.0081
553	E7 - Perimeter Pond	1/7/2014 11:37	0.418		0.111	0.00534		0.0252	19.6	0.000034	39.9	1.83	0.00003	-0.0001	0.28	0.00402	0.0123	0.0265
555	E7 - Perimeter Pond	1/27/2014 13:44	0.38		0.135	0.00369		0.0157	9.69	0.000016	38.9	3.73	0.000015	-0.0001	0.084	0.00335	0.0052	0.012
556	E7 - Perimeter Pond	1/28/2014 14:01	0.383		0.158	0.00246		0.0138	8.56	0.000018	43.8	4.22	0.000013	-0.0001	0.059	0.0029	0.0038	0.0121
557	E7 - Perimeter Pond	1/29/2014 14:37	0.355		0.144	0.00225		0.0147	8.89	0.000012	37.3	4.02	0.000014	-0.0001	0.069	0.00301	0.0041	0.0107
558	E7 - Perimeter Pond	1/30/2014 13:48	0.342		0.142	0.00744		0.0173	9.98	0.000012	40	3.65	0.000015	0.00011	0.078	0.00431	0.0046	0.0266
559	E7 - Perimeter Pond	2/11/2014 14:01	0.32	-0.00001	0.129	0.00097		0.0207	7.52	0.000028	44.2	2.7	-0.00001	-0.0001	0.031	0.00369	0.0023	0.0076
560	E7 - Perimeter Pond	3/4/2014 8:54	0.396		0.18	0.00092		0.0283	8.34	0.000011	64.3	2.81	-0.00001	-0.0001	0.035	0.0048	0.0025	0.0032
561	E7 - Perimeter Pond	4/1/2014 11:20	0.199		0.0632	0.00249		0.0362	10.1	0.000019	18.6	0.723	0.000014	-0.0001	0.11	0.00596	0.006	0.0077
562	E7 - Perimeter Pond	5/1/2014 11:12	0.145		0.117	0.00264		0.0376	7.96	0.000017	15.4	2.45	0.000011	-0.0001	0.074	0.00174	0.0042	0.0109
563	E7 - Perimeter Pond	6/3/2014 11:11	0.0686		0.136	0.00097		0.0401	5.61	-0.00001	37.7	2.47	-0.00001	-0.0001	0.017	0.00132	0.0014	0.0046
564	E7 - Perimeter Pond	7/3/2014 8:38	0.0645		0.193	0.00103		0.0408	5.64	-0.00001	45	3.51	-0.00001	-0.0001	0.037	0.00178	0.002	0.0039
565	E7 - Perimeter Pond	9/2/2014 11:22	0.101		0.174	0.0005		0.0152	6.14	-0.00001	68.9	1.95	-0.00001	-0.0001	0.024	0.00153	0.0021	-0.003

Index	Sample Point	Date	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Alkalinity (CaCO3) (mg/L)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen N-WDGWA (mg/L)
566	E7 - Perimeter Pond	10/15/2014 10:26	sample taken	1179	8.197	8.9	22.8	90	1170	449	8.12	865	20.4	15.1	-0.005	23.3	0.67	2.07	2.16	0.086	
Incomplete Data																					
482	E7 - Perimeter Pond	2/26/2002 14:30		575	7.34	0.8		165		263					0.023						9.64
11	E4 - Main Embankment Seepage Pond	2/26/2002 13:30		569	7.6	2		181		158					0.192						3.21
54	E4 - Main Embankment Seepage Pond	10/11/2005		548	8.48	8.4															
65	E4 - Main Embankment Seepage Pond	9/6/2006		593	7.97	16.8															
69	E4 - Main Embankment Seepage Pond	1/8/2007 10:59																			
71	E4 - Main Embankment Seepage Pond	2/5/2007 10:59																			
76	E4 - Main Embankment Seepage Pond	6/4/2007 10:34																			
78	E4 - Main Embankment Seepage Pond	6/11/2007 10:59																			
93	E4 - Main Embankment Seepage Pond	12/4/2007 13:57																			
99	E4 - Main Embankment Seepage Pond	2/6/2008 10:09																			
101	E4 - Main Embankment Seepage Pond	3/4/2008 10:09																			
103	E4 - Main Embankment Seepage Pond	4/16/2008 10:14																			
128	E4 - Main Embankment Seepage Pond	12/16/2009		1072	7.7	0.2															
151	E4 - Main Embankment Seepage Pond	10/31/2011 14:29		1254	8.22	6															
168	E4 - Main Embankment Seepage Pond	3/10/2013 8:48	sample taken	1255	7.92	7.92															
207	East Main Toe Drain	8/30/2011 14:36		1120	8.25	11.7															
220	East Main Toe Drain	3/10/2013 9:00	Sample taken	1187	7.996	8															
232	East Main Toe Drain	2/18/2014 11:24	Sample Taken	1239	7.692	6.8	0.07														
237	East Main Toe Drain	6/18/2014 15:21	20L bucket test used for Q	1206	8.104	8															
245	West Main Toe Drain	3/10/2013 8:58	Sample taken	1114	8.051	7.9															
258	West Main Toe Drain	6/18/2014 15:30	20L bucket test used for Q	1192	8.008	8.7															
260	West Main Toe Drain	7/8/2014 10:30	Incorrectly calculated as 0.00032 previously	1180	8.014	9.5	0														
262	West Main Toe Drain	9/16/2014 12:20	No power in shed. No flow from East MTD, FD1, FD2, FD3, FD4 or FD5.	1146	7.671	8.5															
281	Perimeter Toe Drain	8/31/2011 10:40		1359	7.93	7.4															
282	Perimeter Toe Drain	9/15/2011 8:40		1354	7.84	7.4															
284	Perimeter Toe Drain	10/27/2011 14:00		1403	7.84	7.7															
290	Perimeter Toe Drain	6/14/2012		1312	7.9	7.5															
291	Perimeter Toe Drain	7/5/2012 9:15	Average, meter didnt settle	1300	7.85	7.2															
292	Perimeter Toe Drain	7/26/2012 11:50		1314	7.93	7.8															
294	Perimeter Toe Drain	8/14/2012 15:19		1297		7.5															
295	Perimeter Toe Drain	10/4/2012 10:55	Hard to find a good spot for the flow	1295	7.6	8															
296	Perimeter Toe Drain	10/25/2012 14:33	FlowTracker	1321	7.812	8.3															
298	Perimeter Toe Drain	11/20/2012 14:02		1338	7.907	8.7															
300	Perimeter Toe Drain	4/22/2013 14:06		1322	7.795	7.5															
302	Perimeter Toe Drain	5/23/2013 6:48		834	7.79	7.1															
303	Perimeter Toe Drain	6/18/2013 15:49		836	7.73	7.1															
304	Perimeter Toe Drain	7/18/2013 13:55		1261	7.957	6.9															
306	Perimeter Toe Drain	8/19/2013 9:51		1264	8.068	7															
308	Perimeter Toe Drain	4/30/2014 8:36		1307	7.74	8.8															
310	Perimeter Toe Drain	6/16/2014 9:37		1268	7.864	8.1															
311	Perimeter Toe Drain	7/7/2014 12:47		1254	7.975	7.8															
316	South Toe Drain	9/15/2011 9:15		1271	7.58	14.4															
317	South Toe Drain	9/29/2011 9:55		1274	7.58	13.7															
319	South Toe Drain	10/27/2011 13:10		1326	7.57	10.6															
325	South Toe Drain	6/6/2012 15:00		1236	7.81	6.9															
326	South Toe Drain	7/11/2012 15:25		1256	7.86	8.9															
327	South Toe Drain	7/24/2012 15:00	Lot's of errors	1254	7.82	10.7															
329	South Toe Drain	8/9/2012 10:29		1267	7.851	12.3															
330	South Toe Drain	8/31/2012 11:35		1276	7.75	13.5															
331	South Toe Drain	9/5/2012 11:25		1292	7.709	13.5															
332	South Toe Drain	9/26/2012 10:57		1293	7.6	12.9															
333	South Toe Drain	10/24/2012 15:00		1308	7.763	11.6															
335	South Toe Drain	11/20/2012 13:27	okay	1309	7.835	9															
337	South Toe Drain	4/22/2013 13:25		1278	8.414	5.8															
339	South Toe Drain	5/23/2013 7:23		553	7.78	6.5															
340	South Toe Drain	6/19/2013 12:50		1240	8.1	8.3															
341	South Toe Drain	7/18/2013 14:35		1195	7.81	11.5															
343	South Toe Drain	8/13/2013 12:00		1281	7.85	13.17															
344	South Toe Drain	10/17/2013 12:50		998	7.8	14															
346	South Toe Drain	11/14/2013 13:50	FULL pipe	1273	7.802	11.7															
347	South Toe Drain	4/30/2014 7:50		1242	7.86	4.5															
349	South Toe Drain	6/16/2014 10:05		1150	7.829	7.1															
350	South Toe Drain	7/7/2014 12:10		1166	7.821	8.9															
352	South Toe Drain	9/16/2014 11:41	South Seepage Pond piped into STD Ditch-not flowing at present	1216	7.774	10.4															
353	South Toe Drain	10/1/2014 13:42	No sample.	1240	7.856	9.9															
356	E5 - Tailings Impoundment Main Embank Drain Comp	7/28/1998 13:00		458	7.37	12.5		226		233			-4	0.6	0.009					0.006	
357	E5 - Tailings Impoundment Main Embank Drain Comp	11/26/1998 11:05		442	7.35	8		178		238			-4	0.53	0.006					0.007	
358	E5 - Tailings Impoundment Main Embank Drain Comp	12/7/1999 10:00		457	7.1	5.1		196		228			-4	0.56	-0.005					0.008	
359	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/1999 15:30		360	6.86	5.9		192		219			-4	0.33	0.011					0.004	
360	E5 - Tailings Impoundment Main Embank Drain Comp	12/15/1999 14:30		441	6.88	5.3		190		220			-4	0.28	0.011					0.005	
361	E5 - Tailings Impoundment Main Embank Drain Comp	7/17/2000 12:00		681	7.23	8.4		133		183			-4	0.47	-0.005					-0.001	
362	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2000 9:15		855	7.18	8.6		134		419			-4	0.72	0.247					0.289	
363	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:00		669	7.37	7.7		174		377			-4	0.52	-0.005					0.617	
364	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:05						189		413			-4	0.36	-0.005					0.746	
452	E5 - Tailings Impoundment Main Embank Drain Comp	9/8/2011 8:11		1141	7.89	7.4															
504	E7 - Perimeter Pond	8/3/2004																			
514	E7 - Perimeter Pond	10/12/2006		968	7.85	9.5															
536	E7 - Perimeter Pond	6/7/2012 10:50	Actual field reading	893	7.86	8.5															
537	E7 - Perimeter Pond	7/5/2012 11:07	Actual field reading	925	8.35	16.5															
539	E7 - Perimeter Pond	9/6/2012 11:07		1356	7.852	12.4															
540	E7 - Perimeter Pond	10/3/2012 10:15		1366	7.89	3.9							10.1								
554	E7 - Perimeter Pond	1/21/2014 2:47	Took a 55 Gallon bulk sample Newalta? Regular sampls taken aswell pH re-check 7.045	1115	8.533	1.1	6.02														
394	E5 - Tailings Impoundment Main Embank Drain Comp	1/8/2007 10:30		738	7.46	6.4		144		215		470	-3	0.2	0.0757			0.758		0.0113	
70	E4 - Main Embankment Seepage Pond	1/8/2007 10:59		700	7.58	3.3		162		234		443	8.7	8.9	-0.005			0.534		0.0343	
95	E4 - Main Embankment Seepage Pond	1/3/2008 13:54		845	7.77	2		151		303		571	-3	2.28	0.0275			1.92		0.041	
230	East Main Toe Drain	1/7/2014 10:45	Sample taken	1212	7.981	7.6		76.8	1190	460	8	891	-3	-0.1	0.0504	29	0.93	1.67	1.93	0.259	
510	E7 - Perimeter Pond	4/4/2005		573				184		270		330	6	9.4	0.043				1.95		
477	E7 - Perimeter Pond	8/16/2001						106		253			-4	1.79	0.895				21		
366	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2001 13:00						113		421			-4	2.24	-0.005				74.3	0.034	
370	E5 - Tailings Impoundment Main Embank Drain	8/16/2001						169		586			-4	0.66	-0.005				92.4		
2	E4 - Main Embankment Seepage Pond	7/19/2001 13:00						90		126			11	24.5	0.014				11.4	0.079	
47	E4 - Main Embankment Seepage Pond	4/4/2005		495		5.2		126		150		278	18.8	14	0.163				0.074		
51	E4 - Main Embankment Seepage Pond	7/5/2005						145		180		304	14.8	14	0.066						
6	E4 - Main Embankment Seepage Pond	8/16/2001						61		157			-4	0.64	-0.005				20.9		
193	E4 - Main Embankment Seepage Pond	4/9/2015 10:20						102	1180	534	8.27	840	5.3	2.13	-0.005	15.6	0.58	5.41	5.44	0.0287	
195	E4 - Main Embankment Seepage Pond	6/2/2015 11:37						38.2	1210	493	7.87	879	-3	0.92	0.0169	15.3	0.54	5.40	5.43	0.0301	
196	E4 - Main Embankment Seepage Pond	7/9/2015 10:32						46.2	1180	490	7.89	933	-3	0.87	0.0131	16.6	0.55	3.95	3.98	0.0247	
157	E4 - Main Embankment Seepage Pond	4/3/2012 10:10	pH meter not working	957		1.3		103	1050	458	7.58	786	3.7	5.52	0.017	17.5	0.52	2.99	3.04	0.047	
194	E4 - Main Embankment Seepage Pond	5/5/2015 14:05						67.0	1240	509	8.14	922	-3	0.80	0.0116	17.3	0.59	5.59	5.62	0.0288	
437	E5 - Tailings Impoundment Main Embank Drain Comp	6/3/2010 8:30				7.8		123	1060	398	8.04	1040	-3	0.52	0.0799	21		2.17	2.19	0.0167	
459	E5 - Tailings Impoundment Main Embank Drain Comp	4/3/2012 10:10	pH meter not working	1320		6.3		99.2	1230	541	7.57	962	-3	0.26	0.0424	20.9	1.05	3.8	3.93	0.134	
431	E5 - Tailings Impoundment Main Embank Drain Comp	12/9/2009 12:45						135		336		705	-3	0.35	0.0951	22.5		1.79		-0.01	
137	E4 - Main Embankment Seepage Pond	9/1/2010		1082		12.5		102	1060	399	8.15	770	-3	0.93	0.0269	24.6		0.497	0.513	0.016	

Index	Sample Point	Date	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Sulphide as S (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	Aluminum (Al)-Total	Antimony (Sb)-Total	Arsenic (As)-Total	Barium (Ba)-Total	Beryllium (Be)-Total	Bismuth (Bi)-Total	Boron (B)-Total	Cadmium (Cd)-Total	Calcium (Ca)-Total	Chromium (Cr)-Total	Cobalt (Co)-Total
566	E7 - Perimeter Pond	10/15/2014 10:26	-0.001	0.0062	0.0277	501			2.24	3.45		0.0071	0.00068	0.00238	0.0509	-0.0001	-0.0005	0.13	0.000019	144	-0.0005	0.0003
Incomplete Data																						
482	E7 - Perimeter Pond	2/26/2002 14:30	-0.005	0.01	0.013				9.64			0.0051	0.00024	0.0007	0.049	-0.00005	-0.00005		0.00001	92.1	0.0014	-0.00002
11	E4 - Main Embankment Seepage Pond	2/26/2002 13:30	-0.005	0.034	0.052				3.21			0.0027	0.00017	0.0021	0.0476	-0.00005	-0.00005		0.00006	49.5	0.0014	0.00028
54	E4 - Main Embankment Seepage Pond	10/11/2005		0.009	0.033																	
65	E4 - Main Embankment Seepage Pond	9/6/2006		0.0145	0.0229																	
69	E4 - Main Embankment Seepage Pond	1/8/2007 10:59																				
71	E4 - Main Embankment Seepage Pond	2/5/2007 10:59																				
76	E4 - Main Embankment Seepage Pond	6/4/2007 10:34																				
78	E4 - Main Embankment Seepage Pond	6/11/2007 10:59																				
93	E4 - Main Embankment Seepage Pond	12/4/2007 13:57		0.0138	0.0411																	
99	E4 - Main Embankment Seepage Pond	2/6/2008 10:09																				
101	E4 - Main Embankment Seepage Pond	3/4/2008 10:09																				
103	E4 - Main Embankment Seepage Pond	4/16/2008 10:14																				
128	E4 - Main Embankment Seepage Pond	12/16/2009		0.109	0.202																	
151	E4 - Main Embankment Seepage Pond	10/31/2011 14:29																				
168	E4 - Main Embankment Seepage Pond	3/10/2013 8:48																				
207	East Main Toe Drain	8/30/2011 14:36																				
220	East Main Toe Drain	3/10/2013 9:00																				
232	East Main Toe Drain	2/18/2014 11:24					-0.02															
237	East Main Toe Drain	6/18/2014 15:21																				
245	West Main Toe Drain	3/10/2013 8:58																				
258	West Main Toe Drain	6/18/2014 15:30																				
260	West Main Toe Drain	7/8/2014 10:30																				
262	West Main Toe Drain	9/16/2014 12:20																				
281	Perimeter Toe Drain	8/31/2011 10:40																				
282	Perimeter Toe Drain	9/15/2011 8:40																				
284	Perimeter Toe Drain	10/27/2011 14:00																				
290	Perimeter Toe Drain	6/14/2012																				
291	Perimeter Toe Drain	7/5/2012 9:15																				
292	Perimeter Toe Drain	7/26/2012 11:50																				
294	Perimeter Toe Drain	8/14/2012 15:19																				
295	Perimeter Toe Drain	10/4/2012 10:55																				
296	Perimeter Toe Drain	10/25/2012 14:33																				
298	Perimeter Toe Drain	11/20/2012 14:02																				
300	Perimeter Toe Drain	4/22/2013 14:06																				
302	Perimeter Toe Drain	5/23/2013 6:48																				
303	Perimeter Toe Drain	6/18/2013 15:49																				
304	Perimeter Toe Drain	7/18/2013 13:55																				
306	Perimeter Toe Drain	8/19/2013 9:51																				
308	Perimeter Toe Drain	4/30/2014 8:36																				
310	Perimeter Toe Drain	6/16/2014 9:37																				
311	Perimeter Toe Drain	7/7/2014 12:47																				
316	South Toe Drain	9/15/2011 9:15																				
317	South Toe Drain	9/29/2011 9:55																				
319	South Toe Drain	10/27/2011 13:10																				
325	South Toe Drain	6/6/2012 15:00																				
326	South Toe Drain	7/11/2012 15:25																				
327	South Toe Drain	7/24/2012 15:00																				
329	South Toe Drain	8/9/2012 10:29																				
330	South Toe Drain	8/31/2012 11:35																				
331	South Toe Drain	9/5/2012 11:25																				
332	South Toe Drain	9/26/2012 10:57																				
333	South Toe Drain	10/24/2012 15:00																				
335	South Toe Drain	11/20/2012 13:27																				
337	South Toe Drain	4/22/2013 13:25																				
339	South Toe Drain	5/23/2013 7:23																				
340	South Toe Drain	6/19/2013 12:50																				
341	South Toe Drain	7/18/2013 14:35																				
343	South Toe Drain	8/13/2013 12:00																				
344	South Toe Drain	10/17/2013 12:50																				
346	South Toe Drain	11/14/2013 13:50																				
347	South Toe Drain	4/30/2014 7:50																				
349	South Toe Drain	6/16/2014 10:05																				
350	South Toe Drain	7/7/2014 12:10																				
352	South Toe Drain	9/16/2014 11:41																				
353	South Toe Drain	10/1/2014 13:42																				
356	E5 - Tailings Impoundment Main Embank Drain Comp	7/28/1998 13:00	0.007			10.9						0.0036		0.0004						66.3		
357	E5 - Tailings Impoundment Main Embank Drain Comp	11/26/1998 11:05	0.031	0.009		23.5						0.0021	0.00006	0.00052	0.0231	-0.0001	-0.0001		0.00002	56.3	-0.0005	0.00027
358	E5 - Tailings Impoundment Main Embank Drain Comp	12/7/1999 10:00	-0.001			37.5						0.0032	0.00026	0.0012	0.0214	-0.00005	-0.00005		0.00009	69.7	0.0011	0.00017
359	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/1999 15:30	0.005			31.7						0.0046	0.00024	0.0011	0.0232	-0.00005	-0.00005		0.00006	67.8	0.0017	0.00026
360	E5 - Tailings Impoundment Main Embank Drain Comp	12/15/1999 14:30	0.006			35.4						0.004	0.00028	0.0012	0.0219	-0.00005	-0.00005		0.00018	68	0.0009	0.00018
361	E5 - Tailings Impoundment Main Embank Drain Comp	7/17/2000 12:00	0.004			172						0.0049	0.00023	0.0051	0.0418	-0.00005	-0.00005		0.00022	56.1	0.0017	0.00042
362	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2000 9:15	0.008			71.5						0.0032	0.00013	0.0007	0.156	-0.00005	-0.00005		0.00005	125	-0.0002	0.0017
363	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:00	0.004			82.8						0.0028	-0.00005	0.0018	0.121	-0.00005	-0.00005		0.00005	115	0.0008	0.00182
364	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:05	0.019			59.7						0.0024	-0.00005	0.0013	0.115	-0.00005	-0.00005		0.00003	126	0.0007	0.00165
452	E5 - Tailings Impoundment Main Embank Drain Comp	9/8/2011 8:11																				
504	E7 - Perimeter Pond	8/3/2004		-0.005	0.014																	
514	E7 - Perimeter Pond	10/12/2006		0.0068	0.0192																	
536	E7 - Perimeter Pond	6/7/2012 10:50																				
537	E7 - Perimeter Pond	7/5/2012 11:07																				
539	E7 - Perimeter Pond	9/6/2012 11:07																				
540	E7 - Perimeter Pond	10/3/2012 10:15																				
554	E7 - Perimeter Pond	1/21/2014 2:47																				
394	E5 - Tailings Impoundment Main Embank Drain Comp	1/8/2007 10:30	0.0228	0.04	0.0446	185			0.89	3.3		0.0026	0.00063	0.00214	0.089	-0.0005	-0.0005	0.137	-0.00005	66.4	-0.0005	0.00035
70	E4 - Main Embankment Seepage Pond	1/8/2007 10:59	-0.001	0.0136	0.0501	158			0.73	3.68		0.0016	0.00045	0.00227	0.0705	-0.0005	-0.0005	0.117	-0.00005	71.7	-0.0005	0.00028
95	E4 - Main Embankment Seepage Pond	1/3/2008 13:54	-0.001	0.0117	0.0329	243			3.43	3.56		0.0016	0.00042	0.00218	0.0749	-0.0005	-0.0005	0.127	-0.00004	95	-0.0005	-0.0001
230	East Main Toe Drain	1/7/2014 10:45	0.0226	0.0332	0.0315	526				2.68												
510	E7 - Perimeter Pond	4/4/2005	0.003	0.023	0.016	82.5				2.3		0.0027	0.00024	0.0004	0.055	-0.00005	-0.00005	0.028	0.00005	87.1	-0.0002	0.00033
477	E7 - Perimeter Pond	8/16/2001	0.014	0.014	0.022	92.7		0.36	21.4			0.0079	0.00054	0.0007	0.0564	-0.00005	0.00102		0.00003	78.2	0.0006	0.00027
366	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2001 13:00	0.073	0.096	0.097	63		-0.1	74.3	5.4		0.0043	0.00011	0.0007	0.152	-0.00005	-0.00005		0.00006	144	0.0005	0.00081
370	E5 - Tailings Impoundment Main Embank Drain Comp	8/16/2001	0.052	0.04	0.04	122		-0.1	92.4			0.0066	0.00015	0.001	0.151	-0.00005	-0.00005		0.00002	186	0.0007	0.00081
2	E4 - Main Embankment Seepage Pond	7/19/2001 13:00	0.039	0.043	0.061	64.2		0.36	11.8	6.6		0.0183	0.00022	0.0018	0.0437	-0.00005	-0.00005		0.0001	38	-0.0002	0.00018
47	E4 - Main Embankment Seepage Pond	4/4/2005	0.016	0.055	0.05	90.6				3.5		0.005	0.00018	0.0012	0.0508	-0.00005	-0.00005	0.069	0.00018	47.9	-0.0002	0.00014
51	E4 - Main Embankment Seepage Pond	7/5/2005	0.014	0.02	0.071	99.9				5.5		0.0029	0.00017	0.002	0.0502	-0.00005	-0.00005	0.085	0.00012	54.9	-0.0002	0.00017
6	E4 - Main Embankment Seepage Pond	8/16/2001	-0.005	0.02	0.036	100		0.35	21.3			0.0048	0.00033	0.0021	0.0611	-0.00005	-0.00005		0.00014	42.8	0.0004	0.00019
193	E4 - Main Embankment Seepage Pond	4/9/2015 10:20	-0.001	0.0075	0.0162	515			5.26	3.97		0.0673	0.00036	0.00162	0.0477	-0.0001	-0.00005	0.091	0.0000202	168	-0.0005	0.00017
195	E4 - Main Embankment Seepage Pond	6/2/2015 11:37	-0.001	0.0051	0.0064	554			5.35	4.43		0.0326	0.00046	0.00182	0.0427	-0.0001	-0.00005	0.118	0.0000096	149	-0.0005	0.00011
196	E4 - Main Embankment Seepage Pond	7/9/2015 10:32	-0.001	0.0057	0.0099	545			3.88	4.40		0.0349	0.00039	0.00185	0.0478	-0.0001	-0.00005	0.132	-0.000015	148	-0.0005	0.00011
157	E4 - Main Embankment Seepage Pond	4/3/2012 10:10	0.0053	0.0111	0.0218	422			3.92	5.06		0.0049	0.0005	0.0014	0.0432	-0.0001	-0.0005	0.095	-0.00017	149	-0.0005	0.00018
194	E4 - Main Embankment Seepage Pond	5/5/2015 14:05	-0.001	0.0046	0.0136	561			5.77	3.76		0.0368	0.00036	0.00160	0.0508	-0.0001	-0.00005	0.112	0.0000144	156	-0.0005	0.00011
437	E5 - Tailings Impoundment Main Embank Drain Comp	6/3/2010 8:30	0.0192	0.031	0.0432	401			3.25	3.3		0.0021	0.00057	0.00146	0.0744	-0.001	-0.001	0.122	0.0001	128	-0.001	0.0003
459	E5 - Tailings Impoundment Main Embank Drain Comp	4/3/2012 10:10	0.0183	0.0275	0.0309	557			4.84	3.15		-0.003	0.00038	0.00138	0.0682	-0.0001	-0.0005	0.126	-0.00019	174	-0.0005	0.00032
431	E5 - Tailings Impoundment Main Embank Drain Comp	12/9/2009 12:45	0.0211	0.0349	0.04	359			2.53	2.62		0.0022	0.00038	0.00176	0.0773	-0.001	-0.001	0.168	-0.00056	107	-0.001	0.00031
137	E4 - Main Embankment Seepage Pond	9/1/2010	-0.001	0.0072	0.0151	421			0.78	4.52		-0.001	0.00038	0.00202	0.0423	-0.0001	-0.0005	0.147	-0.00003	125	-0.0005	-0.0001

Index	Sample Point	Date	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Lithium (Li)-Total	Magnesium (Mg)-Total	Manganese (Mn)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Potassium (K)-Total	Selenium (Se)-Total	Silicon (Si)-Total	Silver (Ag)-Total	Sodium (Na)-Total	Strontium (Sr)-Total	Thallium (Tl)-Total	Tin (Sn)-Total
566	E7 - Perimeter Pond	10/15/2014 10:26	0.0127	-0.03	-0.00005	0.00811	22.1	0.484		0.2	0.00065	10.5	0.00832	5.26	-0.00001	79.6	1.95	-0.00001	-0.0001
Incomplete Data																			
482	E7 - Perimeter Pond	2/26/2002 14:30	0.0042	0.024	-0.00002	0.0019	13.7	0.0348	-0.00005	0.00891	-0.0005	2.6	0.0036	6.85	-0.00001	15.6	0.562	-0.00005	0.00017
11	E4 - Main Embankment Seepage Pond	2/26/2002 13:30	0.0018	-0.005	-0.00002	0.0028	11.8	0.612	-0.00005	0.0454	-0.0005	4.35	0.0013	7.01	-0.00001	35.7	0.463	-0.00005	0.00009
54	E4 - Main Embankment Seepage Pond	10/11/2005																	
65	E4 - Main Embankment Seepage Pond	9/6/2006																	
69	E4 - Main Embankment Seepage Pond	1/8/2007 10:59																	
71	E4 - Main Embankment Seepage Pond	2/5/2007 10:59																	
76	E4 - Main Embankment Seepage Pond	6/4/2007 10:34																	
78	E4 - Main Embankment Seepage Pond	6/11/2007 10:59																	
93	E4 - Main Embankment Seepage Pond	12/4/2007 13:57																	
99	E4 - Main Embankment Seepage Pond	2/6/2008 10:09																	
101	E4 - Main Embankment Seepage Pond	3/4/2008 10:09																	
103	E4 - Main Embankment Seepage Pond	4/16/2008 10:14																	
128	E4 - Main Embankment Seepage Pond	12/16/2009																	
151	E4 - Main Embankment Seepage Pond	10/31/2011 14:29																	
168	E4 - Main Embankment Seepage Pond	3/10/2013 8:48																	
207	East Main Toe Drain	8/30/2011 14:36																	
220	East Main Toe Drain	3/10/2013 9:00																	
232	East Main Toe Drain	2/18/2014 11:24																	
237	East Main Toe Drain	6/18/2014 15:21																	
245	West Main Toe Drain	3/10/2013 8:58																	
258	West Main Toe Drain	6/18/2014 15:30																	
260	West Main Toe Drain	7/8/2014 10:30																	
262	West Main Toe Drain	9/16/2014 12:20																	
281	Perimeter Toe Drain	8/31/2011 10:40																	
282	Perimeter Toe Drain	9/15/2011 8:40																	
284	Perimeter Toe Drain	10/27/2011 14:00																	
290	Perimeter Toe Drain	6/14/2012																	
291	Perimeter Toe Drain	7/5/2012 9:15																	
292	Perimeter Toe Drain	7/26/2012 11:50																	
294	Perimeter Toe Drain	8/14/2012 15:19																	
295	Perimeter Toe Drain	10/4/2012 10:55																	
296	Perimeter Toe Drain	10/25/2012 14:33																	
298	Perimeter Toe Drain	11/20/2012 14:02																	
300	Perimeter Toe Drain	4/22/2013 14:06																	
302	Perimeter Toe Drain	5/23/2013 6:48																	
303	Perimeter Toe Drain	6/18/2013 15:49																	
304	Perimeter Toe Drain	7/18/2013 13:55																	
306	Perimeter Toe Drain	8/19/2013 9:51																	
308	Perimeter Toe Drain	4/30/2014 8:36																	
310	Perimeter Toe Drain	6/16/2014 9:37																	
311	Perimeter Toe Drain	7/7/2014 12:47																	
316	South Toe Drain	9/15/2011 9:15																	
317	South Toe Drain	9/29/2011 9:55																	
319	South Toe Drain	10/27/2011 13:10																	
325	South Toe Drain	6/6/2012 15:00																	
326	South Toe Drain	7/11/2012 15:25																	
327	South Toe Drain	7/24/2012 15:00																	
329	South Toe Drain	8/9/2012 10:29																	
330	South Toe Drain	8/31/2012 11:35																	
331	South Toe Drain	9/5/2012 11:25																	
332	South Toe Drain	9/26/2012 10:57																	
333	South Toe Drain	10/24/2012 15:00																	
335	South Toe Drain	11/20/2012 13:27																	
337	South Toe Drain	4/22/2013 13:25																	
339	South Toe Drain	5/23/2013 7:23																	
340	South Toe Drain	6/19/2013 12:50																	
341	South Toe Drain	7/18/2013 14:35																	
343	South Toe Drain	8/13/2013 12:00																	
344	South Toe Drain	10/17/2013 12:50																	
346	South Toe Drain	11/14/2013 13:50																	
347	South Toe Drain	4/30/2014 7:50																	
349	South Toe Drain	6/16/2014 10:05																	
350	South Toe Drain	7/7/2014 12:10																	
352	South Toe Drain	9/16/2014 11:41																	
353	South Toe Drain	10/1/2014 13:42																	
356	E5 - Tailings Impoundment Main Embank Drain Comp	7/28/1998 13:00	0.0119	0.002	0.00005		16.5	0.0504		0.0018	0.00005	0.093	0.0001	7.58		10.6	0.427		
357	E5 - Tailings Impoundment Main Embank Drain Comp	11/26/1998 11:05	0.0115	-0.002	-0.00005		11.8	0.0673		0.0016	-0.00005	1.14	0.0012	7.37	-0.00001	8.03	0.42		
358	E5 - Tailings Impoundment Main Embank Drain Comp	12/7/1999 10:00	0.0099	-0.005	0.00008	0.0022	13	0.0527	-0.00005	0.00891	-0.0005	1.16	0.0097	7.91	-0.00001	14.5	0.493	-0.00005	0.00016
359	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/1999 15:30	0.0098	-0.005	0.00004	0.0021	12.1	0.0546	-0.00005	0.00764	-0.0005	1.15	0.0071	11.8	-0.00001	13.1	0.548	-0.00005	-0.00005
360	E5 - Tailings Impoundment Main Embank Drain Comp	12/15/1999 14:30	0.0095	-0.005	0.00003	0.0023	12.3	0.0564	-0.00005	0.00976	-0.0005	1.16	0.0096	11.7	-0.00001	14.1	0.534	-0.00005	-0.00005
361	E5 - Tailings Impoundment Main Embank Drain Comp	7/17/2000 12:00	0.0057	-0.005	0.00009	0.0056	10.5	0.431	-0.00005	0.0985	-0.0005	7.96	0.0025	5.99	-0.00001	73	0.608	-0.00005	-0.00005
362	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2000 9:15	0.0048	0.064	-0.00002	0.0018	20.7	0.261	-0.00005	0.0127	-0.0005	3.99	0.0029	7.64	-0.00001	24	0.769	-0.00005	0.00011
363	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:00	0.0059	0.017	-0.00002	0.0023	21.7	0.239	-0.00005	0.0206	-0.0005	3.99	0.0056	8.33	-0.00001	25.2	0.99	-0.00005	-0.00005
364	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:05	0.0056	0.007	-0.00002	0.0018	23.8	0.12	-0.00005	0.00193	-0.0005	-0.05	0.0058	8.46	-0.00001	15.5	1.02	-0.00005	-0.00005
452	E5 - Tailings Impoundment Main Embank Drain Comp	9/8/2011 8:11																	
504	E7 - Perimeter Pond	8/3/2004																	
514	E7 - Perimeter Pond	10/12/2006																	
536	E7 - Perimeter Pond	6/7/2012 10:50																	
537	E7 - Perimeter Pond	7/5/2012 11:07																	
539	E7 - Perimeter Pond	9/6/2012 11:07																	
540	E7 - Perimeter Pond	10/3/2012 10:15																	
554	E7 - Perimeter Pond	1/21/2014 2:47																	
394	E5 - Tailings Impoundment Main Embank Drain Comp	1/8/2007 10:30	0.00097	-0.03	-0.00005	0.0054	12	0.315		0.119	-0.0005	11	0.0038	7.24	-0.00001		0.729	-0.0001	-0.0001
70	E4 - Main Embankment Seepage Pond	1/8/2007 10:59	0.00063	-0.03	-0.00005	-0.005	13.4	0.463		0.0902	-0.0005	7.65	0.0032	7.34	-0.00001	49.3	0.729	-0.0001	-0.0001
95	E4 - Main Embankment Seepage Pond	1/3/2008 13:54	0.00124	-0.03	-0.00005	0.0054	16.1	0.293		0.103	0.00059	9.43	0.0067	6.61	-0.00001		1.07	-0.0001	-0.0001
230	East Main Toe Drain	1/7/2014 10:45																	
510	E7 - Perimeter Pond	4/4/2005	0.0041	-0.005	-0.00002	0.0028	13.6	0.362		0.00953	0.0005	2.58	0.0067	4.51	-0.00001	11	0.455	-0.00005	-0.00005
477	E7 - Perimeter Pond	8/16/2001	0.0086	-0.005	0.00005	0.002	13.9	0.0107	-0.00005	0.009	-0.0005	3.72	0.0064	2.79	0.00001	13.6	0.838	-0.00005	0.00078
366	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2001 13:00	0.0047	-0.005	0.00006	0.0023	24.3	0.0557	-0.00005	0.00141	-0.0005	4.65	0.0049	7.73	-0.00001	16.7	1.28	-0.00005	-0.00005
370	E5 - Tailings Impoundment Main Embank Drain Comp	8/16/2001	0.0051	-0.005	-0.00002	0.0024	29.6	0.059	-0.00005	0.00263	-0.0005	4.14	0.0079	7.85	-0.00001	18.8	2.1	-0.00005	0.0001
2	E4 - Main Embankment Seepage Pond	7/19/2001 13:00	0.0068	-0.005	0.00007	0.0031	10.1	0.0198	-0.00005	0.0379	-0.0005	6.04	0.003	1.99	-0.00001	36.6	0.495	-0.00005	0.00009
47	E4 - Main Embankment Seepage Pond	4/4/2005	0.0023	-0.005	-0.00002	0.0049	8.5	0.0386		0.0963	0.0006	5.66	0.0006	4.28	-0.00001	38.3	0.419	-0.00005	0.00008
51	E4 - Main Embankment Seepage Pond	7/5/2005	0.0023	0.083	0.00004	0.002	10.2	0.106		0.0712	0.0005	4.47	0.0008	5.25	-0.00001	41.6	0.475	-0.00005	-0.00005
6	E4 - Main Embankment Seepage Pond	8/16/2001	0.0064	-0.005	0.00003	0.004	12.1	0.00346	-0.00005	0.0574	-0.0005	7.32	0.0039	0.33	-0.00001	44.2	0.907	-0.00005	0.00021
193	E4 - Main Embankment Seepage Pond	4/9/2015 10:20	0.00429	0.097	0.00007	0.005	28.6	0.0961		0.19	-0.0005	0.0276	4.51		0.000011	54.1	2.95	-0.00001	-0.0001
195	E4 - Main Embankment Seepage Pond	6/2/2015 11:37	0.00540	0.048	-0.00005	0.0069	31.9	0.0760		0.179	-0.0005	8.47	0.0288	3.30	-0.00001	60.3	2.54	0.000026	-0.0001
196	E4 - Main Embankment Seepage Pond	7/9/2015 10:32	0.00474	0.042	-0.00005	0.0065	30.6	0.116		0.159	-0.0005	9.43	0.0248	4.74	-0.00001	65.7	2.30	-0.00001	-0.0001
157	E4 - Main Embankment Seepage Pond	4/3/2012 10:10	0.00251	-0.03	-0.00005	0.00459	20.9	0.233		0.145	-0.0005	10.2	0.0106	5.22	-0.00001	64.4	1.6	-0.00001	-0.0001
194	E4 - Main Embankment Seepage Pond	5/5/2015 14:05	0.00423	0.058	-0.00005	0.0071	29.5	0.0597		0.191	-0.0005	9.95	0.0264	2.75	-0.00001	69.4	2.81	-0.00001	-0.0001
437	E5 - Tailings Impoundment Main Embank Drain Comp	6/3/2010 8:30	0.00346	-0.03	-0.0001	-0.01	19.2	0.271		0.131	-0.001	12.3	0.0077	6.56	-0.00002	69.3	1.4	-0.0002	-0.0002
459	E5 - Tailings Impoundment Main Embank Drain Comp	4/3/2012 10:10	0.00104	-0.03	-0.00005	0.00559	26.1	0.323		0.202	-0.0005	13.2	0.0128	6.49	-0.00001	72.8	2.29	-0.00001	-0.0001
431	E5 - Tailings Impoundment Main Embank Drain Comp	12/9/2009 12:45	0.00181	-0.03	-0.0001	-0.01	16.6	0.437		0.15	0.001	13.6	0.007	6.46	-0.00002	71.5	1.5	-0.0002	-0.0002
137	E4 - Main Embankment Seepage Pond	9/1/2010	0.0013	-0.03	-0.00005	0.0053	21.3	0.152		0.125	-0.0005	13.5	0.0043	2.43	-0.00001	74.7	1.74	-0.0001	-0.0001

Index	Sample Point	Date	Titanium (Ti)-Total	Uranium (U)-Total	Vanadium (V)-Total	Zinc (Zn)-Total	Aluminum (Al)-Dissolved	Antimony (Sb)-Dissolved	Arsenic (As)-Dissolved	Barium (Ba)-Dissolved	Beryllium (Be)-Dissolved	Bismuth (Bi)-Dissolved	Boron (B)-Dissolved	Cadmium (Cd)-Dissolved	Calcium (Ca)-Dissolved	Chromium (Cr)-Dissolved	Cobalt (Co)-Dissolved	Copper (Cu)-Dissolved	Iron (Fe)-Dissolved	Lead (Pb)-Dissolved	Lithium (Li)-Dissolved	Magnesium (Mg)-Dissolved
566	E7 - Perimeter Pond	10/15/2014 10:26	0.014	0.00166	0.0016	-0.003	0.694	0.00065	0.00258	0.0596	-0.0001	-0.0005	0.135	0.000041	135	0.00054	0.00083	0.0424	0.586	0.00039	0.00832	21.4
Incomplete Data																						
482	E7 - Perimeter Pond	2/26/2002 14:30	0.00183	0.00129	0.00199	0.0007	0.108	0.00025	0.0008	0.0524	-0.00005	-0.00005		0.00001	84.3	0.0012	-0.00002	0.0047	0.205	-0.00002	0.002	12.8
11	E4 - Main Embankment Seepage Pond	2/26/2002 13:30	0.00073	0.00125	0.00214	0.0097	0.0595	0.00021	0.0027	0.0568	-0.00005	-0.00005		0.00007	46	0.0009	0.00041	0.0034	0.104	-0.00002	0.003	10.5
54	E4 - Main Embankment Seepage Pond	10/11/2005																				
65	E4 - Main Embankment Seepage Pond	9/6/2006																				
69	E4 - Main Embankment Seepage Pond	1/8/2007 10:59																				
71	E4 - Main Embankment Seepage Pond	2/5/2007 10:59																				
76	E4 - Main Embankment Seepage Pond	6/4/2007 10:34																				
78	E4 - Main Embankment Seepage Pond	6/11/2007 10:59																				
93	E4 - Main Embankment Seepage Pond	12/4/2007 13:57																				
99	E4 - Main Embankment Seepage Pond	2/6/2008 10:09																				
101	E4 - Main Embankment Seepage Pond	3/4/2008 10:09																				
103	E4 - Main Embankment Seepage Pond	4/16/2008 10:14																				
128	E4 - Main Embankment Seepage Pond	12/16/2009																				
151	E4 - Main Embankment Seepage Pond	10/31/2011 14:29																				
168	E4 - Main Embankment Seepage Pond	3/10/2013 8:48																				
207	East Main Toe Drain	8/30/2011 14:36																				
220	East Main Toe Drain	3/10/2013 9:00																				
232	East Main Toe Drain	2/18/2014 11:24																				
237	East Main Toe Drain	6/18/2014 15:21																				
245	West Main Toe Drain	3/10/2013 8:58																				
258	West Main Toe Drain	6/18/2014 15:30																				
260	West Main Toe Drain	7/8/2014 10:30																				
262	West Main Toe Drain	9/16/2014 12:20																				
281	Perimeter Toe Drain	8/31/2011 10:40																				
282	Perimeter Toe Drain	9/15/2011 8:40																				
284	Perimeter Toe Drain	10/27/2011 14:00																				
290	Perimeter Toe Drain	6/14/2012																				
291	Perimeter Toe Drain	7/5/2012 9:15																				
292	Perimeter Toe Drain	7/26/2012 11:50																				
294	Perimeter Toe Drain	8/14/2012 15:19																				
295	Perimeter Toe Drain	10/4/2012 10:55																				
296	Perimeter Toe Drain	10/25/2012 14:33																				
298	Perimeter Toe Drain	11/20/2012 14:02																				
300	Perimeter Toe Drain	4/22/2013 14:06																				
302	Perimeter Toe Drain	5/23/2013 6:48																				
303	Perimeter Toe Drain	6/18/2013 15:49																				
304	Perimeter Toe Drain	7/18/2013 13:55																				
306	Perimeter Toe Drain	8/19/2013 9:51																				
308	Perimeter Toe Drain	4/30/2014 8:36																				
310	Perimeter Toe Drain	6/16/2014 9:37																				
311	Perimeter Toe Drain	7/7/2014 12:47																				
316	South Toe Drain	9/15/2011 9:15																				
317	South Toe Drain	9/29/2011 9:55																				
319	South Toe Drain	10/27/2011 13:10																				
325	South Toe Drain	6/6/2012 15:00																				
326	South Toe Drain	7/11/2012 15:25																				
327	South Toe Drain	7/24/2012 15:00																				
329	South Toe Drain	8/9/2012 10:29																				
330	South Toe Drain	8/31/2012 11:35																				
331	South Toe Drain	9/5/2012 11:25																				
332	South Toe Drain	9/26/2012 10:57																				
333	South Toe Drain	10/24/2012 15:00																				
335	South Toe Drain	11/20/2012 13:27																				
337	South Toe Drain	4/22/2013 13:25																				
339	South Toe Drain	5/23/2013 7:23																				
340	South Toe Drain	6/19/2013 12:50																				
341	South Toe Drain	7/18/2013 14:35																				
343	South Toe Drain	8/13/2013 12:00																				
344	South Toe Drain	10/17/2013 12:50																				
346	South Toe Drain	11/14/2013 13:50																				
347	South Toe Drain	4/30/2014 7:50																				
349	South Toe Drain	6/16/2014 10:05																				
350	South Toe Drain	7/7/2014 12:10																				
352	South Toe Drain	9/16/2014 11:41																				
353	South Toe Drain	10/1/2014 13:42																				
356	E5 - Tailings Impoundment Main Embank Drain Comp	7/28/1998 13:00				0.00005																
357	E5 - Tailings Impoundment Main Embank Drain Comp	11/26/1998 11:05	0.0009		0.00141	0.0013																
358	E5 - Tailings Impoundment Main Embank Drain Comp	12/7/1999 10:00	0.00045	0.00054	0.00427	0.0167																
359	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/1999 15:30	0.00044	0.00091	0.00165	0.0168																
360	E5 - Tailings Impoundment Main Embank Drain Comp	12/15/1999 14:30	0.00052	0.00099	0.00193	0.0168																
361	E5 - Tailings Impoundment Main Embank Drain Comp	7/17/2000 12:00	0.00212	0.00169	0.00134	0.0017																
362	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2000 9:15	0.00066	0.00115	0.0008	0.001												0.0053				
363	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:00	0.00104	0.00181	0.00136	0.001																
364	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:05	0.00082	0.00171	0.00119	0.0009	0.0018	0.0001	0.0008	0.115	-0.00005	-0.00005		0.00003		0.0003	0.00171	0.0055	0.006	-0.00002	0.0019	
452	E5 - Tailings Impoundment Main Embank Drain Comp	9/8/2011 8:11																				
504	E7 - Perimeter Pond	8/3/2004																				
514	E7 - Perimeter Pond	10/12/2006																				
536	E7 - Perimeter Pond	6/7/2012 10:50																				
537	E7 - Perimeter Pond	7/5/2012 11:07																				
539	E7 - Perimeter Pond	9/6/2012 11:07																				
540	E7 - Perimeter Pond	10/3/2012 10:15																				
554	E7 - Perimeter Pond	1/21/2014 2:47																				
394	E5 - Tailings Impoundment Main Embank Drain Comp	1/8/2007 10:30	-0.01	0.00217	-0.001	-0.001	0.0051	0.00064	0.00223	0.0888	-0.0005	-0.0005	0.138	-0.00005	67.2	-0.0005	0.00035	0.00297	0.053	-0.00005	0.0054	12.1
70	E4 - Main Embankment Seepage Pond	1/8/2007 10:59	-0.01	0.00174	-0.001	0.0019	0.184	0.00043	0.00277	0.075	-0.0005	-0.0005	0.115	-0.00005	70.8	-0.0005	0.00042	0.00244	0.307	0.000113	-0.005	13.6
95	E4 - Main Embankment Seepage Pond	1/3/2008 13:54	-0.01	0.002	-0.001	-0.003	0.017	0.00046	0.00233	0.0841	-0.0005	-0.0005	0.129	-0.00004	91.3	-0.0005	0.00027	0.0014	0.039	-0.00005	0.0053	15.7
230	East Main Toe Drain	1/7/2014 10:45					0.004	0.00052	0.00173	0.057	-0.0001	-0.0005	0.13	-0.00012	146	-0.0005	0.00033	0.00353	-0.03	-0.00005	0.00697	
510	E7 - Perimeter Pond	4/4/2005	-0.0005	0.00196	0.0002	0.0027	0.256	0.00026	0.0009	0.0612	-0.00005	-0.00005	0.023	0.00005	85.3	0.0013	0.00052	0.011	0.281	0.00024	0.0021	13.4
477	E7 - Perimeter Pond	8/16/2001	0.00255	0.00135	0.00098	0.002	0.072	0.00068	0.001	0.0576	-0.00005	0.00265		0.00004	73.8	0.0007	0.00034	0.0098	0.055	0.00016	0.0022	13.4
366	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2001 13:00	0.00153	0.00075	0.00094	0.0029	0.0501	0.00013	0.0007	0.157	-0.00005	-0.00005		0.00002	132	0.0007	0.0007	0.0047	0.133	0.00006	0.0021	22.1
370	E5 - Tailings Impoundment Main Embank Drain Comp	8/16/2001	0.00385	0.0015	0.00071	0.0022	0.0069	0.00014	0.001	0.151	-0.00005	-0.00005		0.00002	181	0.0007	0.00095	0.0064	-0.005	-0.00002	0.0025	29.2
2	E4 - Main Embankment Seepage Pond	7/19/2001 13:00	0.00144	0.00102	0.00133	0.005	0.836	0.00023	0.0021	0.0536	-0.00005	-0.00005		0.00009	34.8	0.0013	0.00065	0.0153	0.898	0.00058	0.0034	9.55
47	E4 - Main Embankment Seepage Pond	4/4/2005	-0.0005	0.00148	0.00058	0.0024	0.581	0.00021	0.0018	0.0618	-0.00005	-0.00005	0.074	0.00025	47.3	0.0018	0.00055	0.0055	0.749	0.00037	0.0034	8.63
51	E4 - Main Embankment Seepage Pond	7/5/2005	-0.0005	0.00089	0.00102	0.0007	0.375	0.00018	0.0024	0.0585	-0.00005	-0.00005	0.096	0.00015	54.9	0.0008	0.00042	0.0063	0.587	0.00031	0.0023	10.3
6	E4 - Main Embankment Seepage Pond	8/16/2001	0.00302	0.00122	0.00058	0.0024	0.0219	0.00033	0.0022	0.0633	-0.00005	0.00006		0.00014	40.4	0.0004	0.00021	0.0073	0.01	0.00003	0.0042	11.7
193	E4 - Main Embankment Seepage Pond	4/9/2015 10:20	0.019	0.00152	0.00101	-0.003	-0.003	0.00029	0.0015	0.047	-0.0001	-0.00005	0.098	0.0000129	166	-0.0005	-0.0001	0.00244	-0.03	-0.00005	0.0059	28.9
195	E4 - Main Embankment Seepage Pond	6/2/2015 11:37	-0.01	0.00149	0.00091	-0.003	-0.003	0.00040	0.00158	0.0424	-0.0001	-0.00005	0.112	0.0000080	146	-0.0005	-0.0001	0.00412	-0.03	-0.00005	0.0065	31.4
196	E4 - Main Embankment Seepage Pond	7/9/2015 10:32	-0.01	0.00137	0.00126	-0.003	-0.003	0.00039	0.00174	0.0475	-0.0001	-0.00005	0.132	-0.000015	149	-0.0005	-0.0001	0.00304	-0.03	-0.00005	0.0066	29.0
157	E4 - Main Embankment Seepage Pond	4/3/2012 10:10	-0.01	0.000941	-0.001	-0.003	0.233	0.00052	0.00156	0.0468	-0.0001	-0.0005	0.103	0.000062	152	-0.001	0.00028	0.00461	0.245	0.000076	0.00503	21.5
194	E4 - Main Embankment Seepage Pond	5/5/2015 14:05	-0.01	0.00165	0.00090	-0.003	0.0034	0.00035	0.00151	0.0505	-0.0001	-0.00005	0.109	-0.000005	155	-0.0005	-0.0001	0.00250	-0.03	-0.00005	0.0070	29.8
437	E5 - Tailings Impoundment Main Embank Drain Comp	6/3/2010 8:30	-0.01	0.00133	-0.002	-0.002	0.0083	0.00071	0.00162	0.0785	-0.001	-0.001	0.131	0.000102	124	-0.001	0.00032	0.0497	0.111	-0.0001	-0.01	18.8
459	E5 - Tailings Impoundment Main Embank Drain Comp	4/3/2012 10:10	-0.01	0.0012	-0.001	-0.003	0.0047	0.00039	0.0015	0.0701	-0.0001	-0.0005	0.131	-0.0002	172	-0.0005	0.0003	0.0024	0.034	-0.00005	0.00587	25.9
431	E5 - Tailings Impoundment Main Embank Drain Comp	12/9/2009 12:45	-0.01	0.00131	-0.002	-0.002	0.004	0.0004	0.00195	0.0774	-0.001	-0.001	0.171	-0.00056	109	-0.001	0.0003	0.0122	0.056	-0.0001	-0.01	17
137	E4 - Main Embankment Seepage Pond	9/1/2010	-0.01	0.00106	-0.001	-0.001	0.036	0.00038	0.00207	0.0442	-0.0005	-0.0005	0.153	-0.00003	126	-0.0005	0.00012	0.00253	0.081	-0.00005	0.0054	21.5

Index	Sample Point	Date	Manganese (Mn)-Dissolved	Mercury (Hg)-Dissolved	Molybdenum (Mo)-Dissolved	Nickel (Ni)-Dissolved	Potassium (K)-Dissolved	Selenium (Se)-Dissolved	Silicon (Si)-Dissolved	Silver (Ag)-Dissolved	Sodium (Na)-Dissolved	Strontium (Sr)-Dissolved	Thallium (Tl)-Dissolved	Tin (Sn)-Dissolved	Titanium (Ti)-Dissolved	Uranium (U)-Dissolved	Vanadium (V)-Dissolved	Zinc (Zn)-Dissolved
566	E7 - Perimeter Pond	10/15/2014 10:26	0.5		0.193	0.00102		0.00809	6.47	0.000014	78.3	1.79	-0.00001	-0.0001	0.054	0.00161	0.0036	0.004
Incomplete Data																		
482	E7 - Perimeter Pond	2/26/2002 14:30	0.0428	-0.00005	0.00939	-0.0005		0.0035	6.7	-0.00001	14.8	0.577	-0.00005	0.00019	0.00624	0.00136	0.00165	0.0014
11	E4 - Main Embankment Seepage Pond	2/26/2002 13:30	0.743	-0.00005	0.0535	-0.0005		0.0012	7	-0.00001	39.1	0.481	-0.00005	0.00016	0.00308	0.00123	0.00175	0.0082
54	E4 - Main Embankment Seepage Pond	10/11/2005						-0.0005				0.449						
65	E4 - Main Embankment Seepage Pond	9/6/2006						0.0011				0.58						
69	E4 - Main Embankment Seepage Pond	1/8/2007 10:59																
71	E4 - Main Embankment Seepage Pond	2/5/2007 10:59																
76	E4 - Main Embankment Seepage Pond	6/4/2007 10:34																
78	E4 - Main Embankment Seepage Pond	6/11/2007 10:59																
93	E4 - Main Embankment Seepage Pond	12/4/2007 13:57						0.011			49.4	1.17						
99	E4 - Main Embankment Seepage Pond	2/6/2008 10:09						0.0042				0.856						
101	E4 - Main Embankment Seepage Pond	3/4/2008 10:09						0.0038				0.791						
103	E4 - Main Embankment Seepage Pond	4/16/2008 10:14						0.005				0.867						
128	E4 - Main Embankment Seepage Pond	12/16/2009						0.0078				1.43						
151	E4 - Main Embankment Seepage Pond	10/31/2011 14:29																
168	E4 - Main Embankment Seepage Pond	3/10/2013 8:48																
207	East Main Toe Drain	8/30/2011 14:36																
220	East Main Toe Drain	3/10/2013 9:00																
232	East Main Toe Drain	2/18/2014 11:24																
237	East Main Toe Drain	6/18/2014 15:21																
245	West Main Toe Drain	3/10/2013 8:58																
258	West Main Toe Drain	6/18/2014 15:30																
260	West Main Toe Drain	7/8/2014 10:30																
262	West Main Toe Drain	9/16/2014 12:20																
281	Perimeter Toe Drain	8/31/2011 10:40																
282	Perimeter Toe Drain	9/15/2011 8:40																
284	Perimeter Toe Drain	10/27/2011 14:00																
290	Perimeter Toe Drain	6/14/2012																
291	Perimeter Toe Drain	7/5/2012 9:15																
292	Perimeter Toe Drain	7/26/2012 11:50																
294	Perimeter Toe Drain	8/14/2012 15:19																
295	Perimeter Toe Drain	10/4/2012 10:55																
296	Perimeter Toe Drain	10/25/2012 14:33																
298	Perimeter Toe Drain	11/20/2012 14:02																
300	Perimeter Toe Drain	4/22/2013 14:06																
302	Perimeter Toe Drain	5/23/2013 6:48																
303	Perimeter Toe Drain	6/18/2013 15:49																
304	Perimeter Toe Drain	7/18/2013 13:55																
306	Perimeter Toe Drain	8/19/2013 9:51																
308	Perimeter Toe Drain	4/30/2014 8:36																
310	Perimeter Toe Drain	6/16/2014 9:37																
311	Perimeter Toe Drain	7/7/2014 12:47																
316	South Toe Drain	9/15/2011 9:15																
317	South Toe Drain	9/29/2011 9:55																
319	South Toe Drain	10/27/2011 13:10																
325	South Toe Drain	6/6/2012 15:00																
326	South Toe Drain	7/11/2012 15:25																
327	South Toe Drain	7/24/2012 15:00																
329	South Toe Drain	8/9/2012 10:29																
330	South Toe Drain	8/31/2012 11:35																
331	South Toe Drain	9/5/2012 11:25																
332	South Toe Drain	9/26/2012 10:57																
333	South Toe Drain	10/24/2012 15:00																
335	South Toe Drain	11/20/2012 13:27																
337	South Toe Drain	4/22/2013 13:25																
339	South Toe Drain	5/23/2013 7:23																
340	South Toe Drain	6/19/2013 12:50																
341	South Toe Drain	7/18/2013 14:35																
343	South Toe Drain	8/13/2013 12:00																
344	South Toe Drain	10/17/2013 12:50																
346	South Toe Drain	11/14/2013 13:50																
347	South Toe Drain	4/30/2014 7:50																
349	South Toe Drain	6/16/2014 10:05																
350	South Toe Drain	7/7/2014 12:10																
352	South Toe Drain	9/16/2014 11:41																
353	South Toe Drain	10/1/2014 13:42																
356	E5 - Tailings Impoundment Main Embank Drain Comp	7/28/1998 13:00																
357	E5 - Tailings Impoundment Main Embank Drain Comp	11/26/1998 11:05																
358	E5 - Tailings Impoundment Main Embank Drain Comp	12/7/1999 10:00																
359	E5 - Tailings Impoundment Main Embank Drain Comp	12/14/1999 15:30																
360	E5 - Tailings Impoundment Main Embank Drain Comp	12/15/1999 14:30																
361	E5 - Tailings Impoundment Main Embank Drain Comp	7/17/2000 12:00																
362	E5 - Tailings Impoundment Main Embank Drain Comp	11/15/2000 9:15			0.0142													
363	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:00																
364	E5 - Tailings Impoundment Main Embank Drain Comp	12/12/2000 10:05	0.119		0.00193	-0.0005		0.0062		-0.00001		1.02	-0.00005	-0.00005	0.0008	0.00171	0.0011	0.0006
452	E5 - Tailings Impoundment Main Embank Drain Comp	9/8/2011 8:11																
504	E7 - Perimeter Pond	8/3/2004						0.0035				0.504						
514	E7 - Perimeter Pond	10/12/2006						0.0256				1.39						
536	E7 - Perimeter Pond	6/7/2012 10:50																
537	E7 - Perimeter Pond	7/5/2012 11:07																
539	E7 - Perimeter Pond	9/6/2012 11:07																
540	E7 - Perimeter Pond	10/3/2012 10:15																
554	E7 - Perimeter Pond	1/21/2014 2:47																
394	E5 - Tailings Impoundment Main Embank Drain Comp	1/8/2007 10:30	0.328		0.119	-0.0005		0.0038	7.32	-0.00001		0.742	-0.0001	-0.0001	-0.01	0.00217	-0.001	-0.001
70	E4 - Main Embankment Seepage Pond	1/8/2007 10:59	0.462		0.088	-0.0005		0.0031	7.81	-0.00001		0.718	-0.0001	-0.0001	-0.01	0.00166	0.0011	0.0027
95	E4 - Main Embankment Seepage Pond	1/3/2008 13:54	0.555		0.107	0.00056		0.0066	6.45	-0.00001		1.1	-0.0001	-0.0001	-0.01	0.00199	-0.001	0.002
230	East Main Toe Drain	1/7/2014 10:45			0.213	-0.0005		0.00642							-0.01	0.00117	-0.001	-0.003
510	E7 - Perimeter Pond	4/4/2005	0.38		0.0111	0.001		0.0058	5.08	-0.00001	10.8	0.461	-0.00005	-0.00005	0.0091	0.00206	0.00104	0.0023
477	E7 - Perimeter Pond	8/16/2001	0.0189	-0.00005	0.00927	-0.0005		0.0067	2.9	0.00005	13.3	0.837	0.00006	0.00153	0.00493	0.00126	0.00131	0.0028
366	E5 - Tailings Impoundment Main Embank Drain Comp	7/19/2001 13:00	0.0412	-0.00005	0.00174	-0.0005		0.0054	7.2	0.00001	15.2	1.3	-0.00005	0.00011	0.0031	0.00075	0.00098	0.0016
370	E5 - Tailings Impoundment Main Embank Drain Comp	8/16/2001	0.0734	-0.00005	0.00387	-0.0005		0.0082	7.9	-0.00001	17.8	2.15	-0.00005	0.0001	0.00386	0.00143	0.0007	0.0017
2	E4 - Main Embankment Seepage Pond	7/19/2001 13:00	0.0584	-0.00005	0.0386	0.0011		0.0031	3.2	0.00001	34.1	0.473	-0.00005	0.0001	0.0288	0.00108	0.00322	0.0058
47	E4 - Main Embankment Seepage Pond	4/4/2005	0.164		0.106	0.0012		-0.0005	5.38	-0.00001	37.9	0.445	-0.00005	0.00007	0.024	0.00158	0.00219	0.004
51	E4 - Main Embankment Seepage Pond	7/5/2005	0.127		0.078	0.0011		0.0006	6.08	0.00002	42.7	0.506	-0.00005	0.00006	0.0152	0.00092	0.00194	0.0028
6	E4 - Main Embankment Seepage Pond	8/16/2001	0.0142	-0.00005	0.0569	-0.0005		0.0036	0.3	0.00001	43.6	0.932	-0.00005	0.00014	0.00354	0.00122	0.00062	0.0036
193	E4 - Main Embankment Seepage Pond	4/9/2015 10:20	0.00067		0.175	-0.0005		0.0251	4.27	-0.00001	56.2	2.79	-0.00001	-0.0001	0.015	0.00143	0.00066	-0.003
195	E4 - Main Embankment Seepage Pond	6/2/2015 11:37	0.0310		0.171	-0.0005	8.20	0.0286	3.11	-0.00001	58.9	2.43	-0.00001	-0.0001	-0.01	0.00146	0.00075	-0.003
196	E4 - Main Embankment Seepage Pond	7/9/2015 10:32	0.0927		0.157	-0.0005	9.46	0.0243	4.63	-0.00001	65.4	2.28	-0.00001	-0.0001	-0.01	0.00136	0.00090	-0.003
157	E4 - Main Embankment Seepage Pond	4/3/2012 10:10	0.243		0.153	0.00062		0.0108	5.8	-0.00001	65.8	1.67	-0.00001	-0.0001	0.017	0.000958	0.0013	0.004
194	E4 - Main Embankment Seepage Pond	5/5/2015 14:05	0.0534		0.192	-0.0005	9.62	0.0254	2.64	-0.00001	67.1	2.80	-0.00001	-0.0001	-0.01	0.00167	0.00072	-0.003
437	E5 - Tailings Impoundment Main Embank Drain Comp	6/3/2010 8:30	0.281		0.133	-0.001		0.0071	6.41	-0.00002	71.9	1.43	-0.0002	-0.0002	-0.01	0.00135	-0.002	-0.002
459	E5 - Tailings Impoundment Main Embank Drain Comp	4/3/2012 10:10	0.333		0.207	-0.0005		0.0129	6.44	-0.00001	74.2	2.35	-0.00001	-0.0001	-0.01	0.00125	-0.001	-0.003
431	E5 - Tailings Impoundment Main Embank Drain Comp	12/9/2009 12:45	0.448		0.149	0.001		0.0069	6.63	-0.00002	74.5	1.5	-0.0002	-0.0002	-0.01	0.00124	-0.002	-0.002
137	E4 - Main Embankment Seepage Pond	9/1/2010	0.166		0.125	-0.0005		0.0043	2.55	-0.00001	77.4	1.75	-0.0001	-0.0001	0.012	0.00111	-0.001	0.0021

Index	Sample Point	Date	Comment	Conductivity (in situ) (µs/cm)	pH (in situ) (pH)	Temperature (in situ) (Degrees Celcius)	Turbidity (in situ) (ntu)	Alkalinity (CaCO3) (mg/L)	Conductivity (µs/cm)	Hardness (as CaCO3) (mg/L)	pH (pH)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (ntu)	Ammonia (as N) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Nitrate (as N) (mg/L)	Nitrate and Nitrite (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen N-WDGWA (mg/L)
440	E5 - Tailings Impoundment Main Embank Drain Comp	9/1/2010		1081		7.9		104	1060	375	8.05	767	-3	0.25	0.0929	25.9		1.05	1.08	0.031	
445	E5 - Tailings Impoundment Main Embank Drain Comp	2/3/2011 11:40						110	1140	421	7.95	835	-3	10	0.0715	26		1.64	1.7	0.0653	
142	E4 - Main Embankment Seepage Pond	2/3/2011 12:00						76.9	1510	668	7.84	1230	5.3	2.77	0.0399	30.2		5.45	5.47	0.022	
276	Perimeter Toe Drain	7/8/2010						94.4	1220	502	8.06	972	-3	0.49	0.0973	25.8		0.459	0.473	0.015	
212	East Main Toe Drain	2/8/2012 15:00						107	1110	394	8.06	753	-3	1.48	0.138	26.7	0.95	0.76	0.865	0.105	
143	E4 - Main Embankment Seepage Pond	3/8/2011 10:45						101	1340	558	8.01	1070	10.1	6.96	0.0616	27		3.61	3.64	0.027	
280	Perimeter Toe Drain	8/31/2011						77.6	1340	562	7.87	1040	-3	0.3	0.0775	23.3		1.76	1.84	0.076	
355	South Toe Drain	5/6/2015 11:53						60.8	1250	436	8.06	919	-3	0.16	0.173	24.9	0.68	-0.025	0.042	0.0418	
243	East Main Toe Drain	6/2/2015 11:46						86.3	1240	404	8.18	859	-3	0.50	0.0967	26.4	0.84	-0.025	-0.025	0.0068	
242	East Main Toe Drain	5/4/2015 13:18						70.2	1190	389	8.08	844	-3	0.36	0.0814	26.2	0.82	-0.025	-0.025	0.0248	
211	East Main Toe Drain	12/5/2011 11:20						103	1110	397	8.11	804	-3	0.32	0.107	25.7	0.96	0.968	1.08	0.108	
244	East Main Toe Drain	7/9/2015 10:13						87.0	1200	418	7.89	920	-3	0.17	0.0828	26.4	0.85	-0.025	-0.025	-0.005	
271	West Main Toe Drain	6/2/2015 11:52						86.0	1220	382	8.21	836	-3	0.30	0.0869	27.4	0.93	-0.025	-0.025	0.0145	
270	West Main Toe Drain	5/4/2015 13:28						92.1	1180	366	8.13	829	-3	0.16	0.0702	27.4	0.95	-0.025	0.039	0.0390	
272	West Main Toe Drain	7/9/2015 10:17						90.5	1190	389	7.97	888	-3	0.22	0.0781	26.9	0.90	-0.025	-0.025	-0.005	
10	E4 - Main Embankment Seepage Pond	2/5/2002 12:14		618	7.51	1.2		-1		167		338		0.319					4.74		
12	E4 - Main Embankment Seepage Pond	3/29/2002 16:15		350	8.38	2		-1		116			6	9.13	0.043				6.71		7.48
13	E4 - Main Embankment Seepage Pond	4/27/2002 15:45		370	8.02	12.2		-1		140		232		12.8	-0.005				11.3		
14	E4 - Main Embankment Seepage Pond	5/5/2002 10:15		372	8.1	11.5		-1		152		230		12	-0.005				11.4		12.2
16	E4 - Main Embankment Seepage Pond	6/30/2002 6:50		543	7.69	16.4		-1		162		260	-4	1.15	0.103				4.75		
18	E4 - Main Embankment Seepage Pond	8/31/2002 16:20		418	8.76	10.6		-1		112		256	-4	3.47	-0.005				1.12		
19	E4 - Main Embankment Seepage Pond	9/29/2002 9:15		407	8.1	9.1		-1		115		266	-4	6.31	0.028				1.4		
20	E4 - Main Embankment Seepage Pond	10/31/2002 13:50		437	8.12	3.7		-1		156		282	4	2.17	-0.005				3.19		
21	E4 - Main Embankment Seepage Pond	11/28/2002 16:00		374	7.98	4.4		-1		167		296	4	2.41	0.006				3.44		
22	E4 - Main Embankment Seepage Pond	12/30/2002 14:40		497	7.61	3.3		-1		179		342	-4	1.07	0.05				3.3		
23	E4 - Main Embankment Seepage Pond	1/30/2003 15:55		494	7.75	2.3		-1		185		330	-4	1.54	0.048				3.09		
24	E4 - Main Embankment Seepage Pond	2/28/2003 16:20		437	7.72	2.3		-1		158		276	5	2.05	0.014				1.85		
25	E4 - Main Embankment Seepage Pond	3/31/2003 9:40		315	8.34	3.2		-1		134		208	8	11.8	0.058				1.75		
82	E4 - Main Embankment Seepage Pond	7/3/2007 11:21		730	8.27	18.3		-1		248		487	-3	3.4	0.0455			2.33		0.0198	
373	E5 - Tailings Impoundment Main Embank Drain Comp	4/27/2002 15:10		539	7.07	5.3		-1		240		432		2	-0.005				22.5		
481	E7 - Perimeter Pond	2/5/2002 12:30		688	7.22	0.2		-1		291		372			0.081				4.29		
483	E7 - Perimeter Pond	3/29/2002 17:00		396	7.38	3.9		-1		169			6	11.3	-0.005				6.46		7.04
484	E7 - Perimeter Pond	4/26/2002 14:45		303	7.22	6		-1		127		208		10	-0.005				6.95		
486	E7 - Perimeter Pond	6/30/2002 8:00		664	7.29	16.1		-1		266		362	-4	2.49	0.07				1.66		
488	E7 - Perimeter Pond	8/30/2002 15:30		667	8.08	11.7		-1		319		442	-4	3.49	-0.005				0.28		
489	E7 - Perimeter Pond	9/30/2002 10:55		627	8.12	9.2		-1		305		430	-4	2.31	0.03				0.7		
490	E7 - Perimeter Pond	10/31/2002 15:55		629	8.26	5.7		-1		333		444	-4	1.85	-0.005				1.85		
491	E7 - Perimeter Pond	11/28/2002 13:15		691	8.35	3.1		-1		348		458	-4	1.3	-0.005				1.96		
492	E7 - Perimeter Pond	12/30/2002 14:10		743	7.36	3.4		-1		350		496	-4	4.31	0.036				2.07		
493	E7 - Perimeter Pond	1/30/2003 15:40		710	7.73	1.8		-1		382		524	-4	3.2	0.077				1.98		
494	E7 - Perimeter Pond	2/28/2003 15:35		176	8.34	1.8		-1		154		254	-4	1.66	0.012				1.13		
495	E7 - Perimeter Pond	3/31/2003 9:10		193	8.1	2.8		-1		50.6		60	-4	1.4	0.083				0.28		
P5																					
P50																					
P95																					
P99																					

Index	Sample Point	Date	Orthophosphate-Dissolved (as P) (mg/L)	Phosphorus (P) Total Dissolved (mg/L)	Phosphorus (P) Total (mg/L)	Sulphate (mg/L)	Sulphide as S (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	Aluminum (Al)-Total	Antimony (Sb)-Total	Arsenic (As)-Total	Barium (Ba)-Total	Beryllium (Be)-Total	Bismuth (Bi)-Total	Boron (B)-Total	Cadmium (Cd)-Total	Calcium (Ca)-Total	Chromium (Cr)-Total	Cobalt (Co)-Total
440	E5 - Tailings Impoundment Main Embank Drain Comp	9/1/2010	0.0236	0.0352	0.038	412			1.59	3.56		0.002	0.00045	0.0017	0.0756	-0.0005	-0.0005	0.155	-0.00008	119	-0.0005	0.00038
445	E5 - Tailings Impoundment Main Embank Drain Comp	2/3/2011 11:40	0.0165	0.0275	0.0327	451			1.92	3.89		-0.003	0.00038	0.00164	0.0798	-0.0005	-0.0005	0.143	-0.00007	135	-0.0005	0.00043
142	E4 - Main Embankment Seepage Pond	2/3/2011 12:00	0.0044	0.0121	0.0223	715			6.7	7.06		-0.003	0.0016	0.00163	0.0495	-0.0005	-0.0005	0.107	0.000177	220	-0.0005	0.00024
276	Perimeter Toe Drain	7/8/2010	0.0036	0.0108	0.0152	565			0.52	2.89		-0.002	0.00048	0.00141	0.0388	-0.001	-0.001	0.156	-0.00051	158	-0.001	0.00023
212	East Main Toe Drain	2/8/2012 15:00	0.0418	0.0544	0.0605	458			1.07	4.43		-0.003	0.00038	0.00176	0.0949	-0.0001	-0.0005	0.136	-0.00012	122	-0.0005	0.00049
143	E4 - Main Embankment Seepage Pond	3/8/2011 10:45	0.0039	0.0125	0.0305	597			3.73	5.22		-0.003	0.00083	0.00173	0.0528	-0.0005	-0.0005	0.108	-0.00015	181	-0.0005	0.00024
280	Perimeter Toe Drain	8/31/2011	0.0068		0.0108	635			6.61	2.68		-0.003	0.00064	0.00137	0.0404	-0.0001	-0.0005	0.147	-0.00015	183	-0.0005	0.00074
355	South Toe Drain	5/6/2015 11:53	-0.001	0.0061	0.0110	568			0.288	4.40		0.0041	0.00069	0.00252	0.0268	-0.0001	-0.00005	0.116	0.000106	153	-0.0005	0.00048
243	East Main Toe Drain	6/2/2015 11:46	0.0279	0.0373	0.0363	497			0.159	4.14		0.0032	0.00037	0.00189	0.0566	-0.0001	-0.00005	0.142	0.0000222	128	-0.0005	0.00027
242	East Main Toe Drain	5/4/2015 13:18	0.0296	0.0380	0.0412	494			0.159	4.20		0.0043	0.00044	0.00211	0.0573	-0.0001	-0.00005	0.130	0.0000402	125	-0.0005	0.00029
211	East Main Toe Drain	12/5/2011 11:20	0.0396	0.0558	0.0558	453			1.23	4.76		-0.003	0.00038	0.00174	0.0932	-0.0001	-0.0005	0.125	0.000112	123	-0.0005	0.00051
244	East Main Toe Drain	7/9/2015 10:13	0.0287	0.0383	0.0376	505			0.140	3.98		0.0040	0.00035	0.00200	0.0559	-0.0001	-0.00005	0.130	0.0000215	130	-0.0005	0.00028
271	West Main Toe Drain	6/2/2015 11:52	0.0158	0.0273	0.0330	490			0.136	3.77		0.0036	0.00028	0.00223	0.0570	-0.0001	-0.00005	0.165	0.0000301	122	-0.0005	0.00042
270	West Main Toe Drain	5/4/2015 13:28	0.0172	0.0247	0.0286	495			0.159	3.94		0.0040	0.00031	0.00232	0.0625	-0.0001	-0.00005	0.156	0.0000353	116	-0.0005	0.00043
272	West Main Toe Drain	7/9/2015 10:17	0.0173	0.0283	0.0314	495			0.130	4.02		0.0036	0.00026	0.00245	0.0586	-0.0001	-0.00005	0.152	0.0000298	125	-0.0005	0.00042
10	E4 - Main Embankment Seepage Pond	2/5/2002 12:14	-0.005	0.047	0.079	61.9		-0.1	4.74			0.0038	0.0001	0.0029	0.0627	-0.00005	-0.00005		0.00017	51.3	0.0002	0.00063
12	E4 - Main Embankment Seepage Pond	3/29/2002 16:15	0.006	0.026	0.054	19.8		0.77		10.3		0.0038	0.00009	0.007	0.0395	-0.00005	-0.00005		0.00002	38.8	-0.0002	0.00013
13	E4 - Main Embankment Seepage Pond	4/27/2002 15:45	-0.005			43.5						0.0112	0.00016	0.0007	0.0449	-0.00005	0.00015		0.00004	47.9	0.0003	0.0001
14	E4 - Main Embankment Seepage Pond	5/5/2002 10:15	-0.005			37.9		0.87		5		0.0102	0.00015	0.0008	0.0442	-0.00005	-0.00005		0.00003	44.2	0.0006	0.00016
16	E4 - Main Embankment Seepage Pond	6/30/2002 6:50	-0.005	0.009	0.007	62.7				6.2		0.0028	0.00015	0.0015	0.0452	-0.00005	-0.00005		0.00009	48.4	-0.0002	-0.00002
18	E4 - Main Embankment Seepage Pond	8/31/2002 16:20	0.007	0.019	0.034	59.4				5		0.003	0.00012	0.0031	0.0284	-0.00005	-0.00005		0.00015	31.4	0.0004	0.00006
19	E4 - Main Embankment Seepage Pond	9/29/2002 9:15	-0.005	0.02	0.036	59.8				4.4		0.0083	0.00016	0.0027	0.0311	-0.00005	-0.00005		0.0001	32	-0.0002	-0.00002
20	E4 - Main Embankment Seepage Pond	10/31/2002 13:50	0.006	0.026	0.03	62.2				4.6		0.0031	0.00013	0.0018	0.0422	-0.00005	-0.00005		-0.00001	46.5	-0.0002	-0.00002
21	E4 - Main Embankment Seepage Pond	11/28/2002 16:00	-0.005	0.022	0.026	75.4				3.9		0.0015	0.00015	0.0018	0.047	-0.00005	-0.00005		0.00006	50	-0.0002	-0.00002
22	E4 - Main Embankment Seepage Pond	12/30/2002 14:40	0.013	0.04	0.044	72.9				5.2		0.0012	0.00014	0.0021	0.0555	-0.00005	-0.00005		0.00017	54.8	-0.0002	0.00006
23	E4 - Main Embankment Seepage Pond	1/30/2003 15:55	0.01	0.03	0.046	72.1				4.7		0.0017	0.00013	0.0022	0.0557	-0.00005	-0.00005		0.00002	56.2	-0.0002	-0.00002
24	E4 - Main Embankment Seepage Pond	2/28/2003 16:20	-0.005	0.024	0.044	55.2				5.9		0.0135	0.00015	0.0022	0.0524	-0.00005	0.00008		0.00014	48.5	-0.0002	0.00055
25	E4 - Main Embankment Seepage Pond	3/31/2003 9:40	0.006	0.023	0.056	36.2				9.1		0.0167	0.00012	0.001	0.0321	-0.00005	0.00013		0.00004	39	-0.0002	0.00019
82	E4 - Main Embankment Seepage Pond	7/3/2007 11:21	0.001	0.0108	0.0183	225			4.59	4.43		0.0029	0.00029	0.00192	0.0596	-0.0005	-0.0005	0.098	-0.000017	73.8	-0.0005	-0.0001
373	E5 - Tailings Impoundment Main Embank Drain Comp	4/27/2002 15:10	0.006			67.2						0.0015	0.00017	0.0009	0.0762	-0.00005	-0.00005		0.00007	82.9	0.0004	0.00068
481	E7 - Perimeter Pond	2/5/2002 12:30	-0.005	0.009	0.034	83.2		-0.1	4.29			0.0035	0.00011	0.0009	0.0476	-0.00005	-0.00005		0.00005	96.5	-0.0002	0.00089
483	E7 - Perimeter Pond	3/29/2002 17:00	0.009	0.014	0.038	45.5		0.58		5.3		0.103	0.00021	0.0006	0.0366	-0.00005	-0.00005		0.00001	57.5	0.0004	0.00034
484	E7 - Perimeter Pond	4/26/2002 14:45	-0.005			54.8						0.0682	0.00016	0.0005	0.0258	-0.00005	-0.00005		0.00002	44.3	0.0004	0.0001
486	E7 - Perimeter Pond	6/30/2002 8:00	-0.005	0.007	0.01	136				7.9		0.0033	0.00029	0.0011	0.0467	-0.00005	-0.00005		0.00011	82.3	-0.0002	-0.00002
488	E7 - Perimeter Pond	8/30/2002 15:30	-0.005	0.01	0.016	166				6.7		0.001	0.00015	0.001	0.0461	-0.00005	-0.00005		0.00002	99.8	0.0024	-0.00002
489	E7 - Perimeter Pond	9/30/2002 10:55	-0.005	0.01	0.013	166				5.8		0.0034	0.00018	0.0009	0.042	-0.00005	-0.00005		0.00002	93.5	-0.0002	-0.00002
490	E7 - Perimeter Pond	10/31/2002 15:55	-0.005	0.011	0.014	176				6.9		0.0028	0.00018	0.0006	0.0475	-0.00005	-0.00005		-0.00001	104	-0.0002	-0.00002
491	E7 - Perimeter Pond	11/28/2002 13:15	-0.005	0.007	0.008	183				5.1		0.0008	0.00021	0.0008	0.0502	-0.00005	-0.00005		0.0001	107	0.0004	0.00006
492	E7 - Perimeter Pond	12/30/2002 14:10	0.011	0.015	0.019	185				7		0.0013	0.00026	0.0005	0.0546	-0.00005	-0.00005		0.00007	109	-0.0002	-0.00002
493	E7 - Perimeter Pond	1/30/2003 15:40	-0.005	0.009	0.02	199				7		0.0025	0.00021	0.0008	0.0575	-0.00005	-0.00005		-0.00001	123	-0.0002	-0.00002
494	E7 - Perimeter Pond	2/28/2003 15:35	-0.005	-0.005	0.014	113				5		0.0093	0.0001	0.0004	0.0202	-0.00005	-0.00005		0.00003	47.3	-0.0002	-0.00002
495	E7 - Perimeter Pond	3/31/2003 9:10	0.005	0.012	0.022	11				4.1		0.0144	0.00009	0.0001	0.0104	-0.00005	-0.00005		0.00001	16.8	-0.0002	0.00005
P5																						
P50																						
P95																						
P99																						

Index	Sample Point	Date	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Lithium (Li)-Total	Magnesium (Mg)-Total	Manganese (Mn)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Potassium (K)-Total	Selenium (Se)-Total	Silicon (Si)-Total	Silver (Ag)-Total	Sodium (Na)-Total	Strontium (Sr)-Total	Thallium (Tl)-Total	Tin (Sn)-Total
440	E5 - Tailings Impoundment Main Embank Drain Comp	9/1/2010	0.00137	-0.03	-0.00005	0.0054	18.9	0.443		0.149	-0.0005	14.8	0.0034	6.48	-0.00001	79.8	1.63	-0.0001	-0.0001
445	E5 - Tailings Impoundment Main Embank Drain Comp	2/3/2011 11:40	0.00175	-0.03	-0.00005	0.0055	20.3	0.38		0.145	-0.0005	14.7	0.0055	6.76	-0.00001	81.5	1.79	-0.0001	-0.0001
142	E4 - Main Embankment Seepage Pond	2/3/2011 12:00	0.00571	-0.03	-0.00005	0.0073	29	0.244		0.173	-0.0005	14.6	0.0151	6.03	-0.00001	85.3	1.98	-0.0001	-0.0001
276	Perimeter Toe Drain	7/8/2010	0.00166	-0.03	-0.0001	0.012	26.1	0.393		0.153	-0.001	20.6	-0.002	5.28	-0.00002	87.2	5.25	-0.0002	-0.0002
212	East Main Toe Drain	2/8/2012 15:00	0.0038	-0.03	0.000059	0.00607	21.9	1.1		0.184	0.00067	13.4	0.00143	6.34	-0.00001	87.1	1.65	0.000017	-0.0001
143	E4 - Main Embankment Seepage Pond	3/8/2011 10:45	0.00374	-0.03	-0.00005	0.0067	25.5	0.406	-0.00005	0.15	0.0006	12.9	0.00952	6.27	-0.00001	82.3	1.86	-0.0001	-0.0001
280	Perimeter Toe Drain	8/31/2011	0.0032	-0.03	-0.00005	0.0121	25.7	0.768		0.178	0.00069	21.4	0.00364	5.08	-0.00001	86.7	5.36	-0.00001	-0.0001
355	South Toe Drain	5/6/2015 11:53	0.00576	-0.03	-0.00005	0.0071	15.7	0.363		0.196	-0.0005	11.3	0.00255	6.02	-0.00001	93.0	2.12	-0.00001	-0.0001
243	East Main Toe Drain	6/2/2015 11:46	0.00226	0.030	-0.00005	0.0082	21.2	0.589		0.221	-0.0005	16.1	0.000256	6.13	-0.00001	93.5	2.15	-0.00001	-0.0001
242	East Main Toe Drain	5/4/2015 13:18	0.00269	-0.03	-0.00005	0.0081	19.7	0.574		0.210	-0.0005	16.0	0.000448	5.76	0.000015	94.9	2.06	-0.00001	-0.0001
211	East Main Toe Drain	12/5/2011 11:20	0.00294	-0.03	-0.00005	0.0073	22	1.14		0.184	0.00069	15.6	0.00156	6.27	-0.00001	95.4	1.73	-0.00001	-0.0001
244	East Main Toe Drain	7/9/2015 10:13	0.00183	0.034	-0.00005	0.0080	21.1	0.565		0.213	-0.0005	15.9	0.000184	5.95	-0.00001	94.9	2.06	-0.00001	-0.0001
271	West Main Toe Drain	6/2/2015 11:52	0.00202	0.061	-0.00005	0.0082	20.0	0.389		0.196	-0.0005	17.5	0.00106	6.67	-0.00001	98.8	2.19	-0.00001	-0.0001
270	West Main Toe Drain	5/4/2015 13:28	0.00268	0.041	-0.00005	0.0083	18.3	0.395		0.189	-0.0005	17.6	0.00130	6.22	0.000015	102	2.18	-0.00001	-0.0001
272	West Main Toe Drain	7/9/2015 10:17	0.00153	0.077	-0.00005	0.0078	20.5	0.392		0.191	-0.0005	17.7	0.000629	6.69	-0.00001	103	2.23	-0.00001	-0.0001
10	E4 - Main Embankment Seepage Pond	2/5/2002 12:14	0.0022	-0.005	0.00004	0.0026	10.3	0.719	-0.00005	0.067	-0.0005	6.56	0.0012	7.19	-0.00001	48.8	0.484	-0.00005	0.00017
12	E4 - Main Embankment Seepage Pond	3/29/2002 16:15	0.0042	0.057	0.00007	0.0007	8.08	0.142	-0.00005	0.00762	-0.0005	2.47	0.0008	4.33	-0.00001	11.3	0.303	-0.00005	-0.00005
13	E4 - Main Embankment Seepage Pond	4/27/2002 15:45	0.0022	-0.005	-0.00002	0.0009	7.84	0.0548	-0.00005	0.0133	-0.0005	2.94	0.0007	4.64	-0.00001	13.4	0.357	-0.00005	0.00009
14	E4 - Main Embankment Seepage Pond	5/5/2002 10:15	0.0026	0.008	-0.00002	0.0009	7.33	0.0559	-0.00005	0.0133	-0.0005	3.18	0.0014	4.52	-0.00001	12.5	0.35	-0.00005	0.00009
16	E4 - Main Embankment Seepage Pond	6/30/2002 6:50	0.0036	-0.005	0.0001	0.0018	9.45	0.00016	-0.00005	0.0445	-0.0005	4.44	0.001	1.15	-0.00001	32.4	0.418	-0.00005	-0.00005
18	E4 - Main Embankment Seepage Pond	8/31/2002 16:20	0.0033	-0.005	0.00038	0.0021	9.6	0.0289	-0.00005	0.0613	-0.0005	4.6	0.0009	6.18	-0.00001	44.7	0.345	-0.00005	0.00007
19	E4 - Main Embankment Seepage Pond	9/29/2002 9:15	0.0031	0.011	0.00027	-0.0002	8.98	0.0496	-0.00005	0.0537	-0.0005	5.04	0.0007	5.76	-0.00001	38.8	0.324	-0.00005	0.00005
20	E4 - Main Embankment Seepage Pond	10/31/2002 13:50	0.0025	-0.005	0.00048	0.0024	10.6	0.0238	-0.00005	0.0472	-0.0005	4.09	0.0008	5.54	-0.00001	35.7	0.37	-0.00005	-0.00005
21	E4 - Main Embankment Seepage Pond	11/28/2002 16:00	0.0049	-0.005	0.00013	0.002	10.9	0.0385	-0.00005	0.0497	-0.0005	4.16	0.0009	5.62	-0.00001	36	0.419	-0.00005	0.00008
22	E4 - Main Embankment Seepage Pond	12/30/2002 14:40	0.0018	-0.005	0.00025	0.0022	11.2	0.261	-0.00005	0.0585	-0.0005	5.14	0.0011	5.99	-0.00001	40.7	0.48	-0.00005	0.00008
23	E4 - Main Embankment Seepage Pond	1/30/2003 15:55	0.0014	-0.005	0.00003	0.0019	11.4	0.351	-0.00005	0.0586	-0.0005	5.27	0.0013	6.17	-0.00001	41.9	0.458	-0.00005	-0.00005
24	E4 - Main Embankment Seepage Pond	2/28/2003 16:20	0.0029	0.03	0.00006	0.0018	10.1	0.769	-0.00005	0.0531	-0.0005	4.88	0.001	5.66	-0.00001	36.3	0.435	-0.00005	-0.00005
25	E4 - Main Embankment Seepage Pond	3/31/2003 9:40	0.0029	0.03	-0.00002	0.001	7.79	0.199	-0.00005	0.0194	-0.0005	2.7	0.0013	3.9	-0.00001	17	0.297	-0.00005	0.00007
82	E4 - Main Embankment Seepage Pond	7/3/2007 11:21	0.00347	-0.03	-0.00005	-0.005	15.5	0.0544		0.12	-0.0005	6.59	0.0107	3.88	-0.00001	52.3	1.02	-0.0001	-0.0001
373	E5 - Tailings Impoundment Main Embank Drain Comp	4/27/2002 15:10	0.0025	-0.005	-0.00002	0.002	12.2	0.222	-0.00005	0.0255	-0.0005	3.95	0.0018	7.49	-0.00001	24.7	0.576	-0.00005	-0.00005
481	E7 - Perimeter Pond	2/5/2002 12:30	0.003	0.018	0.00009	0.0026	12.9	0.774	-0.00005	0.00394	-0.0005	3.04	0.0024	7.48	-0.00001	10.3	0.485	-0.00005	0.00019
483	E7 - Perimeter Pond	3/29/2002 17:00	0.007	0.341	0.00003	0.0008	8.08	0.129	-0.00005	0.0033	-0.0005	2.48	0.0027	4.18	-0.00001	8.33	0.354	-0.00005	0.00012
484	E7 - Perimeter Pond	4/26/2002 14:45	0.0031	0.062	-0.00002	0.0006	6.28	0.047	-0.00005	0.00418	-0.0005	1.86	0.0032	3.07	-0.00001	4.87	0.259	-0.00005	-0.00005
486	E7 - Perimeter Pond	6/30/2002 8:00	0.0062	-0.005	0.00008	0.0029	14.2	0.00003	-0.00005	0.0103	-0.0005	2.92	0.0068	1	-0.00001	14	0.489	-0.00005	0.00014
488	E7 - Perimeter Pond	8/30/2002 15:30	0.0039	-0.005	0.00029	0.0023	18.4	0.184	-0.00005	0.00726	0.0006	3.24	0.003	1.45	-0.00001	20.1	0.647	-0.00005	0.0001
489	E7 - Perimeter Pond	9/30/2002 10:55	0.0037	-0.005	0.00023	-0.0002	16.9	0.113	-0.00005	0.00653	-0.0005	3.29	0.0025	1.74	-0.00001	17.4	0.56	-0.00005	-0.00005
490	E7 - Perimeter Pond	10/31/2002 15:55	0.0034	-0.005	0.00024	0.0014	18.4	0.0783	-0.00005	0.00711	-0.0005	3.23	0.0027	2.55	-0.00001	17.2	0.596	-0.00005	-0.00005
491	E7 - Perimeter Pond	11/28/2002 13:15	0.0039	-0.005	-0.00002	0.0017	18.8	0.0751	-0.00005	0.00755	-0.0005	3.48	0.0031	2.45	-0.00001	17.2	0.63	-0.00005	0.00009
492	E7 - Perimeter Pond	12/30/2002 14:10	0.003	-0.005	-0.00002	0.002	18.6	0.00612	-0.00005	0.00837	-0.0005	3.37	0.0034	3.02	-0.00001	15.7	0.651	-0.00005	0.0007
493	E7 - Perimeter Pond	1/30/2003 15:40	0.0034	-0.005	0.00005	0.0018	21.4	0.0423	-0.00005	0.00829	-0.0005	3.8	0.0039	2.97	-0.00001	18.4	0.691	-0.00005	0.00027
494	E7 - Perimeter Pond	2/28/2003 15:35	0.0025	-0.005	0.00005	0.0009	9.71	0.0243	-0.00005	0.0039	-0.0005	2.06	0.0015	1.5	-0.00001	9	0.306	-0.00005	0.00006
495	E7 - Perimeter Pond	3/31/2003 9:10	0.0024	0.019	-0.00002	0.0003	1.87	0.0397	-0.00005	0.00165	-0.0005	0.93	-0.0005	1.13	-0.00001	2.89	0.0931	-0.00005	0.00008
P5																			
P50																			
P95																			
P99																			

Index	Sample Point	Date	Titanium (Ti)-Total	Uranium (U)-Total	Vanadium (V)-Total	Zinc (Zn)-Total	Aluminum (Al)-Dissolved	Antimony (Sb)-Dissolved	Arsenic (As)-Dissolved	Barium (Ba)-Dissolved	Beryllium (Be)-Dissolved	Bismuth (Bi)-Dissolved	Boron (B)-Dissolved	Cadmium (Cd)-Dissolved	Calcium (Ca)-Dissolved	Chromium (Cr)-Dissolved	Cobalt (Co)-Dissolved	Copper (Cu)-Dissolved	Iron (Fe)-Dissolved	Lead (Pb)-Dissolved	Lithium (Li)-Dissolved	Magnesium (Mg)-Dissolved
440	E5 - Tailings Impoundment Main Embank Drain Comp	9/1/2010	-0.01	0.0012	-0.001	-0.001	0.0158	0.00045	0.00174	0.0767	-0.0005	-0.0005	0.158	-0.00007	118	-0.0005	0.00038	0.00299	0.038	-0.00005	0.0056	18.9
445	E5 - Tailings Impoundment Main Embank Drain Comp	2/3/2011 11:40	-0.01	0.0013	-0.001	-0.003	0.0068	0.00039	0.00185	0.0819	-0.0005	-0.0005	0.151	-0.00008	138	-0.0005	0.00044	0.00311	0.062	0.000053	0.0058	20.9
142	E4 - Main Embankment Seepage Pond	2/3/2011 12:00	-0.01	0.000983	-0.001	-0.003	0.109	0.00158	0.00179	0.049	-0.0005	-0.0005	0.11	0.000178	221	-0.0005	0.0003	0.00901	0.162	0.000051	0.0071	29.3
276	Perimeter Toe Drain	7/8/2010	-0.01	0.00215	-0.002	-0.002	0.0834	0.00047	0.00137	0.0399	-0.001	-0.001	0.151	-0.00051	155	-0.001	0.00054	0.00325	0.102	-0.0001	0.013	25.4
212	East Main Toe Drain	2/8/2012 15:00	-0.01	0.00125	-0.001	-0.003	0.0056	0.00036	0.00178	0.0935	-0.0001	-0.0005	0.136	-0.00012	120	-0.0005	0.00049	0.00479	0.043	0.00101	0.00604	21.4
143	E4 - Main Embankment Seepage Pond	3/8/2011 10:45	0.015	0.0011	-0.001	-0.003	0.345	0.00087	0.00206	0.0578	-0.0005	-0.0005	0.112	-0.00015	185	0.00054	0.00043	0.0135	0.347	0.000151	0.0072	26.3
280	Perimeter Toe Drain	8/31/2011	-0.01	0.00191	-0.001	-0.003	0.0125	0.00065	0.00139	0.0415	-0.0001	-0.0005	0.149	-0.00015	187	-0.0005	0.0008	0.00436	-0.03	-0.00005	0.0122	26.4
355	South Toe Drain	5/6/2015 11:53	-0.01	0.00112	0.00175	-0.003	0.0034	0.00065	0.00233	0.0263	-0.0001	-0.00005	0.112	0.0000992	150	-0.0005	0.00036	0.00400	-0.03	-0.00005	0.0069	15.3
243	East Main Toe Drain	6/2/2015 11:46	-0.01	0.00109	0.00085	-0.003	-0.003	0.00042	0.00188	0.0559	-0.0001	-0.00005	0.138	0.0000191	128	-0.0005	0.00025	0.00124	-0.03	-0.00005	0.0078	20.8
242	East Main Toe Drain	5/4/2015 13:18	-0.01	0.00104	0.00098	-0.003	0.0037	0.00043	0.00206	0.0572	-0.0001	-0.00005	0.128	0.0000372	124	-0.0005	0.00028	0.00157	-0.03	-0.00005	0.0079	19.5
211	East Main Toe Drain	12/5/2011 11:20	-0.01	0.00116	-0.001	-0.003	0.0076	0.00038	0.00175	0.0905	-0.0001	-0.0005	0.118	-0.0002	120	-0.0005	0.00051	0.00722	0.046	0.000592	0.00652	21.2
244	East Main Toe Drain	7/9/2015 10:13	-0.01	0.00107	0.00100	-0.003	0.0030	0.00040	0.00201	0.0564	-0.0001	-0.00005	0.124	0.0000180	132	-0.0005	0.00027	0.00121	-0.03	-0.00005	0.0079	21.5
271	West Main Toe Drain	6/2/2015 11:52	-0.01	0.000875	0.00061	-0.003	-0.003	0.00026	0.00199	0.0573	-0.0001	-0.00005	0.160	0.0000658	120	-0.0005	0.00039	0.00134	-0.03	-0.00005	0.0080	19.9
270	West Main Toe Drain	5/4/2015 13:28	-0.01	0.000865	0.00074	-0.003	0.0031	0.00029	0.00210	0.0610	-0.0001	-0.00005	0.152	0.0000370	116	-0.0005	0.00042	0.00109	-0.03	-0.00005	0.0082	18.4
272	West Main Toe Drain	7/9/2015 10:17	-0.01	0.000918	0.00085	-0.003	-0.003	0.00026	0.00215	0.0570	-0.0001	-0.00005	0.141	0.0000167	122	-0.0005	0.00041	0.00096	-0.03	-0.00005	0.0075	20.2
10	E4 - Main Embankment Seepage Pond	2/5/2002 12:14	0.00145	0.00131	0.00146	0.0058	0.0904	0.00013	0.0027	0.0644	-0.00005	-0.00005		0.00012	50.4	0.0005	0.00091	0.0038	0.237	0.00012	0.0025	10.1
12	E4 - Main Embankment Seepage Pond	3/29/2002 16:15	0.0014	0.00031	0.00118	0.0123	0.333	0.00012	0.0009	0.0431	-0.00005	-0.00005		-0.00001	34.2	0.0008	0.00075	0.0057	0.542	0.00023	0.0009	7.54
13	E4 - Main Embankment Seepage Pond	4/27/2002 15:45	0.00121	0.00054	0.00115	-0.0005	0.473	0.00016	0.0009	0.05	-0.00005	0.00017		0.00003	43.9	0.0009	0.0006	0.0057	0.62	0.00027	0.0011	7.4
14	E4 - Main Embankment Seepage Pond	5/5/2002 10:15	0.00109	0.00053	0.0012	0.0011	0.476	0.00017	0.0009	0.0504	-0.00005	-0.00005		0.00003	47.8	0.001	0.00061	0.0068	0.572	0.0003	0.0013	7.93
16	E4 - Main Embankment Seepage Pond	6/30/2002 6:50	0.00087	0.00099	0.00116	0.0046	0.0731	0.00015	0.0017	0.0509	-0.00005	-0.00005		0.0001	49.7	-0.0002	-0.00002	0.0052	0.097	0.00018	0.0019	9.3
18	E4 - Main Embankment Seepage Pond	8/31/2002 16:20	0.00125	0.00089	0.0015	0.0007	0.131	0.00014	0.0032	0.032	-0.00005	-0.00005		0.00014	29.6	0.0012	0.00016	0.0042	0.139	0.00056	0.0025	9.15
19	E4 - Main Embankment Seepage Pond	9/29/2002 9:15	0.00182	0.00096	0.00119	0.0014	0.267	0.00017	0.003	0.0349	-0.00005	0.00006		0.0001	31.6	-0.0002	0.00014	0.0046	0.255	0.00038	0.0003	8.84
20	E4 - Main Embankment Seepage Pond	10/31/2002 13:50	0.00141	0.00116	0.0006	-0.0005	0.0911	0.00013	0.0018	0.0438	-0.00005	-0.00005		-0.00001	45.3	-0.0002	-0.00002	0.0033	0.092	0.00052	0.0023	10.4
21	E4 - Main Embankment Seepage Pond	11/28/2002 16:00	0.00126	0.00118	0.00058	0.0008	0.105	0.00016	0.0019	0.0496	-0.00005	-0.00005		0.00005	49.4	0.0004	0.00007	0.0036	0.1	0.00004	0.0023	10.7
22	E4 - Main Embankment Seepage Pond	12/30/2002 14:40	0.00171	0.00117	0.00127	0.0013	0.0221	0.00014	0.0022	0.0778	-0.00005	-0.00005		0.00016	53.5	-0.0002	0.00011	0.0026	0.045	0.00027	0.0024	11
23	E4 - Main Embankment Seepage Pond	1/30/2003 15:55	0.00201	0.00115	0.0012	0.0017	0.0407	0.00014	0.0023	0.0726	-0.00005	-0.00005		0.00003	55.5	-0.0002	0.00006	0.0027	0.028	0.00004	0.0022	11.2
24	E4 - Main Embankment Seepage Pond	2/28/2003 16:20	0.00178	0.00097	0.0019	0.0119	0.0995	0.00012	0.0023	0.0597	-0.00005	-0.00005		0.00013	46.7	-0.0002	0.00068	0.0034	0.162	0.0001	0.0018	10.1
25	E4 - Main Embankment Seepage Pond	3/31/2003 9:40	0.00205	0.00071	0.00111	0.0021	0.304	0.00015	0.0011	0.038	-0.00005	0.00017		0.00005	40.4	-0.0002	0.00038	0.0041	0.267	0.00011	0.0012	8.01
82	E4 - Main Embankment Seepage Pond	7/3/2007 11:21	-0.01	0.00143	0.001	0.0014	0.117	0.0003	0.00205	0.0625	-0.0005	-0.0005	0.1	-0.000029	75.3	-0.0005	0.00014	0.00437	0.139	0.000063	-0.005	15.8
373	E5 - Tailings Impoundment Main Embank Drain Comp	4/27/2002 15:10	0.00181	0.00074	0.00163	-0.0005	0.0481	0.00016	0.0011	0.0712	-0.00005	-0.00005		0.00006	77.3	0.0002	0.00112	0.0046	0.135	0.00004	0.002	11.5
481	E7 - Perimeter Pond	2/5/2002 12:30	0.00138	0.00105	0.00121	0.0029	0.0489	0.00013	0.0009	0.0464	-0.00005	-0.00005		0.00003	95.6	0.0003	0.00102	0.004	0.211	0.00021	0.0026	12.8
483	E7 - Perimeter Pond	3/29/2002 17:00	0.00333	0.00075	0.00085	0.0083	0.343	0.00023	0.0006	0.04	-0.00005	0.00041		-0.00001	54.3	0.0009	0.00072	0.0065	0.675	0.00019	0.001	8.06
484	E7 - Perimeter Pond	4/26/2002 14:45	0.00365	0.00046	0.0009	0.0043	0.506	0.00016	0.0004	0.0294	-0.00005	-0.00005		0.00002	41.1	0.001	0.00054	0.0057	0.594	0.00021	0.0007	6.03
486	E7 - Perimeter Pond	6/30/2002 8:00	0.002	0.00109	0.00063	0.005	0.0843	0.00032	0.0014	0.0528	-0.00005	-0.00005		0.00052	83.7	-0.0002	0.00006	0.0093	0.141	0.00021	0.0033	13.8
488	E7 - Perimeter Pond	8/30/2002 15:30	0.00399	0.00161	0.002	0.0039	0.106	0.00016	0.001	0.0477	-0.00005	-0.00005		0.00003	98.4	0.0024	0.00007	0.0053	0.111	0.00031	0.0021	17.8
489	E7 - Perimeter Pond	9/30/2002 10:55	0.00381	0.00178	0.00061	0.0055	0.102	0.00019	0.001	0.0436	-0.00005	-0.00005		0.00004	94.7	-0.0002	-0.00002	0.0046	0.099	0.00031	-0.0002	16.7
490	E7 - Perimeter Pond	10/31/2002 15:55	0.0039	0.00187	0.00039	0.0023	0.068	0.00018	0.0006	0.0476	-0.00005	-0.00005		-0.00001	103	-0.0002	-0.00002	0.0039	0.079	0.00049	0.0018	18.4
491	E7 - Perimeter Pond	11/28/2002 13:15	0.00352	0.00186	0.00037	0.0019	0.0474	0.0002	0.0007	0.0501	-0.00005	-0.00005		0.00002	108	0.0003	-0.00002	0.0041	0.048	0.00013	0.0024	18.9
492	E7 - Perimeter Pond	12/30/2002 14:10	0.00442	0.00185	0.001	0.0061	0.121	0.0003	0.0007	0.0571	-0.00005	-0.00005		0.00006	109	-0.0002	-0.00002	0.0042	0.124	0.00058	0.0023	18.8
493	E7 - Perimeter Pond	1/30/2003 15:40	0.00586	0.00205	0.00105	0.0068	0.0432	0.00025	0.0008	0.0611	-0.00005	-0.00005		-0.00001	119	-0.0002	-0.00002	0.005	0.053	0.00017	0.002	20.6
494	E7 - Perimeter Pond	2/28/2003 15:35	0.00256	0.0008	0.00087	0.0343	0.0659	0.0001	0.0005	0.0209	-0.00005	-0.00005		0.00004	45.8	-0.0002	0.00004	0.0027	0.046	0.00014	0.001	9.68
495	E7 - Perimeter Pond	3/31/2003 9:10	0.001	0.00021	0.00045	0.0024	0.0835	0.00009	0.0002	0.0114	-0.00005	-0.00005		0.00002	17.1	-0.0002	0.00009	0.0027	0.066	0.00004	0.0003	1.91
P5																						
P50																						
P95																						
P99																						

Index	Sample Point	Date	Manganese (Mn)-Dissolved	Mercury (Hg)-Dissolved	Molybdenum (Mo)-Dissolved	Nickel (Ni)-Dissolved	Potassium (K)-Dissolved	Selenium (Se)-Dissolved	Silicon (Si)-Dissolved	Silver (Ag)-Dissolved	Sodium (Na)-Dissolved	Strontium (Sr)-Dissolved	Thallium (Tl)-Dissolved	Tin (Sn)-Dissolved	Titanium (Ti)-Dissolved	Uranium (U)-Dissolved	Vanadium (V)-Dissolved	Zinc (Zn)-Dissolved
440	E5 - Tailings Impoundment Main Embank Drain Comp	9/1/2010	0.452		0.151	-0.0005		0.0033	6.47	-0.00001	80.3	1.65	-0.0001	-0.0001	0.011	0.00122	-0.001	-0.001
445	E5 - Tailings Impoundment Main Embank Drain Comp	2/3/2011 11:40	0.396		0.154	-0.0005		0.0055	6.93	-0.00001	84.2	1.86	-0.0001	-0.0001	-0.01	0.00137	-0.001	-0.003
142	E4 - Main Embankment Seepage Pond	2/3/2011 12:00	0.247		0.177	0.00054		0.0152	6.29	-0.00001	84.3	1.99	-0.0001	-0.0001	-0.01	0.000997	0.0011	0.0034
276	Perimeter Toe Drain	7/8/2010	0.502		0.149	-0.001		-0.002	5.29	-0.00002	86.1	5.23	-0.0002	-0.0002	-0.01	0.00215	-0.002	-0.002
212	East Main Toe Drain	2/8/2012 15:00	1.09		0.182	0.00061		0.00146	6.2	-0.00001	86.2	1.64	0.000017	-0.0001	-0.01	0.00122	-0.001	-0.003
143	E4 - Main Embankment Seepage Pond	3/8/2011 10:45	0.439	-0.00005	0.154	0.00095		0.01	7.15	-0.00001	86.2	1.94	-0.0001	-0.0001	0.03	0.00114	0.0017	0.0045
280	Perimeter Toe Drain	8/31/2011	0.807		0.187	0.00068		0.00371	5.25	-0.00001	89.6	5.62	-0.00001	-0.0001	-0.01	0.002	-0.001	-0.003
355	South Toe Drain	5/6/2015 11:53	0.328		0.191	-0.0005	11.1	0.00251	5.87	-0.00001	90.8	2.07	-0.00001	-0.0001	-0.01	0.00109	0.00143	-0.003
243	East Main Toe Drain	6/2/2015 11:46	0.569		0.215	-0.0005	15.7	0.00115	6.02	-0.00001	91.0	2.07	-0.00001	-0.0001	-0.01	0.00107	0.00077	-0.003
242	East Main Toe Drain	5/4/2015 13:18	0.566		0.206	-0.0005	15.8	0.00109	5.72	-0.00001	93.5	2.03	-0.00001	-0.0001	-0.01	0.00102	0.00085	-0.003
211	East Main Toe Drain	12/5/2011 11:20	1.16		0.184	0.00064		0.00143	6.05	-0.00001	93.7	1.72	-0.00001	-0.0001	-0.01	0.00115	-0.001	-0.003
244	East Main Toe Drain	7/9/2015 10:13	0.564		0.210	-0.0005	15.9	0.00121	6.06	-0.00001	95.5	2.03	-0.00001	-0.0001	-0.01	0.00107	0.00072	-0.003
271	West Main Toe Drain	6/2/2015 11:52	0.381		0.191	-0.0005	17.2	0.000991	6.65	-0.00001	96.8	2.14	-0.00001	-0.0001	-0.01	0.000894	0.00055	-0.003
270	West Main Toe Drain	5/4/2015 13:28	0.381		0.182	-0.0005	16.9	0.00128	6.18	-0.00001	98.2	2.10	-0.00001	-0.0001	-0.01	0.000853	0.00063	-0.003
272	West Main Toe Drain	7/9/2015 10:17	0.381		0.181	-0.0005	17.4	0.000575	6.56	-0.00001	101	2.10	-0.00001	-0.0001	-0.01	0.000873	0.00053	-0.003
10	E4 - Main Embankment Seepage Pond	2/5/2002 12:14	0.703	-0.00005	0.0664	-0.0005		0.0007	7	-0.00001	47.7	0.472	-0.00005	0.00013	0.00545	0.00129	0.00119	0.0063
12	E4 - Main Embankment Seepage Pond	3/29/2002 16:15	0.153	-0.00005	0.00888	-0.0005		0.0006	4.74	0.00001	10.7	0.311	-0.00005	-0.00005	0.0137	0.00038	0.00149	0.011
13	E4 - Main Embankment Seepage Pond	4/27/2002 15:45	0.103	-0.00005	0.0125	-0.0005		0.0008	5.24	-0.00001	12.8	0.346	-0.00005	-0.00005	0.0173	0.00052	0.00196	0.0021
14	E4 - Main Embankment Seepage Pond	5/5/2002 10:15	0.104	-0.00005	0.0137	-0.0005		0.001	5.43	-0.00001	13.3	0.357	-0.00005	0.00012	0.016	0.00055	0.00173	0.0044
16	E4 - Main Embankment Seepage Pond	6/30/2002 6:50	0.057	-0.00005	0.0457	-0.0005		0.0011	1.29	-0.00001	30.8	0.438	-0.00005	-0.00005	0.0035	0.00103	0.00192	0.0128
18	E4 - Main Embankment Seepage Pond	8/31/2002 16:20	0.063	-0.00005	0.0611	0.001		-0.0005	6.18	-0.00001	42.3	0.367	-0.00005	-0.00005	0.0068	0.00089	0.00216	0.0007
19	E4 - Main Embankment Seepage Pond	9/29/2002 9:15	0.0749	-0.00005	0.0543	-0.0005		0.0008	6.24	-0.00001	36.4	0.326	-0.00005	-0.00005	0.0113	0.00094	0.00213	0.0018
20	E4 - Main Embankment Seepage Pond	10/31/2002 13:50	0.0272	-0.00005	0.0461	-0.0005		0.0007	5.41	-0.00001	34	0.383	-0.00005	-0.00005	0.0044	0.00114	0.00085	0.0008
21	E4 - Main Embankment Seepage Pond	11/28/2002 16:00	0.0451	-0.00005	0.0492	-0.0005		0.0009	5.49	-0.00001	35	0.429	-0.00005	0.00007	0.0053	0.00117	0.00086	-0.0005
22	E4 - Main Embankment Seepage Pond	12/30/2002 14:40	0.301	-0.00005	0.058	-0.0005		0.0012	5.85	-0.00001	39.5	0.486	-0.00005	-0.00005	0.0032	0.00111	0.00127	0.0015
23	E4 - Main Embankment Seepage Pond	1/30/2003 15:55	0.378	-0.00005	0.0599	-0.0005		0.0011	6.15	-0.00001	40.4	0.483	-0.00005	-0.00005	0.0035	0.00108	0.00108	0.0018
24	E4 - Main Embankment Seepage Pond	2/28/2003 16:20	0.855	-0.00005	0.053	-0.0005		0.0011	5.66	-0.00001	36.3	0.439	-0.00005	-0.00005	0.0042	0.00096	0.00248	0.0145
25	E4 - Main Embankment Seepage Pond	3/31/2003 9:40	0.291	-0.00005	0.0182	-0.0005		0.0011	5	-0.00001	16.6	0.304	-0.00005	-0.00005	0.0105	0.00069	0.00184	0.006
82	E4 - Main Embankment Seepage Pond	7/3/2007 11:21	0.063		0.123	-0.0005		0.011	4.18	-0.00001	52.1	1.05	-0.0001	-0.0001	-0.01	0.00143	0.0013	0.0016
373	E5 - Tailings Impoundment Main Embank Drain Comp	4/27/2002 15:10	0.256	-0.00005	0.026	-0.0005		0.0017	7.66	-0.00001	24.7	0.58	-0.00005	0.00006	0.0027	0.00068	0.00099	-0.0005
481	E7 - Perimeter Pond	2/5/2002 12:30	0.755	-0.00005	0.00342	-0.0005		0.0022	7.3	-0.00001	10.3	0.471	-0.00005	0.00008	0.00407	0.00099	0.00058	0.0029
483	E7 - Perimeter Pond	3/29/2002 17:00	0.135	-0.00005	0.00401	-0.0005		0.0029	4.82	0.00002	8.41	0.389	-0.00005	0.00006	0.0144	0.00085	0.00157	0.0077
484	E7 - Perimeter Pond	4/26/2002 14:45	0.061	-0.00005	0.0041	-0.0005		0.0024	3.76	-0.00001	4.68	0.249	-0.00005	0.00008	0.0166	0.00048	0.00172	0.0076
486	E7 - Perimeter Pond	6/30/2002 8:00	0.141	-0.00005	0.0107	-0.0005		0.0079	1.21	-0.00001	12.9	0.517	-0.00005	-0.00005	0.0049	0.00113	0.00179	0.0161
488	E7 - Perimeter Pond	8/30/2002 15:30	0.204	-0.00005	0.00692	-0.0005		0.0027	1.61	-0.00001	18.7	0.674	-0.00005	0.00006	0.0085	0.00156	0.00229	0.0063
489	E7 - Perimeter Pond	9/30/2002 10:55	0.129	-0.00005	0.00697	-0.0005		0.0024	1.83	-0.00001	16.3	0.582	-0.00005	-0.00005	0.0075	0.00177	0.001	0.0075
490	E7 - Perimeter Pond	10/31/2002 15:55	0.0903	-0.00005	0.00715	-0.0005		0.0028	2.59	-0.00001	16.4	0.611	-0.00005	-0.00005	0.0066	0.00184	0.00059	0.0044
491	E7 - Perimeter Pond	11/28/2002 13:15	0.0846	-0.00005	0.00766	-0.0005		0.0029	2.42	-0.00001	16.8	0.641	-0.00005	-0.00005	0.006	0.00189	0.00052	0.0024
492	E7 - Perimeter Pond	12/30/2002 14:10	0.0775	-0.00005	0.00865	-0.0005		0.0033	3.27	-0.00001	15.6	0.644	-0.00005	0.00013	0.0083	0.00183	0.0013	0.0119
493	E7 - Perimeter Pond	1/30/2003 15:40	0.0935	-0.00005	0.00854	-0.0005		0.0039	2.94	-0.00001	17.3	0.713	-0.00005	0.00028	0.0077	0.00193	0.00092	0.0082
494	E7 - Perimeter Pond	2/28/2003 15:35	0.0266	-0.00005	0.00378	-0.0005		0.0019	1.57	-0.00001	8.75	0.308	-0.00005	0.00006	0.005	0.0008	0.00099	0.0634
495	E7 - Perimeter Pond	3/31/2003 9:10	0.0494	-0.00005	0.00139	-0.0005		-0.0005	1.34	-0.00001	2.58	0.0942	-0.00005	-0.00005	0.0031	0.00021	0.00057	0.005
P5																		
P50																		
P95																		
P99																		

Appendix I – Tailings Source Terms

Tailings Source Terms

Source: C:\Users\sday\Dropbox\Projects\Mount_Polley\SourceTermReport\[TailingsReview_1CI008007_SJD_REV07.xlsx]

		Alkalinity	Cl	F	NO3	NO2	NH3	PO4	SO4	DOC	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Mo	Ni	K	Se	Ag	Na	Tl	U	V	Zn
		mgCaCO3/l	mg/L	mg/L	mgN/L	mgN/L	mgN/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Seepage	P95	99.1	23.4	0.81	1.85	0.037	0.04465	0.006	374	3.81	0.0412	0.0004	0.00179	0.0575	0.00005	0.126	0.00006	119	0.00025	0.00033	0.00417	0.082	0.00005	0.0052	19.1	0.279	0.142	0.00025	15.7	0.0055	0.000005	65.1	0.000025	0.001255	0.001	0.0015
Seepage	P99	163.5	28.9	1.0705	7.702	0.2793	0.15125	0.03025	601.75	7.012	0.7499	0.001107	0.002733	0.09226	0.0005	0.17515	0.000274	190.7	0.002187	0.001077	0.02122	1.023	0.000563	0.009877	30.075	0.7898	0.214	0.001989	17.3	0.0251	0.00002	94.3	0.0001	0.002952	0.003467	0.012
Drained Down	P95	114.8	3.98	1.202	0.1434	0.005	0.04465	0.00844	837.2	0	0.03042	0.005892	0.01198	0.05418	0.00005	0.1408	0.000134	234	0.00025	0.000156	0.03894	0.015	0.000025	0.02572	28.3	0.279	0.8714	0.00066	15.34	0.08372	0.000005	72.18	0.000018	0.001255	0.00744	0.0034
Drained Down	P99	123.28	22.6	1.528	0.7504	0.01	0.15125	0.009424	2016.8	0	0.034336	0.006073	0.012928	0.057736	0.0001	0.2442	0.000527	600.96	0.00025	0.000486	0.049476	0.015	0.00005	0.043632	70.48	0.7898	1.6712	0.001212	29.984	0.40336	0.00001	173.68	2.62E-05	0.002952	0.007628	0.0077

		Alkalinity	Cl	F	NO3	NO2	NH3	PO4	SO4	DOC	Al	Sb	As	Ba	Be	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Mo	Ni	K	Se	Ag	Na	Tl	U	V	Zn
		mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t	mg/t
Ore Processing	P5	73485	1500	11167.89	2266.319	19.50684	606.3256	2758.065	32790	0	281.88	0.4725	6.255	32.61	1.5	33	0.15	25875	1.5	0.3	3	90	0.3	15	2125.65	2.2035	50.52	1.5	2867.85	12.078	0.15	12150	0.3	0.10725	12.48	30
Ore Processing	P50	86550	1545	13680.37	3021.759	26.00912	808.4341	2758.065	48150	0	484.5	1.23	9	42.15	1.5	39	0.15	30330	1.5	0.3	8.1	90	0.3	15	4110	3.135	68.55	1.5	5820	48.75	0.15	14280	0.3	0.222	29.7	30
Ore Processing	P95	92100	2766	14823.01	3777.199	32.5114	1010.543	2758.065	95655	0	578.85	2.3085	20.475	118.8	1.5	75.45	0.15	46005	1.5	0.3	25.755	90	0.3	15	5497.5	14.496	133.515	1.5	8092.5	61.485	0.15	18079.5	0.3	0.33525	53.22	30

APPENDIX D

Water Quality Modelling Report

17 October 2016

MOUNT POLLEY MINING CORPORATION

Water Quality Modelling Report

Submitted to:
Mount Polley Mining Corporation
PO Box 12
Likely, BC
V0L 1N0

Attention: Dale Reimer, General Manager

REPORT

Reference Number: 1411734-176-R-Rev0-16000

Distribution:

1 Electronic Copy - Mount Polley Mining Corporation
1 Hard Copy - Golder Associates Ltd.

Golder Associates

Table of Contents

1.0 INTRODUCTION 1

2.0 MODEL APPROACH 2

2.1 Conceptual Model 2

2.2 Model Platform 3

2.3 Model Set-Up 4

2.3.1 Water Quality Scenarios 5

2.3.2 Open Pits 5

2.3.3 Water Management Ponds and Ditches 6

2.3.4 Waste Rock Dumps and Tailings Storage Facility 6

2.3.5 Ore Stockpiles 7

2.3.6 Receiving Environment 7

2.4 Model Limitations and Uncertainty 8

3.0 MODEL INPUTS 10

3.1 Model Linkages 10

3.2 Site Water Quality 10

3.2.1 Site Monitoring Data Inputs 12

3.3 Receiving Environment Water Quality 18

3.4 Geochemical Source Terms 18

3.5 Mine Plan 18

3.6 Particulate Metals 20

4.0 MODEL CALIBRATION 21

4.1 Observed Concentrations between Projected Ranges 29

4.2 Observed Concentrations below Projected Ranges 29

4.3 Observed Concentrations above Projected Ranges 29

5.0 RESULTS 31

5.1 Operations 31

5.1.1 Quality of Discharge 31

5.1.2 Ore Stockpiles 36

5.1.3 Other Site Facilities 36
5.1.4 Quesnel Lake – Predicted Water Quality 36
5.2 Contingency Scenarios 38
5.2.1 Quality of Discharge 38
5.2.2 Bootjack Lake – Predicted Water Quality 41
5.3 Closure and Post-closure 43
5.3.1 Quality of Discharge 43
5.3.2 Ore Stockpiles 49
5.3.3 Other Site Facilities 49
6.0 SUMMARY 50
7.0 CLOSURE 52
REFERENCES 53
STUDY LIMITATIONS 54

TABLES

Table 2-1: Water Quality Model Constituent List 4
Table 3-1: Summary of Water Quality Inputs to the Springer Pit 11
Table 3-2: Summary of Stochastic Water Quality Inputs 14
Table 5-1: Summary of Predicted Springer Pit and Perimeter Embankment Till Borrow Pond Water Quality – Operations 33
Table 5-2: Summary of Predicted Quesnel Lake Initial Dilution Zone Quality – Operations 37
Table 5-3: Summary of Predicted Springer Pit Water Quality – No Discharge Scenario 39
Table 5-4: Summary of Predicted Bootjack Lake Initial Dilution Zone Quality – No Discharge Scenario 42
Table 5-5: Summary of Predicted Springer Pit Water Quality – Closure and Post-closure 45
Table 5-6: Summary of Predicted Perimeter Embankment Till Borrow Pond Water Quality – Closure and Post-closure 46

FIGURES

Figure 4-1: Springer Pit – Time Series Plots for Selected Parameters – Calibration 23
Figure 4-2: Wight Pit – Time Series Plots for Selected Parameters – Calibration 24
Figure 4-3: Central Collection Sump – Time Series Plots for Selected Parameters – Calibration 25
Figure 4-4: Tailings Storage Facility – Time Series Plots for Selected Parameters – Calibration 26
Figure 4-5: Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters – Calibration 27

Figure 4-6: Northwest Sump – Time Series Plots for Selected Parameters - Calibration....28

Figure 5-1: Springer Pit – Time Series Plots for Selected Parameters – Operations....34

Figure 5-2: Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters – Operations....35

Figure 5-3: Springer Pit – Time Series Plots for Selected Parameters – No Discharge Scenario....40

Figure 5-4: Springer Pit – Time Series Plots for Selected Parameters - Closure and Post-closure....47

Figure 5-5: Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters - Closure and Post-closure....48

ATTACHMENTS

ATTACHMENT A
Seepage Rates for Storage Facilities

ATTACHMENT B
Model Results and Time Series Figures

1.0 INTRODUCTION

Mount Polley Mining Corporation (MPMC) has prepared a Technical Assessment Report (TAR) to support an application to amend its *Environmental Management Act* (EMA) Permit 11678 to allow water discharge for the remainder of Operations. The Terms of Reference (TOR) for developing a TAR require the water quality of all site discharges be predicted and evaluated, as part of an impact assessment, at various points within the mine site and at downstream receptors (MoE 2014). To achieve this objective, a water quality model (WQM) was developed to predict the water quality during Operations from the Perimeter Embankment Till Borrow Pond (PETBP) and the Springer Pit.

A number of contingency scenarios have also been considered to account for unforeseen circumstances, assuming site water would be stored in the Springer Pit and discharge would not occur for an extended period. Hydrogeological modelling (Attachment C of Appendix B of the TAR) indicates that water would exfiltrate from the Springer Pit and migrate towards Bootjack Lake as the pit lake elevation rises and remains above 1,030 metres above sea level (masl). Hydrodynamic models were developed for Quesnel Lake (Appendix J of the TAR) and Bootjack Lake (Appendix I of the TAR) to evaluate the dilution factors of site effluent in initial dilution zones (IDZs) in these lakes. The dilution factors were then applied to the modelled site effluent water qualities to predict the water quality for all model constituents at the edge of the IDZ in each waterbody.

This report provides the details of the WQM development, including the approach, inputs and assumptions, calibration, and model results. Assessment of discharge water qualities and the impact of these discharges on downstream receptors is presented in Section 6.0 of the TAR.

2.0 MODEL APPROACH

The WQM has been developed to satisfy permitting requirements for both EMA and *Mines Act*. The main focal points of the EMA requirements are the point of discharge from the mine and the receiving environment during Operations, which are the subject of the proposed EMA Permit amendment. The *Mines Act* requirements focus on the operational facilities within the mine during Operations and Closure. The *Mines Act* requirements include addressing BC Ministry of Energy and Mines (MEM) review comments on the M-200 Permit amendment application to Return to Full Operations and the Terms of Reference established in the information requests provided by MEM (see Appendix A of the TAR). The TOR include predictions of site water quality during Operations, Closure, and Post-closure in the Springer Pit, the PETBP, and the following other site facilities:

- Central Collection Sump (CCS)
- Cariboo Pit
- 9K Sump
- Northwest (NW) Sump
- Mine Drainage Creek Sump
- Bootjack Creek Sump
- South Embankment Seepage Collection Pond (SESCP)
- Main Embankment Seepage Collection Pond (MESCP)
- Tailings Storage Facility (TSF) supernatant pond
- Seepage from all ore stockpiles (Cariboo, #1, #3, and High Oxide)

The WQM has been developed within an integrated framework that simulates processes within the mine and receiving environment on a continuous time scale.

2.1 Conceptual Model

To evaluate the quality of potential discharges from the Mount Polley Mine (the Mine), the WQM, developed in GoldSim™ (Golder 2015), was updated to reflect the four-year mine plan detailed in the Return to Full Operations Permit Amendment Application (MPMC 2015a). The Closure and Post-closure modelling reflects plans in the 2015 Mine Reclamation and Closure Plan Update (MPMC 2015b), both filed with MEM on 6 November 2015.

A site-wide water balance model (SWWBM) was developed to predict flow on site and in the receiving environment, and comprises the underlying transport framework for evaluating mass transfers in the WQM (Appendix B of the TAR). The SWWBM accounts for all conveyed flows at the Mine as well as flows in local watercourses. The WQM was directly linked to the SWWBM so that mass transfers for each flow were accounted for in the model.

The WQM was set up to predict site and discharge concentrations from October 2014 to January 2100. This comprises four model periods:

- **Calibration (1 October 2014 to 1 February 2016):** The model was developed to hindcast conditions so that the model could be calibrated to historical on-site monitoring data.
- **Operations (1 February 2016 to 30 June 2020):** This includes final stages of restricted operations and the return to full operations.
- **Closure (1 July 2020 to 30 June 2022):** A two-year Closure period is assumed to facilitate the deposition of the potentially acid generating (PAG) stockpile material into the Springer Pit and reclamation of other site facilities (e.g., waste rock dumps).
- **Post-closure (1 July 2022 to 1 January 2100):** This includes pit filling, discharge, and establishing steady-state conditions at site facilities.

The conceptual WQM was developed to account for mine waste management and water management plans for Operations, Closure, and Post-closure, which are described in detail in Sections 2.2 and 2.3, respectively, of the TAR.

2.2 Model Platform

The WQM was developed using GoldSim Version 11.1 (GoldSim 2010). GoldSim is a graphical, object-oriented mathematical modelling program where all input parameters and functions are defined by the user and are built as individual objects or elements linked together by mathematical expressions. The object-based nature of the program is designed to facilitate an understanding of the various factors that control an engineered or natural system and predict potential changes in the system.

GoldSim was selected for the current assessment for the following reasons:

- It facilitates probabilistic simulations, allowing descriptive statistics and probabilities to be assigned to the model outputs.
- The model framework can be easily adjusted to account for changing/future conditions on a mine site, allowing the model to be used as an operational and planning tool.
- Water quantity and water quality models can be directly linked, allowing both models to be updated simultaneously when conducting sensitivity scenarios for alternate water management strategies.

2.3 Model Set-Up

The WQM was developed to evaluate the Mine discharge water quality. However, other Mine facilities (e.g., open pits, ponds, sumps, or ditches) were included in the model so that the influence of drainage from these facilities is reflected in the effluent quality predictions. In the WQM, concentrations at each location were estimated by accounting for storage volumes, mass inflows, and outflows.

The WQM simulated concentrations on a daily time step from October 2014 to 2028, and then on a monthly time-step until January 2100. The flows in the WQM, which were linked directly from the SWWBM, were input monthly for the entire simulation period. The model was run stochastically for 500 realizations. For each realization, a unique value was calculated based on randomly sampled values from within a statistical probability distribution function that was derived for each input. Median and 95th percentile concentrations were then calculated for each site facility in the WQM. To put the results in context, a 95th percentile prediction indicates the maximum concentration that is likely to be reached over the duration of the simulation, with a 95% likelihood that concentrations will be at or below that concentration (it does not suggest that concentrations will exceed this value 5% of the time).

Modelled constituents are listed in Table 2-1. Concentrations were predicted at all points of interest, including concentrations in the downstream receptors proposed in the TAR (Quesnel Lake and Bootjack Lake).

Table 2-1: Water Quality Model Constituent List

Category	Constituent
Physical Parameters	Total Dissolved Solids (calculated), Hardness (calculated)
Major Ions	Calcium, Chloride, Fluoride, Magnesium, Potassium, Sodium, Sulphate
Nutrients	Ammonia, Nitrate, Nitrite, Total Phosphorus
Dissolved Metals and Metalloids	Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Uranium, Vanadium, Zinc

Notes: Other water quality parameters such as pH and temperature were assumed based on historical site monitoring. Total suspended solids concentrations are assumed to be settled to 15 mg/L (milligrams per litre).

Geochemical testing suggests that acid mine drainage is not expected to occur at the Mine during Operations. Therefore, pH and alkalinity were not included in the model. All potentially acid generating (PAG) waste rock is currently stored in the Temporary NW PAG Stockpile, which will be rehandled during Closure for subaqueous disposal in the Springer Pit. Estimated times to the onset of acid generation for PAG material vary between decades (Appendix C of the TAR) and 100 years (MPMC 2015c. This material is assumed to remain non-acid generating (NAG) throughout Operations, and remain NAG following subaqueous disposal.

Approximately 18% of the final Springer Pit wall rock is also expected to be PAG; this material is assumed to remain NAG until 10 years after pit filling (i.e., during 2055), when it is assumed to become acid generating. The pit walls were assumed to remain NAG throughout Operations. To date, acidic drainage has not been observed at the Mine. Therefore, the conservative source term was developed to account for potential acidic drainage to the pit is thought to represent “worst-case” conditions (see Section 3.4). Since the majority of the wall rock drainage reporting to the Springer Pit is from non-PAG wall rock, the pit lake is not expected to become acidic (i.e., acidic drainage, if present, will be neutralized in-pit).

Total metal predictions were calculated using dissolved metal predictions and empirical particulate metal concentrations. The particulate metal inputs and calculations used are discussed in Section 3.0.

2.3.1 Water Quality Scenarios

MPMC maintains a database of site water quality monitoring results that extend over a decade. These data are therefore considered to represent the most probable drainage water quality from Mine site facilities. Source terms developed by SRK Consulting (Appendix C of the TAR) represent a conservative estimate of Mine' site facility drainage water quality under the assumption that the sources are at their solubility limits, and they provide a conservative estimate of how the site drainage could change over the long term. Because it is not possible to know at what point in time the source-term method may become a better predictor of water quality, and because that time may vary for different sources and constituents, the following two scenarios were included in the WQM:

- **Scenario 1:** discharge water quality evaluated using site monitoring data as inputs
- **Scenario 2:** discharge water quality evaluated using source terms developed by SRK (Appendix C of the TAR)

Within the context of the TAR, Scenario 1 results are used as the design basis for water treatment, as well as to provide inputs into the impact assessment. Concentrations modelled in this scenario are thought to be more representative of Operations water quality than Scenario 2 because the main conditions driving source water chemistry (e.g., water management practices, milling and mining activities, pH and redox state of mine materials) are not anticipated to change for the remainder of Operations. The model accounts for the main drivers that are expected to change, such as mining and milling of specific ore bodies and transfer of tailings to the TSF. Therefore, Scenario 1 results were used for deriving permit limits that are proposed for Operations. The Scenario 2 results are provided for use in deriving trigger values that can be compared against monitoring data for the Comprehensive Environment Monitoring Plan (CEMP; see Section 8.0 of the TAR) to identify when adaptive management strategies are required. Future water quality monitoring data can be used to validate both models and will provide an early indication of whether site drainage is tending toward solubility limits, which would indicate the need for additional management strategies. Ongoing monitoring also provides an opportunity to validate and refine source terms, which can in turn be used to update and refine Closure and Post-closure water management strategies.

Details regarding the WQM set-up at each location are described in the following subsections.

2.3.2 Open Pits

The following pits were included in the water model: Springer Pit, Cariboo Pit, Wight Pit, and Boundary Pit. Open pits were modelled as reservoirs in GoldSim, with each inflow that could influence the pit water quality being assigned a flow rate and chemical profile based on site water quality monitoring data or geochemical source terms (Appendix C of the TAR). For pits that are currently flooded or have water stored in them, the initial mass in the reservoir was calculated based on the observed quantity and quality in the pit at the start of the model simulation. Pit lakes and sumps were assumed to be fully mixed with no vertical stratification or lateral heterogeneity.

2.3.3 Water Management Ponds and Ditches

Water management ponds and sumps were modelled using one of two methods. For facilities with sufficient storage capacity (PETBP and MESCP), the water quality was modelled using the method described above for open pits. All other ponds, sumps, and ditches (Mill Site Sump, Mine Drainage Creek Sump, Bootjack Creek Sump, CCS, SESCP, Southeast Rock Disposal Site [SERDS] Ditch, and Long Ditch) had residence times lower than the minimum model time-step (i.e., less than one day) and were therefore modelled as flow-through systems, where all inflow water qualities were conservatively mixed using the predicted flow rates from the SWWBM, following Equation 1.

$$C_{pond} = \frac{\sum C_i V_i}{\sum V_i} \quad (1)$$

Where: C_{pond} = concentration in pond
C_i = concentration in inflow i
V_i = flow rate of inflow i

2.3.4 Waste Rock Dumps and Tailings Storage Facility

Runoff and seepage volumes from waste rock piles and the TSF were predicted by the SWWBM. The WQM assigned an input water quality to these flows based on site monitoring data or geochemical source terms (Appendix C of the TAR), and the load was mixed with other inflows at site facilities using Equation 1. Water quality inputs assigned to these flows are discussed in Sections 3.2 and 3.3.

It was assumed in the model that the TSF will be fully saturated during Operations; however, following Operations, seepage from the TSF will originate from both saturated and unsaturated tailings as draindown of the tailings occurs. The proportion of seepage from saturated and unsaturated tailings in the TSF during Closure and Post-closure are based on hydrogeologic modelling of the facility (see Attachment F of Appendix B of the TAR).

As noted in Section 2.3.1, Scenario 1 predictions assume that mine site facility drainage will be similar to observed conditions into the future. Therefore, in this scenario, a source term for unsaturated tailings is not considered. As indicated in Appendix C of the TAR, the tailings have low concentrations of sulphide and are not highly reactive. Therefore, flushing of oxidation products produced since the drain down of the tailings following the tailings dam breach is not expected to be a significant source of load in comparison to all other site drainages and use of the historical monitoring data to represent operational seepage water quality from the TSF was considered appropriate in the context of this scenario (see Section 2.3.1). The Scenario 2 predictions, which include an unsaturated source term during Closure and Post-closure, are provided to illustrate mine site facility runoff and seepage chemistry should drainages approach their solubility limits. As described in Section 2.3.1, Scenario 2 predictions are provided to derive trigger values as part of the CEMP, to identify when adaptive management strategies would be required, and future water quality monitoring data can be used to validate the model input source term.

In Closure and Post-closure, waste rock dumps and the TSF are assumed to be progressively reclaimed. The associated changes in runoff and seepage volume from waste rock piles and tailings areas were incorporated in the SWWBM. The water quality of runoff from these facilities was assumed to return to natural watershed runoff as revegetation occurs; the time required for water quality to stabilize was assumed to be 20 years after Closure. Seepage from these facilities was assumed to remain as contact water in perpetuity. Monitoring for the remainder of Operations and through Closure and Post-closure will be used to refine these assumptions and revise water management strategies accordingly.

2.3.5 Ore Stockpiles

Ore stockpile areas (e.g., Cariboo, #1, #3, and High Oxide) were included in the waste-rock watershed catchment areas delineated in the SWWBM (Appendix B of the TAR). Flow and load from these facilities were therefore indirectly accounted for in the GoldSim model. To determine the relative annual flow and sulphate load (as a proxy of the relative influence of this drainage on discharge water quality) from these facilities to the total discharge from the Mine, separate calculations were completed using the surface areas of these facilities. Ore stockpile areas were assumed to remain unchanged from the current areas in Closure and Post-closure, with no reclamation. Ore stockpiles were assigned a NAG waste-rock water quality as described in Section 3.0.

Sulphate was selected to account for loadings because it is a conservative parameter with a robust site monitoring data set. Sulphate concentrations are also generally elevated in waste rock seepage data from site relative to other site facilities. The NAG source term was considered appropriate for ore stockpiles because the stockpiles are not expected to be acid generating and metal concentrations will be controlled based on solubility (Appendix C of the TAR).

2.3.6 Receiving Environment

Discharge from the site was assumed to be directed to Quesnel Lake during Operations, and seepage from the Springer Pit may also discharge to Bootjack Lake (see Appendix G of the TAR). To evaluate Mine-related impacts to surface-water quality in Quesnel and Bootjack lakes, three-dimensional hydrodynamic models were developed for these waterbodies. Details of the model development, inputs and assumptions are provided in Appendices I (Bootjack Lake) and J (Quesnel Lake). The hydrodynamic models were used to develop daily and monthly dilution time series at the edge of the IDZ in Quesnel and Bootjack lakes by calculating the density of the effluent (based on temperature, assumed total suspended solids [TSS] and predicted total dissolved solids [TDS] concentrations) and mixing the effluent in the lakes at the predicted discharge rates (see Section 5.0 of the TAR). Daily maximum and monthly average concentrations of all modelled parameters were predicted at the edge of the IDZ using Equation 2:

$$C_{IDZ} = \frac{(C_{eff} - C_{rec})}{D} + C_{rec} \quad (2)$$

Where:
- C_{IDZ} = concentration at edge of IDZ
- C_{eff} = effluent concentration
- C_{rec} = receiving environment concentration
- D = dilution ratio

Daily maximum and monthly average concentrations were calculated for both the maximum mean and maximum 95th percentile discharge concentrations (see Section 5.0 of the TAR), which were screened against the BC Water Quality Guidelines (WQGs) (see Section 6.3 of the TAR).

In the case of discharge to Quesnel Lake, seepage from the Polley Flats area and the TSF that may report to Hazeltine Creek was also conservatively mixed with the predicted water at the edge of the IDZ to account for the loads from these sources. Seepage from the Polley Flats to Quesnel Lake was assumed to occur at 20 L/s based on site observations on 12 May 2016. The water quality of this seepage was assumed to be the mean observed water quality from the Polley Flats measured by MoE in March 2016. These assumptions are considered conservative because the Polley Flats area is currently undergoing remediation and ongoing analysis of the materials indicate concentrations of key parameters (e.g., copper) are decreasing in seepage. Seepage from the TSF was assumed to occur at 3.3 m^3/s based on hydrogeologic modelling (Attachment F of Appendix B of the TAR).

Predicted concentrations at the edge of the IDZ were estimated using untreated site discharge water qualities, and the results were subsequently used as the basis for the surface water impact assessment (see Section 6.0 of the TAR). This approach provides a conservative estimate of impacts to surface water, as well as indicating the need for additional mitigation where guidelines would not be met without specific treatment, as in the case of copper (Appendix E of the TAR).

Closure and Post-closure water quality predictions of site discharges were produced since an objective of this TAR is to develop a Long-Term Water Management Plan that is adaptable to Mine development through Operations, Closure, and Post-closure. However, as noted in Section 5.0 of the TAR, discharge limits are only being sought for the remainder of Operations. The model indicated a need for water treatment at Closure/Post-Closure in order to meet the goal of distributing mine waters back to pre-mining watersheds, and the technology selected to treat Closure drainage will need to be piloted and optimized before reliable treatment predictions can be made. Therefore, receiving environment water qualities are only developed for the Operations period.

2.4 Model Limitations and Uncertainty

In complex systems such as mines and receiving environments, observed conditions will vary with respect to forecasted conditions. Water quality modelling requires the use of many assumptions due to the uncertainty related to determining the physical and geochemical characteristics of a complex system. The prediction of water quality is based on several inputs (e.g., surface and groundwater flows, baseline water quality, future mine contact water quality), all of which have inherent variability and uncertainty. The WQM represents an attempt to incorporate natural and site processes, and combine them with flows to develop predictions for water quality along with associated probabilities.

Given the inherent uncertainties, the WQM should be viewed as a tool to aid in the design of monitoring programs and mine planning, development of mitigation strategies, and identification of potential risks. Therefore, management decisions should consider trends and relative differences in model results rather than absolute concentrations. Conservative assumptions have been incorporated where uncertainty is known to exist, so that predicted concentrations under modelled scenarios are likely to exceed actual future concentrations.

The following key assumptions have been made in the WQM:

- The source term chemical profiles used in the modelling are representative of their respective input sources. The inherent assumption in Scenario 1 is that water quality data obtained to date adequately represent the input sources and will continue to do so over the modelled timeframe. Water quality data for model inputs were selected from available lab testing and field monitoring, augmented by professional judgement where necessary.
- Measured water quality constituents that were lower than the analytical detection limit were set equal to half the detection limit.
- Geochemical characterization studies indicate there is a component of PAG waste rock at site. These materials are stored in the Temporary NW PAG Stockpile, and MPMC proposes to rehandle these materials during Closure for subaqueous disposal in the Springer Pit. Estimated times to the onset of acid generation vary between decades (Appendix C of the TAR) and 100 years (MPMC 2015c).
- Approximately 18% of the combined Cariboo-Springer Pit wall area is considered PAG (MPMC 2016a, pers. comm.). This material is assumed to remain non-acid generating until the pit is filled in Post-closure, and is assigned a water quality equal to that of the monzonite wall rock prior to becoming acid generating. In Scenario 2 simulations, this material is assumed to become acid generating and is assigned a PAG pit wall source term 10 years after the Springer Pit has been refilled.
- All site open pits, ponds, and sumps are fully mixed systems. No stratification is considered over the modelled timeframe. All inputs are mixed with existing water volumes to calculate predicted water quality. Although the Springer Pit does become thermally stratified on a seasonal basis, it is holomictic with turnover frequencies (two per year) shorter than its hydraulic residence time (greater than one year). Therefore, this assumption has minimal effect on predictive ability.
- All constituents are assumed to behave conservatively. That is, they are assumed to not settle, precipitate, sorb, degrade, or undergo any other process that would reduce concentrations. This assumption is likely to have negligible effects on major ion predictions, but may lead to overestimation of some nutrients and metals.
- Waste rock piles are assumed to be reclaimed in Post-closure following the reclamation schedule described in Appendix B of the TAR. Following revegetation, the runoff from these facilities is assumed to return to natural watershed runoff quality. Seepage from waste rock facilities is assumed remain as contact water quality in perpetuity.
- A chemical load from the Polley Flats to Hazeltine Creek is assumed to be equal to the median water quality measured in March 2016 and an estimated flow rate of 20 L/s based on site observations.
- Load from the ore stockpiles left at surface in Closure and Post-closure is assumed to have negligible impact on discharge water quality. Runoff from these areas is assigned background water quality in Closure. During Operations, these areas are assigned NAG waste rock or disturbed land area water quality. Estimated runoff and seepage from these facilities represents less than 5% of the total discharge flow and load from the site.

The data and approach used to estimate future water quality are commensurate with industry best practices (Vandenberg et al. 2011; MEND 2009; INAP 2009) and are believed to provide a reasonable approximation of the system, as currently understood, within the context of the assumptions used in the model.

3.0 MODEL INPUTS

Model inputs were derived from model linkages, site water quality data, receiving environmental water quality, geochemical source terms, and the mine plan. Each of these inputs is described in the sections below.

3.1 Model Linkages

Outputs from several models were used as inputs to the WQM, including:

- **SWWBM (Appendix B of the TAR)**—used as quantity and timing input for all site flows, including: climate, conveyances, and pumping rates.
- **Hydrogeological models (Attachments C and F of Appendix B of the TAR)**—used to assign seepage flow rates to and from open pits, seepage rates from the TSF, and proportion of TSF seepage from unsaturated tailings during Closure.
- **Hydrodynamic modelling of Quesnel Lake (Appendix J of the TAR**)—used to estimate dilution ratios at the edge of the IDZ in Quesnel Lake during Operations.
- **Hydrodynamic modelling of Bootjack Lake (Appendix I of the TAR**)—used to estimate dilution ratios at the edge of the IDZ in Bootjack Lake.

Preliminary estimates of seepage losses from the Northeast Zone (NEZ) Soil Stockpile, the NEZ Dump, the SERDS, and the Temporary NW PAG Stockpile were also developed (Attachment A). Seepage losses from these facilities were not accounted for in the WQM. These volumes are accounted for in the SWWBM and are considered in the surface discharges from the Mine. This approach is considered reasonable for the following reasons:

- These sources represent a small component of the total discharge from the Mine.
- Site discharges are mixed with baseline water quality in Bootjack and Quesnel Lakes and the influence of site seepage on downstream receptors are inherently accounted for in the model baseline inputs.
- Water quality monitoring is conducted regularly in the receiving environment to detect the influence of non-point sources.

3.2 Site Water Quality

A summary description of the water quality assigned to each flow in the model is presented in Table 3-1. Each of the inputs used for the two model scenarios are discussed in additional detail in the following subsections.

Direct precipitation onto the water surface of water management facilities was assumed to carry no load of any modelled constituents.

Table 3-1: Summary of Water Quality Inputs to the Springer Pit

Category	Description	Model Input	
		Scenario 1	Scenario 2
Waste Rock Contact Water	Boundary Pit Waste Rock Seepage and Runoff	Distribution based on observed Boundary Dump Seep water quality (n = 28, June 2013 - May 2015).	SRK source term for Boundary Pit waste rock.
	Wight Pit Waste Rock Seepage and Runoff	Distribution based on observed Joe's Creek Pipe (from North Bell Dump) water quality (n = 16, August 2014 - January 2016).	SRK source term for Wight Pit waste rock.
	NAG Waste Rock Seepage and Runoff (including ore stockpiles)	Distribution based on observed East RDS, NEZ Dump, SERDS Seep water quality (n = 139, May 2013 - December 2015).	SRK source term for NAG waste rock.
	Temporary NW PAG Stockpile Seepage and Runoff	Distribution based on observed PAG Dump Seep water quality (n = 42, May 2013 - May 2015).	SRK source term for PAG waste rock (pre-acid).
	Ore Stockpile Runoff	Same as NAG Waste Rock Runoff input.	Same as NAG Waste Rock Runoff input.
Pit Wall Runoff	Boundary Pit Wall Runoff	Distribution based on observed Boundary, Springer, and Cariboo Pit water quality (n = 39, February 2011 - November 2015).	Based on SRK source terms for wall rock lithologies (BX, MZ, DI, and PAG) and wall rock proportions.
	Wight Pit Wall Runoff	Distribution based on observed Wight Pit water quality (n = 27, September 2006 - November 2015).	Based on SRK source terms for wall rock lithologies (BX, MZ, DI, and PAG) and wall rock proportions.
	Cariboo Pit Wall Runoff	Same as Boundary Pit Wall Runoff Input.	Based on SRK source terms for wall rock lithologies (BX, MZ, DI, and PAG) and wall rock proportions. PAG rock assumed to be MZ until July 2055.
	Springer Pit Wall Runoff	Same as Boundary Pit Wall Runoff Input.	Based on SRK source terms for wall rock lithologies (BX, MZ, DI, and PAG) and wall rock proportions. PAG rock assumed to be MZ until July 2055.
Tailings Storage Facility	TSF Pumped Draindown	Distribution based on observed TSF Main Embankment Drain (E5) water quality (n = 114, January 2006 – October 2013).	SRK source term for TSF Seepage.
	TSF Process Water	Based on predicted load from Wight Pit (flow P16), Springer (flow P1), and TSF (flow P28), plus additional load from SRK source term for processed ore: Fresh Ore = P5, Stockpile Ore = P95.	
	TSF Seepage - Saturated	Predicted TSF water quality.	Predicted TSF water quality.
	TSF Seepage - Unsaturated	Same as TSF Seepage – Saturated.	SRK source term for TSF Draindown (P95 - P99) – representative of unsaturated tailings.
	TSF Beach Runoff	Distribution based on observed TSF supernatant water quality (n = 84, June 2006 - May 2014).	SRK source term for Seepage (P95 - P99).
Other	Disturbed Runoff	Distribution based on W4 and W5 site monitored data (n = 276, January 2006 - May 2014).	
	Undisturbed Runoff	Distribution based on W8 and W8z site monitored water quality (n = 270, January 2006 - November 2015).	
	Groundwater Inflow	Distribution based on GW12-1/2, GW15-1/2 site monitored data (n = 35, June 2013 - June 2015).	

RDS = Rock Disposal Site; NEZ = Northeast Zone; SERDS = Southeast Rock Disposal Site; NW = northwest; PAG = potentially acid generating; NAG = non-acid generating; TSF = Tailings Storage Facility.

3.2.1 Site Monitoring Data Inputs

For each site monitoring data input (Table 3-1), statistical distributions were assigned to each modelled constituent. Available site water quality data were compiled and used to represent these source waters. The following standardized process was used to develop a statistical distribution for each constituent:

- Step 1: Determine if data are available and if values are less than the method detection limit.
- Step 2: Examine time-series of available data to select the most representative range of data to use for input:
  - The following general rules were used to select the data used for input to the model:
    - Where no trend was apparent in the monitored data over time, the whole data set was used as input to the model.
    - Where a decreasing trend was observed in the monitored data, the whole data set was used, including the earlier, higher values, thereby adding conservatism and representing a potential return to conditions that led to higher concentrations (without specifying what those conditions were).
    - Where an increasing trend was observed in the monitored data, input data were limited to the range of data most representative of current or recent conditions.
- Step 3: Remove outliers from selected data:
  - Three statistical tests were used to identify outliers. These included the three times standard deviation (3σ) rule, the Hampel identifier, and combined Rosner-Dixon test. A data point was considered an outlier only if it was flagged by all three tests. By using multiple tests, the possibility of misdiagnoses was reduced (Beckman and Cook 1983; Jain 1981; Kottegoda 1984; Pearson 2001).
- Step 4: Fit suitable statistical distributions to the resulting data:
  - The probability distributions considered for the water quality data were normal, lognormal, or delta-lognormal, as these are typical distributions for water quality data (AEP 1995; US EPA 1991). To identify which distribution best described a constituent, all three distributions were initially fitted to the available data. Statistical goodness of fit tests, consisting of the Chi-squared test, the Kolmogorov-Smirnov test and the squared correlation coefficient (Sokal and Rohlf 1981) were used to determine which distribution was most appropriate.
- Step 5: Process special cases:
  - Two special cases occurred during the above process: data sets with less than 10 observations, and datasets with all observations at a single constant value at or below the analytical detection limit:
    - Where less than 10 observations were available for a constituent, additional comparable site monitoring data were used so that all distributions were based on more than 10 data points.
    - Where all data were at a single value a constant input was used equal to this value.
    - Where all data were below detection limits, a constant input was used at half the detection limit.

  - Where dissolved mercury data were not available for a location, a constant input was used equal to half the lowest detection limit measured on site, consistent with other locations.

- Step 6: Determine the minimum and maximum bounds to define a reasonable range for the selected distribution:
  - The maximum observed value was used as the maximum bound of all distributions.
  - The minimum value of a distribution was set to zero for the normal distribution, a value very close to zero (e.g., 0.00000001) for the lognormal distribution, or half the detection limit for the delta-lognormal distribution.

A summary of the distributions selected, maximum, 95th percentile, and mean values used for each constituent, and number of samples for each water quality input is presented in Table 3-2.

Table 3-2:
Summary of Stochastic Water Quality Inputs

Parameter	Units	Boundary Pit Waste Rock Contact Water					Wight Pit Waste Rock Contact Water / Joe's Creek Pipe					Non-PAG Waste Rock Contact Water				
		Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples	Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples	Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples
Physical Parameters																
Total Dissolved Solids	mg/L	Normal	828	209	1120	28	Normal	1641	100	1790	16	Normal	1227	447	2140	139
Major Ions																
Calcium	mg/L	Normal	203	49	261	28	Normal	328	18	354	16	Normal	261	90	432	139
Chloride	mg/L	Delta-Lognormal	2.1	1.7	2.5	28	Lognormal	7.3	1.3	15	16	Lognormal	3.2	2.3	21	139
Fluoride	mg/L	Lognormal	0.14	1.5	0.3	28	Lognormal	0.14	1.5	0.37	16	Lognormal	0.19	2.2	0.79	139
Magnesium	mg/L	Normal	27	8.6	40	28	Normal	67	4.0	73	16	Normal	48	19	96	139
Potassium	mg/L	Normal	1.4	0.32	2.0	28	Normal	2.5	0.15	2.6	16	Lognormal	2.3	1.7	9.8	139
Sodium	mg/L	Normal	6.4	1.4	8.8	28	Normal	18	0.98	20	16	Normal	18	6.8	44	139
Sulphate	mg/L	Normal	455	145	659	28	Normal	900	47	959	16	Normal	726	322	1400	139
Nutrients																
Ammonia	mg/L (as N)	Lognormal	0.038	3.7	0.41	28	Lognormal	0.0028	1.4	0.0086	16	Delta-Lognormal	0.033	3.9	0.35	133
Nitrate	mg/L (as N)	Delta-Lognormal	0.29	2.5	0.99	28	Normal	39	4.5	46	16	Delta-Lognormal	3.5	4.1	54	139
Nitrite	mg/L (as N)	Lognormal	0.0034	2.4	0.023	28	Lognormal	0.0068	1.7	0.016	16	Delta-Lognormal	0.13	6.8	2.1	135
Total Phosphorus	mg/L	Lognormal	0.079	2.3	0.32	27	Lognormal	0.045	1.1	0.059	16	Lognormal	0.012	2.4	0.056	119
Dissolved Metals																
Aluminum	mg/L	Lognormal	0.003	2.1	0.029	28	Normal	0.0036	0.00054	0.0046	16	Lognormal	0.0079	3.1	0.43	139
Antimony	mg/L	Normal	0.00015	0.000045	0.00024	28	Lognormal	0.00053	1.1	0.00058	16	Normal	0.00026	0.00015	0.00068	138
Arsenic	mg/L	Lognormal	0.00096	1.7	0.0029	28	Normal	0.0014	0.000067	0.0016	16	Lognormal	0.00032	2.0	0.0024	138
Barium	mg/L	Normal	0.04	0.0087	0.056	28	Normal	0.066	0.0047	0.076	16	Lognormal	0.048	1.8	0.19	139
Beryllium	mg/L	Lognormal	0.000052	1.3	0.00019	28	Constant	-	-	0.00005	2	Constant	-	-	0.0001	139
Boron	mg/L	Normal	0.056	0.0073	0.069	28	Lognormal	0.085	1.1	0.095	16	Normal	0.061	0.024	0.12	128
Cadmium	mg/L	Lognormal	0.000024	2.1	0.000074	28	Lognormal	0.000046	1.2	0.000063	16	Lognormal	0.000061	3.4	0.0012	139
Chromium	mg/L	Constant	-	-	0.00025	28	Constant	-	-	0.00025	16	Delta-Lognormal	0.00051	1.7	0.00059	139
Cobalt	mg/L	Lognormal	0.00018	2.7	0.0016	28	Delta-Lognormal	0.000094	1.7	0.00012	16	Delta-Lognormal	0.0012	3.3	0.0071	133
Copper	mg/L	Normal	0.0045	0.0027	0.0095	28	Normal	0.018	0.00091	0.02	16	Lognormal	0.012	3.7	0.52	139
Iron	mg/L	Lognormal	0.041	2.7	0.33	28	Constant	-	-	0.015	16	Delta-Lognormal	0.11	3.5	1.8	138
Lead	mg/L	Lognormal	0.000036	1.8	0.00017	28	Constant	-	-	0.000025	2	Lognormal	0.000034	1.5	0.0002	139
Lithium	mg/L	Delta-Lognormal	0.0019	1.3	0.0029	28	Normal	0.0043	0.0005	0.005	16	Normal	0.002	0.0012	0.0051	138
Manganese	mg/L	Lognormal	0.041	4.9	0.5	28	Lognormal	0.024	1.4	0.054	16	Lognormal	0.06	17	8.9	139
Mercury	mg/L	Constant	-	-	0.0000025	-	Constant	-	-	0.0000025	1	Constant	-	-	0.0000025	-
Molybdenum	mg/L	Lognormal	0.022	1.6	0.054	28	Lognormal	0.07	1.1	0.086	16	Normal	0.13	0.093	0.4	137
Nickel	mg/L	Delta-Lognormal	0.00058	1.7	0.00068	28	Constant	-	-	0.00025	2	Lognormal	0.00067	2.6	0.007	138
Selenium	mg/L	Lognormal	0.0024	1.6	0.0069	28	Normal	0.053	0.0055	0.06	16	Lognormal	0.036	3.9	0.26	139
Silicon	mg/L	Normal	6.1	0.61	7.6	28	Normal	5.9	0.21	6.3	16	Lognormal	5.7	1.2	9.5	139
Silver	mg/L	Delta-Lognormal	0.0000086	1.7	0.00001	28	Constant	-	-	0.000005	2	Lognormal	0.0000069	1.5	0.000044	139
Strontium	mg/L	Normal	2.1	0.75	3.6	28	Normal	3.5	0.28	4.0	16	Lognormal	2.0	2.2	7.5	139
Thallium	mg/L	Lognormal	0.0000053	1.3	0.00002	28	Constant	-	-	0.000005	2	Lognormal	0.0000065	1.4	0.000035	139
Tin	mg/L	Constant	-	-	0.00005	28	Constant	-	-	0.00005	2	Lognormal	0.000066	1.4	0.00025	139
Titanium	mg/L	Normal	0.012	0.0057	0.024	28	Normal	0.012	0.0073	0.023	16	Normal	0.011	0.0068	0.031	139
Uranium	mg/L	Normal	0.00084	0.00032	0.0015	28	Normal	0.0014	0.00018	0.0017	16	Normal	0.0012	0.00074	0.0034	132
Vanadium	mg/L	Lognormal	0.00049	1.4	0.0015	28	Delta-Lognormal	0.00057	1.7	0.00066	10	Lognormal	0.00058	1.8	0.004	139
Zinc	mg/L	Lognormal	0.0017	1.4	0.004	28	Delta-Lognormal	0.0058	1.1	0.0068	16	Lognormal	0.0046	3.2	0.14	139

Table 3-2:
Summary of Stochastic Water Quality Inputs

Parameter	Units	PAG Waste Rock Contact Water					Pit Wall Rock Runoff (Springer Pit, Cariboo Pit, Boundary Pit)					Wight Pit Wall Rock Runoff				
		Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples	Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples	Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples
Physical Parameters																
Total Dissolved Solids	mg/L	Normal	1190	495	2140	38	Lognormal	686	1.5	1300	28	Lognormal	994	1.2	1460	14
Major Ions																
Calcium	mg/L	Normal	252	104	432	38	Lognormal	146	1.5	267	28	Normal	227	46	306	13
Chloride	mg/L	Lognormal	4.2	2.0	14	38	Lognormal	4.2	2.6	15	28	Lognormal	2.5	1.6	5.5	11
Fluoride	mg/L	Lognormal	0.1	1.6	0.31	38	Normal	0.57	0.23	0.93	14	Lognormal	0.77	1.7	2.0	6
Magnesium	mg/L	Normal	46	17	76	38	Normal	24	11	42	28	Lognormal	28	1.2	39	13
Potassium	mg/L	Normal	4.2	1.6	9.0	38	Normal	2.3	1.3	5.5	28	Lognormal	1.7	1.2	2.1	12
Sodium	mg/L	Normal	20	8.7	44	38	Normal	22	12	43	28	Normal	30	13	71	26
Sulphate	mg/L	Normal	591	311	1140	38	Lognormal	332	1.8	736	28	Lognormal	483	1.3	836	27
Nutrients																
Ammonia	mg/L (as N)	Lognormal	0.057	5.5	1.6	38	Lognormal	0.035	9.2	2.5	39	Delta-Lognormal	0.18	3.6	1.5	24
Nitrate	mg/L (as N)	Normal	20	16	54	42	Lognormal	7.7	1.8	33	38	Lognormal	5.8	2.0	19	14
Nitrite	mg/L (as N)	Delta-Lognormal	0.16	6.4	2.1	39	Delta-Lognormal	0.05	3.3	0.45	38	Lognormal	0.025	3.7	0.27	26
Total Phosphorus	mg/L	Delta-Lognormal	0.034	1.8	0.1	33	Delta-Lognormal	0.0065	1.6	0.015	38	Lognormal	0.015	4.0	0.17	26
Dissolved Metals																
Aluminum	mg/L	Delta-Lognormal	0.0076	1.6	0.022	37	Lognormal	0.0034	1.9	0.014	36	Delta-Lognormal	0.021	1.7	0.11	25
Antimony	mg/L	Normal	0.00025	0.00013	0.0005	42	Normal	0.0019	0.00046	0.0032	37	Lognormal	0.0013	1.3	0.0019	13
Arsenic	mg/L	Normal	0.00056	0.00017	0.0013	38	Normal	0.0017	0.00077	0.0036	39	Delta-Lognormal	0.0018	2.1	0.0062	26
Barium	mg/L	Normal	0.094	0.036	0.19	42	Lognormal	0.044	1.5	0.091	28	Normal	0.032	0.0077	0.04	13
Beryllium	mg/L	Constant	-	-	0.0001	42	Constant	-	-	0.0013	39	Constant	-	-	0.0013	25
Boron	mg/L	Normal	0.046	0.017	0.083	37	Normal	0.14	0.076	0.28	28	Delta-Lognormal	0.64	1.5	1.6	26
Cadmium	mg/L	Lognormal	0.000043	3.8	0.0005	42	Lognormal	0.000067	2.0	0.0002	39	Normal	0.00019	0.00012	0.00042	25
Chromium	mg/L	Delta-Lognormal	0.00051	1.7	0.00059	42	Constant	-	-	0.000025	39	Constant	-	-	0.0013	25
Cobalt	mg/L	Lognormal	0.0013	6.5	0.026	42	Lognormal	0.00021	2.1	0.00077	39	Normal	0.0011	0.00059	0.0023	25
Copper	mg/L	Lognormal	0.0081	1.8	0.025	42	Lognormal	0.018	1.8	0.071	39	Delta-Lognormal	0.018	2.6	0.15	26
Iron	mg/L	Lognormal	0.043	4.0	1.8	41	Constant	-	-	0.015	38	Constant	-	-	0.015	25
Lead	mg/L	Lognormal	0.000036	1.6	0.0002	42	Constant	-	-	0.000025	22	Delta-Lognormal	0.0011	1.7	0.0012	25
Lithium	mg/L	Normal	0.0017	0.001	0.0042	42	Lognormal	0.0054	1.6	0.012	39	Normal	0.01	0.0034	0.016	25
Manganese	mg/L	Normal	2.2	2.3	8.9	42	Lognormal	0.034	2.4	0.16	28	Lognormal	0.12	2.6	0.53	25
Mercury	mg/L	Constant	-	-	0.0000025	-	Constant	-	-	0.0000025	-	Constant	-	-	0.0000025	-
Molybdenum	mg/L	Lognormal	0.043	5.4	0.58	42	Normal	0.14	0.054	0.23	28	Normal	0.15	0.03	0.2	13
Nickel	mg/L	Lognormal	0.00061	2.0	0.0032	42	Lognormal	0.00032	1.5	0.001	26	Normal	0.00098	0.00032	0.0014	25
Selenium	mg/L	Normal	0.08	0.071	0.26	42	Lognormal	0.027	1.6	0.075	39	Delta-Lognormal	0.012	1.5	0.023	13
Silicon	mg/L	Lognormal	7.2	1.1	9.5	38	Normal	5.9	2.2	10	28	Delta-Lognormal	8.9	1.1	12	25
Silver	mg/L	Lognormal	0.0000078	1.8	0.000044	42	Lognormal	0.0000074	1.6	0.000026	39	Constant	-	-	0.000025	25
Strontium	mg/L	Normal	1.1	0.36	1.5	42	Normal	2.2	1.2	3.9	28	Delta-Lognormal	8.7	1.6	22	26
Thallium	mg/L	Constant	-	-	0.00001	42	Constant	-	-	0.00001	39	Lognormal	0.000081	3.7	0.00025	25
Tin	mg/L	Constant	-	-	0.0001	42	Constant	-	-	0.0001	39	Constant	-	-	0.00025	25
Titanium	mg/L	Normal	0.011	0.0077	0.031	42	Normal	0.0089	0.005	0.022	28	Delta-Lognormal	0.0099	1.7	0.012	24
Uranium	mg/L	Normal	0.0013	0.00067	0.0027	42	Normal	0.0057	0.0016	0.0096	27	Normal	0.0045	0.0017	0.0079	13
Vanadium	mg/L	Lognormal	0.00062	2.1	0.004	42	Lognormal	0.001	1.9	0.0033	39	Lognormal	0.0014	1.9	0.0032	25
Zinc	mg/L	Lognormal	0.0026	2.0	0.028	42	Lognormal	0.0017	1.5	0.005	28	Delta-Lognormal	0.015	1.4	0.023	12

Table 3-2:
Summary of Stochastic Water Quality Inputs

Parameter	Units	Tailings Pumped Draindown					TSF Beach Runoff					Disturbed Site Runoff				
		Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples	Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples	Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples
Physical Parameters																
Total Dissolved Solids	mg/L	Normal	820	90	1040	47	Normal	909	70	996	30	Delta-Lognormal	211	2.2	1110	264
Major Ions																
Calcium	mg/L	Lognormal	130	1.2	176	41	Normal	150	14	171	26	Lognormal	50	2.3	242	233
Chloride	mg/L	Normal	23	1.8	27	52	Normal	22	4.5	28	32	Lognormal	0.64	2.5	13	188
Fluoride	mg/L	Normal	0.9	0.15	1.1	21	Normal	0.69	0.096	0.86	24	Lognormal	0.072	1.3	0.13	113
Magnesium	mg/L	Normal	20	2.6	26	41	Lognormal	17	1.3	30	26	Lognormal	9.1	2.2	48	233
Potassium	mg/L	Normal	12	2.0	16	86	Normal	21	4.6	31	26	Lognormal	0.96	1.8	3.6	233
Sodium	mg/L	Normal	78	6.7	90	41	Normal	78	14	100	26	Lognormal	4.7	1.8	16	233
Sulphate	mg/L	Normal	448	61	577	47	Normal	546	43	596	32	Lognormal	37	4.3	539	265
Nutrients																
Ammonia	mg/L (as N)	Normal	0.064	0.02	0.1	47	Lognormal	0.24	1.9	0.88	30	Lognormal	0.004	2.3	12	265
Nitrate	mg/L (as N)	Lognormal	2.0	1.5	3.8	47	Lognormal	6.3	1.2	10	30	Lognormal	0.36	9.8	26	257
Nitrite	mg/L (as N)	Lognormal	0.016	7.4	0.22	89	Lognormal	0.11	1.4	0.22	30	Lognormal	0.0011	4.0	0.86	260
Total Phosphorus	mg/L	Normal	0.034	0.0058	0.044	48	Lognormal	0.012	2.2	0.06	30	Lognormal	0.021	1.7	0.35	276
Dissolved Metals																
Aluminum	mg/L	Lognormal	0.0025	1.6	0.01	85	Lognormal	0.022	1.6	0.088	26	Lognormal	0.024	4.0	1.7	232
Antimony	mg/L	Lognormal	0.00038	1.3	0.00083	85	Normal	0.0017	0.00045	0.0056	26	Lognormal	0.000081	1.9	0.00047	233
Arsenic	mg/L	Lognormal	0.0018	1.2	0.0024	86	Normal	0.0017	0.00032	0.003	26	Lognormal	0.00041	1.6	0.0016	233
Barium	mg/L	Lognormal	0.07	1.1	0.09	41	Normal	0.072	0.0074	0.12	26	Lognormal	0.024	2.1	0.11	233
Beryllium	mg/L	Constant	-	-	0.0005	85	Constant	-	-	0.00005	25	Constant	-	-	0.0013	233
Boron	mg/L	Normal	0.13	0.017	0.17	86	Normal	0.12	0.02	0.15	26	Lognormal	0.039	1.8	0.15	233
Cadmium	mg/L	Lognormal	0.000063	2.7	0.00039	86	Lognormal	0.000025	2.3	0.0001	25	Lognormal	0.000012	2.6	0.00016	233
Chromium	mg/L	Lognormal	0.00032	1.5	0.002	85	Constant	-	-	0.00025	26	Lognormal	0.00037	1.8	0.0023	233
Cobalt	mg/L	Delta-Lognormal	0.00032	1.2	0.00046	85	Normal	0.000066	0.000031	0.00014	26	Lognormal	0.000072	2.0	0.00093	233
Copper	mg/L	Lognormal	0.0013	1.7	0.0062	84	Lognormal	0.0016	1.6	0.0067	26	Lognormal	0.0054	1.7	0.06	233
Iron	mg/L	Delta-Lognormal	0.024	1.7	0.042	85	Constant	-	-	0.015	26	Lognormal	0.039	2.8	1.3	233
Lead	mg/L	Lognormal	0.000029	1.4	0.00005	83	Constant	-	-	0.000025	26	Lognormal	0.000036	1.8	0.00066	233
Lithium	mg/L	Delta-Lognormal	0.0055	1.1	0.0071	85	Lognormal	0.0097	1.6	0.024	26	Lognormal	0.0013	3.5	0.012	233
Manganese	mg/L	Normal	0.37	0.061	0.49	40	Normal	0.016	0.011	0.037	26	Lognormal	0.0056	3.4	0.33	233
Mercury	mg/L	Constant	-	-	0.0000025	-	Constant	-	-	0.000005	2	Constant	-	-	0.0000025	-
Molybdenum	mg/L	Lognormal	0.15	1.2	0.2	86	Normal	0.18	0.02	0.21	26	Lognormal	0.0057	3.8	0.06	233
Nickel	mg/L	Lognormal	0.00033	1.5	0.0011	85	Lognormal	0.00029	1.4	0.00073	26	Lognormal	0.00043	1.8	0.0042	233
Selenium	mg/L	Lognormal	0.0064	1.5	0.014	41	Lognormal	0.024	1.3	0.042	25	Lognormal	0.0018	5.3	0.058	233
Silicon	mg/L	Lognormal	6.5	1.0	7.0	41	Normal	5.5	1.1	7.5	26	Constant	-	-	0.000005	-
Silver	mg/L	Constant	-	-	0.0001	85	Constant	-	-	0.000005	25	Lognormal	0.0000068	1.7	0.000029	233
Strontium	mg/L	Normal	1.3	0.49	2.3	86	Normal	1.4	0.16	4.8	26	Lognormal	0.34	2.6	2.7	233
Thallium	mg/L	Normal	0.000052	0.000034	0.0001	85	Delta-Lognormal	0.000022	1.7	0.000029	25	Constant	-	-	0.00025	233
Tin	mg/L	Constant	-	-	0.0001	85	Constant	-	-	0.00005	26	Lognormal	0.000061	1.7	0.0006	233
Titanium	mg/L	Lognormal	0.0056	1.3	0.015	41	Normal	0.0072	0.0041	0.016	26	Lognormal	0.0052	1.6	0.061	233
Uranium	mg/L	Normal	0.0013	0.0001	0.0015	41	Normal	0.00068	0.00037	0.0018	26	Lognormal	0.00025	2.9	0.002	233
Vanadium	mg/L	Constant	-	-	0.0005	30	Normal	0.0048	0.0025	0.01	26	Lognormal	0.00063	1.7	0.0048	233
Zinc	mg/L	Lognormal	0.00093	1.7	0.0031	85	Lognormal	0.0016	1.4	0.0059	26	Lognormal	0.0014	1.8	0.029	233

Table 3-2:
Summary of Stochastic Water Quality Inputs

Parameter	Units	Undisturbed Site Runoff					Groundwater Inflow				
		Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples	Distribution Selected	Mean	Standard Deviation	Maximum	Number of Samples
Physical Parameters											
Total Dissolved Solids	mg/L	Normal	138	65	277	264	Lognormal	213	1.6	629	35
Major Ions											
Calcium	mg/L	Lognormal	18	2.1	52	247	Lognormal	46	2.0	133	35
Chloride	mg/L	Lognormal	1.7	2.8	12	157	Lognormal	1.0	2.6	4.6	35
Fluoride	mg/L	Lognormal	0.066	1.6	0.14	68	Normal	0.26	0.15	0.49	35
Magnesium	mg/L	Lognormal	6.5	2.5	23	249	Normal	13	10	32	35
Potassium	mg/L	Lognormal	0.81	1.5	2.6	247	Lognormal	0.56	2.6	2.1	35
Sodium	mg/L	Lognormal	4.7	1.7	12	247	Lognormal	12	1.9	29	35
Sulphate	mg/L	Delta-Lognormal	5.2	2.2	26	265	Lognormal	57	2.6	363	35
Nutrients											
Ammonia	mg/L (as N)	Lognormal	0.0043	1.9	0.029	265	Delta-Lognormal	0.014	1.7	0.018	35
Nitrate	mg/L (as N)	Lognormal	0.039	4.9	0.94	251	Delta-Lognormal	0.81	9.0	9.8	35
Nitrite	mg/L (as N)	Lognormal	0.001	2.8	0.028	256	Delta-Lognormal	0.055	1.7	0.36	35
Total Phosphorus	mg/L	Lognormal	0.022	1.5	0.089	266	Lognormal	0.017	2.2	0.073	35
Dissolved Metals											
Aluminum	mg/L	Normal	0.12	0.095	0.41	248	Delta-Lognormal	0.0057	1.4	0.0085	35
Antimony	mg/L	Lognormal	0.000052	1.3	0.00016	249	Lognormal	0.000086	2.1	0.0006	35
Arsenic	mg/L	Lognormal	0.00058	1.8	0.0018	249	Lognormal	0.0012	2.7	0.0082	35
Barium	mg/L	Normal	0.0084	0.0023	0.014	247	Normal	0.019	0.011	0.04	35
Beryllium	mg/L	Constant	-	-	0.00005	76	Constant	-	-	0.00005	35
Boron	mg/L	Normal	0.014	0.0073	0.031	246	Normal	0.22	0.16	0.53	35
Cadmium	mg/L	Lognormal	0.0000097	1.7	0.000039	246	Lognormal	0.0000065	2.3	0.000047	35
Chromium	mg/L	Normal	0.0009	0.00029	0.0018	249	Delta-Lognormal	0.00057	1.7	0.00066	35
Cobalt	mg/L	Lognormal	0.000061	1.5	0.0003	248	Delta-Lognormal	0.00024	1.8	0.0006	35
Copper	mg/L	Normal	0.0027	0.0016	0.0071	249	Delta-Lognormal	0.0011	1.7	0.0025	35
Iron	mg/L	Normal	0.16	0.11	0.55	249	Delta-Lognormal	0.19	1.7	0.33	35
Lead	mg/L	Lognormal	0.000036	1.8	0.00024	247	Delta-Lognormal	0.00011	1.7	0.00028	35
Lithium	mg/L	Delta-Lognormal	0.00093	1.7	0.002	76	Normal	0.0028	0.0011	0.0048	35
Manganese	mg/L	Lognormal	0.0052	2.4	0.037	248	Lognormal	0.013	17	0.83	35
Mercury	mg/L	Constant	-	-	0.0000025	-	Constant	-	-	0.0000025	-
Molybdenum	mg/L	Normal	0.0012	0.0013	0.0057	247	Normal	0.029	0.016	0.062	35
Nickel	mg/L	Normal	0.001	0.00059	0.0023	249	Delta-Lognormal	0.0015	1.7	0.0037	35
Selenium	mg/L	Lognormal	0.00041	1.4	0.0014	249	Lognormal	0.00063	15	0.072	35
Silicon	mg/L	Lognormal	5.3	1.3	8.5	249	Lognormal	8.6	1.2	13	35
Silver	mg/L	Lognormal	0.0000068	1.7	0.000035	248	Constant	-	-	0.000005	35
Strontium	mg/L	Lognormal	0.16	1.8	0.68	249	Normal	0.23	0.14	0.62	35
Thallium	mg/L	Lognormal	0.0000068	1.9	0.000025	76	Delta-Lognormal	0.0000094	1.7	0.000011	35
Tin	mg/L	Lognormal	0.00005	1.3	0.00048	249	Delta-Lognormal	0.00017	1.7	0.00035	35
Titanium	mg/L	Lognormal	0.0049	1.4	0.014	249	Delta-Lognormal	0.011	1.7	0.013	35
Uranium	mg/L	Lognormal	0.00023	3.1	0.0016	249	Normal	0.0005	0.00035	0.0015	35
Vanadium	mg/L	Lognormal	0.00058	1.5	0.0021	249	Delta-Lognormal	0.0026	2.1	0.011	35
Zinc	mg/L	Lognormal	0.0013	1.9	0.0076	249	Delta-Lognormal	0.0042	1.7	0.0064	35

3.3 Receiving Environment Water Quality

Mean baseline water quality for each receiving environment, Quesnel Lake and Bootjack Lake, was used in IDZ water quality calculations (see Section 2.3.6). Development of these baseline water qualities is discussed in Section 3.0 of the TAR. Baseline water quality profiles for receiving environment locations are presented in Table 3-16 and Table 3-17 of the TAR.

3.4 Geochemical Source Terms

Derivation of geochemical source terms is described by SRK (Appendix C of the TAR). Source terms were developed from interpretation of site data and geochemical testing, or by scaling up of laboratory testing (pit wall source terms). Source terms were derived for the major geochemical sources identified at site:

- waste rock piles
- stored tailings
- ore processing
- pit walls
- ore stockpiles

Source terms were input to the Scenario 2 site WQM as static water quality or loading inputs, as recommended by SRK (Appendix C of the TAR) and presented in Table 3-1.

Two stochastic simulations of Scenario 2 were run using the high and low ranges of the geochemical source terms. These simulations encompass the full range of water qualities predicted by the geochemical source terms. Both of these simulations are considered conservative as the lower of the Scenario 2 simulations uses median and 95th percentile geochemical source term inputs (rather than a lower bound).

Input concentrations of nitrogen species in waste rock pile runoff and seepage were provided for both active and inactive piles. All inputs are assigned the inactive source term beginning in Closure.

Loading rates for ore processing were provided as 5th percentile, median, and 95th percentile rates. Following advice provided by SRK (Appendix C of the TAR), the 5th percentile rate were assigned to fresh ore in the mill, while the 95th percentile rate was assigned to stockpiled ore processed in the mill.

3.5 Mine Plan

In addition to the mine plan information incorporated into the SWWBM, the WQM also used the expected relative proportions of fresh and stockpiled ore to be processed in the mill (MPMC 2016b, pers. comm.), and capacity of pore space within PAG rock deposited in the Springer Pit. As presented in Section 3.4, the loading rate inputs used to represent mass addition during processing from these materials is different. The proportion of stockpiled ore throughout Operations used in the model is presented in Table 3-3.

The SWWBM assumes the PAG rock in the Temporary NW Stockpile will be deposited in the Springer Pit during Closure to a final elevation of 1,004 masl (Appendix B of the TAR). All pit lake capacity below this elevation represents pore space within the PAG rock. The WQM assumes that, following deposition of the PAG rock, all inflow to the Springer Pit will become entrained within this pore space until the rock is saturated. At this point, a closure pit lake will form above the PAG rock. The model assumes there will be no mixing of PAG pore space water with the overlying pit lake.

All groundwater inflow to and outflow from the Springer Pit lake following deposition of the PAG material is assumed to occur below 1,004 masl, i.e., within the deposited PAG rock. The water quality in the PAG pore space is not modelled directly. Where groundwater inflow exceeds outflow, the excess is assumed to mix with the overlying pit lake. This flow is assigned the NAG waste rock input water quality. Where groundwater outflow exceeds inflow, this is represented as a loss of pit lake water to the PAG pore space.

Table 3-3: Schedule of Stockpiled Ore to be processed

Date/Period	Percentage Stockpiled Ore Processed (%)
9/1/2015	0
10/1/2015	0
11/1/2015	0
12/1/2015	0
1/1/2016	0
2/1/2016	23
3/1/2016	23
4/1/2016	22
5/1/2016	4
6/1/2016	0
7/1/2016	0
8/1/2016	0
9/1/2016	0
10/1/2016	0
11/1/2016	0
12/1/2016	0
2017 Q1	0
2017 Q2	0
2017 Q3	0
2017 Q4	0
2018 Q1	0
2018 Q2	0
2018 Q3	5
2018 Q4	0
2019 Q1	0
2019 Q2	40
2019 Q3	100
2019 Q4	100

Date/Period	Percentage Stockpiled Ore Processed (%)
2020 Q1	100
2020 Q2	100
2020 Q3	100
2020 Q4	0
2021 Q1	0
2021 Q2	0
2021 Q3	0
2021 Q4	0

3.6 Particulate Metals

Total metal predictions were calculated using dissolved metal predictions and empirical particulate metal concentrations. Monitoring data for the SERDS Ditch and Long Ditch were used to establish the empirical particulate metal concentrations because these facilities are expected to contribute the majority of particulate load to site discharges. The model assumes that TSS will be settled to 15 mg/L (i.e., the maximum permitted discharge concentrations) prior to being discharged.

Monitored data for total and dissolved metals were used to calculate observed particulate metal concentrations in the SERDS Ditch and Long Ditch. The strength of correlation of measured particulate metal concentrations to TSS concentrations was calculated using linear regressions. An empirical particulate metal concentration for each parameter was established by grouping each parameter into the following categories:

- **Correlated parameters** ($R^2 \geq 0.75$)—a particulate concentration corresponding to 15 mg/L TSS was calculated using the regression equation, and this concentration was added to both the maximum median and 95th percentile dissolved metal predictions to calculate a total metal concentration.
- **Poorly-correlated parameters** ($0.25 < R^2 < 0.75$)—median and 95th percentile particulate concentrations were calculated based on observed data for samples with a TSS below 15 mg/L, and these concentrations were added to the maximum median and 95th percentile dissolved metal concentrations, respectively.
- **Non-correlated parameters** ($R^2 \leq 0.25$)—median and 95th percentile particulate concentrations were calculated based on all observed data, and these concentrations were added to the maximum median and 95th percentile dissolved metal concentrations, respectively.

4.0 MODEL CALIBRATION

The WQM was set up to hindcast concentrations from October 2014 to January 2016. Predictions and observations were used to check model performance, and to update inputs or assumptions to calibrate the model at the following locations:

- Springer Pit
- Wight Pit
- CCS
- PETBP
- TSF
- NW Sump

While all of these facilities were included in the comparison, calibration efforts were focussed on the facilities with the most complete dataset during the calibration period; namely the Springer Pit, PETBP and NW Sump.

To avoid over-tuning the model, the calibration also focused on key parameters (total dissolved solids [TDS], sulphate, nitrate, dissolved copper, dissolved molybdenum, and dissolved selenium) for Scenario 1. Where discrepancies between modelled and monitored data existed, the model was adjusted to better reflect monitoring data. The following adjustments were used to achieve calibration with monitoring data:

- adjusting the proportion of Wight Pit runoff and groundwater inflows assumed to be waste rock contact water based on storage of waste rock in the pit
- adjusting input data used to develop disturbed and undisturbed site runoff inputs based on advice from site personnel
- scaling of mill loading rates provided by SRK

Adjusted predictions for Scenario 1 are shown compared to monitoring data in Figures 4-1 to 4-6 (predictions for all parameters and locations are provided in Attachment B). Following the adjustments noted above, the model results are considered to be reasonably well calibrated to monitoring data for the key parameters presented, with the exception of Wight Pit, which is discussed further in Section 4.3.

For the Scenario 2 model, calibration efforts focussed on conservative parameters: TDS and sulphate. In addition to the adjustments described above, the following changes were also made to better match monitoring data during the calibration period:

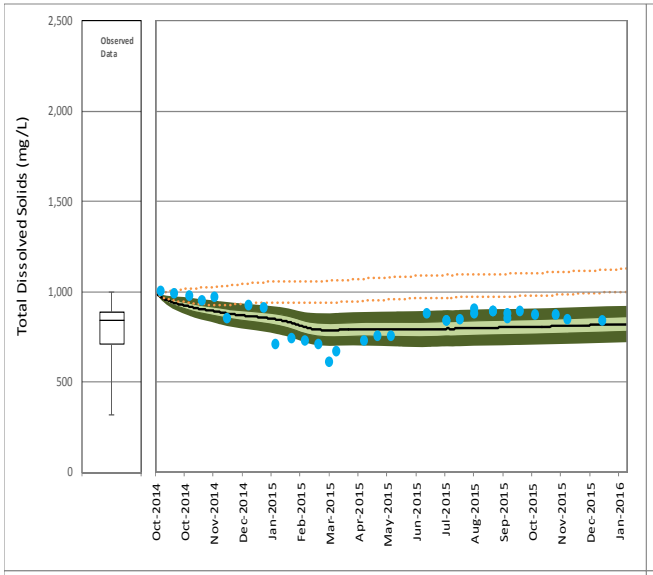
- adjusting the proportion of undisturbed runoff to waste rock contact water quality in runoff from waste rock piles (with the exception of nitrogen species)
- no scaling of mill loading rates was performed

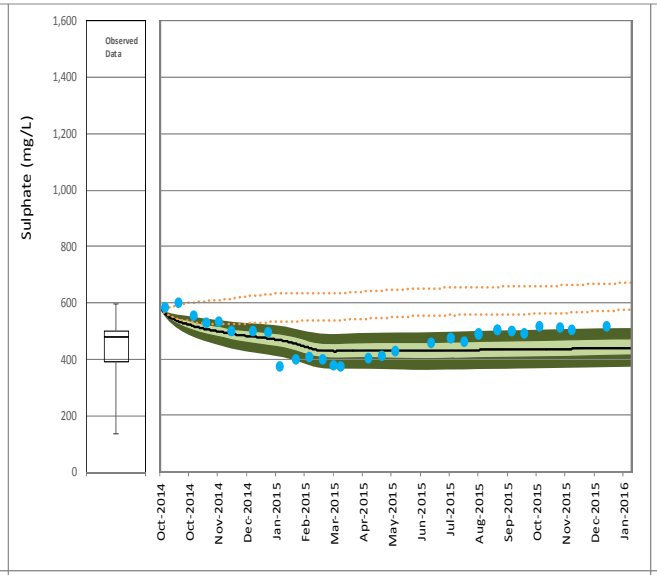
The mill loading rate was scaled in Scenario 1 because it was inherently accounted for in the site monitoring data and was therefore considered to be a “degree of freedom” that could be calibrated. In Scenario 2, this source term was treated as an explicit input that was not subject to calibration.

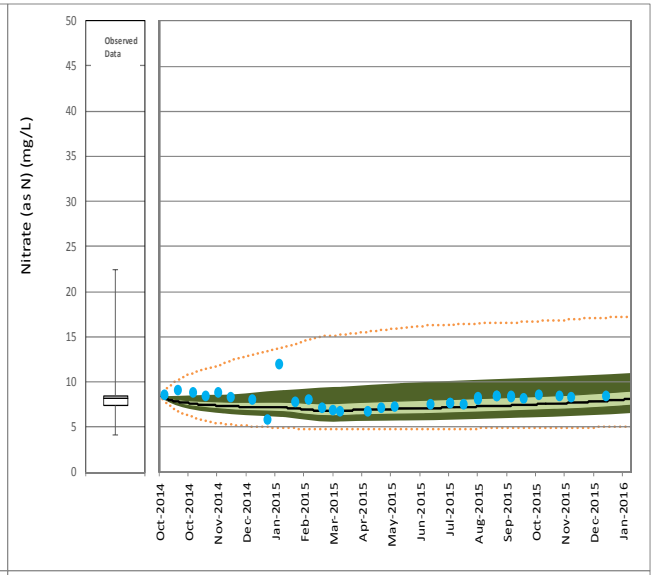
Scenario 2 predictions are shown as orange lines in Figures 4-1 to 4-6. These lines represent the 95th percentile from the most conservative (“High”) model simulation, and the 5th percentile from the less conservative (“Low”) model simulation. The model results for calibrated parameters (TDS, sulphate) match monitored data reasonably well. Model results for other parameters (nitrate, copper, molybdenum, and selenium) tend to be higher in Scenario 2 than in the monitored data or Scenario 1 predictions. This discrepancy was expected as the geochemical source term inputs used in Scenario 2 are considered representative of a conservative long-term water quality where parameters have reached their solubility limits (Appendix C of the TAR).

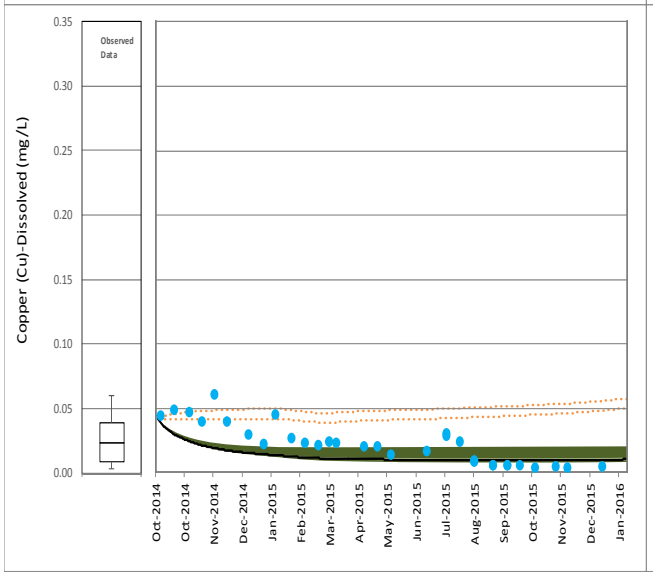
Based on the comparison of the calibration model results to monitored concentrations at calibrated locations, model performance for predicting constituent concentrations can be grouped into three categories:

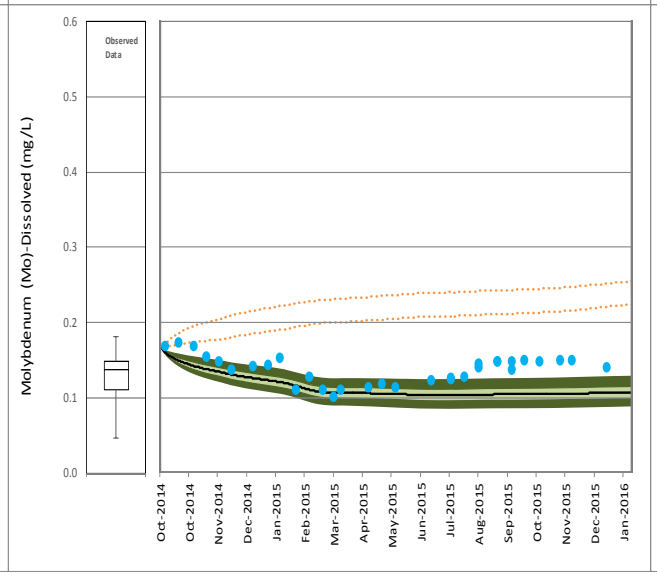
- Observed concentrations were between the projected 5th and 95th percentile model results, including:
  - TDS, calcium, magnesium, sulphate, ammonia, nitrate, nitrite, aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, mercury, nickel, selenium, titanium, and vanadium.
- Observed concentrations were generally below the 5th percentile model results, including:
  - Chloride, fluoride, silicon, potassium, silicon, sodium, phosphorus, beryllium, manganese, silver, thallium, tin, and zinc.
- Observed concentrations were greater than the 95th percentile model results, including:
  - Antimony, boron, lithium, molybdenum, strontium, and uranium.

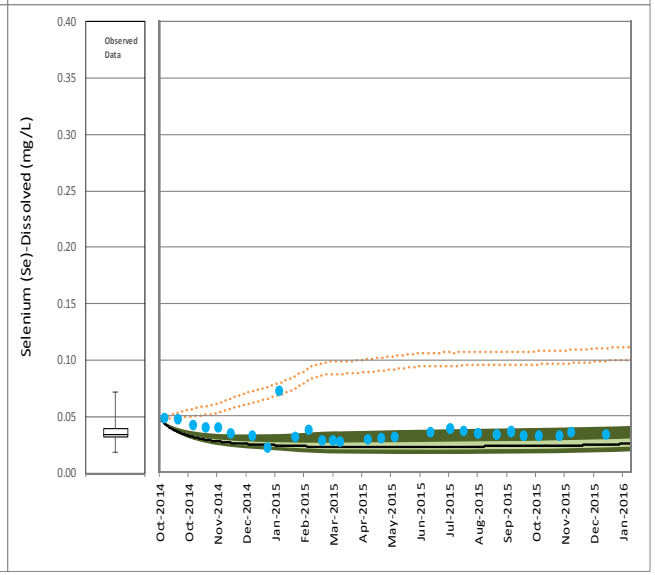


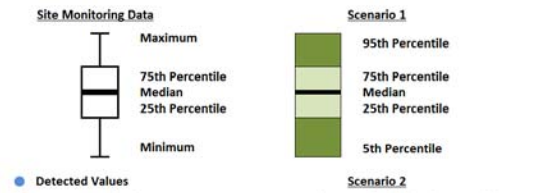












Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

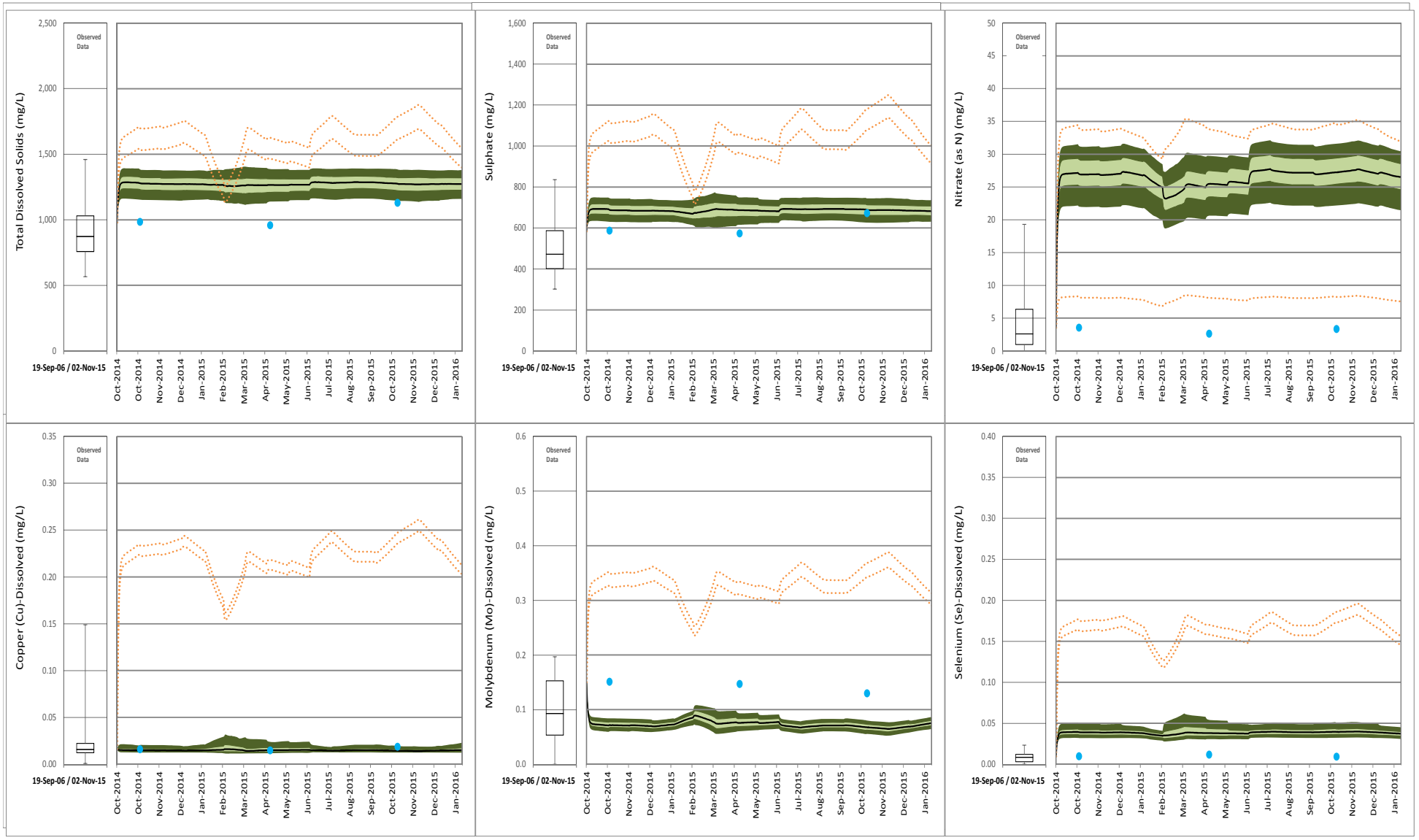
PROJECT No. 1411734 / 16000

TITLE

Springer Pit – Time Series Plots for Selected Parameters Calibration

FIGURE No. 4 - 1

REVISION 0



Site Monitoring Data

Maximum

75th Percentile

Median

25th Percentile

Minimum

Detected Values

Non- Detected Values

Scenario 1

95th Percentile

75th Percentile

Median

25th Percentile

5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

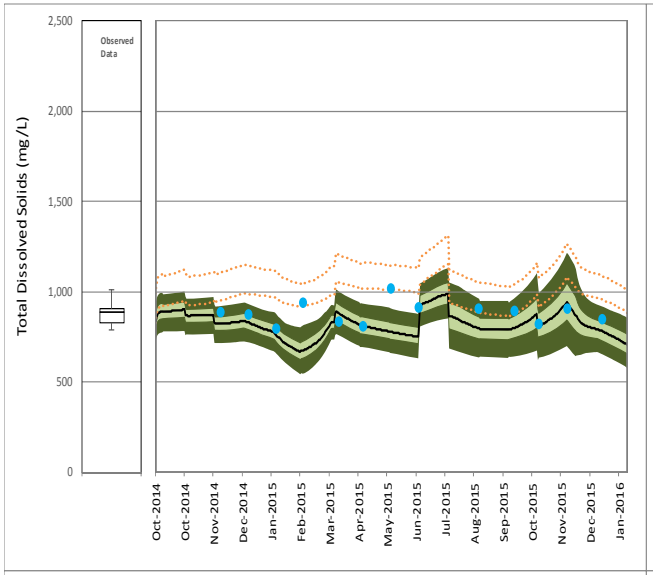
PROJECT No. 1411734 / 16000

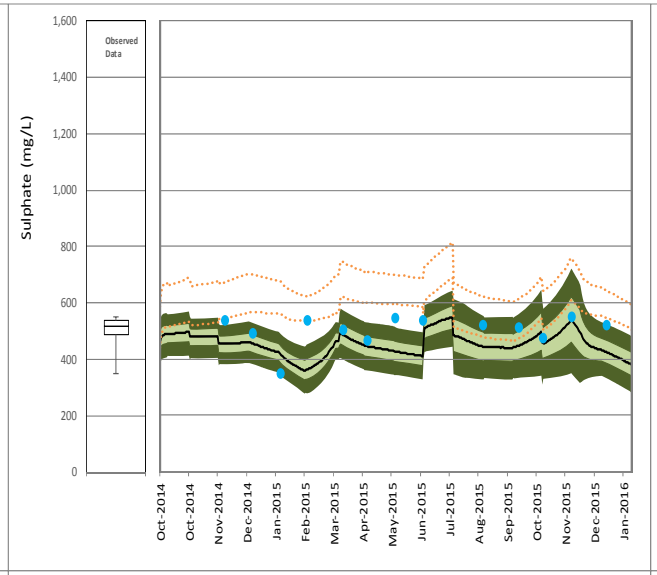
TITLE

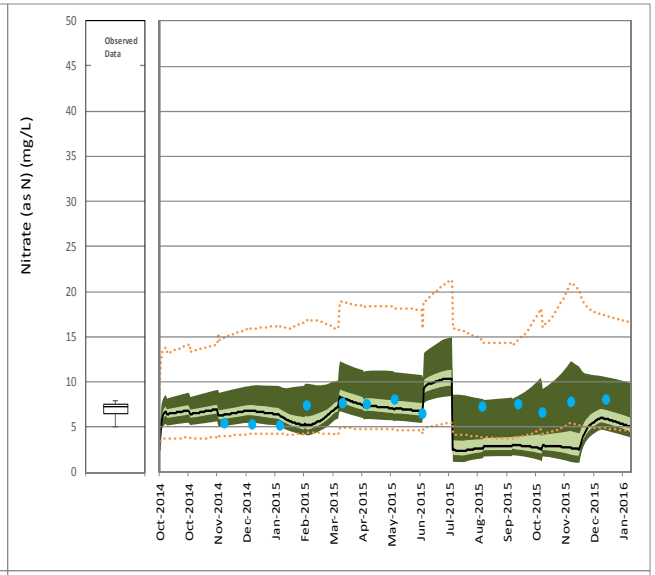
Wight Pit – Time Series Plots for Selected Parameters Calibration

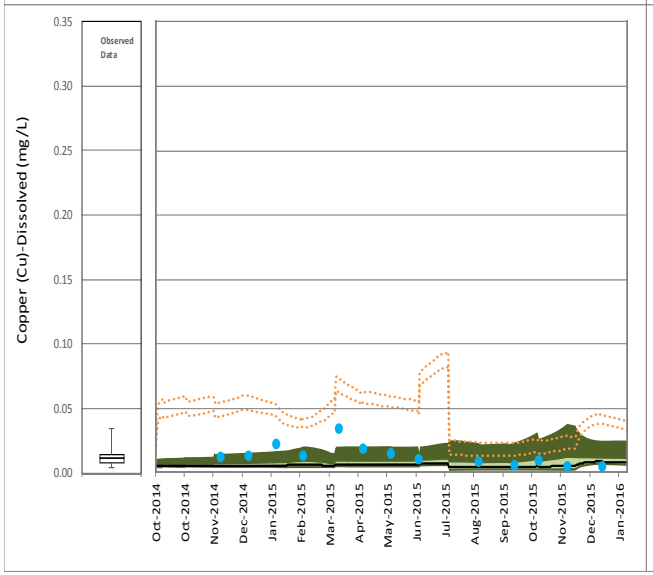
FIGURE No. 4 - 2

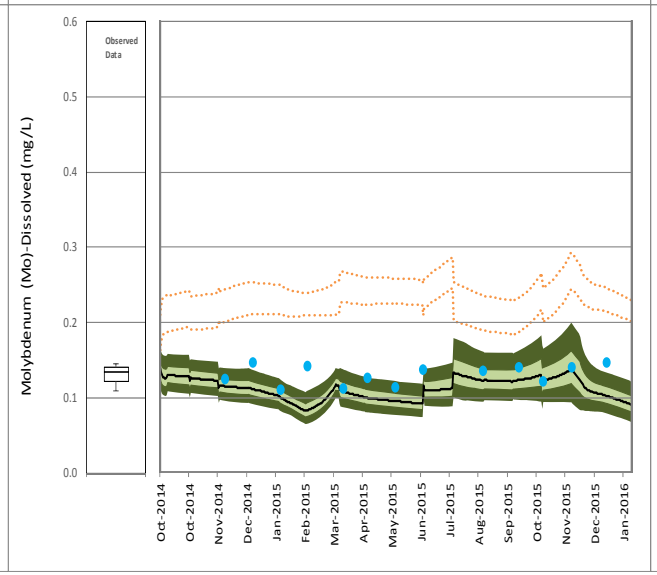
REVISION 0

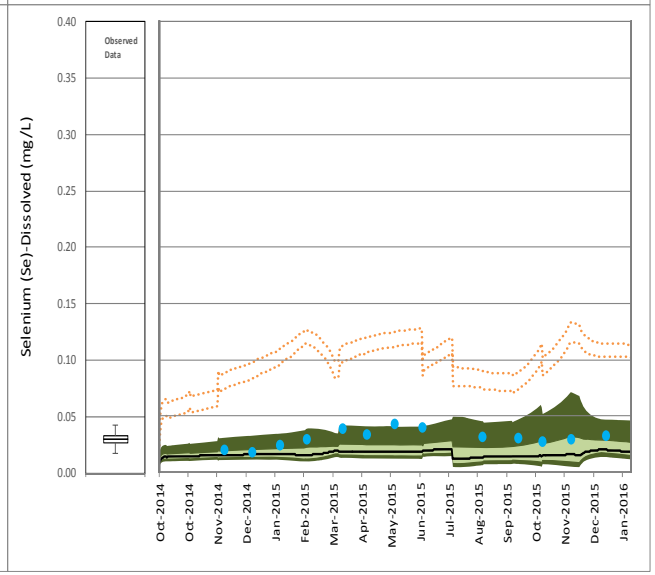


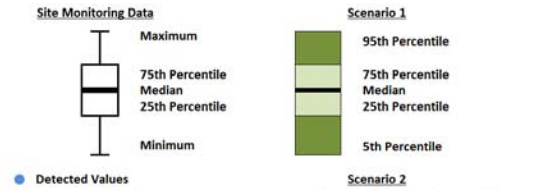












Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

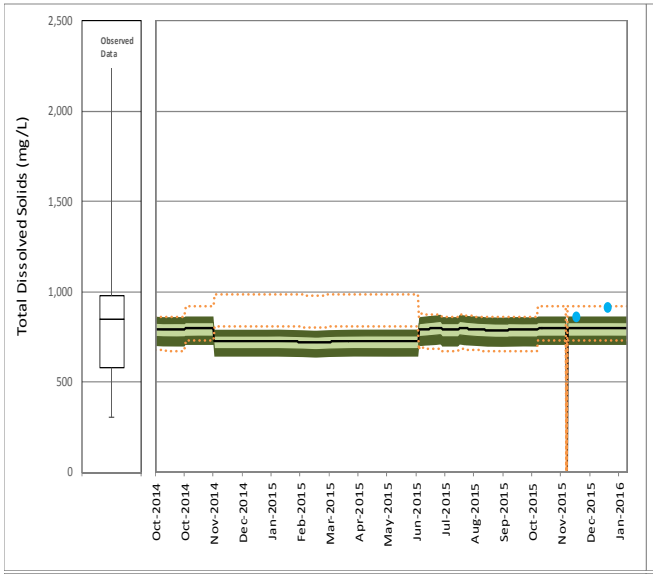
PROJECT No. 1411734 / 16000

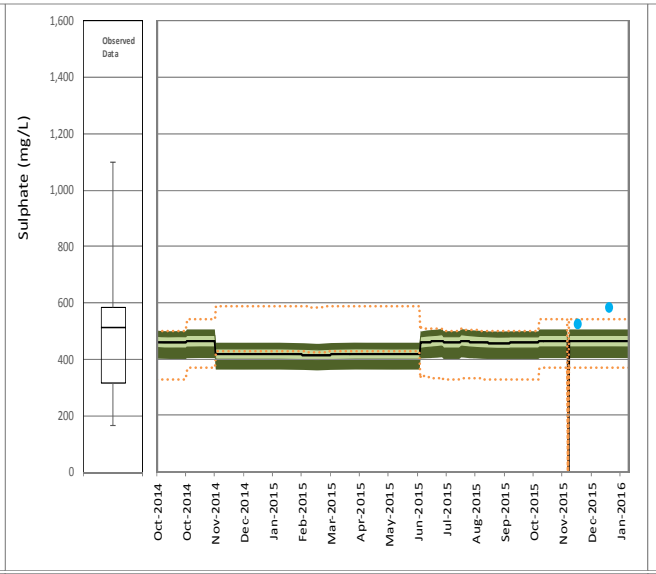
TITLE

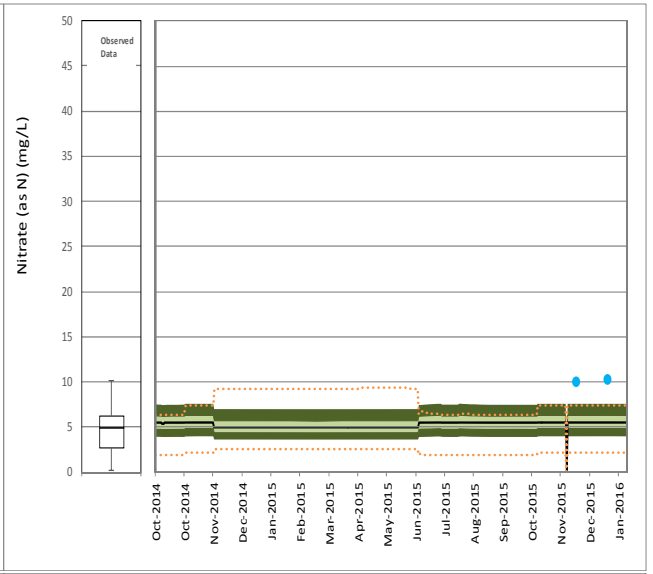
Central Collection Pond – Time Series Plots for Selected Parameters Calibration

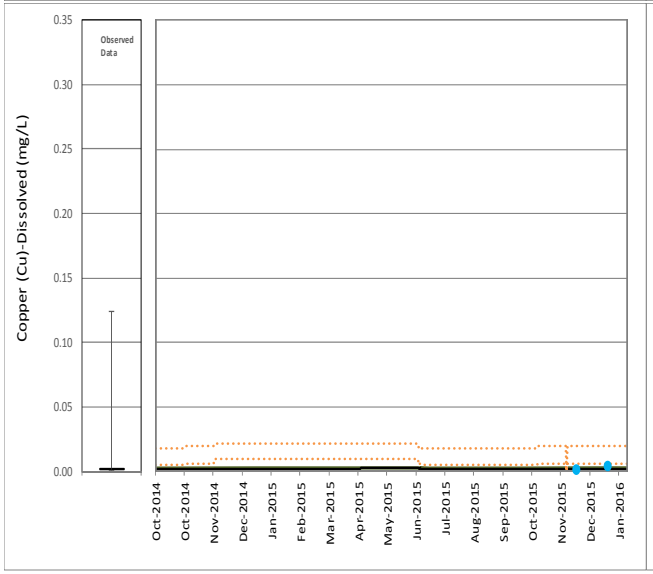
FIGURE No. 4 - 3

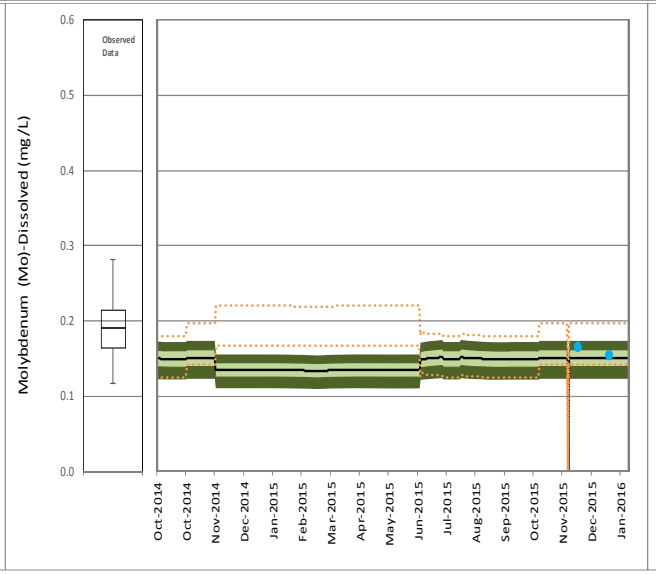
REVISION 0

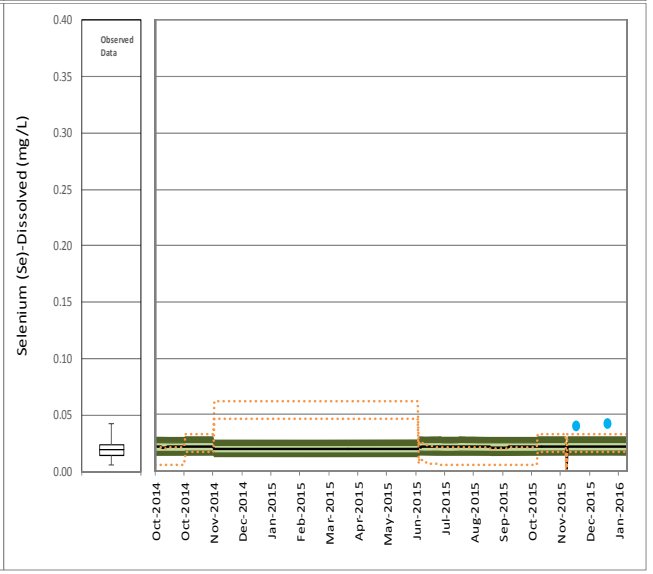


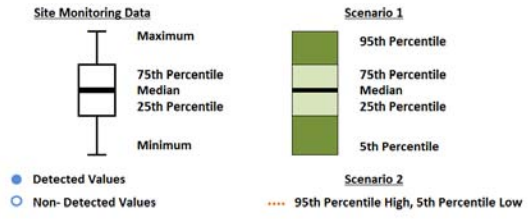












Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

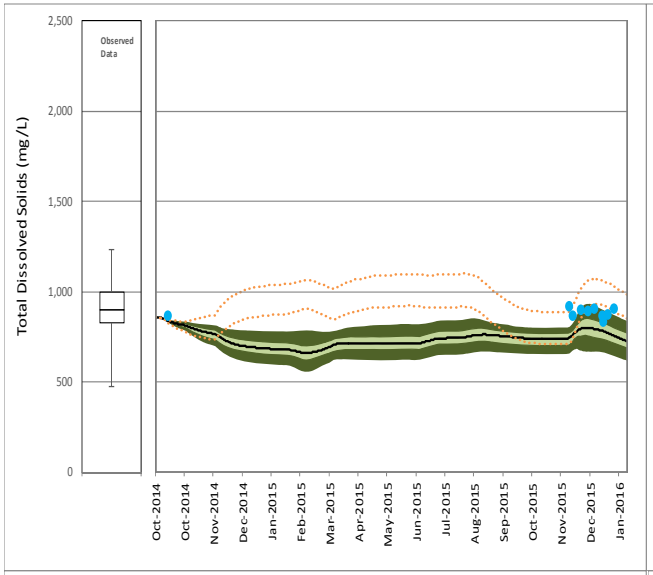
PROJECT No. 1411734 / 16000

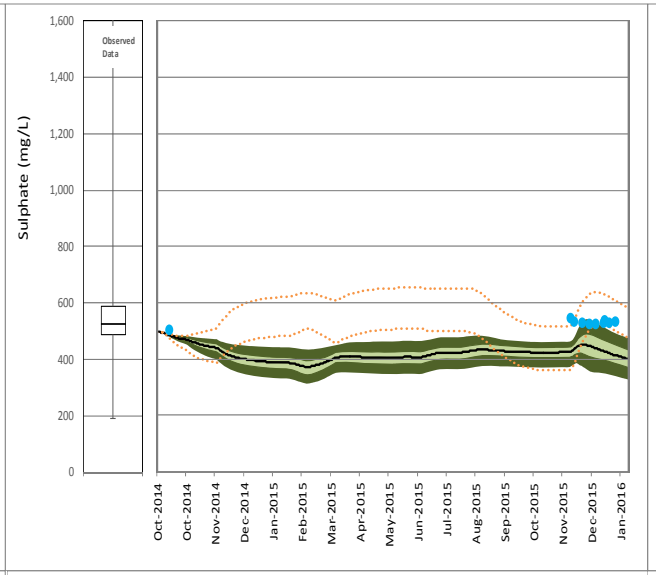
TITLE

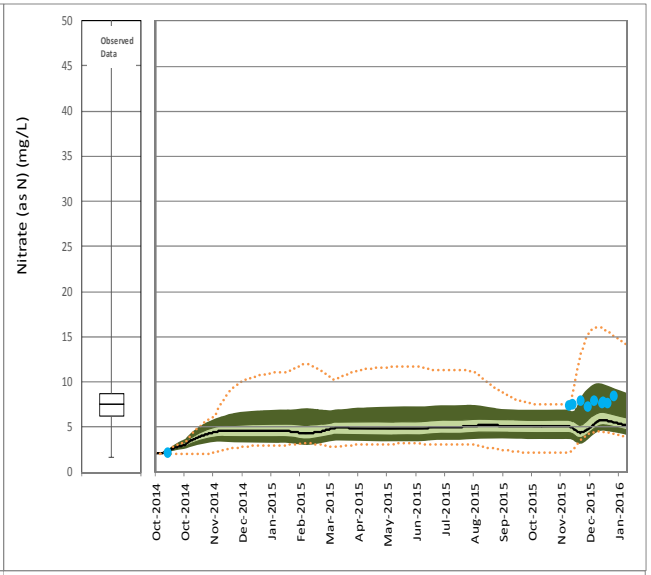
Tailings Storage Facility – Time Series Plots for Selected Parameters Calibration

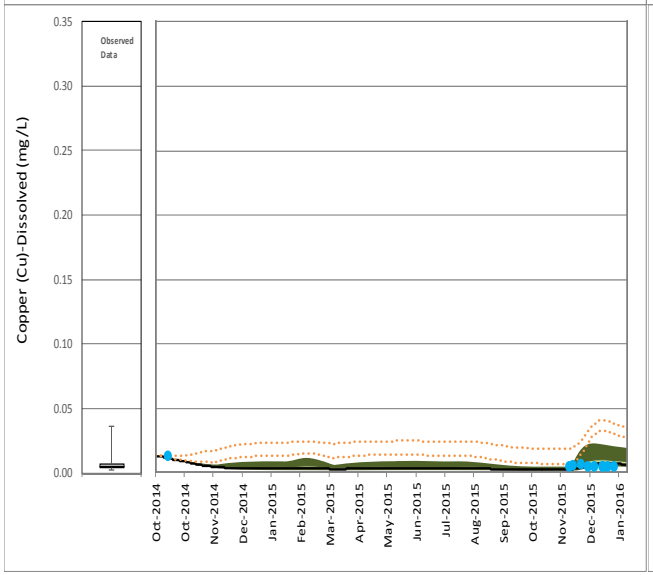
FIGURE No. 4 - 4

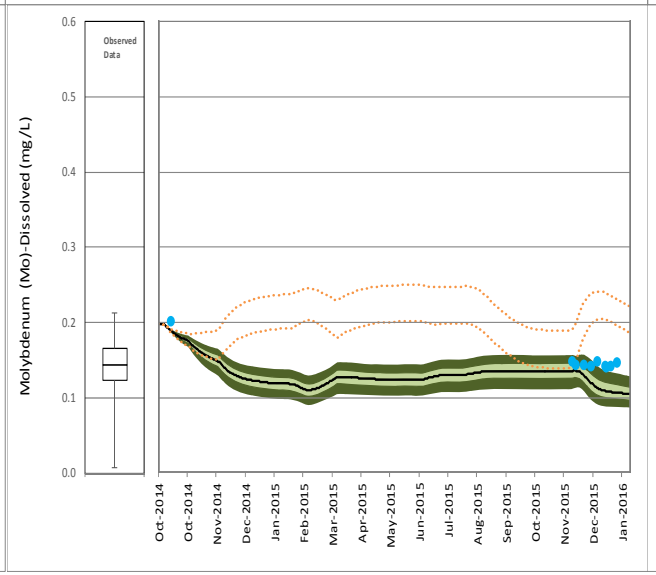
REVISION 0

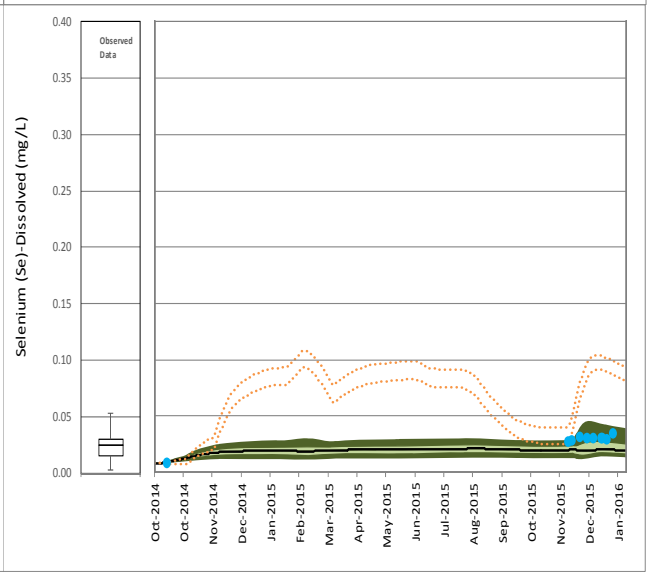


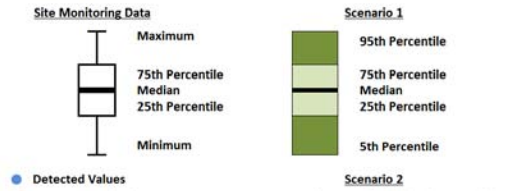












Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

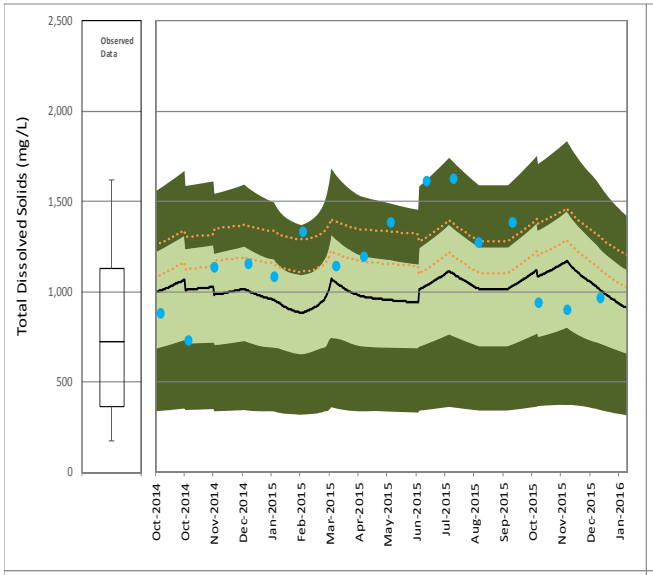
PROJECT No. 1411734 / 16000

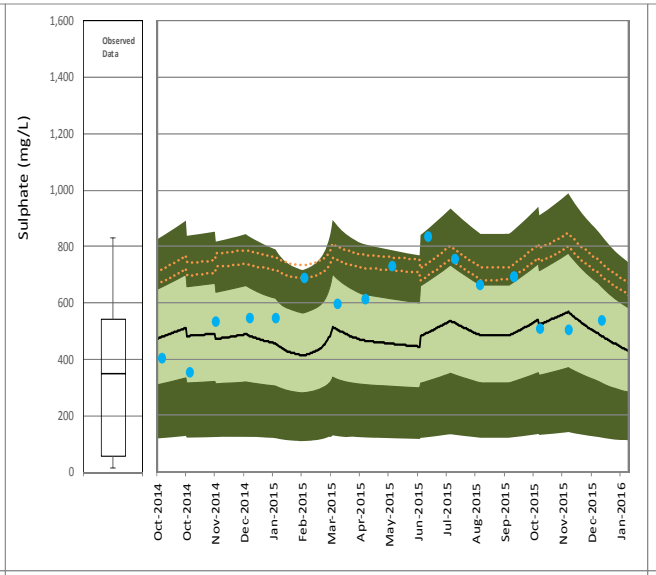
TITLE

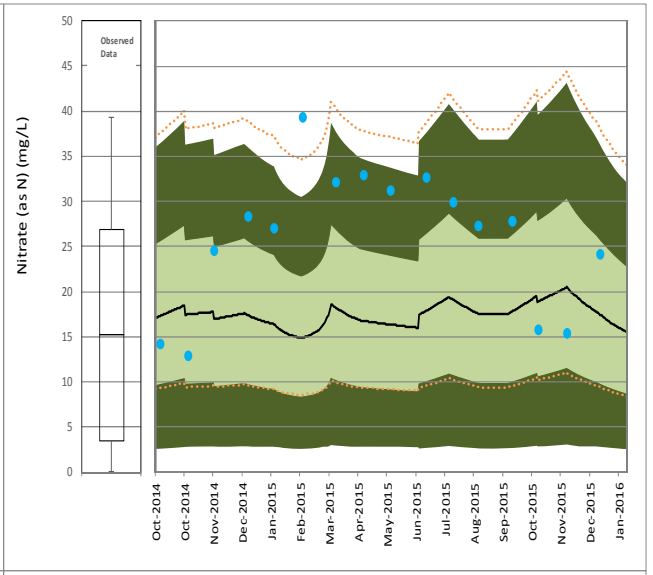
Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters Calibration

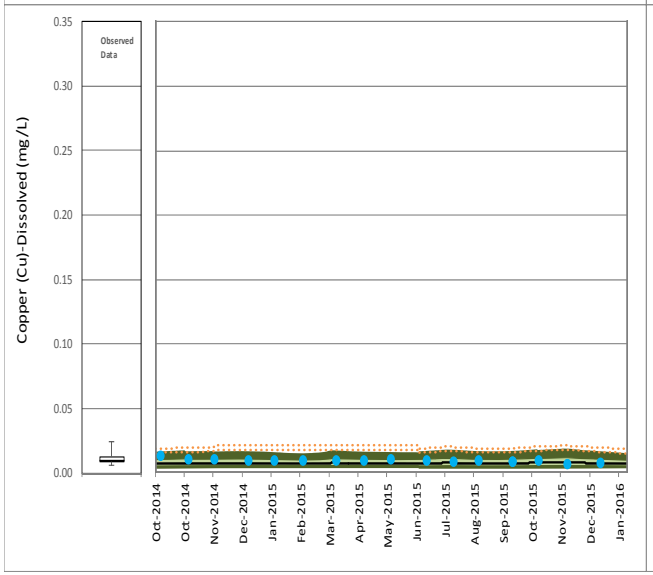
FIGURE No. 4 - 5

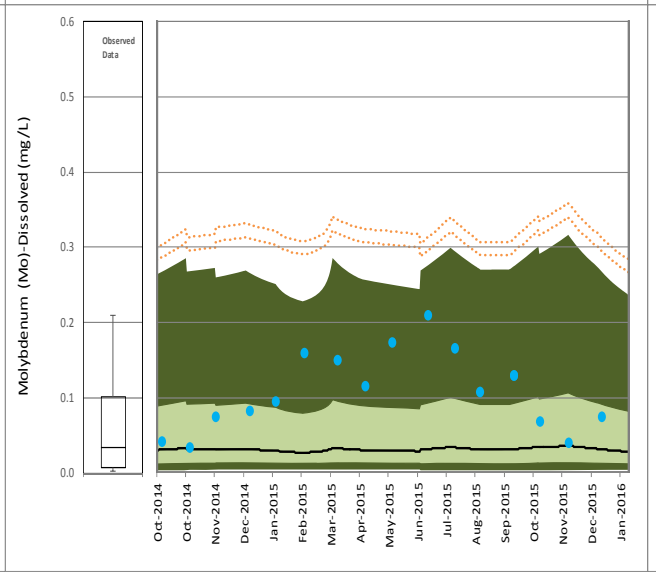
REVISION 0

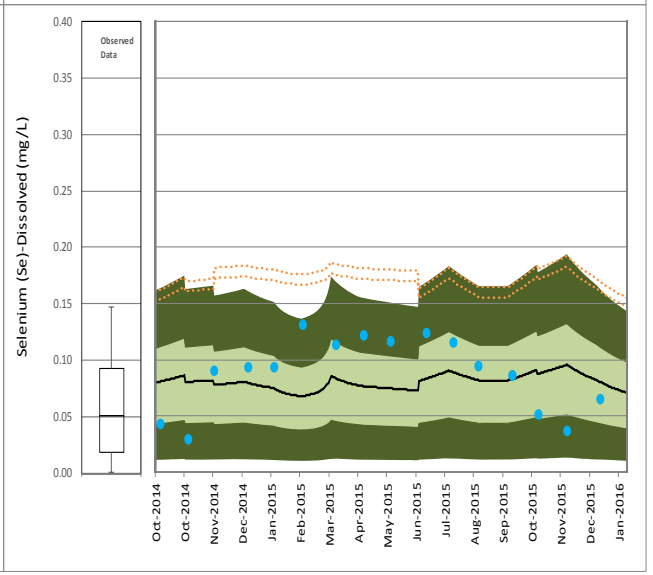


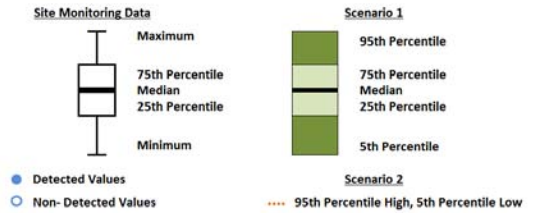












Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

PROJECT No. 1411734 / 16000

TITLE

Northwest Sump – Time Series Plots for Selected Parameters Calibration

FIGURE No. 4 - 6

REVISION 0

4.1 Observed Concentrations between Projected Ranges

Where projected 5th and 95th percentile predictions fell within the range of historical measurements, the model was considered to be in good agreement with monitored data. The good agreement indicates that model inputs were well characterized and that these constituents were not sensitive to assumptions or model conditions not matching site operations.

4.2 Observed Concentrations below Projected Ranges

Where observations were consistently below the 5th percentile predictions, the model was considered to be over-predicting concentrations. There are several reasons why the model may be over-predicting concentrations, including:

- The model was developed to predict water quality conservatively; where uncertainty exists in model inputs, the inputs are selected such that under-prediction would be minimized. Thus, over-prediction is generally expected.
- Biological uptake of nutrients is not accounted for in the model.
- Metal concentrations that are far below detection limits may be skewed upward by model inputs where half-detection limits were applied.
- Settling of particulate material in the pit is not accounted for in the model.
- Geochemical processes, such as precipitation and adsorption, are not accounted for in the model.

Although these factors may lead to over-prediction of concentrations, the model is considered valid for the purpose of developing permit effluent limits because the limits are also derived such that acute guidelines and Metal Mining Effluent Regulations limits are met at end-of-pipe and chronic guidelines are met within an IDZ in the receiving environment. Therefore, deviations in model predictions from observed conditions in this category tend toward additional environmental protection.

4.3 Observed Concentrations above Projected Ranges

Deviations in model predictions from observed conditions in this category may require follow-up action to understand the causes, both in the context of adaptive site water management, and in the context of improving predictions for Closure and Post-closure water management planning.

In general, deviations of observed data above projected ranges occur in the Springer Pit near the end of the calibration period, after the restart of the mill in August 2015. These deviations may be associated with ass addition during mill processing. Similar to the discussion presented in the model validation memorandum (Golder 2015), these increases may be due to accumulation of soluble constituents on the ore prior to processing. Trends in these parameters generally reached a steady state by the end of the calibration period. The forward modelling scenarios used these steady, higher concentrations at the end of the calibration period as starting conditions in each facility, which should lead to improved predictions.

Other deviations above projected ranges are seen in the Wight Pit hindcasts during the calibration period. Limited monitoring data at this location created difficulties in achieving good agreement in the model results. The proportion of Wight Pit runoff and groundwater inflow was used to achieve calibration in the model, however, this process was focussed mainly on achieving good agreement at discharge sources (PETBP, Springer Pit), rather than the Wight Pit itself.

5.0 RESULTS

In this section, the maximum concentrations from the median and 95th percentile results, calculated based on 500 realizations, are presented and discussed. Time series of all modelled parameters for both model scenarios at all modelled site facilities are included in Attachment B.

5.1 Operations

MPMC is currently permitted to discharge up to 0.3 m^3/s per Permit 11678 Section 1.1.3. Site water requiring discharge is managed through the Springer Pit and/or the PETBP before being discharged, as described in Appendix B and Section 5.0 of the TAR.

In the near-term, the primary focus of water management will be to dewater the Springer Pit. As described in Appendix B of the TAR, a pipeline has been installed directly from the Springer Pit to the water treatment plant to maximize flows and achieve the permitted discharge rate. As the water level is drawn down in the Springer Pit, mine contact water will be conveyed to the CCS, and then flow by gravity to the PETBP, where it will be treated and discharged. If inflows to the CCS exceed the permitted discharge rate, excess contact water will be temporarily stored in the TSF. At other times, the TSF will be pumped to the CCS for use in processing or treatment prior to discharge.

During Operations, site discharges are proposed to report to Quesnel Lake and Bootjack Lake as follows:

- Discharge to Quesnel Lake via the Hazeltine Channel until the end of November 2017 (per current Permit).
- Discharge conveyed by pipeline to Quesnel Lake after November 2017 (Appendix G of the TAR).
- Seepage from the Springer Pit may discharge to Bootjack Lake in the event that water levels in the pit remain or rise above 1,030 masl.

The following subsections provide the details of the quantity and quality of these discharges.

5.1.1 Quality of Discharge

The predicted quality of discharges for the Springer Pit and the PETBP are provided in Table 5-1. Predictions are shown assuming no treatment (with the exception of removal of TSS to a maximum of 15 mg/L), so that water treatment can be added or modified if necessary. The concentrations provided in Table 5-1 represent the maximum of the daily median and 95th percentile concentrations modelled during Operations. Time series results for select parameters, including TDS, sulphate, nitrate, copper, molybdenum, and selenium, are presented in Figure 5-1 (Springer Pit) and Figure 5-2 (PETBP). Based on site water quality monitoring and geochemical testing, these are considered to be the key parameters for the Mine. To illustrate ranges, box and whisker plots showing the range of concentrations observed in the Springer Pit and the PETBP are also presented.

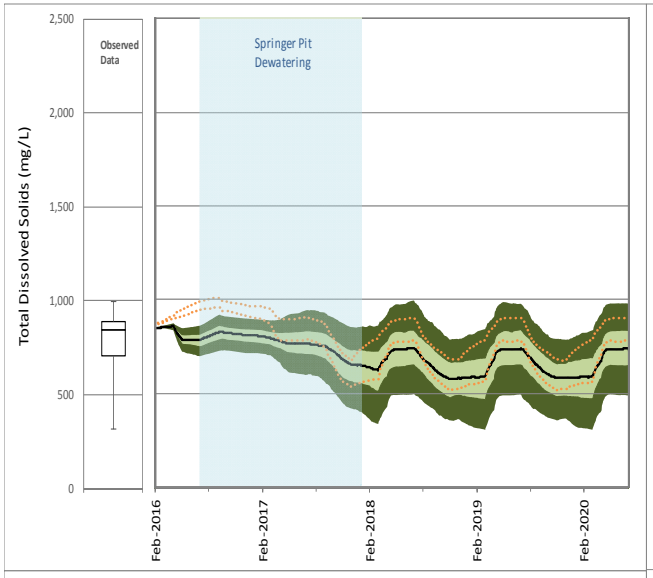
Predicted Springer Pit concentrations generally remain stable until the end of 2017, when stored water in the Springer Pit is anticipated to be pumped out. Concentrations remain relatively stable since the pit lake accounts for the largest component of water in the pit during this period, in comparison to other inflows (e.g., pit wall rock runoff, Temporary NW PAG Stockpile drainage). As the pit lake elevation is drawn down, the pit water quality becomes more variable as a result of the inflows accounting for a larger percentage of the water stored in the Springer Pit (i.e., less equalization). Subsequently, water quality follows a stronger seasonal trend, with peak concentrations occurring during freshet as a result of increased loadings from pit wall rock runoff and the Temporary NW PAG Stockpile.

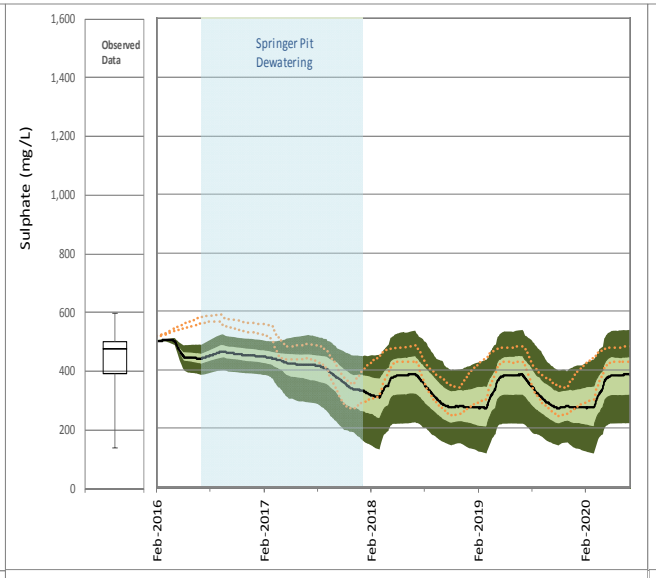
After the Springer Pit is dewatered, the PETBP will be used to store site water prior to it being discharged via the water treatment plant. The PETBP will collect drainage from several Mine site facilities and, therefore, the quality in the pond is a function of the constituent concentrations in several sources. Water quality is predicted to reflect more seasonal variability in the PETBP after the Springer Pit is dewatered in January 2018, because there will no longer be a dampening effect due to the large volume of water stored on site.

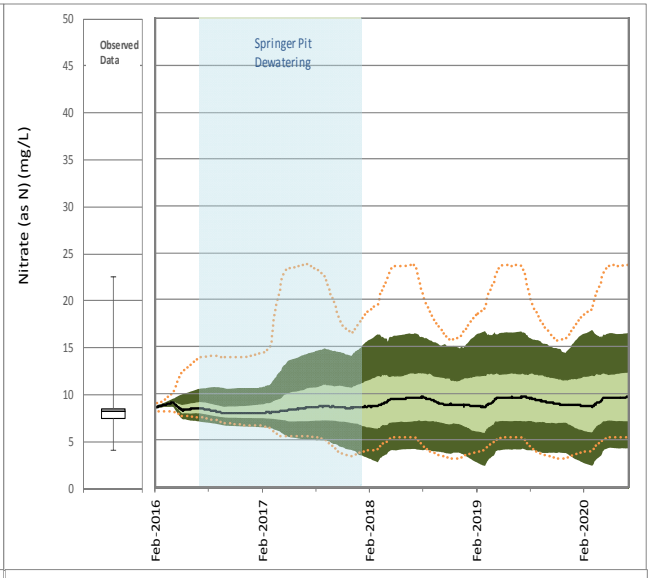
Table 5-1:
Summary of Predicted Bootjack Lake Initial Dilution Zone Quality – No Discharge Scenario

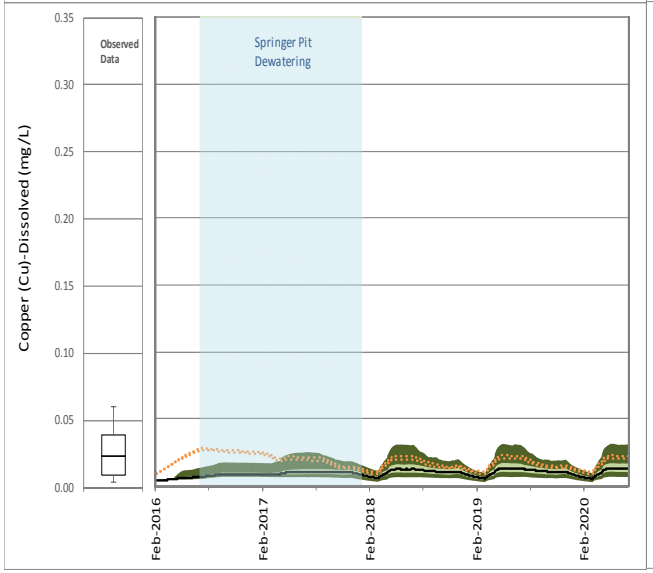
Parameter	Units	Scenario 1				Scenario 2			
		Springer Pit		Perimeter Embankment Till Borrow Pond		Springer Pit		Perimeter Embankment Till Borrow Pond	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters									
Hardness[a]	mg $CaCO_3$/L	571	697	593	677	695	712	864	901
Total Dissolved Solids	mg/L	865	1002	883	998	1002	1017	1173	1205
Major Ions									
Calcium	mg/L	174	212	183	207	213	217	264	272
Chloride	mg/L	9.3	9.4	11	13	16	18	17	19
Fluoride	mg/L	2.5	2.8	8.2	9.7	5.3	5.3	17	17
Magnesium	mg/L	33	41	33	39	39	42	50	54
Potassium	mg/L	9.3	9.3	10.0	13	9.8	9.8	15	15
Sodium	mg/L	43	43	45	49	45	45	51	54
Sulphate	mg/L	505	541	515	556	584	592	695	708
Nutrients									
Ammonia	mg/L (as N)	0.21	0.54	0.53	0.64	0.33	0.33	1.0	1.0
Nitrate	mg/L (as N)	9.8	17	9.3	14	22	24	21	22
Nitrite	mg/L (as N)	0.08	0.43	0.057	0.23	0.3	0.31	0.29	0.3
Total Phosphorus	mg/L	0.023	0.044	0.032	0.036	0.06	0.069	0.064	0.072
Total Metals									
Aluminum	mg/L	0.56	0.59	0.82	0.88	0.69	0.74	1.3	1.4
Antimony	mg/L	0.0014	0.0016	0.0018	0.0022	0.0016	0.0018	0.0033	0.0035
Arsenic	mg/L	0.0024	0.0033	0.012	0.014	0.0046	0.0047	0.024	0.025
Barium	mg/L	0.086	0.087	0.11	0.12	0.097	0.098	0.19	0.2
Beryllium	mg/L	0.00034	0.00048	0.00095	0.0012	0.0007	0.00079	0.0021	0.0022
Boron	mg/L	0.16	0.3	0.15	0.2	0.26	0.39	0.25	0.3
Cadmium	mg/L	0.000061	0.00023	0.00013	0.00026	0.00021	0.00031	0.00039	0.0005
Chromium	mg/L	0.0012	0.0013	0.0018	0.002	0.0016	0.0017	0.0032	0.0034
Cobalt	mg/L	0.00097	0.0049	0.00084	0.0023	0.007	0.0072	0.0058	0.0058
Copper	mg/L	0.018	0.048	0.025	0.049	0.033	0.044	0.083	0.096
Iron	mg/L	0.59	0.76	0.63	0.69	0.63	0.72	0.82	0.99
Lead	mg/L	0.00023	0.00024	0.00039	0.00041	0.00032	0.00032	0.00065	0.00069
Lithium	mg/L	0.014	0.016	0.013	0.018	0.016	0.019	0.025	0.028
Manganese	mg/L	0.98	2.2	0.33	1.0	2.6	2.6	2.4	2.4
Mercury	mg/L	0.0000025	0.0000026	0.0000032	0.0000035	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.15	0.17	0.15	0.18	0.21	0.23	0.34	0.36
Nickel	mg/L	0.0016	0.002	0.002	0.0024	0.0028	0.0029	0.0048	0.0051
Selenium	mg/L	0.044	0.087	0.054	0.079	0.14	0.14	0.19	0.2
Silver	mg/L	0.000034	0.000049	0.000094	0.00012	0.000073	0.000083	0.00021	0.00022
Strontium	mg/L	3.0	3.4	2.8	3.5	3.7	4.1	6.4	6.9
Thallium	mg/L	0.000091	0.0001	0.00021	0.00026	0.00014	0.00015	0.00042	0.00043
Tin	mg/L	0.000071	0.00025	0.000064	0.00019	0.000098	0.00025	0.000091	0.00021
Titanium	mg/L	0.031	0.035	0.03	0.033	0.036	0.038	0.039	0.042
Uranium	mg/L	0.0026	0.0051	0.0024	0.0031	0.0032	0.0038	0.0043	0.0052
Vanadium	mg/L	0.0051	0.0057	0.031	0.036	0.0094	0.0096	0.061	0.062
Zinc	mg/L	0.0093	0.011	0.022	0.026	0.022	0.022	0.057	0.058
Dissolved Metals									
Aluminum	mg/L	0.075	0.098	0.33	0.39	0.2	0.25	0.8	0.86
Antimony	mg/L	0.0014	0.0014	0.0017	0.002	0.0016	0.0016	0.0033	0.0034
Arsenic	mg/L	0.0023	0.0031	0.012	0.014	0.0044	0.0046	0.024	0.024
Barium	mg/L	0.081	0.082	0.1	0.12	0.092	0.093	0.19	0.19
Beryllium	mg/L	0.00034	0.0004	0.00095	0.0012	0.0007	0.00071	0.0021	0.0021
Boron	mg/L	0.16	0.27	0.15	0.16	0.26	0.36	0.25	0.27
Cadmium	mg/L	0.000057	0.00014	0.00012	0.00017	0.00021	0.00022	0.00039	0.0004
Chromium	mg/L	0.00055	0.00061	0.0012	0.0014	0.00098	0.001	0.0026	0.0027
Cobalt	mg/L	0.00065	0.0046	0.00051	0.002	0.0067	0.0069	0.0055	0.0055
Copper	mg/L	0.014	0.032	0.021	0.034	0.028	0.029	0.079	0.08
Iron	mg/L	0.041	0.22	0.086	0.15	0.086	0.17	0.27	0.45
Lead	mg/L	0.000083	0.000095	0.00024	0.00026	0.00017	0.00018	0.00051	0.00054
Lithium	mg/L	0.013	0.013	0.012	0.015	0.016	0.016	0.025	0.025
Manganese	mg/L	0.96	2.2	0.32	1.0	2.6	2.6	2.3	2.4
Mercury	mg/L	0.0000025	0.0000026	0.0000032	0.0000035	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.15	0.15	0.15	0.16	0.21	0.21	0.34	0.35
Nickel	mg/L	0.001	0.0014	0.0014	0.0018	0.0022	0.0023	0.0042	0.0045
Selenium	mg/L	0.044	0.083	0.054	0.074	0.14	0.14	0.19	0.19
Silver	mg/L	0.000034	0.000039	0.000094	0.00011	0.000073	0.000073	0.00021	0.00021
Strontium	mg/L	3.0	3.0	2.8	3.1	3.7	3.7	6.4	6.5
Thallium	mg/L	0.000091	0.000094	0.00021	0.00025	0.00014	0.00014	0.00042	0.00042
Tin	mg/L	0.000071	0.00015	0.000064	0.000085	0.000098	0.00015	0.000091	0.00011
Titanium	mg/L	0.0087	0.013	0.0078	0.011	0.014	0.015	0.017	0.02
Uranium	mg/L	0.0025	0.0044	0.0023	0.0024	0.0031	0.0032	0.0043	0.0046
Vanadium	mg/L	0.0038	0.0044	0.029	0.035	0.0081	0.0083	0.06	0.06
Zinc	mg/L	0.0078	0.0095	0.02	0.025	0.021	0.021	0.056	0.057

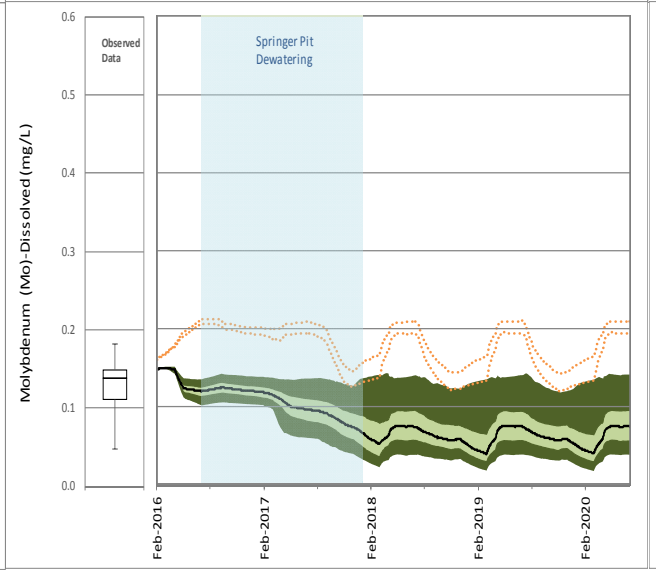
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

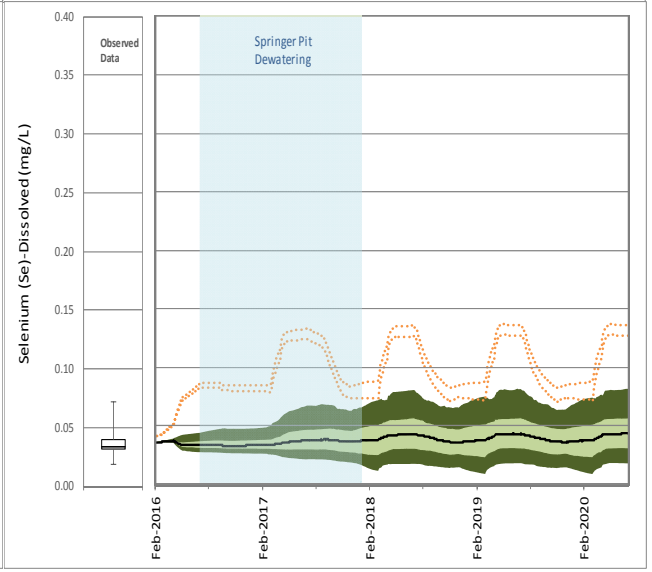












Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

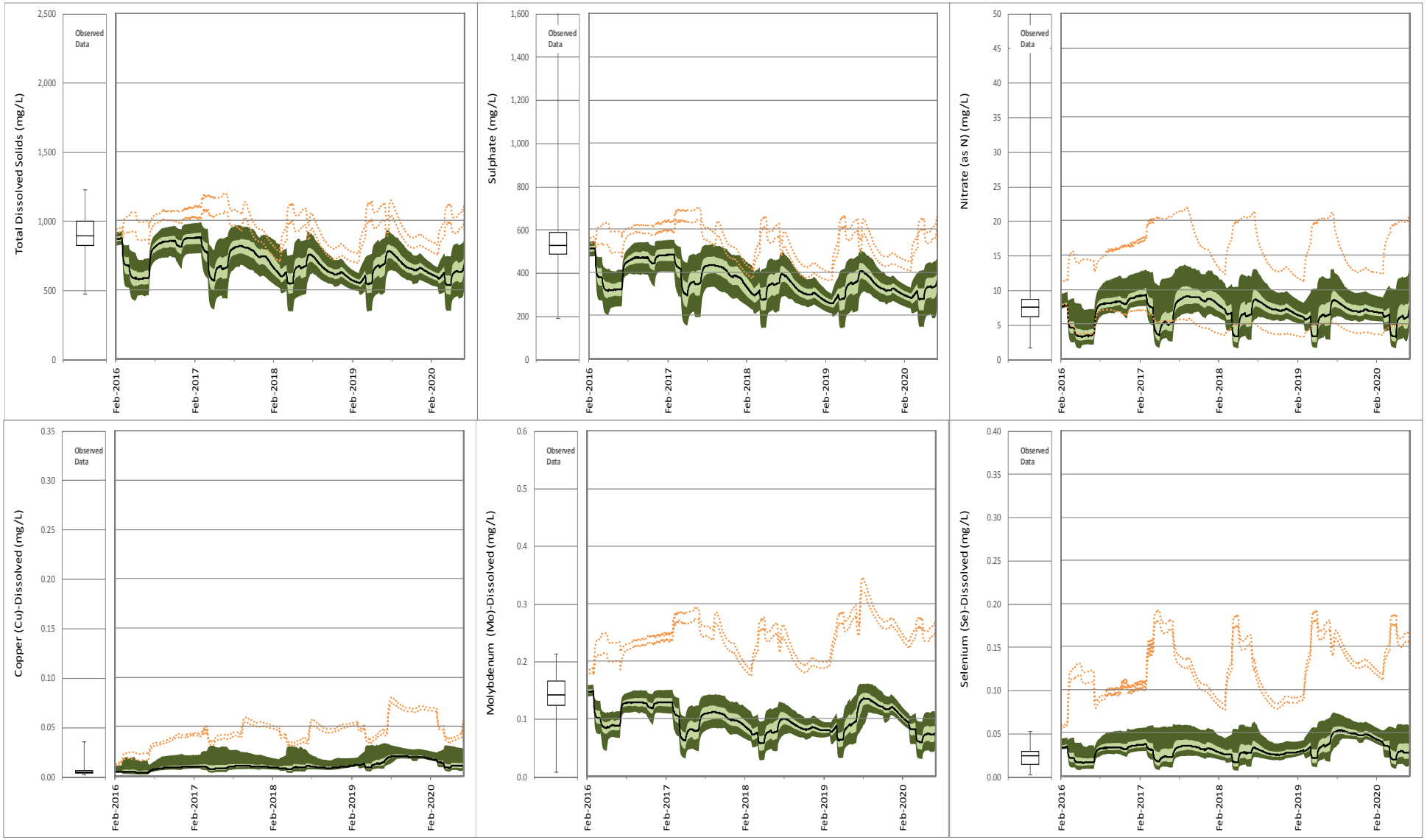
PROJECT No. 1411734 / 16000

TITLE

Springer Pit - Time Series Plots for Selected Parameters Operations

FIGURE No. 5 - 1

REVISION 0



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

Scenario 2

- 95th Percentile High, 5th Percentile Low

Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

PROJECT No. 1411734 / 16000

TITLE

Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters Operations

FIGURE No. 5 - 2

REVISION 0

5.1.2 Ore Stockpiles

The ore stockpile areas were incorporated into the SWWBM and WQM as waste rock and disturbed land area. The total flow (runoff and seepage) from the ore stockpile areas is less than 3% of the total discharge from site during Operations. Applying NAG waste rock water quality based on site monitoring data to all contact water from the ore stockpiles, the total sulphate load from these facilities is less than 4% of the total load from site during Operations.

5.1.3 Other Site Facilities

As discussed in Section 2.0, the main objective of the WQM was to predict the quality of discharges during Operations for the purpose of establishing permit limits. However, water quality predictions of site facilities that will not discharge to the receiving environment (e.g., CCS) were requested as part of MEM IR-12 (see Appendix A of the TAR) as part of their review on the M-200 Permit amendment application to return to full operations. Time series for all site facilities requested as part of IR-12 that are not considered as discharges for the EMA Permit 11678 amendment are presented in Attachment B for all modelled parameters.

5.1.4 Quesnel Lake – Predicted Water Quality

To evaluate Mine related impacts to surface water quality in Quesnel Lake, a three dimensional hydrodynamic model was developed for this waterbody. Details of the model development, inputs, and assumptions are provided in Appendix J of the TAR. The hydrodynamic models were used to develop daily and monthly dilution time series at the edge of the IDZ in Quesnel Lake.

Predicted concentrations in the IDZ were calculated from the predicted dilution from the hydrodynamic model using Equation 2 (Section 3.3), assuming maximum median and 95th percentile discharge predictions would be maintained throughout Operations. Trends in predicted concentrations will closely match those seen in the dilution time series (Appendix J of the TAR). Dilution in the IDZ is predicted to be seasonal driven by stratification in the lake, with minimum dilution occurring in the fall as a result of weakening stratification and seiche events (Appendix J of the TAR). Predicted Quesnel Lake IDZ concentrations are not sensitive to seepage from the TSF and Polley Flats.

Daily maximum and monthly average concentrations calculated for both the maximum mean and maximum 95th percentile discharge concentrations are presented in Table 5-2. Assessment of these predictions using BC WQGs is presented in Section 6.3 of the TAR.

Summary of Predicted Quesnel Lake Initial Dilution Zone Quality – Operations

Parameter	Units	Daily Minimum Dilution			30-day Average Dilution		
		5th Percentile	Median	95th Percentile	5th Percentile	Median	95th Percentile
Physical Parameters							
Hardness[a]	mg $CaCO_3$/L	73	73	75	66	67	68
Total Dissolved Solids	mg/L	101	98	102	89	89	91
Major Ions							
Calcium	mg/L	24	24	25	22	22	23
Chloride	mg/L	0.87	0.86	0.89	0.73	0.74	0.77
Fluoride	mg/L	0.34	0.32	0.31	0.2	0.2	0.22
Magnesium	mg/L	3.2	3.1	3.3	2.8	2.8	2.9
Potassium	mg/L	0.82	0.82	0.87	0.7	0.71	0.75
Sodium	mg/L	2.7	2.5	2.6	2.0	2.0	2.1
Sulphate	mg/L	26	24	25	19	19	19
Nutrients							
Ammonia	mg/L (as N)	0.024	0.023	0.025	0.015	0.016	0.019
Nitrate	mg/L (as N)	0.35	0.37	0.55	0.24	0.27	0.38
Nitrite	mg/L (as N)	0.0021	0.0027	0.011	0.0016	0.002	0.0073
Total Phosphorus	mg/L	0.0031	0.0031	0.0033	0.0027	0.0027	0.0029
Total Metals							
Aluminum	mg/L	0.05	0.047	0.045	0.037	0.037	0.037
Antimony	mg/L	0.00016	0.00016	0.00016	0.00014	0.00014	0.00015
Arsenic	mg/L	0.00058	0.00054	0.00051	0.00037	0.00036	0.00039
Barium	mg/L	0.009	0.0089	0.009	0.0075	0.0077	0.0079
Beryllium	mg/L	0.00013	0.00013	0.00013	0.00012	0.00012	0.00012
Boron	mg/L	0.015	0.015	0.018	0.013	0.013	0.015
Cadmium	mg/L	0.000009	0.0000092	0.000013	0.0000071	0.0000075	0.000011
Chromium	mg/L	0.00055	0.00054	0.00054	0.00053	0.00053	0.00053
Cobalt	mg/L	0.00013	0.00013	0.00021	0.00012	0.00012	0.00017
Copper	mg/L	0.0019	0.0018	0.0026	0.0015	0.0015	0.0021
Iron	mg/L	0.054	0.052	0.054	0.045	0.045	0.046
Lead	mg/L	0.000066	0.000065	0.000063	0.00006	0.00006	0.00006
Lithium	mg/L	0.0014	0.0014	0.0016	0.0013	0.0013	0.0014
Manganese	mg/L	0.01	0.023	0.053	0.0076	0.016	0.036
Mercury	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	0.006	0.0056	0.0063	0.004	0.004	0.0044
Nickel	mg/L	0.00055	0.00055	0.00056	0.00053	0.00054	0.00054
Selenium	mg/L	0.0019	0.002	0.0029	0.0012	0.0014	0.002
Silver	mg/L	0.000013	0.000013	0.000013	0.000012	0.000012	0.000012
Strontium	mg/L	0.23	0.23	0.25	0.2	0.2	0.21
Thallium	mg/L	0.000017	0.000017	0.000017	0.000014	0.000014	0.000015
Tin	mg/L	0.00010	0.00010	0.0001	0.00010	0.00010	0.0001
Titanium	mg/L	0.011	0.011	0.011	0.01	0.01	0.011
Uranium	mg/L	0.00025	0.00024	0.00029	0.00022	0.00022	0.00025
Vanadium	mg/L	0.0016	0.0015	0.0015	0.0011	0.0011	0.0012
Zinc	mg/L	0.0037	0.0037	0.0037	0.0034	0.0034	0.0035
Dissolved Metals							
Aluminum	mg/L	0.018	0.017	0.017	0.013	0.013	0.014
Antimony	mg/L	0.00016	0.00016	0.00016	0.00013	0.00014	0.00014
Arsenic	mg/L	0.00055	0.00051	0.00049	0.00034	0.00034	0.00037
Barium	mg/L	0.0085	0.0085	0.0086	0.0072	0.0073	0.0076
Beryllium	mg/L	0.00013	0.00013	0.00013	0.00012	0.00012	0.00012
Boron	mg/L	0.015	0.015	0.016	0.013	0.013	0.014
Cadmium	mg/L	0.0000088	0.0000091	0.00001	0.000007	0.0000074	0.0000086
Chromium	mg/L	0.00052	0.00052	0.00052	0.00051	0.00051	0.00052
Cobalt	mg/L	0.00011	0.00012	0.0002	0.00011	0.00011	0.00017
Copper	mg/L	0.0015	0.0015	0.0019	0.0012	0.0012	0.0015
Iron	mg/L	0.032	0.032	0.035	0.031	0.031	0.033
Lead	mg/L	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011
Lithium	mg/L	0.0014	0.0014	0.0015	0.0013	0.0013	0.0013
Manganese	mg/L	0.0087	0.022	0.052	0.0066	0.015	0.035
Mercury	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Molybdenum	mg/L	0.006	0.0056	0.0058	0.004	0.004	0.0041
Nickel	mg/L	0.00053	0.00053	0.00054	0.00052	0.00052	0.00053
Selenium	mg/L	0.0019	0.002	0.0028	0.0012	0.0014	0.0019
Silver	mg/L	0.000013	0.000013	0.000013	0.000012	0.000012	0.000012
Strontium	mg/L	0.23	0.23	0.23	0.2	0.2	0.2
Thallium	mg/L	0.000017	0.000017	0.000017	0.000014	0.000014	0.000015
Tin	mg/L	0.00010	0.00010	0.0001	0.00010	0.00010	0.0001
Titanium	mg/L	0.010	0.010	0.01	0.010	0.010	0.01
Uranium	mg/L	0.00024	0.00023	0.00026	0.00021	0.00021	0.00022
Vanadium	mg/L	0.0016	0.0015	0.0015	0.0011	0.0011	0.0012
Zinc	mg/L	0.0036	0.0036	0.0036	0.0033	0.0033	0.0034

NOTES:

a) Calculated based on predicted calcium and magnesium concentrations

5.2 Contingency Scenarios

A number of contingency scenarios have been considered in the water balance (Appendix B of the TAR) to account for unforeseen circumstances. The “No Discharge” scenario assumes that site water would be stored in the Springer Pit and discharge would not occur for an extended period. The quality of the seepage from the Springer Pit to Bootjack Lake under such a scenario is dependent on whether this would occur during Operations. Within the context of the WQM, the No Discharge scenario is defined by the following assumptions:

- the Mine is unable to discharge beginning in March 2017 (which represents a worst-case scenario in terms of the volume of water that needs to be stored)
- all water is managed through the Springer Pit until it reaches an elevation of 1,050 masl

5.2.1 Quality of Discharge

The qualities of untreated discharges for the Springer Pit under the No Discharge scenario are presented in Table 5-3. The predicted Springer Pit seepage water qualities represent the maximum of the median and 95th percentile concentrations when the pit lake elevation is greater than 1,030 masl, which corresponds to the elevation at which seepage may exfiltrate from the pit to Bootjack Lake. Particulate metals are not expected to be transported by seepage; therefore, total metal concentrations in Springer Pit seepage water quality are assumed equal to dissolved metal concentrations.

Time series results for select parameters, including TDS, sulphate, nitrate, copper, molybdenum, and selenium, are presented in Figure 5-3. These time series show predictions throughout the No Discharge scenario, including the dewatering and refilling periods in which the Springer Pit is not expected to exfiltrate. Concentrations are generally stable throughout the model time frame (e.g., TDS) or increase through refilling as pit wall runoff and other site flows report to the pit (e.g., copper).

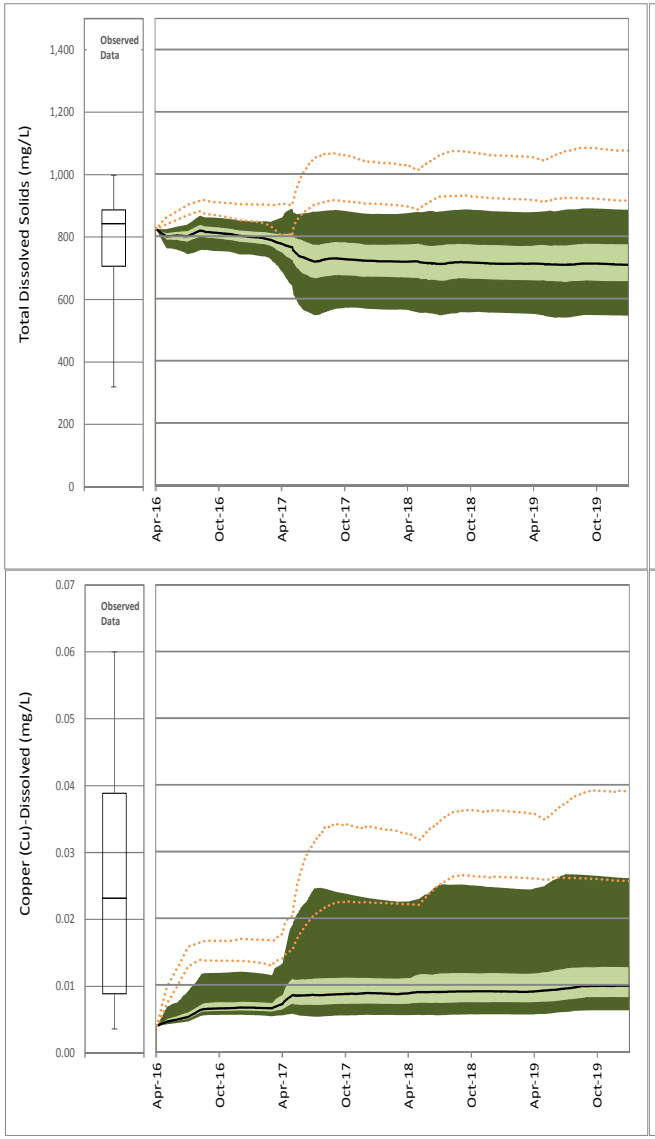
Table 5-3:
Summary of Predicted Springer Pit Water Quality – No Discharge Scenario

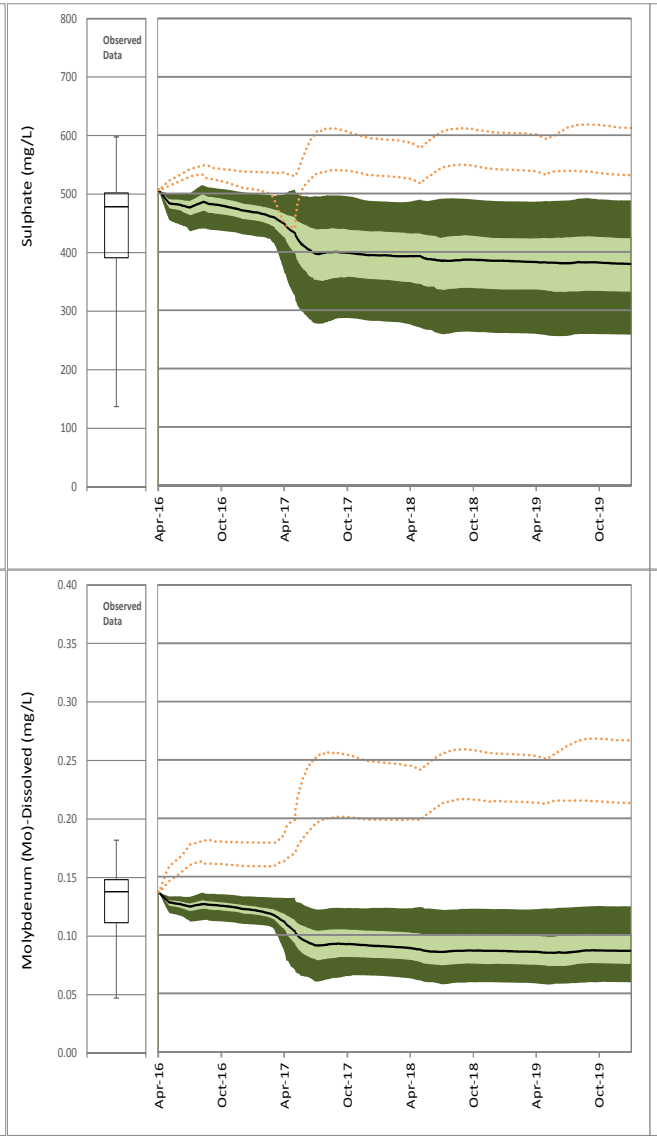
Parameter	Units	Scenario 1		Scenario 2	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters					
Hardness[a]	mg $CaCO_3$/L	489	616	767	815
Total Dissolved Solids	mg/L	723	903	1045	1100
Major Ions					
Calcium	mg/L	150	188	235	248
Chloride	mg/L	5.0	6.7	14	15
Fluoride	mg/L	2.4	2.9	4.8	5.7
Magnesium	mg/L	28	36	44	48
Potassium	mg/L	4.5	5.9	6.9	7.4
Sodium	mg/L	23	29	32	35
Sulphate	mg/L	388	499	605	627
Nutrients					
Ammonia	mg/L (as N)	0.18	0.29	0.34	0.39
Nitrate	mg/L (as N)	7.5	13	20	22
Nitrite	mg/L (as N)	0.044	0.23	0.28	0.3
Total Phosphorus	mg/L	0.02	0.028	0.055	0.062
Total Metals					
Aluminum	mg/L	0.083	0.12	0.26	0.32
Antimony	mg/L	0.00073	0.00096	0.0016	0.0017
Arsenic	mg/L	0.0025	0.0032	0.0053	0.0065
Barium	mg/L	0.053	0.072	0.088	0.096
Beryllium	mg/L	0.00038	0.00048	0.00064	0.00075
Boron	mg/L	0.1	0.13	0.2	0.22
Cadmium	mg/L	0.000065	0.00013	0.00022	0.00024
Chromium	mg/L	0.00052	0.00063	0.0011	0.0013
Cobalt	mg/L	0.00047	0.002	0.0052	0.0056
Copper	mg/L	0.01	0.027	0.036	0.04
Iron	mg/L	0.052	0.14	0.13	0.2
Lead	mg/L	0.000086	0.0001	0.0002	0.00023
Lithium	mg/L	0.0069	0.0083	0.012	0.013
Manganese	mg/L	0.39	0.99	2.1	2.3
Mercury	mg/L	0.0000025	0.0000025	0.0000023	0.0000024
Molybdenum	mg/L	0.088	0.13	0.26	0.27
Nickel	mg/L	0.0008	0.0013	0.0024	0.0029
Selenium	mg/L	0.033	0.061	0.15	0.16
Silver	mg/L	0.000034	0.00004	0.000072	0.000083
Strontium	mg/L	1.3	2.1	4.4	4.7
Thallium	mg/L	0.00011	0.00012	0.00013	0.00015
Tin	mg/L	0.000062	0.000084	0.000081	0.000096
Titanium	mg/L	0.0075	0.01	0.014	0.016
Uranium	mg/L	0.0015	0.0019	0.0033	0.0035
Vanadium	mg/L	0.0048	0.0064	0.0097	0.013
Zinc	mg/L	0.0081	0.013	0.021	0.024
Dissolved Metals					
Aluminum	mg/L	0.083	0.12	0.26	0.32
Antimony	mg/L	0.00073	0.00096	0.0016	0.0017
Arsenic	mg/L	0.0025	0.0032	0.0053	0.0065
Barium	mg/L	0.053	0.072	0.088	0.096
Beryllium	mg/L	0.00038	0.00048	0.00064	0.00075
Boron	mg/L	0.1	0.13	0.2	0.22
Cadmium	mg/L	0.000065	0.00013	0.00022	0.00024
Chromium	mg/L	0.00052	0.00063	0.0011	0.0013
Cobalt	mg/L	0.00047	0.002	0.0052	0.0056
Copper	mg/L	0.01	0.027	0.036	0.04
Iron	mg/L	0.052	0.14	0.13	0.2
Lead	mg/L	0.000086	0.0001	0.0002	0.00023
Lithium	mg/L	0.0069	0.0083	0.012	0.013
Manganese	mg/L	0.39	0.99	2.1	2.3
Mercury	mg/L	0.0000025	0.0000025	0.0000023	0.0000024
Molybdenum	mg/L	0.088	0.13	0.26	0.27
Nickel	mg/L	0.0008	0.0013	0.0024	0.0029
Selenium	mg/L	0.033	0.061	0.15	0.16
Silver	mg/L	0.000034	0.00004	0.000072	0.000083
Strontium	mg/L	1.3	2.1	4.4	4.7
Thallium	mg/L	0.00011	0.00012	0.00013	0.00015
Tin	mg/L	0.000062	0.000084	0.000081	0.000096
Titanium	mg/L	0.0075	0.01	0.014	0.016
Uranium	mg/L	0.0015	0.0019	0.0033	0.0035
Vanadium	mg/L	0.0048	0.0064	0.0097	0.013
Zinc	mg/L	0.0081	0.013	0.021	0.024

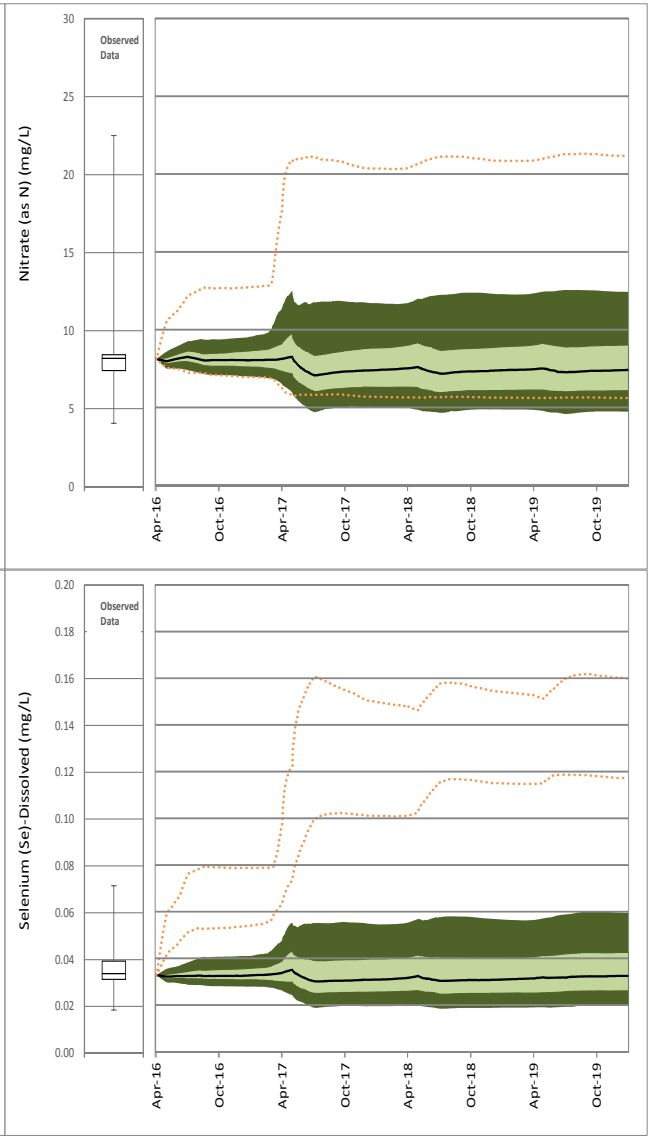
NOTES:

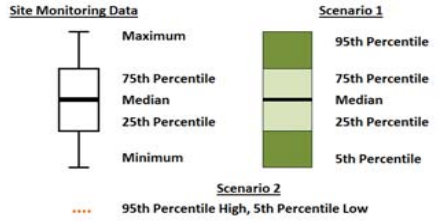
a) Calculated based on predicted calcium and magnesium concentrations

b) Total metals equal to dissolved metals in seepage









Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

PROJECT No. 11411734 / 16000

TITLE

Springer Pit – Time Series Plots for Selected Parameters No Discharge Scenario

FIGURE No. 5 - 3

REVISION 0

5.2.2 Bootjack Lake – Predicted Water Quality

Hydrogeological modelling (Attachment E of Appendix B of the TAR) indicates that seepage from the Cariboo-Springer Pit to Bootjack Lake will increase to a maximum of 420 m^3/d under average conditions when the pit lake elevation is at 1,050 masl. The influence of the seepage on Bootjack Lake water quality was evaluated at the edge of the IDZ assuming the maximum daily median and 95th percentile concentrations would be maintained throughout the No Discharge scenario.

The hydrodynamic model used a tracer (a modelled constituent, not a physical input to the lake) to predict dilution within the IDZ of Bootjack Lake (Appendix I of the TAR). Seepage from the Springer Pit was predicted to increase tracer concentrations in the Bootjack Lake IDZ until they reach a steady state by 2036 (Appendix I of the TAR). Seasonality following 2036 was driven by concentration and dilution during ice formation and melting (Appendix I of the TAR). The predicted tracer concentration was used to calculate concentrations at the edge of the mixing zone. Therefore, trends in predicted concentrations in the IDZ will closely follow those seen in the tracer.

The maximum predicted Bootjack Lake water quality at the edge of the IDZ is presented in Table 5-4. Assessment of these predictions using BC WQGs is presented in Section 6.3 of the TAR.

Table 5-4:
Summary of Predicted Bootjack Lake Initial Dilution Zone Quality – No Discharge Scenario

Parameter	Units	Daily Minimum Dilution Four Year Mine Life		Daily Minimum Dilution Minimum Dilution Scenario		30-day Average Dilution Four Year Mine Life		30-day Average Dilution Minimum Dilution Scenario	
		Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile
Physical Parameters									
Hardness[a]	mg $CaCO_3$/L	53	56	73	82	52	55	73	82
Total Dissolved Solids	mg/L	79	83	109	122	79	83	109	121
Major Ions									
Calcium	mg/L	16	17	23	25	16	17	23	25
Chloride	mg/L	1.5	1.5	1.7	1.8	1.5	1.5	1.6	1.8
Fluoride	mg/L	0.12	0.13	0.23	0.26	0.12	0.13	0.23	0.26
Magnesium	mg/L	2.9	3.1	4.1	4.6	2.9	3.1	4.1	4.6
Potassium	mg/L	0.57	0.6	0.75	0.85	0.56	0.6	0.75	0.85
Sodium	mg/L	3.0	3.1	3.9	4.3	3.0	3.1	3.9	4.3
Sulphate	mg/L	13	16	31	39	13	16	31	38
Nutrients									
Ammonia	mg/L (as N)	0.0068	0.0095	0.015	0.023	0.0068	0.0093	0.015	0.023
Nitrate	mg/L (as N)	0.18	0.31	0.53	0.9	0.18	0.3	0.53	0.89
Nitrite	mg/L (as N)	0.0015	0.006	0.0036	0.017	0.0015	0.0059	0.0035	0.016
Total Phosphorus	mg/L	0.015	0.015	0.015	0.016	0.015	0.015	0.015	0.016
Total Metals									
Aluminum	mg/L	0.027	0.028	0.03	0.033	0.027	0.028	0.03	0.033
Antimony	mg/L	0.000066	0.000072	0.000098	0.00011	0.000066	0.000071	0.000097	0.00011
Arsenic	mg/L	0.00043	0.00045	0.00053	0.00058	0.00043	0.00045	0.00053	0.00057
Barium	mg/L	0.019	0.019	0.02	0.022	0.019	0.019	0.02	0.022
Beryllium	mg/L	0.000058	0.00006	0.000073	0.00008	0.000058	0.00006	0.000073	0.00008
Boron	mg/L	0.048	0.049	0.051	0.053	0.048	0.049	0.051	0.053
Cadmium	mg/L	0.0000064	0.0000081	0.0000092	0.000014	0.0000064	0.000008	0.0000091	0.000014
Chromium	mg/L	0.00026	0.00026	0.00027	0.00028	0.00026	0.00026	0.00027	0.00028
Cobalt	mg/L	0.00006	0.000096	0.000079	0.00019	0.00006	0.000095	0.000079	0.00018
Copper	mg/L	0.0029	0.0033	0.0032	0.0044	0.0029	0.0033	0.0032	0.0044
Iron	mg/L	0.097	0.098	0.096	0.1	0.097	0.098	0.096	0.1
Lead	mg/L	0.000026	0.000027	0.000029	0.000031	0.000026	0.000027	0.000029	0.000031
Lithium	mg/L	0.00065	0.00069	0.00095	0.001	0.00065	0.00068	0.00094	0.001
Manganese	mg/L	0.093	0.11	0.11	0.15	0.093	0.11	0.11	0.15
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.0032	0.0041	0.0072	0.0099	0.0032	0.0041	0.0072	0.0098
Nickel	mg/L	0.00026	0.00028	0.00029	0.00032	0.00026	0.00027	0.00029	0.00032
Selenium	mg/L	0.00097	0.0016	0.0025	0.0045	0.00096	0.0016	0.0025	0.0044
Silver	mg/L	0.0000057	0.0000058	0.000007	0.0000074	0.0000057	0.0000058	0.000007	0.0000074
Strontium	mg/L	0.15	0.17	0.2	0.26	0.15	0.17	0.2	0.26
Thallium	mg/L	0.0000075	0.0000079	0.000012	0.000013	0.0000075	0.0000078	0.000012	0.000013
Tin	mg/L	0.00005	0.000051	0.000051	0.000052	0.00005	0.000051	0.000051	0.000052
Titanium	mg/L	0.0051	0.0051	0.0052	0.0054	0.0051	0.0051	0.0052	0.0054
Uranium	mg/L	0.000074	0.000086	0.00014	0.00017	0.000074	0.000085	0.00014	0.00017
Vanadium	mg/L	0.0011	0.0011	0.0013	0.0014	0.0011	0.0011	0.0013	0.0014
Zinc	mg/L	0.0017	0.0018	0.002	0.0023	0.0017	0.0018	0.002	0.0023
Dissolved Metals									
Aluminum	mg/L	0.0062	0.0072	0.0098	0.013	0.0062	0.0071	0.0098	0.013
Antimony	mg/L	0.00012	0.00012	0.00014	0.00016	0.00011	0.00012	0.00014	0.00016
Arsenic	mg/L	0.00039	0.00041	0.00049	0.00054	0.00039	0.00041	0.00049	0.00054
Barium	mg/L	0.018	0.018	0.02	0.021	0.018	0.018	0.019	0.021
Beryllium	mg/L	0.000033	0.000036	0.00005	0.000057	0.000033	0.000036	0.00005	0.000056
Boron	mg/L	0.046	0.047	0.049	0.051	0.046	0.047	0.049	0.051
Cadmium	mg/L	0.0000098	0.000012	0.000012	0.000017	0.0000098	0.000011	0.000012	0.000017
Chromium	mg/L	0.00026	0.00026	0.00027	0.00028	0.00026	0.00026	0.00027	0.00028
Cobalt	mg/L	0.00011	0.00014	0.00013	0.00023	0.00011	0.00014	0.00013	0.00023
Copper	mg/L	0.0023	0.0027	0.0027	0.0038	0.0023	0.0027	0.0027	0.0038
Iron	mg/L	0.016	0.018	0.018	0.024	0.016	0.018	0.018	0.024
Lead	mg/L	0.000026	0.000027	0.000029	0.000031	0.000026	0.000027	0.000029	0.000031
Lithium	mg/L	0.0026	0.0026	0.0028	0.0029	0.0026	0.0026	0.0028	0.0029
Manganese	mg/L	0.026	0.04	0.043	0.085	0.026	0.04	0.043	0.084
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.0031	0.004	0.0071	0.0098	0.0031	0.004	0.0071	0.0097
Nickel	mg/L	0.00026	0.00028	0.00029	0.00032	0.00026	0.00027	0.00029	0.00032
Selenium	mg/L	0.00095	0.0016	0.0025	0.0044	0.00094	0.0016	0.0025	0.0044
Silver	mg/L	0.0000057	0.0000058	0.000007	0.0000074	0.0000057	0.0000058	0.000007	0.0000074
Strontium	mg/L	0.15	0.17	0.2	0.26	0.15	0.17	0.2	0.26
Thallium	mg/L	0.0000075	0.0000079	0.000012	0.000013	0.0000075	0.0000078	0.000012	0.000013
Tin	mg/L	0.00005	0.000051	0.000051	0.000052	0.00005	0.000051	0.000051	0.000052
Titanium	mg/L	0.0051	0.0051	0.0052	0.0054	0.0051	0.0051	0.0052	0.0054
Uranium	mg/L	0.00007	0.000081	0.00014	0.00017	0.000069	0.00008	0.00014	0.00017
Vanadium	mg/L	0.0006	0.00064	0.0008	0.00092	0.0006	0.00064	0.0008	0.00091
Zinc	mg/L	0.0028	0.0029	0.0031	0.0034	0.0028	0.0029	0.0031	0.0034

NOTES:

a) Calculated based on predicted calcium and magnesium concentrations

5.3 Closure and Post-closure

At Closure, mining infrastructure, including pipelines and pumps, will be decommissioned. Closure drainage is expected to be implemented such that Mine site facilities will generally drain to their natural watersheds (pending piloting and design of potential treatment and water management methods), including flooded open pits, once they have passively filled during Post-closure. During this period, there will be individual site discharges (see Section 5.0) to the following receptors are conceptually planned:

- Bootjack Lake
- Polley Lake
- Quesnel Lake via Hazeltine Creek

To provide the basis for design of a conceptual passive treatment system, it was assumed that all discharges would continue to be managed through the PETBP during the Closure and Post-closure periods. This is the first step in the implementation process, which allows a treatment concept to be developed that can manage all of the load from site during the Post-closure period. The second stage in the process is to pilot the water treatment system during Operations to evaluate the empirical efficiency of the system, which can then be used to refine the WQM for the purposes of evaluating Post-closure impacts, optimizing the passive treatment system and establishing effluent criteria. While a conceptual passive system (with semi-passive design alternatives) has been developed, it is anticipated that MPMC will continue to assess alternatives for Closure/Post-closure water management during Operations.

The following sections provide the estimated discharge water quantity and quality from the PETBP assuming all site water is managed through this facility. Predicted water qualities are also presented for the Springer Pit, since this represents potential surface and subsurface discharges during Post-closure.

5.3.1 Quality of Discharge

The qualities of untreated discharges for the Springer Pit and the PETBP are provided in Table 5-5 and Table 5-6, respectively. The concentrations provided in these tables represent the maximum of the daily median and 95th percentile concentrations modelled during Closure and Post-closure. Maximum predictions are also presented for long-term Post-closure (2050 to 2100). Time series results for TDS, sulphate, nitrate, copper, molybdenum, and selenium are presented Figure 5-4 (Springer Pit) and Figure 5-5 (PETBP). The total concentrations presented in tables and figures assume that TSS have been settled to less than 15 mg/L.

During Post-closure, the PAG waste rock will be placed in the Springer Pit. The waste rock dumps and the TSF will be re-sloped and re-vegetated. The surface runoff from the TSF and waste rock dumps will evolve to a natural runoff water quality as the vegetation establishes in these facilities. As a result, predicted concentrations of many parameters generally decrease in the PETBP as this Closure strategy is implemented (Figure 5-4).

Modelled concentrations in the PETBP are seasonal, with peak concentrations occurring during the winter months. This occurs because there is no surface runoff, and only seepage from the waste rock dumps and TSF, assigned waste rock or tailings chemical profiles, is draining to the PETBP. Although the seepage produced during this period represents a small percentage of the total annual volume (less than 5%), in the absence of any other drainages to the PETBP, concentrations increase in this facility. During freshet and all other non-winter months, concentrations decrease (Figure 5-5). There is also a small increase in modelled concentrations in 2045. This occurs when the Springer Pit is full and begins to drain to the PETBP during Post-closure.

Constituent concentrations in the Springer Pit are predicted to increase as the pit initially fills. As the wall rock proportion decreases in Post-closure, concentrations subsequently decrease to steady-state concentrations as the water is replaced by catchment runoff (Figure 5-4).

The Springer Pit highwall is expected to contain approximately 18% PAG rock. No acidic drainage has been observed at the Mine, though a conservative source term was developed based on humidity cell tests that had their neutralization potential removed (Appendix C of the TAR). This source term was incorporated into the Scenario 2 predictions, under the assumption that the PAG component of the pit wall would become acid generating following refilling. If this occurs, several parameters are predicted to increase in the Springer Pit, most notably copper (Figure 5-4). Since acidic drainage has not been observed at the Mine and PAG onset times are predicted to be longer than the remaining permitted period of Operations, it is not reflected in the Scenario 1 water quality inputs, this increasing trend is not observed in the Scenario 1 results (Figure 5-4).

There is a high degree of uncertainty in the PAG wall source term since acidic drainage has not been observed to date. The results presented herein that assume this source term are thought to be conservatively high. MPMC will evaluate the composition of acidic drainage throughout Operations and update the model as required to reduce the uncertainty in the Post-closure predictions.

Table 5-5:
Summary of Predicted Springer Pit Water Quality – Closure and Post-closure

Parameter	Units	Closure (7/1/2020 - 7/1/2022)				Post-Closure (7/1/2022 - 1/1/2050)				Long Term Post-Closure (1/1/2050 - 1/1/2100)			
		Scenario 1		Scenario 2		Scenario 1		Scenario 2		Scenario 1		Scenario 2	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters													
Hardness[a]	mg $CaCO_3$/L	519	695	652	697	522	709	711	756	296	404	343	388
Total Dissolved Solids	mg/L	746	984	863	904	751	1005	932	978	439	575	462	506
Major Ions													
Calcium	mg/L	158	212	200	211	159	216	217	229	89	121	105	117
Chloride	mg/L	3.1	5.2	15	17	3.1	5.9	17	18	2.3	4.2	15	17
Fluoride	mg/L	0.22	0.34	0.43	0.46	0.26	0.42	0.48	0.51	0.23	0.32	0.42	0.45
Magnesium	mg/L	30	40	37	41	30	42	41	45	18	25	20	23
Potassium	mg/L	2.2	3.0	4.3	4.6	2.2	3.0	4.4	4.7	1.2	1.8	2.1	2.4
Sodium	mg/L	16	21	18	20	16	22	20	22	12	16	11	13
Sulphate	mg/L	389	547	458	482	392	561	509	542	211	294	208	240
Nutrients													
Ammonia	mg/L (as N)	0.19	0.44	0.13	0.14	0.22	0.55	0.13	0.14	0.16	0.39	0.031	0.036
Nitrate	mg/L (as N)	9.6	17	22	24	9.6	17	22	24	4.2	8.3	1.5	3.6
Nitrite	mg/L (as N)	0.074	0.36	0.3	0.31	0.081	0.37	0.59	0.6	0.051	0.13	0.27	0.29
Total Phosphorus	mg/L	0.02	0.031	0.059	0.067	0.02	0.032	0.068	0.075	0.014	0.023	0.34	0.35
Total Metals													
Aluminum	mg/L	0.5	0.53	0.68	0.74	0.52	0.56	0.68	0.74	0.54	0.59	0.72	0.77
Antimony	mg/L	0.0007	0.0013	0.0009	0.0011	0.00087	0.0017	0.0012	0.0014	0.00073	0.0013	0.00065	0.00084
Arsenic	mg/L	0.0012	0.0018	0.0026	0.0032	0.0013	0.0021	0.0028	0.0034	0.0013	0.0021	0.0036	0.0043
Barium	mg/L	0.055	0.077	0.074	0.076	0.055	0.077	0.077	0.08	0.032	0.044	0.075	0.078
Beryllium	mg/L	0.00016	0.0003	0.000083	0.00017	0.00021	0.00033	0.000084	0.00017	0.00023	0.00031	0.00034	0.00042
Boron	mg/L	0.11	0.18	0.22	0.28	0.12	0.21	0.23	0.3	0.11	0.19	0.2	0.27
Cadmium	mg/L	0.000056	0.00023	0.00021	0.00031	0.000056	0.00025	0.00021	0.00031	0.000041	0.00018	0.00018	0.00028
Chromium	mg/L	0.00084	0.00092	0.0013	0.0014	0.00094	0.001	0.0013	0.0014	0.001	0.0012	0.0014	0.0015
Cobalt	mg/L	0.00097	0.004	0.0067	0.0067	0.00096	0.0037	0.0067	0.0068	0.00051	0.001	0.018	0.018
Copper	mg/L	0.018	0.047	0.027	0.038	0.02	0.061	0.03	0.041	0.016	0.038	0.32	0.33
Iron	mg/L	0.58	0.71	0.63	0.7	0.6	0.71	0.63	0.7	0.61	0.68	0.67	0.73
Lead	mg/L	0.00018	0.00019	0.00027	0.00029	0.00018	0.0002	0.00027	0.00029	0.00017	0.00019	0.00035	0.00038
Lithium	mg/L	0.0033	0.0073	0.0053	0.0084	0.0037	0.0081	0.0066	0.0095	0.003	0.0069	0.0075	0.011
Manganese	mg/L	0.78	1.7	2.5	2.6	0.76	1.7	2.6	2.7	0.065	0.47	0.74	0.78
Mercury	mg/L	0.0000025	0.0000026	0.0000025	0.0000025	0.0000025	0.0000027	0.0000025	0.0000025	0.0000022	0.0000022	0.0000022	0.0000022
Molybdenum	mg/L	0.077	0.16	0.21	0.22	0.087	0.16	0.23	0.24	0.058	0.1	0.099	0.12
Nickel	mg/L	0.0011	0.0018	0.0022	0.0026	0.0011	0.0019	0.0023	0.0026	0.0011	0.0016	0.0051	0.0055
Selenium	mg/L	0.044	0.087	0.13	0.14	0.045	0.088	0.15	0.16	0.018	0.043	0.067	0.075
Silver	mg/L	0.0000068	0.00002	0.000029	0.000042	0.0000068	0.00002	0.000029	0.000042	0.0000055	0.000018	0.00005	0.000063
Strontium	mg/L	1.1	2.4	2.8	3.3	1.2	2.9	4.2	4.6	0.85	1.8	2.0	2.5
Thallium	mg/L	0.000045	0.000059	0.000011	0.000024	0.000047	0.000062	0.000011	0.000024	0.000023	0.000035	0.000023	0.000036
Tin	mg/L	0.00007	0.00019	0.000096	0.00022	0.000071	0.0002	0.000099	0.00022	0.000052	0.00018	0.00035	0.00047
Titanium	mg/L	0.031	0.035	0.036	0.037	0.031	0.036	0.036	0.038	0.028	0.031	0.031	0.032
Uranium	mg/L	0.0023	0.0045	0.0024	0.0033	0.0028	0.0056	0.003	0.0038	0.0023	0.0043	0.0016	0.0024
Vanadium	mg/L	0.0024	0.0032	0.0044	0.0051	0.0024	0.0035	0.0044	0.0054	0.0023	0.0034	0.0038	0.0049
Zinc	mg/L	0.0042	0.0092	0.012	0.013	0.0042	0.011	0.012	0.013	0.0033	0.0063	0.068	0.069
Dissolved Metals													
Aluminum	mg/L	0.012	0.04	0.19	0.25	0.035	0.067	0.19	0.25	0.047	0.098	0.23	0.28
Antimony	mg/L	0.00068	0.0012	0.00088	0.0009	0.00085	0.0015	0.0012	0.0013	0.00071	0.0011	0.00063	0.00066
Arsenic	mg/L	0.00098	0.0016	0.0025	0.003	0.0011	0.0019	0.0026	0.0032	0.0011	0.0019	0.0034	0.0041
Barium	mg/L	0.05	0.071	0.068	0.07	0.05	0.071	0.071	0.075	0.026	0.039	0.069	0.073
Beryllium	mg/L	0.00016	0.00022	0.000083	0.000085	0.00021	0.00025	0.000084	0.000086	0.00023	0.00023	0.00034	0.00034
Boron	mg/L	0.1	0.15	0.22	0.25	0.12	0.17	0.23	0.26	0.1	0.15	0.2	0.24
Cadmium	mg/L	0.000051	0.00014	0.00021	0.00021	0.000052	0.00016	0.00021	0.00021	0.000036	0.000083	0.00018	0.00018
Chromium	mg/L	0.00019	0.00028	0.00064	0.0008	0.0003	0.0004	0.00064	0.0008	0.00038	0.00053	0.00071	0.00087
Cobalt	mg/L	0.00064	0.0037	0.0063	0.0064	0.00064	0.0034	0.0064	0.0064	0.00018	0.00072	0.018	0.018
Copper	mg/L	0.013	0.032	0.022	0.023	0.016	0.046	0.025	0.026	0.011	0.023	0.32	0.32
Iron	mg/L	0.036	0.16	0.085	0.15	0.053	0.17	0.085	0.15	0.068	0.13	0.12	0.19
Lead	mg/L	0.000032	0.000049	0.00012	0.00014	0.000032	0.00005	0.00012	0.00014	0.000026	0.00005	0.0002	0.00023
Lithium	mg/L	0.003	0.0044	0.005	0.0055	0.0034	0.0052	0.0063	0.0066	0.0027	0.004	0.0072	0.0077
Manganese	mg/L	0.76	1.7	2.5	2.5	0.74	1.7	2.6	2.7	0.05	0.45	0.72	0.77
Mercury	mg/L	0.0000025	0.0000026	0.0000025	0.0000025	0.0000025	0.0000027	0.0000025	0.0000025	0.0000022	0.0000022	0.0000022	0.0000022
Molybdenum	mg/L	0.077	0.14	0.21	0.21	0.087	0.15	0.23	0.23	0.058	0.087	0.099	0.1
Nickel	mg/L	0.00057	0.0012	0.0017	0.002	0.00057	0.0013	0.0017	0.0021	0.00055	0.0010	0.0045	0.0049
Selenium	mg/L	0.044	0.082	0.13	0.14	0.045	0.083	0.15	0.15	0.018	0.039	0.067	0.07
Silver	mg/L	0.0000068	0.00001	0.000029	0.000032	0.0000068	0.00001	0.000029	0.000032	0.0000055	0.000008	0.00005	0.000053
Strontium	mg/L	1.1	1.9	2.8	2.8	1.2	2.4	4.2	4.2	0.83	1.4	2.0	2.1
Thallium	mg/L	0.000045	0.00005	0.000011	0.000015	0.000047	0.000053	0.000011	0.000015	0.000023	0.000025	0.000023	0.000026
Tin	mg/L	0.00007	0.000093	0.000096	0.00012	0.000071	0.000095	0.000099	0.00012	0.000052	0.000078	0.00035	0.00037
Titanium	mg/L	0.0087	0.013	0.014	0.015	0.0088	0.013	0.014	0.015	0.006	0.009	0.0084	0.0097
Uranium	mg/L	0.0023	0.0039	0.0024	0.0026	0.0027	0.0049	0.003	0.0032	0.0022	0.0037	0.0015	0.0018
Vanadium	mg/L	0.0011	0.0019	0.0031	0.0038	0.0012	0.0022	0.0032	0.0041	0.00099	0.0021	0.0025	0.0036
Zinc	mg/L	0.0026	0.0076	0.01	0.011	0.0027	0.0093	0.01	0.011	0.0018	0.0048	0.066	0.067

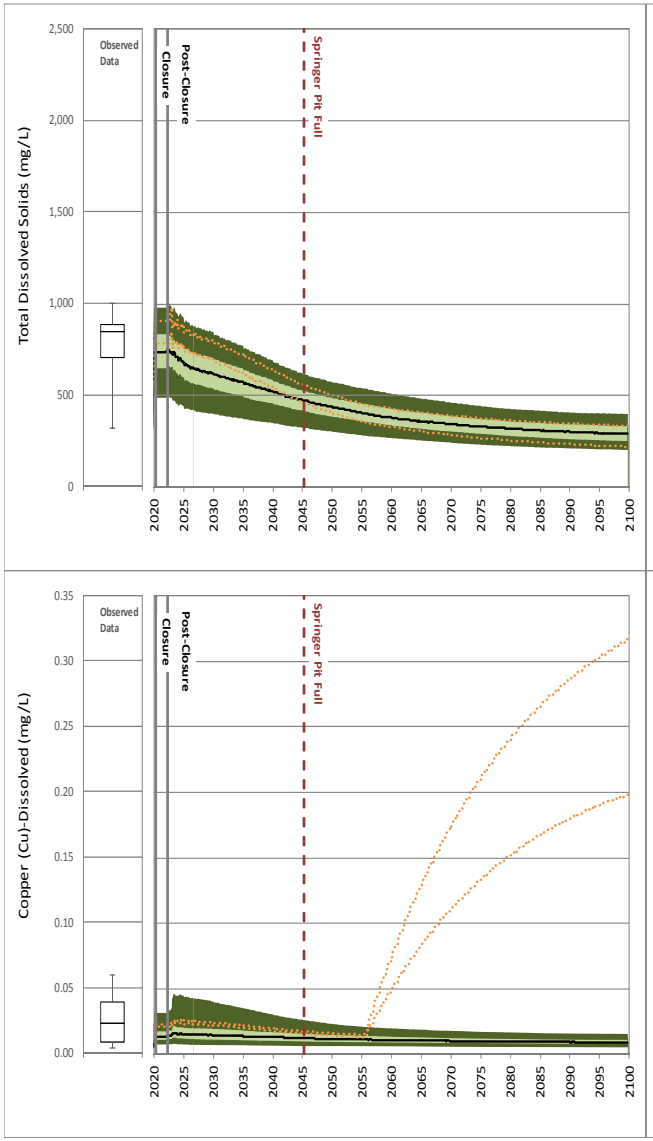
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

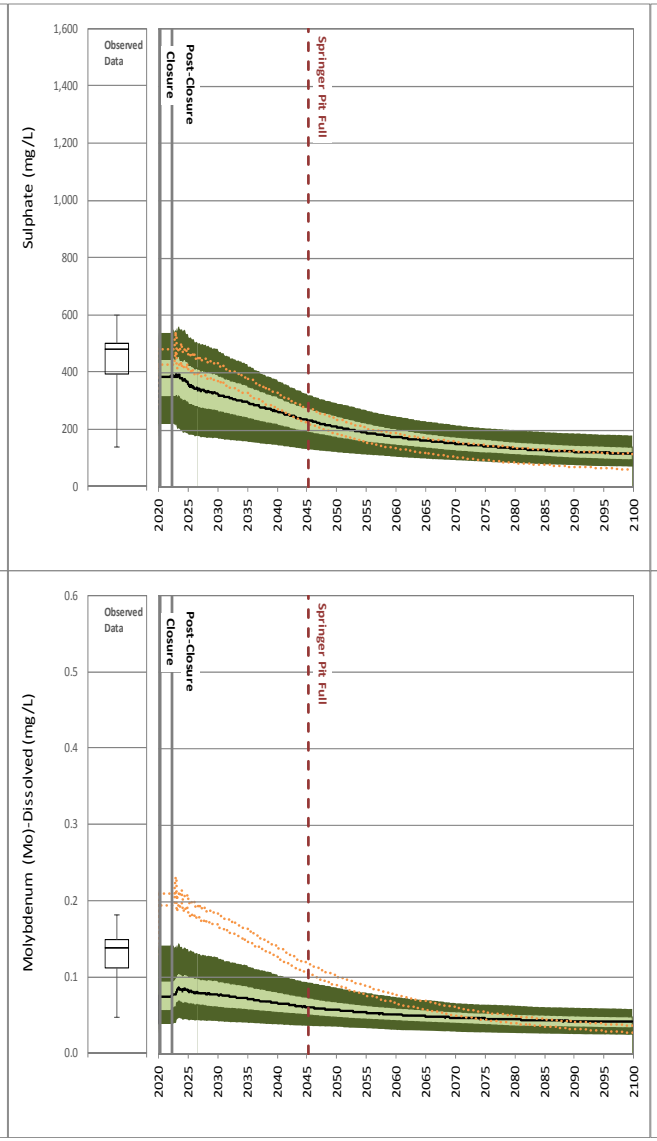
Table 5-6:
Summary of Predicted Perimeter Embankment Till Borrow Pond Water Quality – Closure and Postclosure

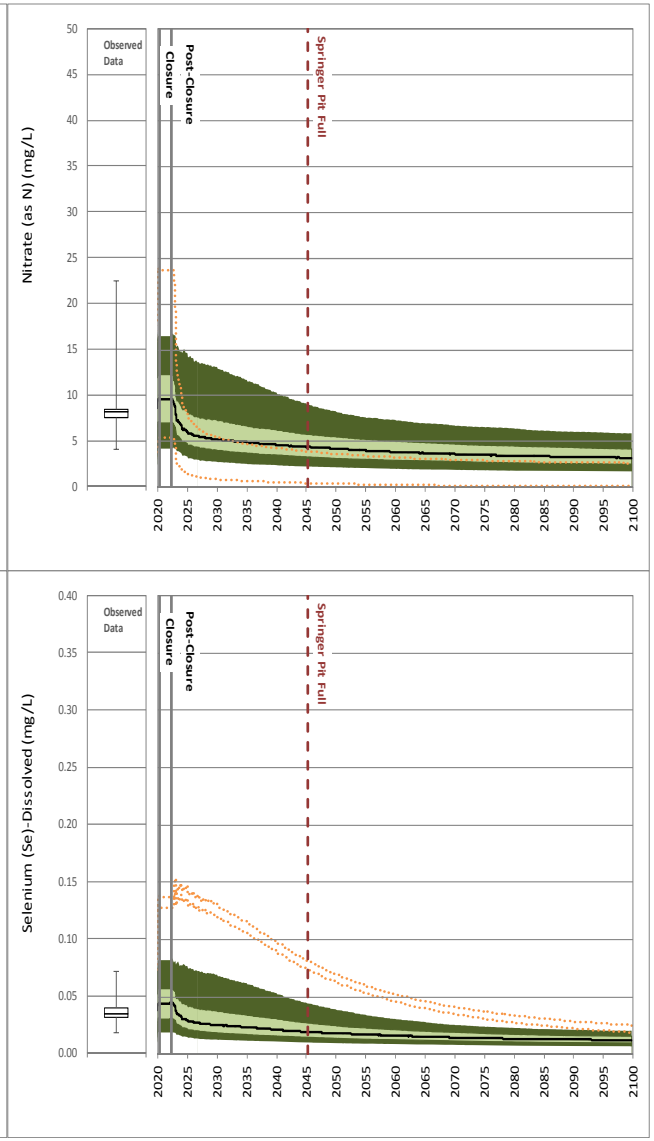
Parameter	Units	Closure (7/1/2020 - 7/1/2022)				Post-Closure (7/1/2022 - 1/1/2050)				Long Term Post-Closure (1/1/2050 - 1/1/2100)			
		Scenario 1		Scenario 2		Scenario 1		Scenario 2		Scenario 1		Scenario 2	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters													
Hardness[a]	mg $CaCO_3$/L	697	1029	1143	1189	462	612	720	775	429	577	587	632
Total Dissolved Solids	mg/L	1005	1510	1479	1530	687	912	949	1011	634	849	804	860
Major Ions													
Calcium	mg/L	214	311	350	362	142	184	219	232	132	173	179	192
Chloride	mg/L	3.5	8.6	15	17	3.9	6.6	9.8	13	3.2	5.8	10	13
Fluoride	mg/L	0.14	0.35	0.46	0.47	0.19	0.32	0.4	0.42	0.19	0.32	0.38	0.4
Magnesium	mg/L	40	61	65	69	26	37	42	48	24	35	34	37
Potassium	mg/L	2.7	4.6	6.5	6.8	2.1	3.2	4.2	4.7	1.8	2.9	3.5	3.9
Sodium	mg/L	17	25	30	32	15	19	23	27	14	17	19	21
Sulphate	mg/L	554	906	907	935	372	531	576	617	339	495	471	502
Nutrients													
Ammonia	mg/L (as N)	0.029	0.25	0.16	0.16	0.075	0.18	0.11	0.11	0.075	0.18	0.093	0.095
Nitrate	mg/L (as N)	9.4	25	4.7	4.7	9.3	17	3.0	3.5	7.8	16	2.7	3.5
Nitrite	mg/L (as N)	0.041	0.5	1.7	1.7	0.034	0.32	1.1	1.1	0.034	0.26	0.93	0.93
Total Phosphorus	mg/L	0.02	0.037	0.08	0.088	0.022	0.034	0.059	0.071	0.02	0.034	0.16	0.17
Total Metals													
Aluminum	mg/L	0.57	0.65	0.62	0.7	0.58	0.68	0.62	0.69	0.58	0.67	0.64	0.72
Antimony	mg/L	0.00025	0.00057	0.0018	0.002	0.00039	0.00076	0.0014	0.0016	0.00039	0.00077	0.0012	0.0013
Arsenic	mg/L	0.00071	0.0011	0.0026	0.0029	0.00097	0.0014	0.0023	0.0025	0.00097	0.0015	0.0024	0.0028
Barium	mg/L	0.063	0.12	0.12	0.12	0.04	0.065	0.07	0.072	0.037	0.063	0.06	0.065
Beryllium	mg/L	0.000074	0.00035	0.000099	0.00023	0.00012	0.00035	0.000075	0.00021	0.00013	0.00026	0.00017	0.00027
Boron	mg/L	0.051	0.11	0.2	0.24	0.088	0.15	0.14	0.18	0.089	0.15	0.14	0.19
Cadmium	mg/L	0.000062	0.00036	0.00024	0.00034	0.000046	0.00025	0.00017	0.00027	0.000046	0.00024	0.00015	0.00025
Chromium	mg/L	0.0012	0.0014	0.0013	0.0016	0.0013	0.0016	0.0013	0.0016	0.0013	0.0016	0.0013	0.0016
Cobalt	mg/L	0.0012	0.0052	0.011	0.011	0.00063	0.0018	0.0053	0.0053	0.00051	0.0017	0.0088	0.0088
Copper	mg/L	0.014	0.072	0.037	0.049	0.013	0.053	0.059	0.07	0.013	0.051	0.14	0.16
Iron	mg/L	0.65	0.78	0.66	0.78	0.66	0.77	0.66	0.78	0.66	0.77	0.66	0.78
Lead	mg/L	0.00018	0.0002	0.00023	0.00024	0.00018	0.00021	0.00021	0.00023	0.00018	0.00021	0.00025	0.00028
Lithium	mg/L	0.002	0.007	0.0081	0.011	0.0026	0.0069	0.007	0.01	0.0026	0.0063	0.0067	0.01
Manganese	mg/L	0.98	2.5	4.5	4.5	0.24	1.0	2.3	2.3	0.064	0.96	1.3	1.3
Mercury	mg/L	0.0000023	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000021	0.0000022	0.0000021	0.0000021
Molybdenum	mg/L	0.093	0.22	0.38	0.4	0.064	0.12	0.26	0.3	0.064	0.12	0.21	0.24
Nickel	mg/L	0.0014	0.0027	0.0031	0.0034	0.0014	0.002	0.0028	0.0032	0.0014	0.0019	0.0033	0.0038
Selenium	mg/L	0.05	0.14	0.25	0.26	0.017	0.069	0.17	0.17	0.017	0.066	0.12	0.13
Silver	mg/L	0.00001	0.000025	0.000019	0.000032	0.000012	0.000025	0.000015	0.000029	0.000010	0.000022	0.000025	0.000039
Strontium	mg/L	1.4	4.0	6.8	7.3	1.5	3.2	5.2	5.7	1.4	3.0	3.8	4.3
Thallium	mg/L	0.00011	0.00012	0.00005	0.000062	0.00011	0.00012	0.000042	0.000054	0.000045	0.000062	0.000037	0.000049
Tin	mg/L	0.000067	0.0002	0.000093	0.0002	0.000063	0.00019	0.000075	0.00019	0.00006	0.00018	0.00017	0.00029
Titanium	mg/L	0.033	0.04	0.044	0.045	0.029	0.033	0.036	0.038	0.029	0.032	0.034	0.035
Uranium	mg/L	0.0011	0.0026	0.0049	0.0057	0.0013	0.0025	0.0035	0.0045	0.0013	0.0026	0.0026	0.0034
Vanadium	mg/L	0.0019	0.0026	0.0039	0.004	0.002	0.0025	0.0032	0.0036	0.002	0.0026	0.0032	0.0036
Zinc	mg/L	0.005	0.017	0.011	0.012	0.0046	0.011	0.015	0.016	0.0044	0.011	0.032	0.033
Dissolved Metals													
Aluminum	mg/L	0.079	0.16	0.13	0.21	0.092	0.19	0.13	0.2	0.09	0.18	0.15	0.23
Antimony	mg/L	0.00023	0.00039	0.0018	0.0018	0.00037	0.00058	0.0014	0.0014	0.00037	0.00059	0.0011	0.0011
Arsenic	mg/L	0.00052	0.00093	0.0024	0.0027	0.00078	0.0012	0.0021	0.0023	0.00078	0.0013	0.0022	0.0026
Barium	mg/L	0.057	0.11	0.11	0.12	0.034	0.059	0.065	0.067	0.031	0.057	0.054	0.059
Beryllium	mg/L	0.000074	0.00027	0.000099	0.00015	0.00012	0.00027	0.000075	0.00013	0.00013	0.00018	0.00017	0.00019
Boron	mg/L	0.048	0.074	0.2	0.21	0.085	0.12	0.14	0.15	0.086	0.12	0.14	0.15
Cadmium	mg/L	0.000058	0.00026	0.00024	0.00024	0.000042	0.00015	0.00016	0.00018	0.000042	0.00015	0.00015	0.00016
Chromium	mg/L	0.00053	0.00078	0.00068	0.00097	0.00065	0.00095	0.00066	0.00096	0.00064	0.00093	0.00066	0.00095
Cobalt	mg/L	0.0009	0.0049	0.011	0.011	0.0003	0.0015	0.005	0.005	0.00018	0.0013	0.0084	0.0085
Copper	mg/L	0.0097	0.057	0.033	0.034	0.0089	0.037	0.054	0.055	0.0088	0.035	0.14	0.14
Iron	mg/L	0.11	0.24	0.11	0.23	0.11	0.23	0.11	0.23	0.11	0.23	0.11	0.23
Lead	mg/L	0.000033	0.000059	0.00008	0.000096	0.000034	0.000063	0.000066	0.00009	0.000031	0.000062	0.00011	0.00013
Lithium	mg/L	0.0017	0.0041	0.0078	0.0085	0.0023	0.004	0.0067	0.0076	0.0023	0.0033	0.0064	0.0071
Manganese	mg/L	0.96	2.5	4.5	4.5	0.23	1.0	2.3	2.3	0.049	0.94	1.3	1.3
Mercury	mg/L	0.0000023	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000023	0.0000021	0.0000022	0.0000021	0.0000021
Molybdenum	mg/L	0.093	0.2	0.38	0.38	0.064	0.11	0.26	0.29	0.064	0.11	0.21	0.22
Nickel	mg/L	0.00085	0.0021	0.0026	0.0028	0.00081	0.0015	0.0023	0.0027	0.0008	0.0013	0.0028	0.0032
Selenium	mg/L	0.05	0.14	0.25	0.26	0.017	0.064	0.17	0.17	0.017	0.062	0.12	0.13
Silver	mg/L	0.00001	0.000015	0.000019	0.000022	0.000012	0.000015	0.000015	0.000019	0.000010	0.000012	0.000025	0.000029
Strontium	mg/L	1.4	3.6	6.8	6.9	1.5	2.8	5.2	5.3	1.4	2.6	3.8	3.9
Thallium	mg/L	0.00011	0.00011	0.00005	0.000052	0.00011	0.00011	0.000042	0.000045	0.000045	0.000052	0.000037	0.00004
Tin	mg/L	0.000067	0.0001	0.000093	0.0001	0.000063	0.000093	0.000075	0.000087	0.00006	0.000079	0.00017	0.00019
Titanium	mg/L	0.01	0.018	0.021	0.023	0.0071	0.011	0.014	0.016	0.0067	0.010	0.011	0.013
Uranium	mg/L	0.0011	0.0019	0.0048	0.0051	0.0013	0.0019	0.0035	0.0038	0.0013	0.0019	0.0026	0.0028
Vanadium	mg/L	0.00058	0.0014	0.0026	0.0027	0.00073	0.0012	0.0019	0.0023	0.00072	0.0013	0.0019	0.0023
Zinc	mg/L	0.0035	0.015	0.0097	0.011	0.003	0.010	0.014	0.015	0.0029	0.0093	0.03	0.031

NOTES:

a) Calculated based on predicted calcium and magnesium concentrations







Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

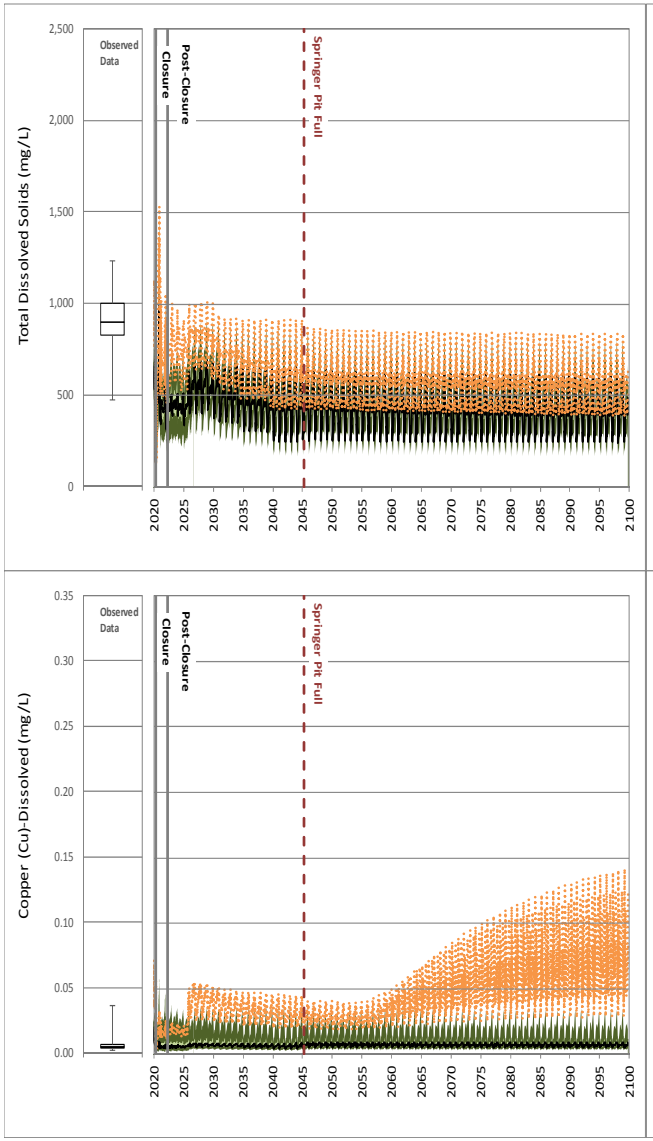
PROJECT No. 11411734 / 16000

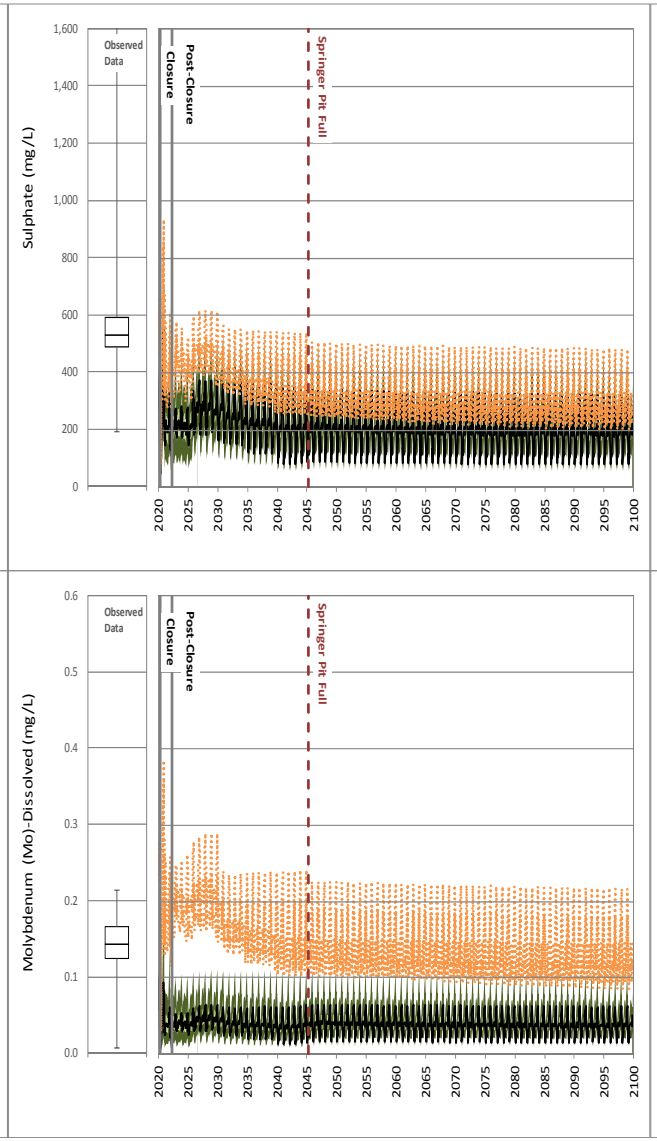
TITLE

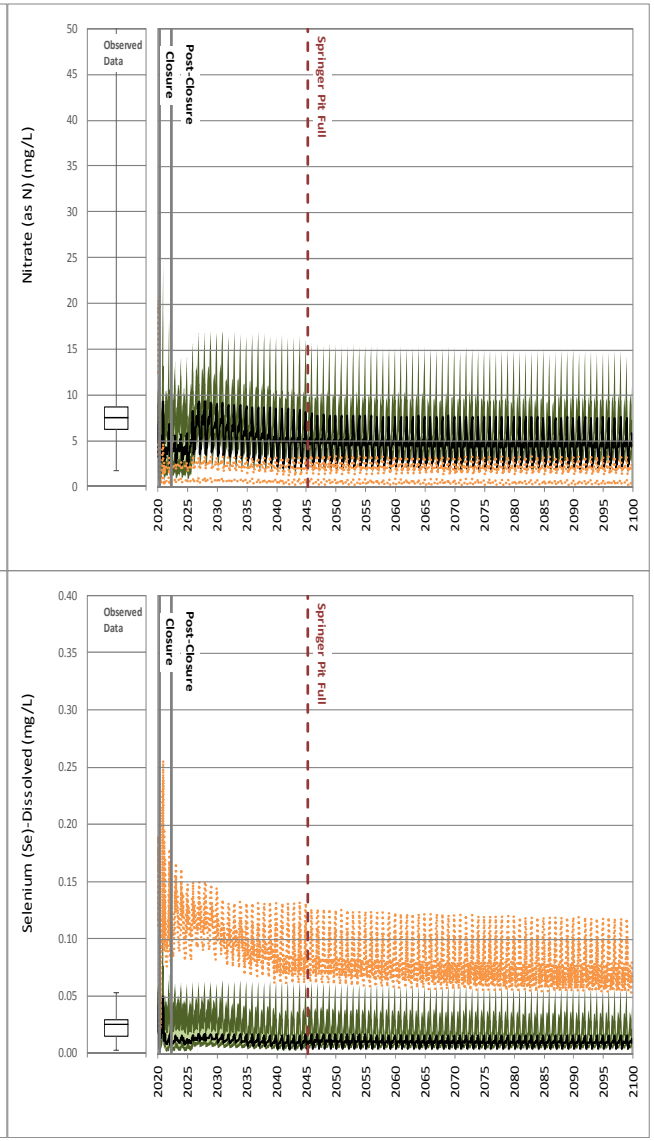
Springer Pit – Time Series Plots for Selected Parameters Closure – Post Closure

FIGURE No. 5 - 4

REVISION 0







Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

Golder Associates

CLIENT

Mount Polley Mining Corporation

DESIGN	CQ	15 JUN 16
CHECK	PAB	15 JUN 16
REVIEW	MKH	17 JUN 16

PROJECT No. 11411734 / 16000

TITLE

Perimeter Embankment Till Borrow Pond – Time Series Plots for Selected Parameters Closure – Post Closure

FIGURE No. 5 - 5

REVISION 0

5.3.2 Ore Stockpiles

Load from the remaining ore stockpiles in Closure and Post-closure is assumed to have negligible impact on discharge water quality as drainage from these facilities only accounts for a small component of the total discharge load. Assuming the ore stockpiles are not reduced in area or reclaimed in Closure or Post-closure, the total flow (runoff and seepage) from the ore stockpile areas will be less than 5% of the total discharge from site. This is considered a conservative assumption because ore stockpiles are expected to be reduced prior to Closure. Applying a NAG waste rock water quality to all contact water from the ore stockpiles, the total sulphate load from these facilities is less than 6% of the total load from site during Closure and Post-closure.

5.3.3 Other Site Facilities

Time series for all modelled site facilities during Closure and Post-Closure are presented in Attachment B for all modelled parameters.

6.0 SUMMARY

A WQM was developed using GoldSim to predict site water quality at the Mine, and discharge water quality from the Springer Pit and PETBP. The SWWBM (Appendix B of the TAR) formed the basis of the WQM. The model was calibrated from 1 October 2014, to 1 February 2016, and water qualities were predicted for the following timeframes:

- Operations (1 February 2016 – 30 June 2020)
- Closure (1 July 2020 – 30 June 2022)
- Post-closure (1 July 2022 – 1 January 2100)

Two model scenarios were developed to evaluate site water quality (See Section 3.0):

- **Scenario 1**—discharge water quality evaluated using site monitoring data as inputs
- **Scenario 2**—discharge water quality evaluated using source terms developed by SRK (Appendix C of the TAR)

Comparison of model results for the calibration period to site monitoring data indicated generally good agreement between model predictions and observed conditions (See Section 4.0). In most cases for which model results differed from observed water quality, the model tended to over predict constituent concentrations. However, monitored concentrations of some constituents were above projected water quality ranges for the Mine. These deviations may require follow-up action to understand the causes, both in the context of ongoing, adaptive site water management, and in the context of improving future predictions for long-term water management.

The Mine has a positive water balance, and as such, discharge will be required during Operations, Closure, and Post-closure. The location and number of discharges is anticipated to vary throughout these periods. During Operations, contact water from within the Mine site and the outlet location can be closely managed. Water is proposed to be discharged from the Springer Pit and the PETBP. Discharges during Operations will report to Quesnel Lake, either via Hazeltine Creek (up to November 2017; permitted), or via direct pipeline (after November 2017; proposed) (Appendix G of the TAR).

Water quality in the Springer Pit is predicted to remain stable during dewatering, until the end of 2017. As the pit lake is drawn down during Operations, water quality in the pit is predicted to follow stronger seasonal trends, with peaks occurring during freshet as a result of increased flow from pit wall rock and the Temporary NW PAG Stockpile. In Closure and Post-closure, predicted concentrations in the Springer Pit generally decrease as the pit refills.

During Operations, water quality is predicted to be seasonal in the PETBP following dewatering of the Springer Pit, since the dewatering of the Springer Pit represents the largest volume of water pumped to the PETBP. Seasonality in the PETBP is predicted to continue in Closure and Post-closure with peak concentrations occurring during the winter months related to seepage from the waste rock dumps and TSF. Although the seepage produced during this period represents a small percentage of the total annual volume (less than 5%), in the absence of any other drainages to the PETBP, concentrations are projected to increase in this facility. Predicted concentrations of some parameters in the PETBP (e.g., copper) are predicted to increase slightly in 2045 when the Springer Pit is full and begins to drain to the PETBP.

Predicted concentrations in the IDZ of Quesnel Lake were based on predicted site discharge water quality and predicted dilution ratios from the Quesnel Lake hydrodynamic model (Appendix J of the TAR). Trends in predicted Quesnel Lake IDZ concentrations are seasonal with minimum dilution occurring in the fall, following the trends of predicted dilution which is driven by stratification in the lake (Appendix J of the TAR). Daily maximum and monthly average Quesnel Lake IDZ concentrations are presented in Table 5-2. Assessment of these predictions using BC WQGs is presented in Section 6.3 of the TAR.

A No Discharge scenario was considered to account for unforeseen circumstances (i.e., treatment system long-term technical failure), assuming site water would be stored in the Springer Pit and discharge would not occur for an extended period. Hydrogeological modelling (Attachment E of Appendix B of the TAR), indicates water would exfiltrate from the Springer Pit and migrate towards Bootjack Lake as the pit lake elevation rises above 1,030 masl. Predicted Springer Pit concentrations in this scenario are generally stable throughout the model time frame (e.g., TDS) or increase through refilling as pit wall runoff and other site flows report to the pit (e.g., copper). Predicted concentrations in the Bootjack Lake IDZ are predicted to increase over time due seepage from the Springer Pit before reaching steady data by 2036, similar to the tracer concentrations predicted in the hydrodynamic modelling (Appendix I of the TAR). Assessment of these predictions using BC WQGs is presented in Section 6.3 of the TAR.

It is recognized that water quality modelling is based on multiple inputs and assumptions, all of which have inherent variability and uncertainty (see Section 2.4). The model presented in this document is based on stochastic inputs which account for and replicate some of the natural variability in site conditions, and geochemical source terms (Appendix C of the TAR). Among other measures of conservatism applied, only the maximum median and 95th percentile predictions for each phase are presented and used for assessment.

7.0 CLOSURE

The reader is referred to the Study Limitations, which follows the text and forms an integral part of this report.

We trust this report satisfies your current requirements. If you have any questions or require further assistance, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Paul Beddoes, MSc, RPBio
Environmental Scientist

Michael K. Herrell, MSc, PGeo
Associate, Senior Geochemist

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

PAB/MKH/JV/bb/it/kp

o:\final\2014\1421\1411734\1411734-176-r-rev0-16000\1411734-176-r-rev0-16000-wq model 17oct_16.docx

REFERENCES

AEP (Alberta Environmental Protection). 1995. Water Quality Based Effluent Limits Procedures Manual. Environmental Protection. Edmonton, Alberta.

Beckman RJ, RD Cook. 1983. Outliers. Technometrics. 25:119-149.

Golder (Golder Associates Ltd.). 2015. Validation of the Springer Pit Lake Model. Technical Memorandum submitted to MPMC December 18, 2015. Reference No. 1411734-111-TM-RevA-6000.

GoldSim. 2010. GoldSim User Manual. GoldSim Consulting Group. Redmond, Washington. December 2010.

INAP (International Network for Acid Prevention). 2009. Global Acid Rock Drainage Guide. (www.gardguide.com).

Jain RB. 1981. Percentage Points of Many-Outlier Detection Procedures. Technometrics. 23:71-75.

Kottegoda NT. 1984. Investigation of Outliers in Annual Maximum Flow Series. Journal of Hydrology. 72:105-137.

MEND (Mine Environment Neutral Drainage). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. Natural Resources Canada.

MoE (British Columbia Ministry of Environment). 2014. Technical Guidance, Environmental Management Act Applications: Volume 1: Terms of Reference: Environmental Impact Assessment and Technical Assessment Report. December 2014.

MPMC. 2015a. Permit Amendment Application. Mount Polley Mine Return to Full Operations. Submitted to Ministry of Energy and Mines in November 2015.

MPMC. 2015b. 2014 Environmental and Reclamation Report for Mount Polley Mine. Submitted to Ministry of Energy and Mines in March 2015.

MPMC. 2015c. Mine Reclamation and Closure Plan Update, Mount Pulley Mine. Submitted to Ministry of Energy and Mines, November 6, 2015. MPMC. 2016a. Email from Ryan Brown: Mount Polley Pit Wall Lithologies. March 28, 2016.

MPMC. 2016b. Email from Ryan Brown: Mount Polley Model Closure Assumptions. April 22, 2016.

Pearson RK. 2001. Exploring Process Data. Journal of Process Control. 11:179-194.

Sokal RR, FJ Rohlf. 1981. Biometry – The Principles and Practice of Statistics in Biological Research, 2nd Edition. WH Freeman and Company. New York.

US EPA (United States Environmental Protection Agency). 1991. Technical Support Document for Water Quality-Based Toxics Control. EPA 50512-90-001. Washington, D.C.

Vandenberg JA, N Lauzon, S Prakash, K Salzsauler. 2011. Use of Water Quality Models for Design and Evaluation of Pit Lakes. Mine Pit Lakes: Closure and Management. C.D. McCullough (Ed.), Australian Centre for Geomechanics. Pp. 63 – 81.

STUDY LIMITATIONS

This report was prepared for the exclusive use of Mount Polley Mining Corporation (MPMC). The inferences concerning the data, site and receiving environment conditions contained in this report are based on information obtained during investigations conducted at the site by Golder Associates Ltd. (Golder), other consultants and MPMC, and are based solely on the condition of the site at the time of the site studies and subsequent investigations and remediation and other information obtained by Golder, as described in this report. Soil, surface water and groundwater conditions may vary with location, depth, time, sampling methodology, analytical techniques and other factors.

In evaluating the subject site and water quality data, Golder has relied in good faith on information provided. The factual data, interpretations and recommendations pertain to a specific project as described in this report, based on the information obtained during the assessment by Golder on the dates cited in the report, and are not applicable to any other project or site location. Golder accept no responsibility for any deficiency or inaccuracy contained in this report as a result of reliance on the aforementioned information.

The findings and conclusions documented in this report have been prepared for the specific application to this project, and have been developed in a manner consistent with that level of care normally exercised by environmental professionals currently practising under similar conditions in the jurisdiction. Golder makes no other warranty, expressed or implied and assumes no liability with respect to the use of the information contained in this report at the subject site, or any other site, for other than its intended purpose.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or action based on this report. All third parties relying on this report do so at their own risk. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely upon the electronic media versions of Golder's report or other work product. Golder is not responsible for any unauthorized use or modifications of this report.

MPMC may rely on the information contained in this report subject to the above limitations.

Golder makes no other representation whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations and the regulations themselves may change over time, thus MPMC should review these issues.

If new information is discovered during future work, including excavations, sampling, soil boring, predictive geochemistry or other investigations, Golder should be requested to re-evaluate the conclusions of this report and to provide amendments, as required, prior to any reliance upon the information presented herein. The validity of this report is affected by any change of site conditions, purpose, development plans or significant delay from the date of this report in initiating or completing the project.

ATTACHMENT A

Seepage Rates for Storage Facilities

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-168-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

FROM Jennifer Levenick
Willy Zawadzki

EMAIL jlevenick@golder.com
wzawadzki@golder.com

PRELIMINARY ESTIMATES OF POTENTIAL SEEPAGE RATES FOR STORAGE FACILITIES – LONG-TERM TECHNICAL ASSESSMENT REPORT - MOUNT POLLEY MINE

1.0 INTRODUCTION

The following technical memorandum summarizes the preliminary estimates of potential seepage quantity from four storage facilities at the Mount Polley Mine that is operated by the Mount Polley Mine Corporation (MPMC) near Likely, BC. These facilities are: the Northeast Zone (NEZ) Soil Stockpile; the NEZ Dump, the Southeast Rock Disposal Site (SERDS) and the Temporary Northwest (NW) Potentially Acid Generating (PAG) stockpile. The analysis was completed in support of concurrent water quality and site-wide water balance studies that are included in the Technical Assessment Report (TAR) for the mine.

2.0 METHODOLOGY AND RESULTS

Potential seepage from the four storage facilities to the subsurface was estimated based on the footprint of each facility at closure, the average site annual precipitation (670 mm/yr) and estimates of groundwater recharge. As an initial or base case estimate, 30% of the average annual precipitation was assumed to infiltrate through soil/rock of each facility into the groundwater flow system, a value that corresponds to the recharge rate that was estimated for the area between Bootjack Lake and Polley Lake during calibration of a numerical groundwater for the Springer Pit and Cariboo Pit (Golder 2014). Considering the uncertainty in the estimated recharge that was evaluated using this groundwater model (lower bound and upper bound scenarios), it was assumed it could range between 20% and 50% of the average annual recharge.

Table 1 presents a summary of the potential seepage rates estimated for each storage facility into the groundwater flow system. These preliminary estimates do not account for seepage which may be collected in drainage ditches down-gradient of each facility or for reduced infiltration along steeper slopes of the facilities due to higher surface water runoff. Therefore, actual seepage from these facilities to the subsurface may be lower than that summarized in Table 1.

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

Table 1: Preliminary Estimates of Potential Seepage from Storage Facilities

Storage Facility	Predicted Seepage (l/s)			General Groundwater Flow Direction
	Lower Bound (20% of Average Annual Precipitation)	Base Case (30% of Average Annual Precipitation)	Upper Bound (50% of Average Annual Precipitation)	
NEZ Soil Stockpile	0.1	0.2	0.5	East-Northeast
NEZ Dump	0.9	1.3	2.2	East
SERDS	3.3	4.9	8.2	Southeast
Temporary NW PAG Stockpile	2.6	3.9	6.6	Northwest, West, Southwest

NEZ = Northeast Zone; SERDS = Southeast Rock Disposal Site; NW PAG = Northwest Potentially Acid Generating

3.0 CLOSURE

We trust that the above information is sufficient for your needs at this time. Should you have any questions or require clarification, please do not hesitate contact the undersigned at 604-296-4200.

GOLDER ASSOCIATES LTD.

Jennifer Levenick, PEng
Associate, Senior Hydrogeologist

Willy Zawadzki, PGeo
Principal, Senior Hydrogeologist

JL/WA/pn/kp

Attachment: Study Limitations

o:\final\2014\1421\1411734\1411734-168-tm-rev0-16000\1411734-168-tm-rev0-16000-other facilities 17oct_16.docx

REFERENCE

Golder Associates Ltd. 2014. *Updated Predictions of Pit Lake Formation for the Springer Open Pit – Mount Polley Mine*. Submitted to Mount Polley Mining Corporation on December 16, 2014.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

ATTACHMENT B

Model Results and Time Series Figures

17 October 2016

MOUNT POLLEY MINE
RESUMED OPERATIONS AND CLOSURE WATER MANAGEMENT PLAN

Model Results and Time Series Figures

Submitted to:
Mount Polley Mining Corporation
Box 12
Likely, BC
V0L 1N0

Attention: Ms. Colleen Hughes, Mr. Luke Moger, Ms. Lyn Anglin, Mr. Don Parsons, and Mr. Art Frye

REPORT

Reference Number: 1411734-205-R-Rev0-16000

Distribution:

1 Electronic Copy - Mount Polley Mining Corporation
1 Hard Copy - Golder Associates Ltd.

Golder Associates

Table of Contents

1.0 INTRODUCTION 1

1.1 Springer Pit 2

1.2 Perimeter Embankment Till Borrow Pond 24

1.3 Central Collection Sump (CCS) 47

1.4 Cariboo Pit 69

1.5 9K Sump 91

1.6 Northwest (NW) Sump 113

1.7 Mine Drainage Creek Sump 135

1.8 Bootjack Creek Sump 157

1.9 South Embankment Seepage Collection Pond (SESCP) 179

1.10 Main Embankment Seepage Collection Pond (MESCP) 201

1.11 Tailings Storage Facility (TSF) Supernatant Pond 223

1.12 Wight Pit 245

2.0 CLOSURE 267

REFERENCE 268

TABLES

Table B1a: Predicted Springer Pit Water Quality – Scenario 1 3

Table B1b: Predicted Springer Pit Water Quality – Scenario 2 4

Table B2a: Predicted PETBP Water Quality – Scenario 1 25

Table B2b: Predicted PETBP Water Quality – Scenario 2 26

Table B3a: Predicted CCS Water Quality – Scenario 1 48

Table B3b: Predicted CCS Water Quality – Scenario 2 49

Table B4a: Predicted Cariboo Pit Water Quality – Scenario 1 70

Table B4b: Predicted Cariboo Pit Water Quality – Scenario 2 71

Table B5a: Predicted 9km Sump Water Quality – Scenario 1 92

Table B5b: Predicted 9km Sump Water Quality – Scenario 2 93

Table B6a: Predicted Northwest Sump Water Quality – Scenario 1 114

Table B6b: Predicted Northwest Sump Water Quality – Scenario 2 115

Table B7a: Predicted Mine Drainage Creek Sump Water Quality – Scenario 1 136
Table B7b: Predicted Mine Drainage Creek Sump Water Quality – Scenario 2 137
Table B8a: Predicted Bootjack Creek Sump Water Quality – Scenario 1 158
Table B8b: Predicted Bootjack Creek Sump Water Quality – Scenario 2 159
Table B9a: Predicted SESCP Water Quality – Scenario 1 180
Table B9b: Predicted SESCP Water Quality – Scenario 2 181
Table B10a: Predicted MESCP Water Quality – Scenario 1 202
Table B10b: Predicted MESCP Water Quality – Scenario 2 203
Table B11a: Predicted TSF Supernatant Pond Water Quality – Scenario 1 224
Table B11b: Predicted TSF Supernatant Pond Water Quality – Scenario 2 225
Table B12a: Predicted Wight Pit Water Quality – Scenario 1 246
Table B12b: Predicted Wight Pit Water Quality – Scenario 2 247

FIGURES

Figure B1: Time Series Plots of Predicted Springer Pit Water Quality 5
Figure B2: Time Series Plots of Predicted PETBP Water Quality 27
Figure B3: Time Series Plots of Predicted CCS Water Quality 50
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality 72
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality 94
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality 116
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality 138
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality 160
Figure B9: Time Series Plots of Predicted SESCP Water Quality 182
Figure B10: Time Series Plots of Predicted MESCP Water Quality 204
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality 226
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality 248

1.0 INTRODUCTION

The site water quality model (WQM) described in Appendix D was designed to predict site discharge water quality during Operations, Closure and Post-closure. The focus of the results presented in the Technical Assessment Report (TAR) and in Appendix D was on the key discharge locations during Operations (e.g., the Springer Pit and the Perimeter Embankment Till Borrow Pond [PETBP]) and from a centralized location in Closure/Post-closure (e.g., the PETBP). The predicted discharge water quality from these locations was used in the TAR as follows:

- provide input into the proposed effluent limits for discharge during Operations (see Section 5.4 of the TAR)
- provide input into the proposed effluent limits for Springer Pit seepage to Bootjack Lake (see Section 5.4 of the TAR)
- predict the influence of site discharge water quality on downstream receptors as part of the Environmental Effects Predictions (see Section 6.0 of the TAR)
- inform treatment design during Operations, Closure and Post-closure (see Section 5.5 of the TAR)

The WQM included an input source term or calculated water quality for each drainage source that could influence site discharge water qualities that are presented in the TAR. In their review of the *Mines Act* Permit amendment application to return the mine to full operations (MPMC 2015), the BC Ministry of Energy and Mines (MEM) submitted information requirements to Mount Polley Mining Corporation, which were established as an additional Terms of Reference for the TAR (see Appendix A of the TAR). The information requirements included water quality predictions of the following locations during Operations, Closure, and Post-closure:

- Springer Pit
- PETBP
- Central Collection Sump (CCS)
- Cariboo Pit
- 9K Sump
- Northwest (NW) Sump
- Mine Drainage Creek Sump
- Bootjack Creek Sump
- South Embankment Seepage Collection Pond (SESCP)
- Main Embankment Seepage Collection Pond (MESCP)
- Tailings Storage Facility (TSF) supernatant pond
- All ore stockpiles (Cariboo, #1, #3, and High Oxide)

This attachment presents summary statistics and time series plots of WQM results for these locations, except for the ore stockpiles, which are discussed in Sections 5.1.2 (Operations) and 5.3.2 (Closure and Post-Closure) of Appendix D. Results are also presented for Wight Pit.

1.1 Springer Pit

Table B1 presents the maximum predicted median and 95th percentile results for the Springer Pit, calculated based on 500 realizations for Scenario 1 (Table B1a) and Scenario 2 (Table B1b). Time series plots for each modelled parameter are provided in Figure B1.

Table B1a:
Predicted Springer Pit Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	644	644	571	697	519	695	522	709	296	404
Total Dissolved Solids	mg/L	998	998	865	1002	746	984	751	1005	439	574
Major Ions											
Calcium	mg/L	201	201	174	212	158	212	159	216	89	121
Chloride	mg/L	14	15	9.3	9.4	3.1	5.2	3.1	5.9	2.3	4.2
Fluoride	mg/L	1.8	1.8	2.5	2.8	0.22	0.34	0.26	0.42	0.23	0.32
Magnesium	mg/L	34	34	33	40	30	40	30	42	18	25
Potassium	mg/L	6.8	8.0	9.3	9.3	2.2	3.0	2.2	3.0	1.2	1.8
Sodium	mg/L	48	52	43	43	16	21	16	22	12	16
Sulphate	mg/L	581	581	505	541	388	547	392	561	211	294
Nutrients											
Ammonia	mg/L (as N)	0.14	0.19	0.21	0.54	0.19	0.44	0.22	0.55	0.16	0.39
Nitrate	mg/L (as N)	8.5	11	9.8	17	9.6	17	9.6	17	4.2	8.3
Nitrite	mg/L (as N)	0.085	0.13	0.08	0.43	0.074	0.36	0.081	0.37	0.051	0.13
Total Phosphorus	mg/L	0.025	0.031	0.023	0.044	0.02	0.031	0.02	0.032	0.014	0.023
Total Metals											
Aluminum	mg/L	0.54	0.57	0.56	0.59	0.5	0.53	0.52	0.56	0.54	0.59
Antimony	mg/L	0.0022	0.0023	0.0014	0.0016	0.0007	0.0013	0.00087	0.0017	0.00073	0.0013
Arsenic	mg/L	0.0023	0.0025	0.0024	0.0033	0.0012	0.0018	0.0013	0.0021	0.0013	0.0021
Barium	mg/L	0.062	0.072	0.086	0.087	0.055	0.077	0.055	0.077	0.032	0.044
Beryllium	mg/L	0.00035	0.00049	0.00034	0.00048	0.00016	0.0003	0.00021	0.00033	0.00023	0.00031
Boron	mg/L	0.17	0.21	0.16	0.3	0.11	0.18	0.12	0.21	0.11	0.19
Cadmium	mg/L	0.00012	0.00025	0.000061	0.00023	0.000056	0.00023	0.000056	0.00025	0.000041	0.00018
Chromium	mg/L	0.0011	0.0012	0.0012	0.0013	0.00084	0.00092	0.00094	0.001	0.001	0.0012
Cobalt	mg/L	0.0018	0.0018	0.00097	0.0049	0.00097	0.004	0.00096	0.0037	0.00051	0.0010
Copper	mg/L	0.048	0.059	0.018	0.048	0.018	0.047	0.02	0.061	0.016	0.038
Iron	mg/L	0.58	0.63	0.59	0.76	0.58	0.71	0.6	0.71	0.61	0.68
Lead	mg/L	0.00021	0.00022	0.00023	0.00024	0.00018	0.00019	0.00018	0.0002	0.00017	0.00019
Lithium	mg/L	0.008	0.011	0.014	0.016	0.0033	0.0073	0.0037	0.0081	0.003	0.0069
Manganese	mg/L	0.3	0.61	1.0	2.2	0.78	1.7	0.76	1.7	0.065	0.47
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000026	0.0000025	0.0000026	0.0000025	0.0000027	0.0000022	0.0000022
Molybdenum	mg/L	0.17	0.18	0.15	0.17	0.077	0.16	0.087	0.16	0.058	0.10
Nickel	mg/L	0.0013	0.0015	0.0016	0.002	0.0011	0.0018	0.0011	0.0019	0.0011	0.0016
Selenium	mg/L	0.048	0.052	0.044	0.087	0.044	0.087	0.045	0.088	0.018	0.043
Silver	mg/L	0.000049	0.00006	0.000034	0.000049	0.0000068	0.00002	0.0000068	0.00002	0.0000055	0.000018
Strontium	mg/L	2.0	2.4	3.0	3.4	1.1	2.4	1.2	2.9	0.84	1.8
Thallium	mg/L	0.000086	0.00011	0.000091	0.0001	0.000045	0.000059	0.000047	0.000062	0.000023	0.000035
Tin	mg/L	0.000072	0.00018	0.000071	0.00025	0.00007	0.00019	0.000071	0.0002	0.000052	0.00018
Titanium	mg/L	0.041	0.041	0.031	0.035	0.031	0.035	0.031	0.036	0.028	0.031
Uranium	mg/L	0.0055	0.0061	0.0026	0.0051	0.0023	0.0045	0.0028	0.0056	0.0023	0.0043
Vanadium	mg/L	0.0043	0.0048	0.0051	0.0057	0.0024	0.0032	0.0024	0.0035	0.0023	0.0034
Zinc	mg/L	0.0075	0.01	0.0093	0.011	0.0042	0.0092	0.0042	0.011	0.0033	0.0063
Dissolved Metals											
Aluminum	mg/L	0.052	0.078	0.075	0.098	0.012	0.04	0.035	0.067	0.047	0.098
Antimony	mg/L	0.0021	0.0021	0.0014	0.0014	0.00068	0.0012	0.00085	0.0015	0.00071	0.0011
Arsenic	mg/L	0.0021	0.0024	0.0022	0.0031	0.00098	0.0016	0.0011	0.0019	0.0011	0.0019
Barium	mg/L	0.056	0.067	0.081	0.082	0.05	0.071	0.05	0.071	0.026	0.039
Beryllium	mg/L	0.00035	0.00041	0.00034	0.0004	0.00016	0.00022	0.00021	0.00025	0.00023	0.00023
Boron	mg/L	0.17	0.17	0.16	0.27	0.1	0.15	0.12	0.17	0.1	0.15
Cadmium	mg/L	0.00011	0.00015	0.000056	0.00014	0.000051	0.00014	0.000052	0.00016	0.000036	0.000083
Chromium	mg/L	0.00048	0.00059	0.00055	0.00061	0.00019	0.00028	0.0003	0.0004	0.00038	0.00053
Cobalt	mg/L	0.0015	0.0015	0.00065	0.0046	0.00064	0.0037	0.00064	0.0034	0.00018	0.00072
Copper	mg/L	0.044	0.044	0.014	0.032	0.013	0.032	0.016	0.046	0.011	0.023
Iron	mg/L	0.038	0.085	0.041	0.22	0.036	0.16	0.053	0.17	0.068	0.13
Lead	mg/L	0.000066	0.000076	0.000083	0.000095	0.000032	0.000049	0.000032	0.00005	0.000026	0.00005
Lithium	mg/L	0.0078	0.0078	0.013	0.013	0.003	0.0044	0.0034	0.0052	0.0027	0.004
Manganese	mg/L	0.28	0.59	1.0	2.2	0.76	1.7	0.74	1.7	0.05	0.45
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000026	0.0000025	0.0000026	0.0000025	0.0000027	0.0000022	0.0000022
Molybdenum	mg/L	0.17	0.17	0.15	0.15	0.077	0.14	0.087	0.15	0.058	0.087
Nickel	mg/L	0.00075	0.00097	0.001	0.0014	0.00057	0.0012	0.00057	0.0013	0.00055	0.0010
Selenium	mg/L	0.048	0.048	0.044	0.083	0.044	0.082	0.045	0.083	0.018	0.039
Silver	mg/L	0.000049	0.00005	0.000034	0.000039	0.0000068	0.00001	0.0000068	0.00001	0.0000055	0.000008
Strontium	mg/L	2.0	2.0	3.0	3.0	1.1	1.9	1.2	2.4	0.82	1.4
Thallium	mg/L	0.000086	0.000097	0.000091	0.000094	0.000045	0.00005	0.000047	0.000053	0.000023	0.000025
Tin	mg/L	0.000072	0.000084	0.000071	0.00015	0.00007	0.000093	0.000071	0.000095	0.000052	0.000078
Titanium	mg/L	0.019	0.019	0.0087	0.013	0.0087	0.013	0.0088	0.013	0.006	0.009
Uranium	mg/L	0.0055	0.0055	0.0025	0.0044	0.0023	0.0039	0.0027	0.0049	0.0022	0.0037
Vanadium	mg/L	0.003	0.0035	0.0038	0.0044	0.0011	0.0019	0.0012	0.0022	0.001	0.0021
Zinc	mg/L	0.0059	0.0084	0.0078	0.0095	0.0026	0.0076	0.0027	0.0093	0.0018	0.0048

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

Table B1b:
Predicted Springer Pit Water Quality - Scenario 2

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	737	777	695	712	652	697	711	756	343	388
Total Dissolved Solids	mg/L	1090	1134	1002	1017	863	904	932	978	462	506
Major Ions											
Calcium	mg/L	226	238	213	217	200	211	217	229	105	117
Chloride	mg/L	18	19	16.0	18.0	15.0	17.0	17.0	18.0	15.0	17.0
Fluoride	mg/L	3.3	3.4	5.3	5.3	0.43	0.46	0.48	0.51	0.42	0.45
Magnesium	mg/L	42	44	39	42	37	41	41	45	20	23
Potassium	mg/L	9.2	9.5	9.8	9.8	4.3	4.6	4.4	4.7	2.1	2.4
Sodium	mg/L	50	56	45	45	18	20	20	22	11	13
Sulphate	mg/L	639	675	584	592	458	482	509	542	208	240
Nutrients											
Ammonia	mg/L (as N)	0.25	0.27	0.33	0.33	0.13	0.14	0.13	0.14	0.03	0.04
Nitrate	mg/L (as N)	16.0	17	22.0	24	22.0	24	22.0	24	1.5	3.6
Nitrite	mg/L (as N)	0.26	0.29	0.30	0.31	0.30	0.31	0.59	0.6	0.27	0.29
Total Phosphorus	mg/L	0.038	0.043	0.06	0.069	0.059	0.067	0.068	0.075	0.34	0.35
Total Metals											
Aluminum	mg/L	0.76	0.88	0.69	0.74	0.68	0.74	0.68	0.74	0.72	0.77
Antimony	mg/L	0.0022	0.0023	0.0016	0.0018	0.0009	0.0011	0.0012	0.0014	0.00065	0.0008
Arsenic	mg/L	0.0039	0.0041	0.0046	0.0047	0.0026	0.0032	0.0028	0.0034	0.0036	0.0043
Barium	mg/L	0.085	0.091	0.097	0.098	0.074	0.076	0.077	0.08	0.075	0.078
Beryllium	mg/L	0.0005	0.00066	0.0007	0.00079	0.00008	0.00017	0.00008	0.00017	0.00034	0.00042
Boron	mg/L	0.19	0.24	0.26	0.39	0.22	0.28	0.23	0.3	0.2	0.27
Cadmium	mg/L	0.00025	0.00037	0.00021	0.00031	0.00021	0.00031	0.00021	0.00031	0.00018	0.00028
Chromium	mg/L	0.0018	0.002	0.0016	0.0017	0.0013	0.0014	0.0013	0.0014	0.0014	0.0015
Cobalt	mg/L	0.0041	0.0043	0.0070	0.0072	0.0067	0.0067	0.0067	0.0068	0.0180	0.0180
Copper	mg/L	0.059	0.073	0.033	0.044	0.027	0.038	0.03	0.041	0.32	0.33
Iron	mg/L	0.81	0.98	0.63	0.72	0.63	0.7	0.63	0.7	0.67	0.73
Lead	mg/L	0.00037	0.00045	0.00032	0.00032	0.00027	0.00029	0.00027	0.00029	0.00035	0.00038
Lithium	mg/L	0.010	0.014	0.016	0.019	0.0053	0.0084	0.0066	0.0095	0.0075	0.011
Manganese	mg/L	1.4	1.5	2.6	2.6	2.5	2.6	2.6	2.7	0.74	0.78
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000022	0.0000022
Molybdenum	mg/L	0.24	0.27	0.21	0.23	0.21	0.22	0.23	0.24	0.099	0.12
Nickel	mg/L	0.0032	0.0035	0.0028	0.0029	0.0022	0.0026	0.0023	0.0026	0.0051	0.0055
Selenium	mg/L	0.11	0.12	0.14	0.14	0.13	0.14	0.15	0.16	0.067	0.075
Silver	mg/L	0.000049	0.000061	0.000072	0.000083	0.000029	0.000042	0.000029	0.000042	0.000050	0.000063
Strontium	mg/L	3.6	4.2	3.7	4.1	2.8	3.3	4.2	4.6	2.0	2.5
Thallium	mg/L	0.00011	0.00013	0.00014	0.00015	0.000011	0.000024	0.000011	0.000024	0.000023	0.000036
Tin	mg/L	0.000083	0.00019	0.000098	0.00025	0.000096	0.00022	0.000099	0.00022	0.00035	0.00047
Titanium	mg/L	0.041	0.043	0.036	0.038	0.036	0.037	0.036	0.038	0.031	0.032
Uranium	mg/L	0.0055	0.0061	0.0032	0.0038	0.0024	0.0033	0.003	0.0038	0.0016	0.0024
Vanadium	mg/L	0.0072	0.0076	0.0094	0.0096	0.0044	0.0051	0.0044	0.0054	0.0038	0.0049
Zinc	mg/L	0.024	0.026	0.022	0.022	0.012	0.013	0.012	0.013	0.068	0.069
Dissolved Metals											
Aluminum	mg/L	0.27	0.39	0.20	0.25	0.19	0.25	0.19	0.25	0.23	0.28
Antimony	mg/L	0.0021	0.0021	0.0016	0.0016	0.00088	0.0009	0.0012	0.0012	0.00063	0.0007
Arsenic	mg/L	0.0037	0.0039	0.0044	0.0046	0.0025	0.003	0.0026	0.0032	0.0034	0.0041
Barium	mg/L	0.08	0.085	0.092	0.093	0.068	0.07	0.071	0.075	0.069	0.073
Beryllium	mg/L	0.0005	0.00058	0.0007	0.00071	0.00008	0.00009	0.00008	0.00009	0.00034	0.00034
Boron	mg/L	0.19	0.2	0.26	0.36	0.22	0.25	0.23	0.26	0.2	0.24
Cadmium	mg/L	0.00024	0.00027	0.00021	0.00022	0.00021	0.00021	0.00021	0.00021	0.00018	0.00018
Chromium	mg/L	0.0011	0.0014	0.00098	0.0010	0.00064	0.0008	0.00064	0.0008	0.00071	0.00087
Cobalt	mg/L	0.0038	0.0039	0.0067	0.0069	0.0063	0.0064	0.0064	0.0064	0.0180	0.0180
Copper	mg/L	0.055	0.058	0.028	0.029	0.022	0.023	0.025	0.026	0.32	0.32
Iron	mg/L	0.26	0.44	0.086	0.17	0.085	0.15	0.085	0.15	0.12	0.19
Lead	mg/L	0.00022	0.00030	0.00017	0.00018	0.00012	0.00014	0.00012	0.00014	0.00020	0.00023
Lithium	mg/L	0.010	0.011	0.016	0.016	0.005	0.0055	0.0063	0.0066	0.0072	0.0077
Manganese	mg/L	1.4	1.5	2.6	2.6	2.5	2.5	2.6	2.7	0.72	0.77
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000022	0.0000022
Molybdenum	mg/L	0.24	0.26	0.21	0.21	0.21	0.21	0.23	0.23	0.099	0.10
Nickel	mg/L	0.0026	0.0029	0.0022	0.0023	0.0017	0.002	0.0017	0.0021	0.0045	0.0049
Selenium	mg/L	0.11	0.11	0.14	0.14	0.13	0.14	0.15	0.15	0.067	0.07
Silver	mg/L	0.000049	0.000051	0.000072	0.000073	0.000029	0.000032	0.000029	0.000032	0.000050	0.000053
Strontium	mg/L	3.6	3.8	3.7	3.7	2.8	2.8	4.2	4.2	2.0	2.1
Thallium	mg/L	0.00011	0.00012	0.00014	0.00014	0.000011	0.000015	0.000011	0.000015	0.000023	0.000026
Tin	mg/L	0.000083	0.000094	0.000098	0.00015	0.000096	0.00012	0.000099	0.00012	0.00035	0.00037
Titanium	mg/L	0.019	0.021	0.014	0.015	0.014	0.015	0.014	0.015	0.0084	0.0096
Uranium	mg/L	0.0055	0.0055	0.0031	0.0032	0.0024	0.0026	0.003	0.0032	0.0015	0.0018
Vanadium	mg/L	0.0059	0.0063	0.0081	0.0083	0.0031	0.0038	0.0032	0.0041	0.0025	0.0036
Zinc	mg/L	0.022	0.024	0.021	0.021	0.010	0.011	0.010	0.011	0.066	0.067

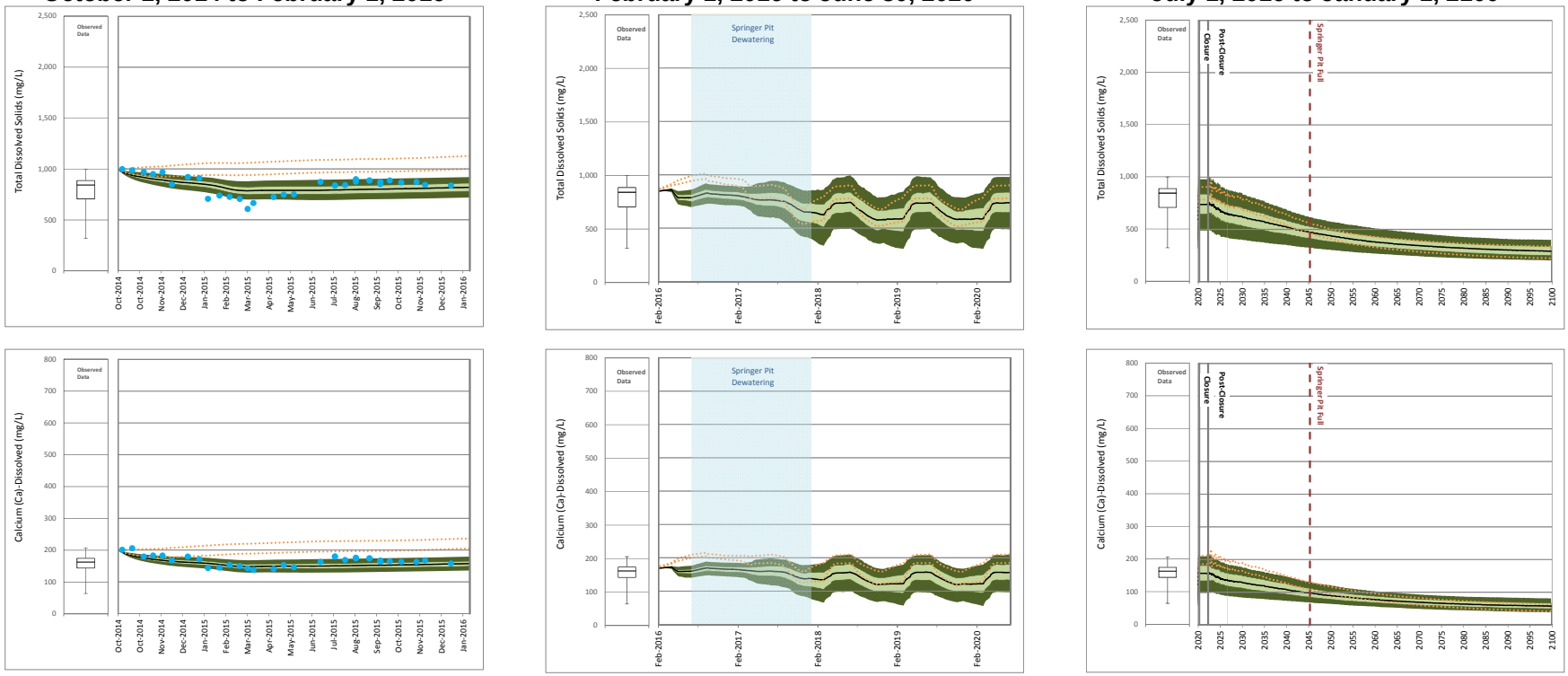
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

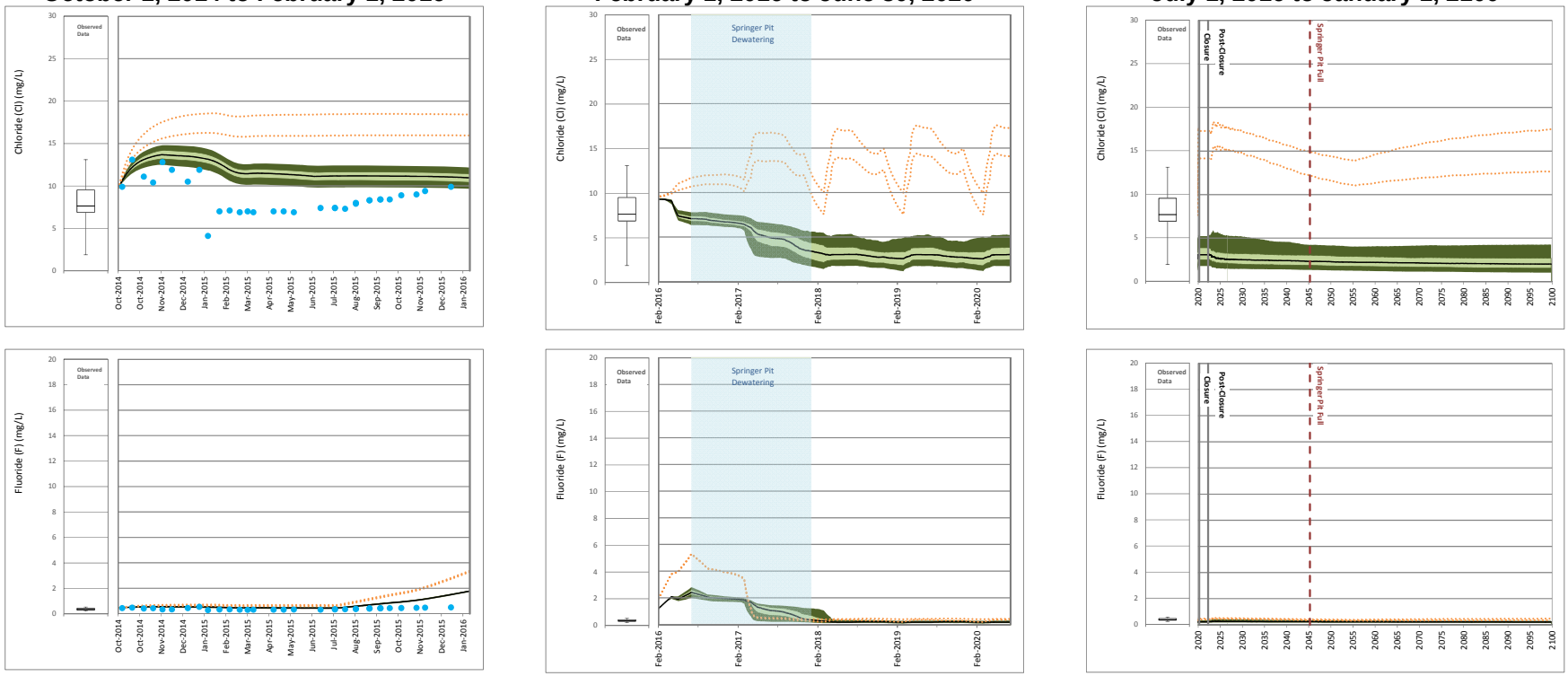
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

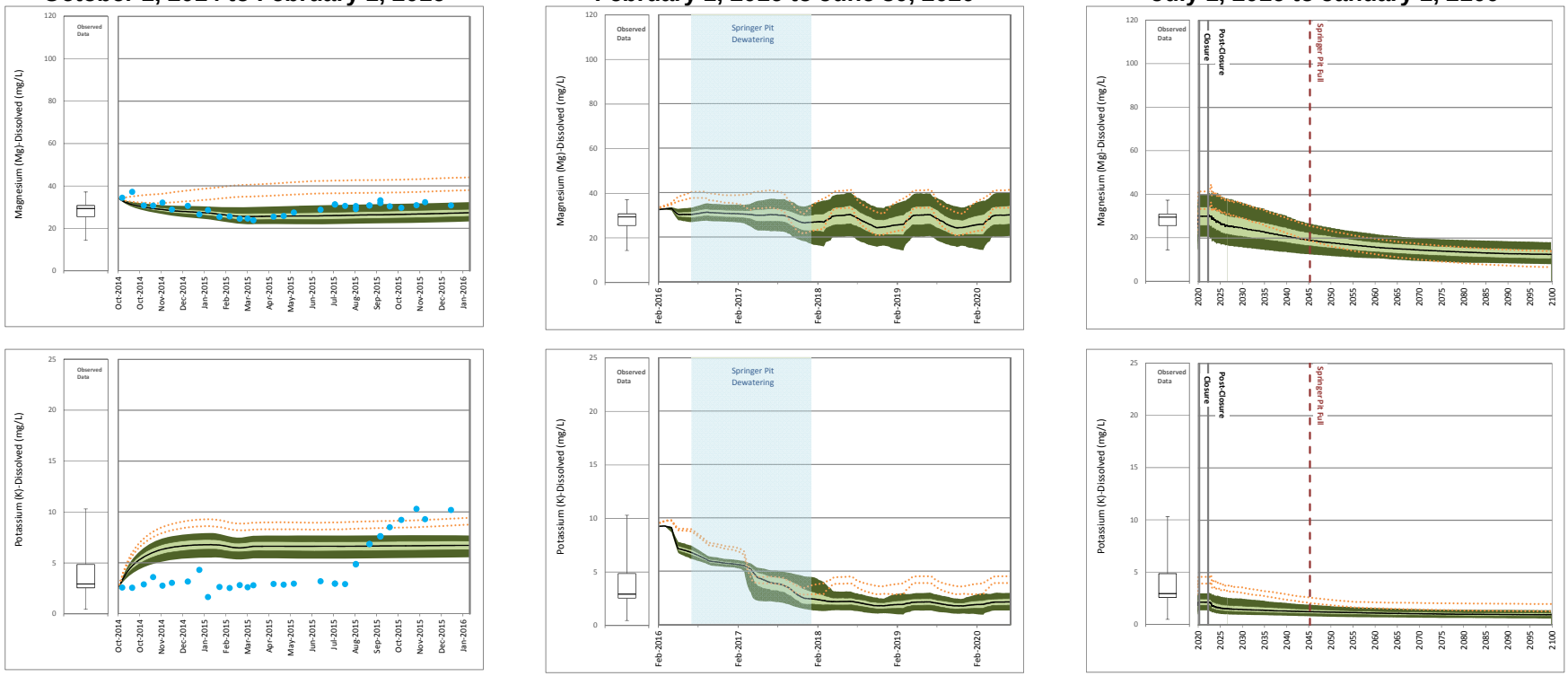
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

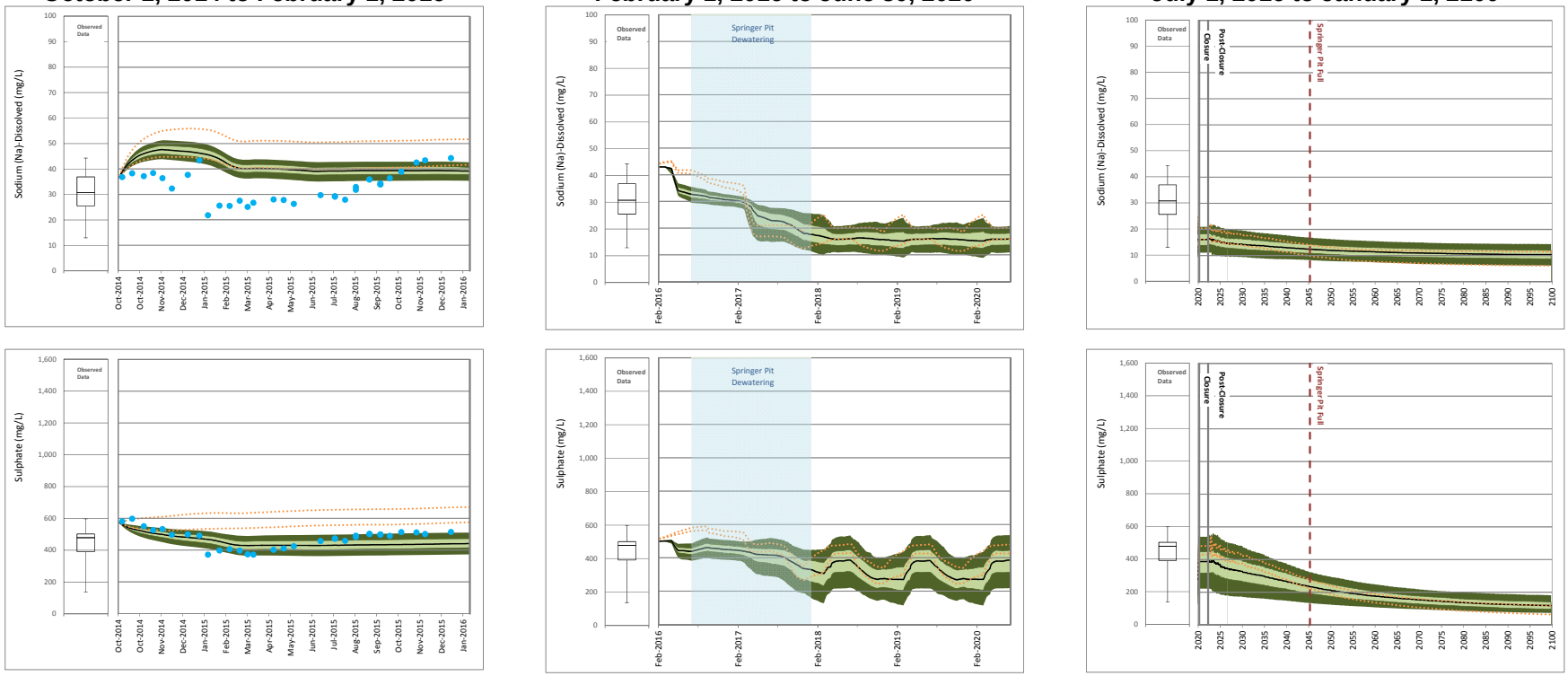
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

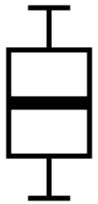
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

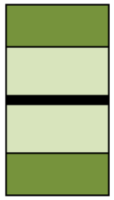


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

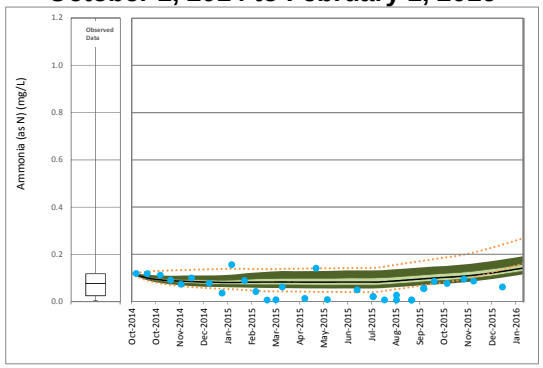
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

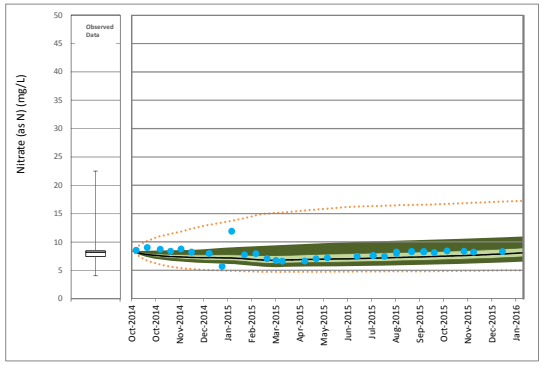
Golder Associates

ATTACHMENT B

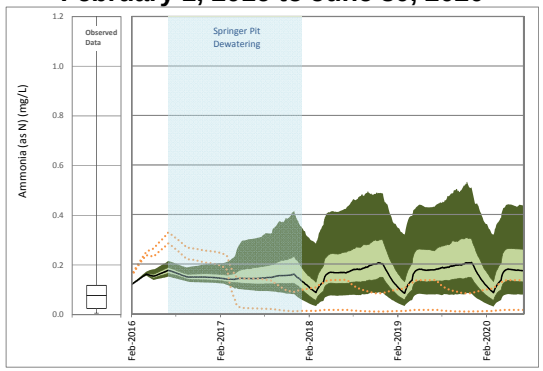
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

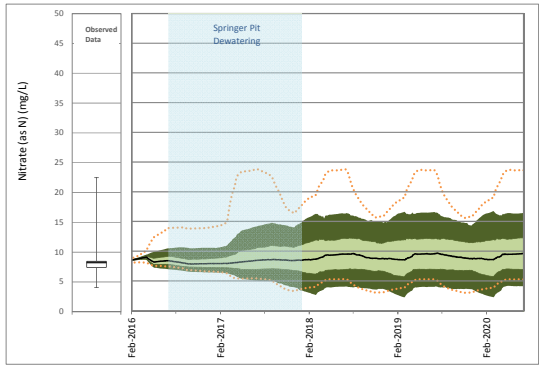
Calibration
October 1, 2014 to February 1, 2016



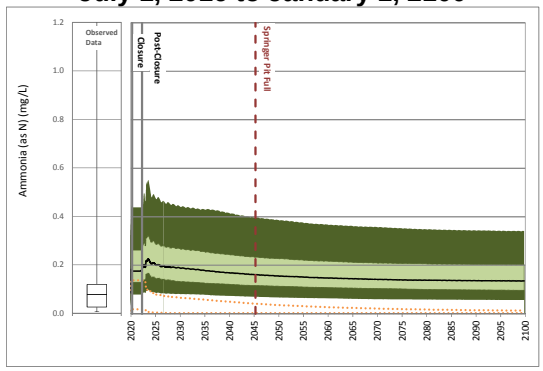


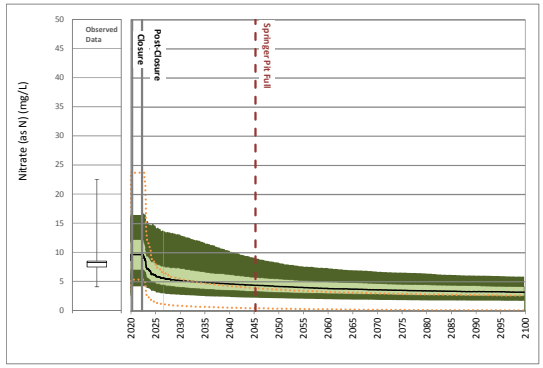
Operations
February 1, 2016 to June 30, 2020



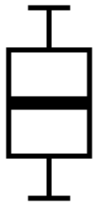


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

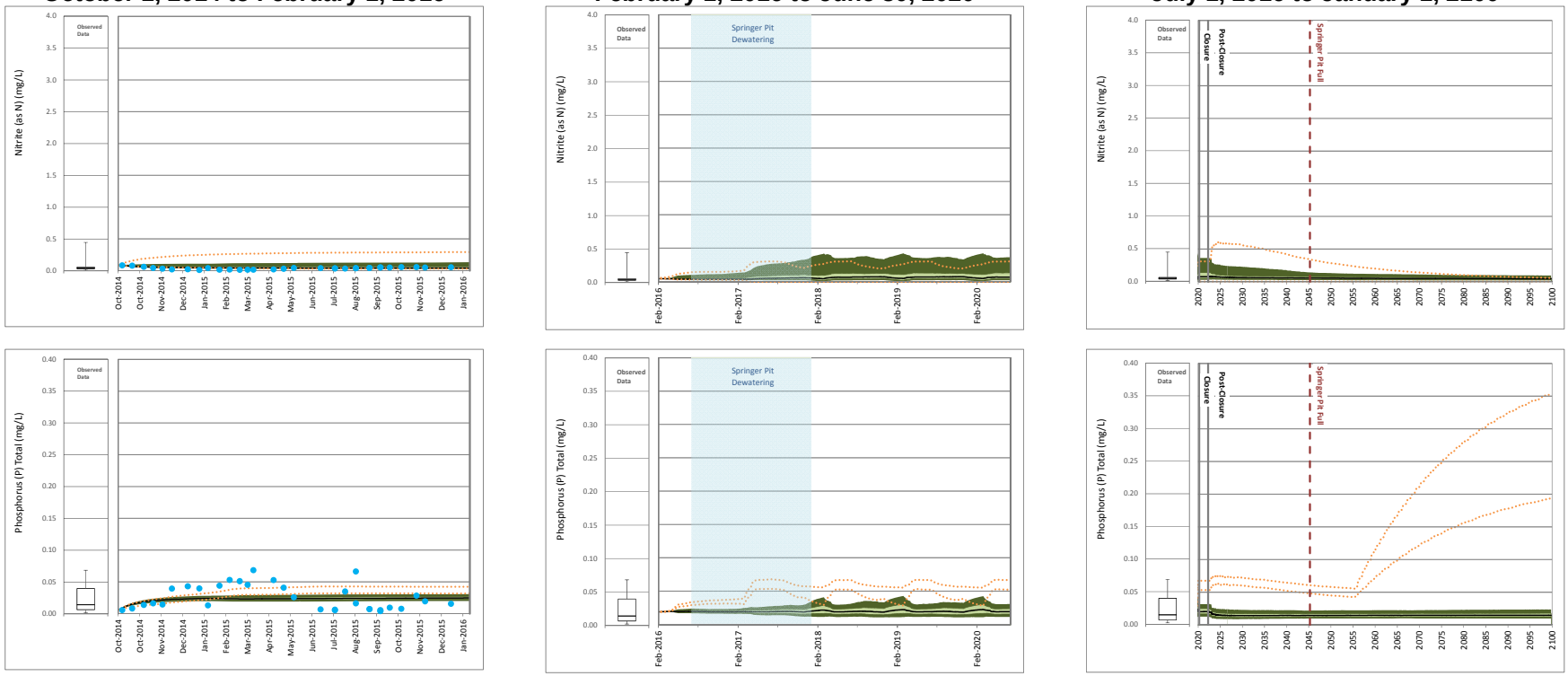
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

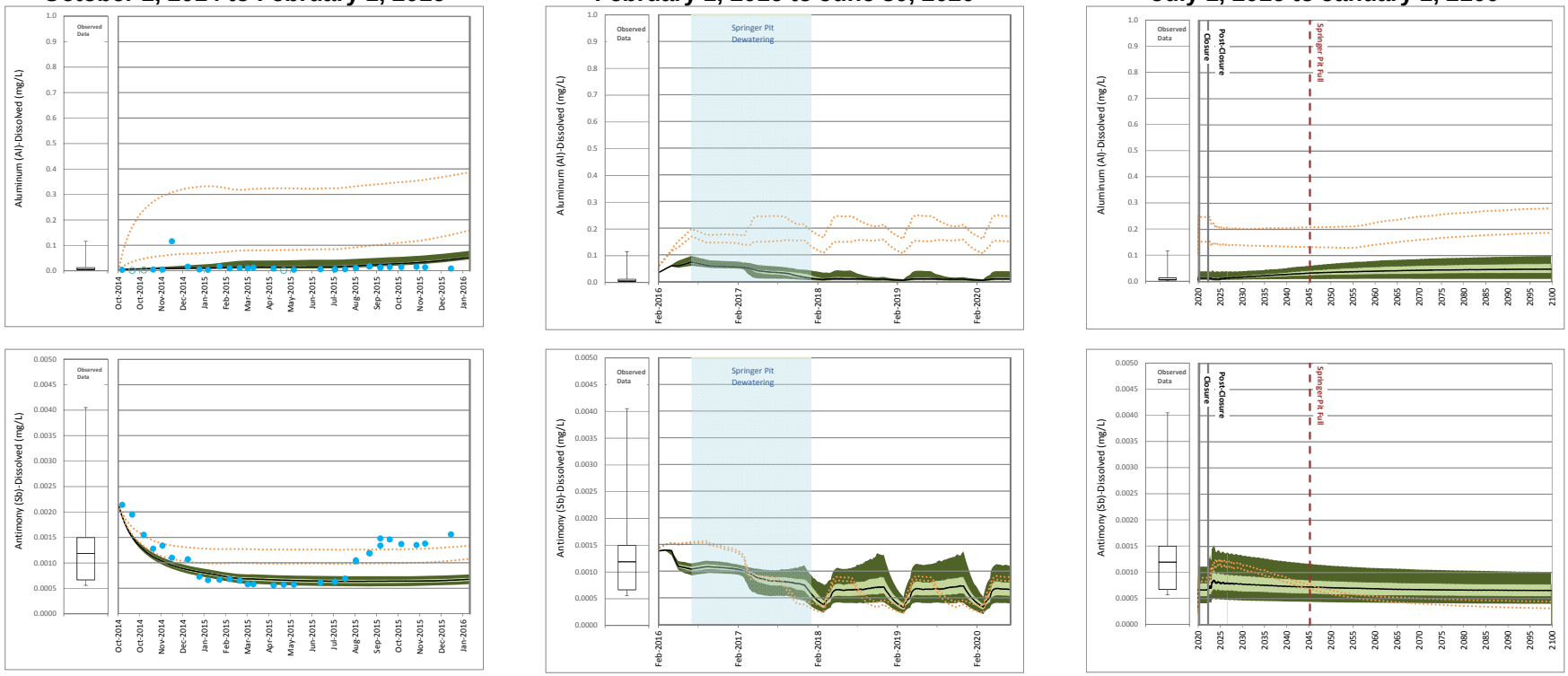
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

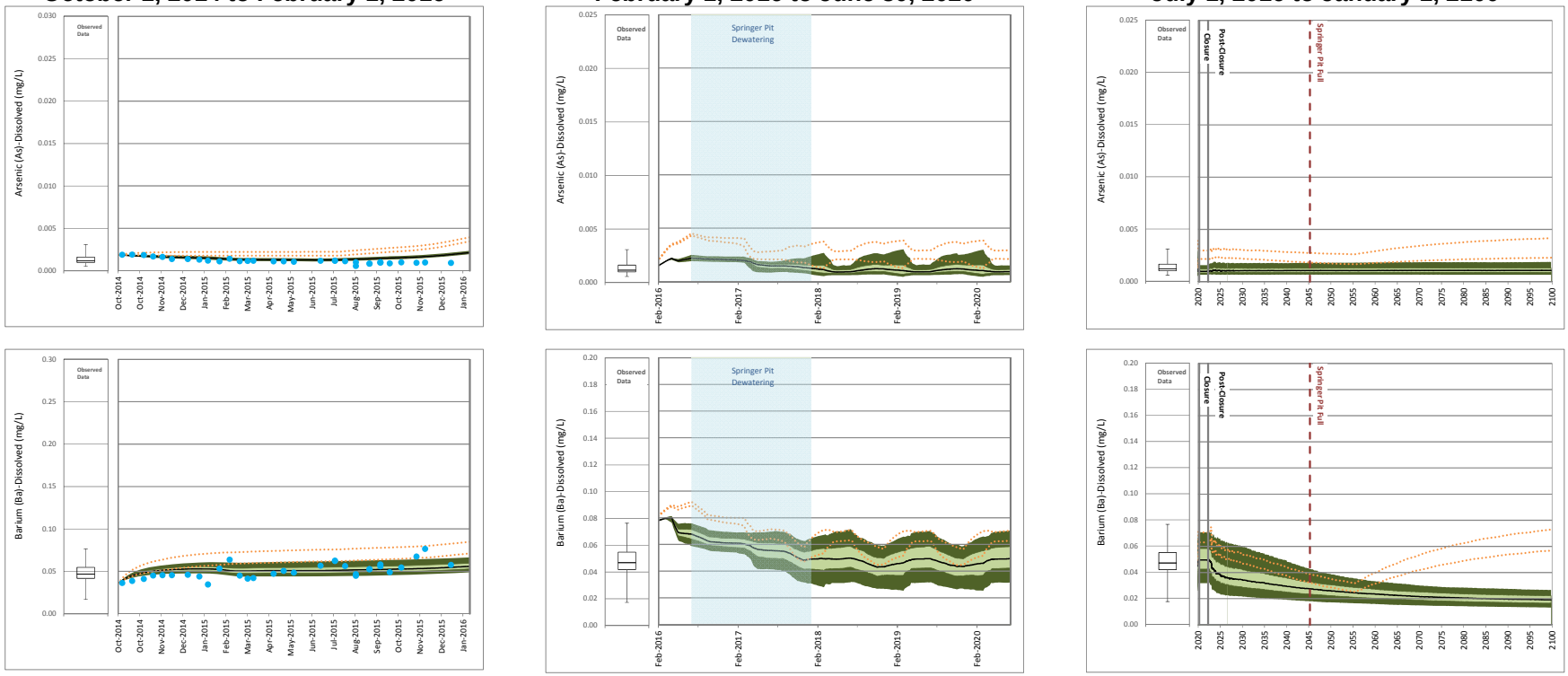
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

- Detected Values
- Non- Detected Values

Scenario 2

- 95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

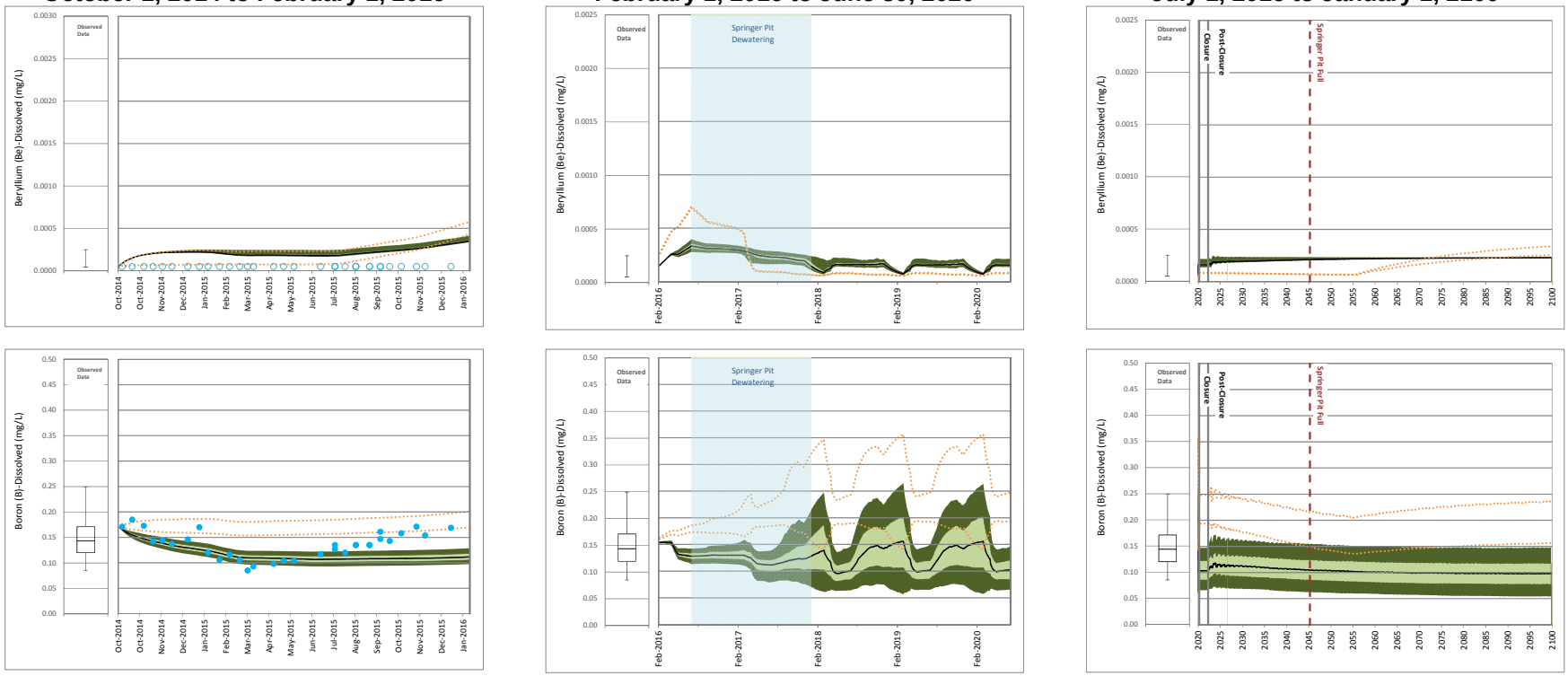
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

- Detected Values
- Non- Detected Values

Scenario 2

- 95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

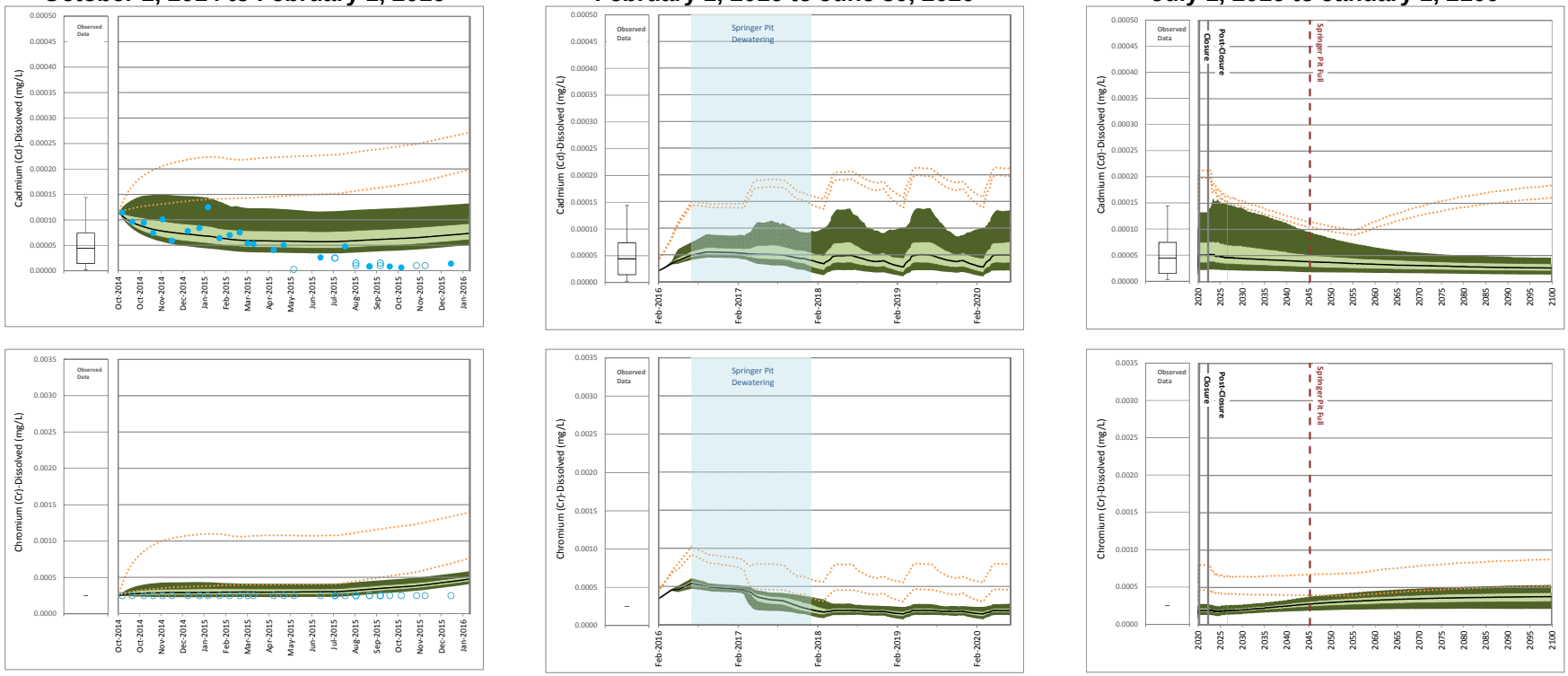
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

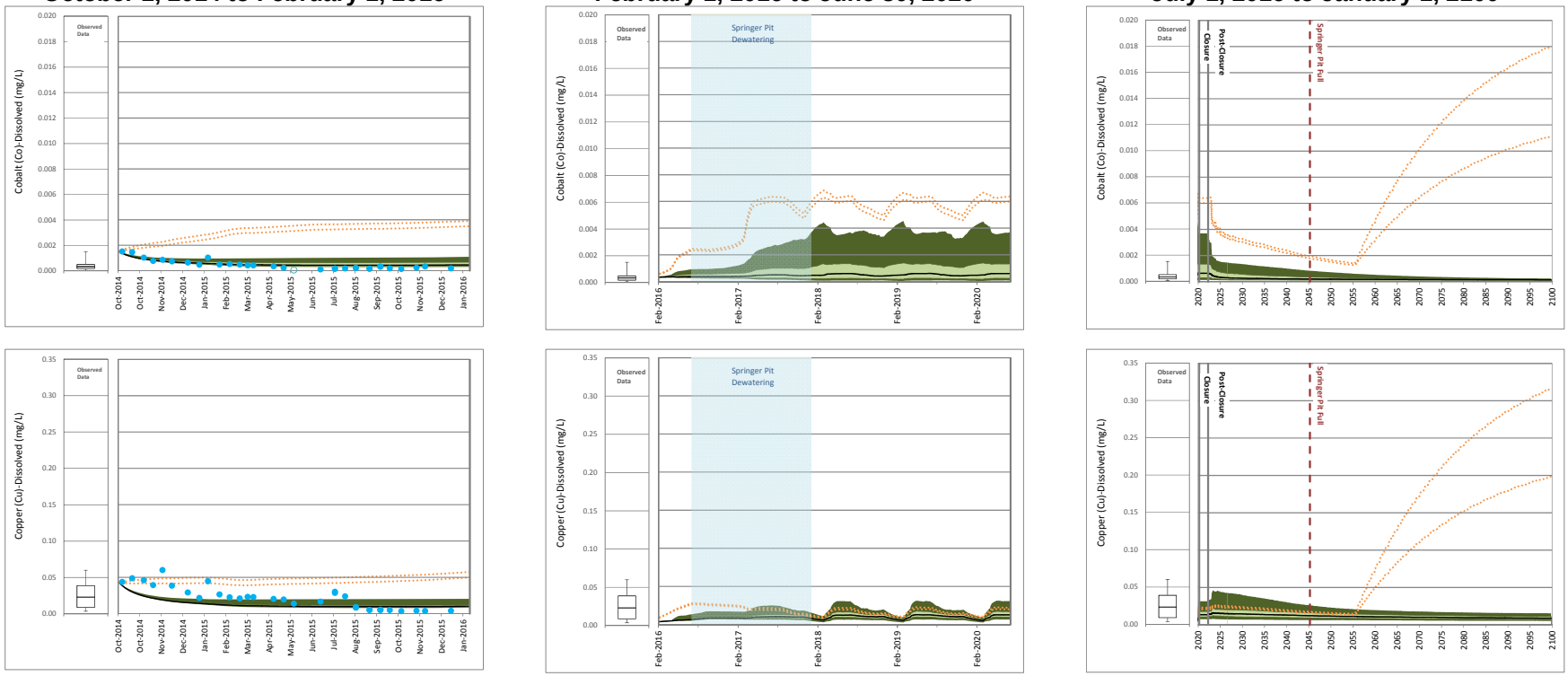
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



17 October 2016
Reference No.
1411734-205-R-Rev0-16000

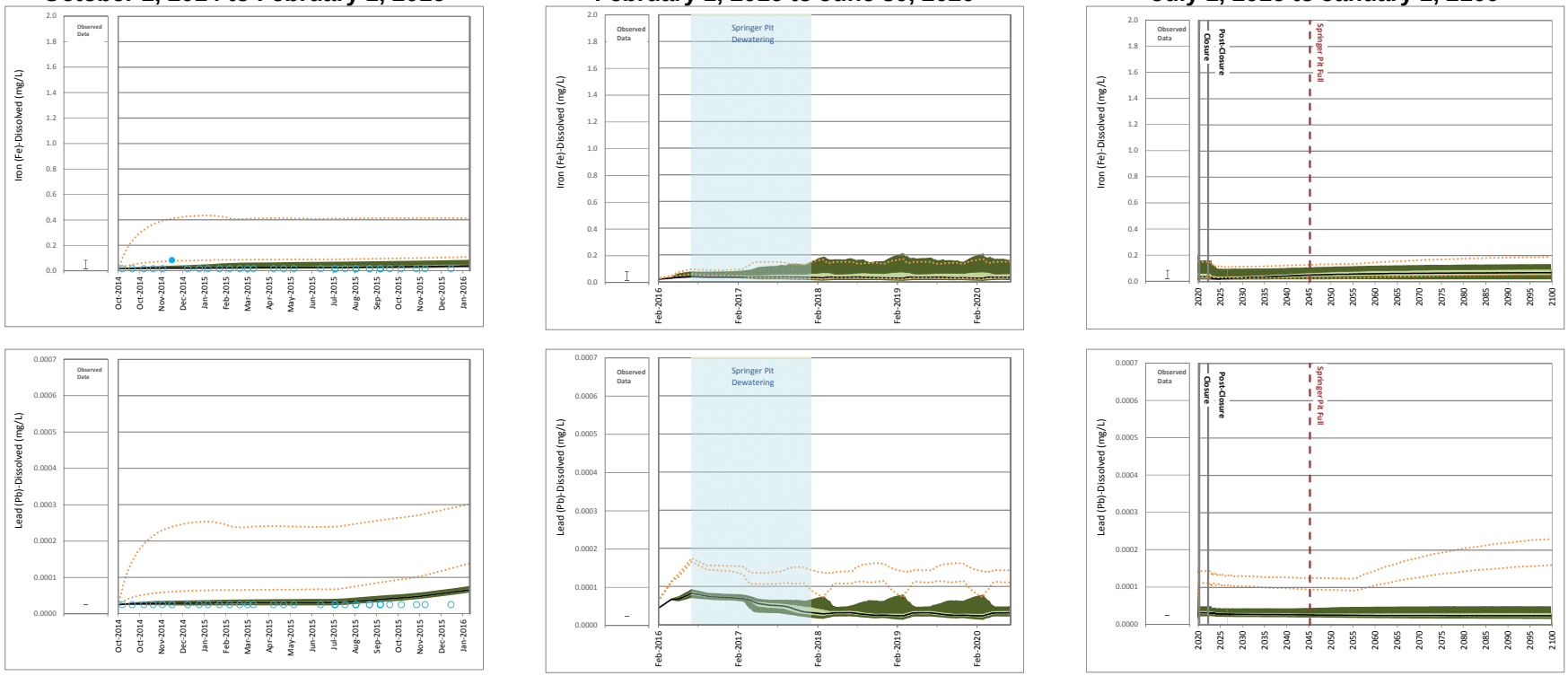
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

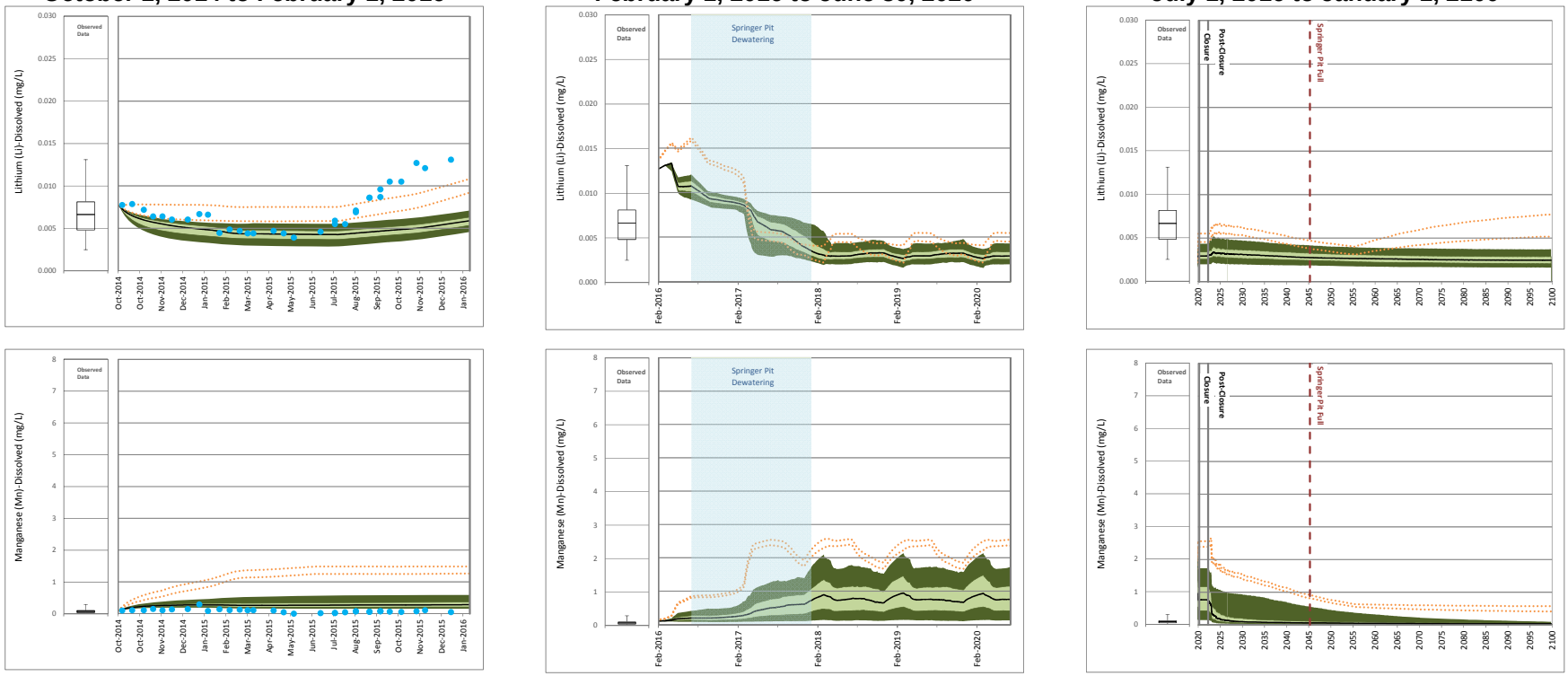
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

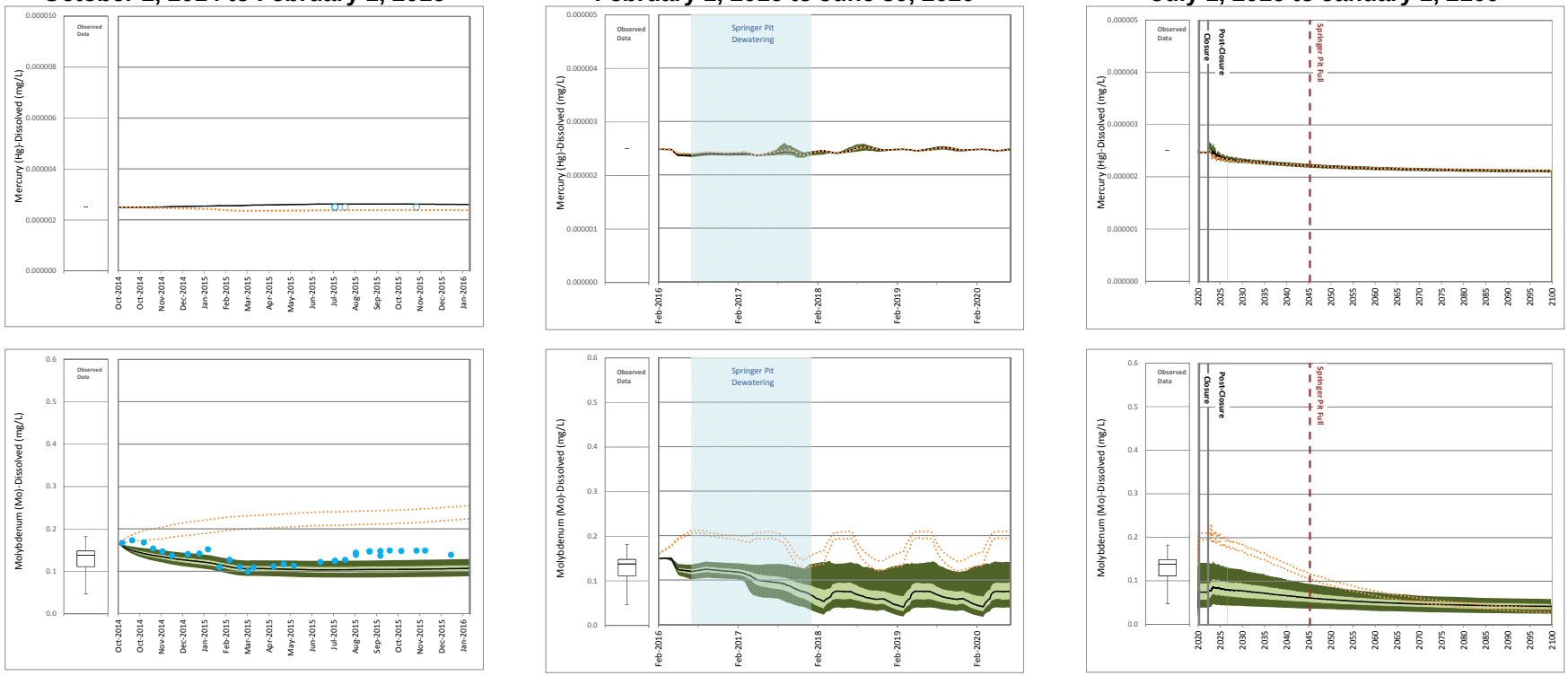
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

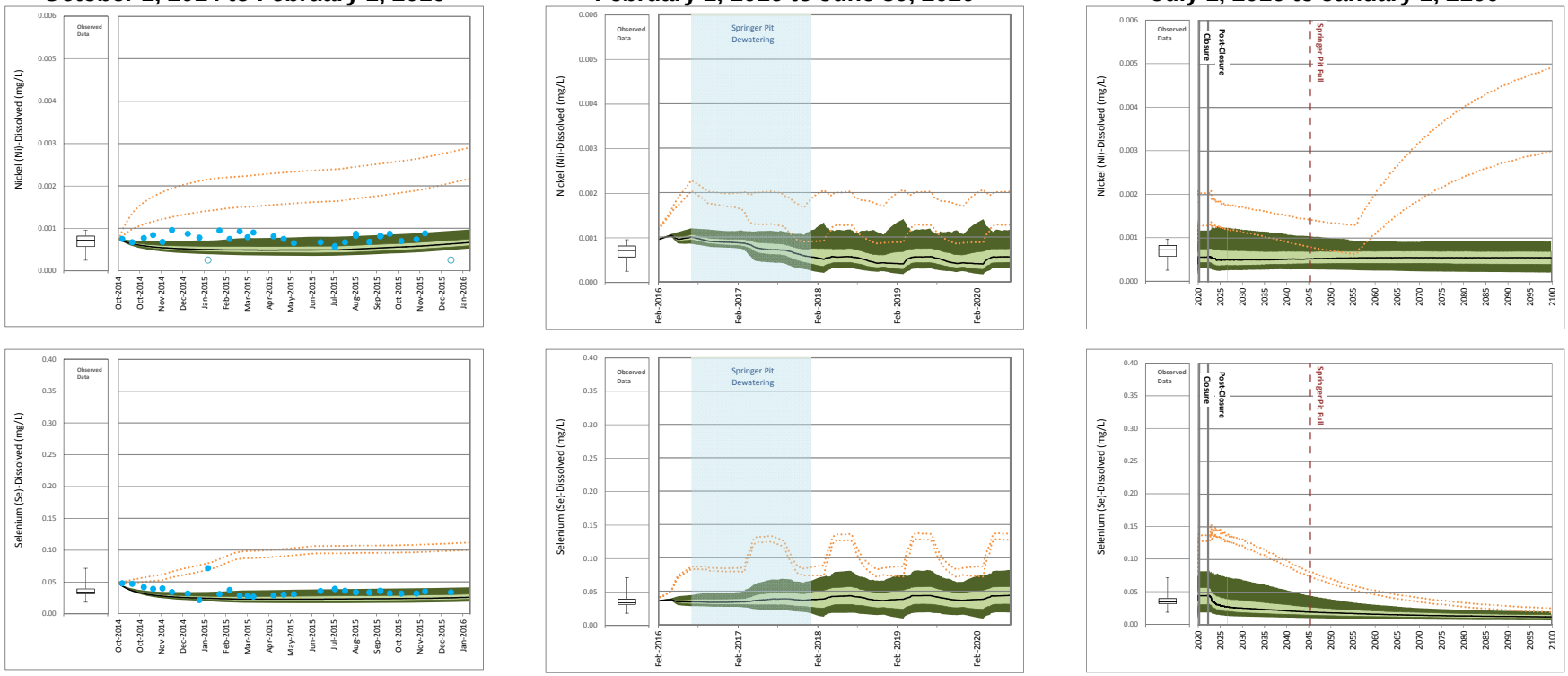
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

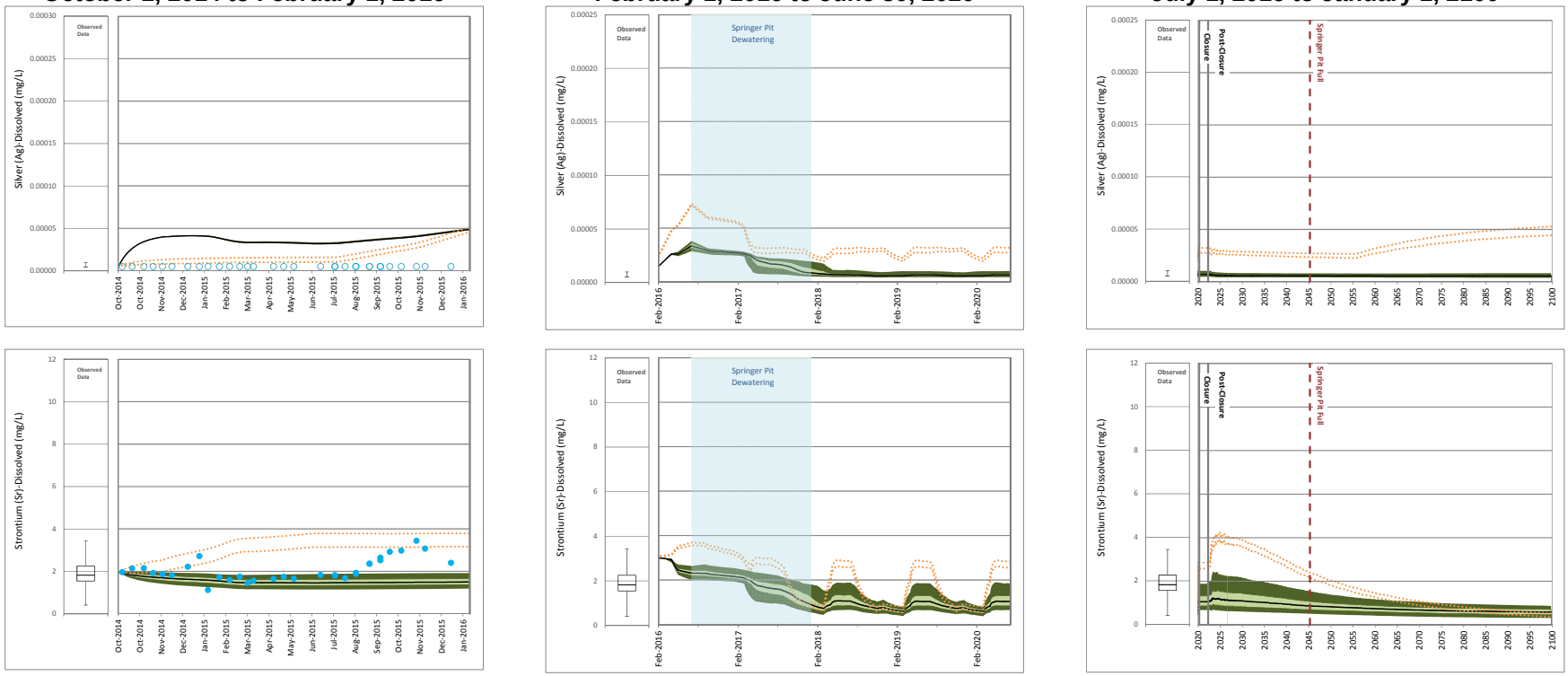
ATTACHMENT B

Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

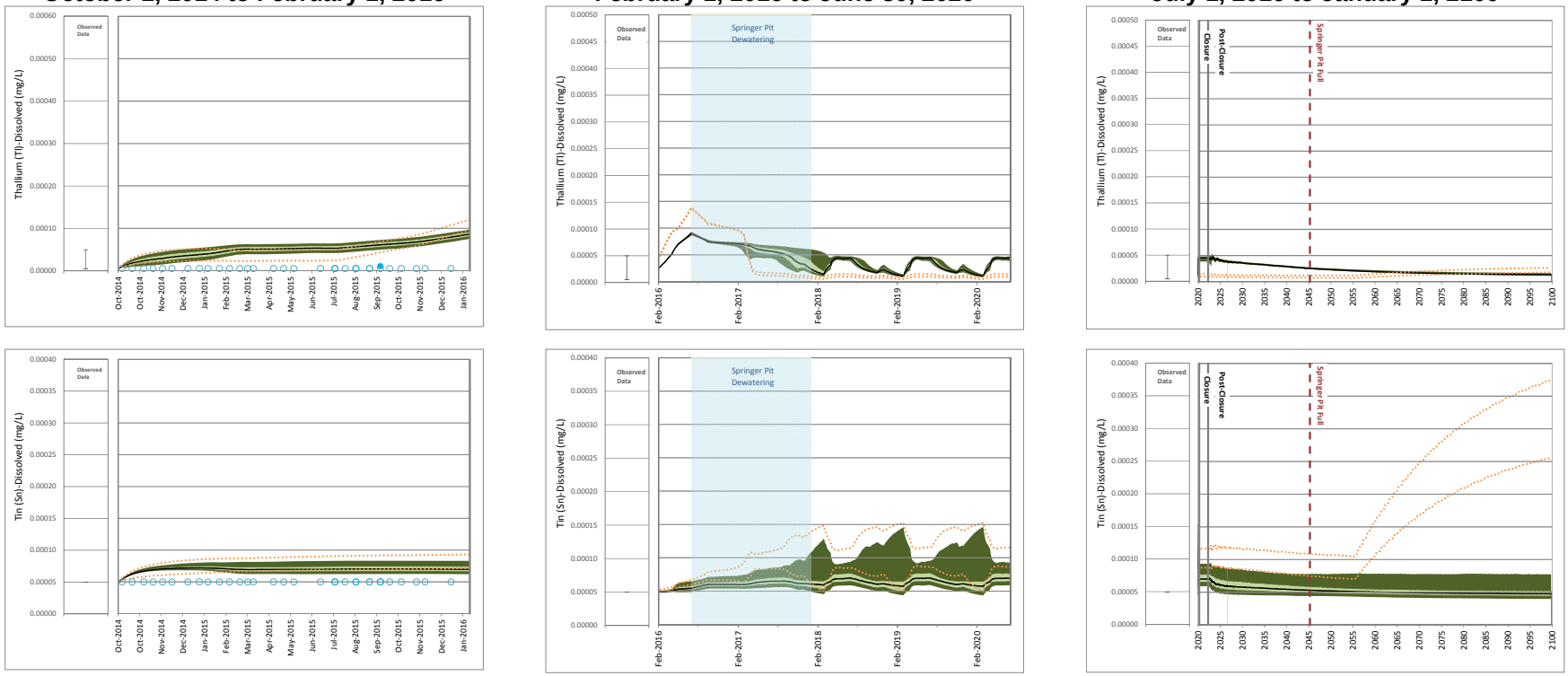
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

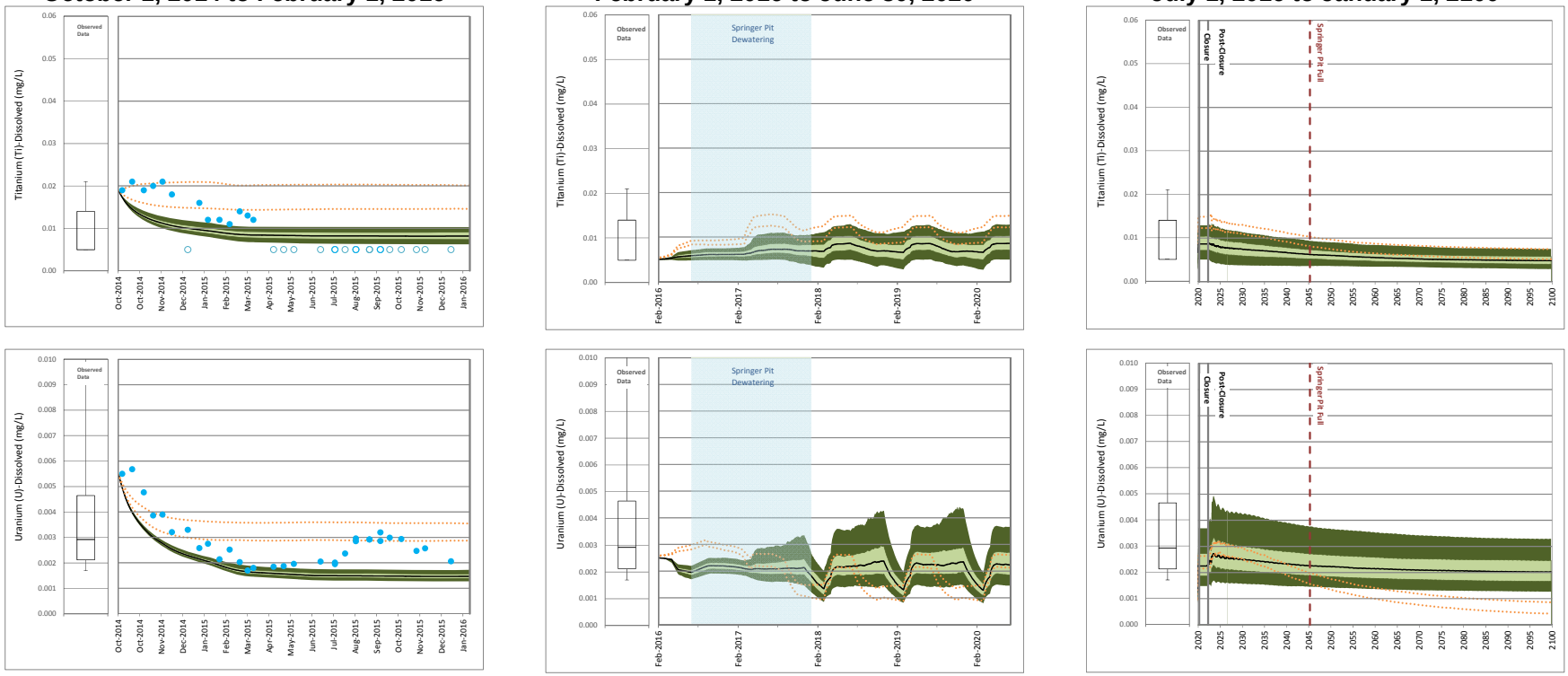
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

- Detected Values
- Non- Detected Values

Scenario 2

- 95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

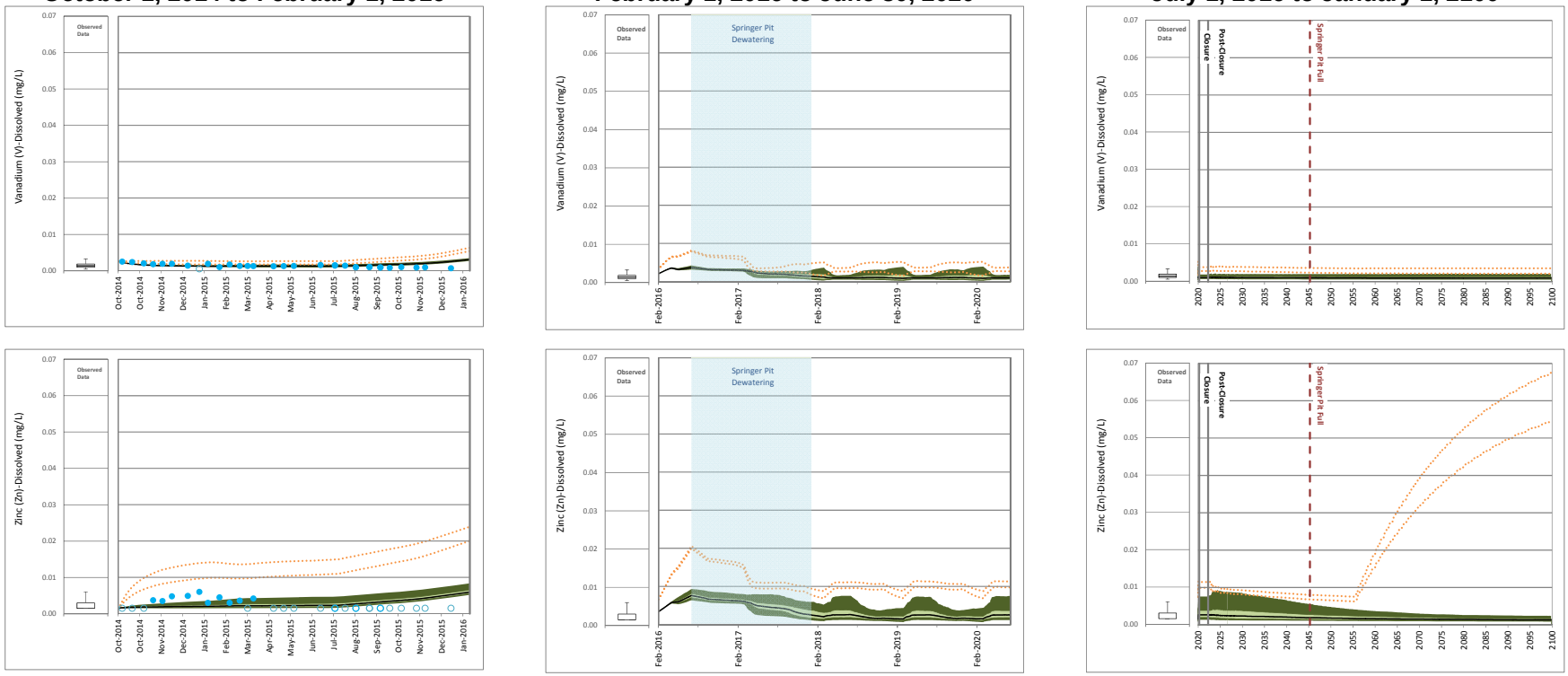
Golder Associates

ATTACHMENT B
Figure B1: Time Series Plots of Predicted Springer Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

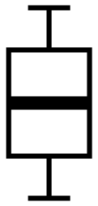
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



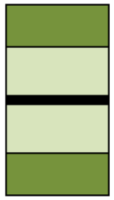
o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig1-springerpit.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.2 Perimeter Embankment Till Borrow Pond

Table B2 presents the maximum predicted median and 95th percentile results for the PETBP, calculated based on 500 realizations for Scenario 1 (Table B2a) and Scenario 2 (Table B2b). Time series plots for each modelled parameter are provided in Figure B2.

Table B2a:
Predicted PETBP Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	476	568	593	677	697	1029	462	612	429	577
Total Dissolved Solids	mg/L	865	939	883	998	1005	1510	687	912	634	849
Major Ions											
Calcium	mg/L	150	176	183	207	214	311	142	184	132	173
Chloride	mg/L	23	23	11	13	3.5	8.6	3.9	6.6	3.2	5.8
Fluoride	mg/L	1.0	1.1	8.2	9.7	0.1	0.4	0.19	0.32	0.19	0.32
Magnesium	mg/L	25	31	33	39	40	61	26	37	24	35
Potassium	mg/L	16	22	10.0	13	2.7	4.6	2.1	3.2	1.8	2.9
Sodium	mg/L	80	80	45	49	17	25	15	19	14	17
Sulphate	mg/L	501	546	515	556	554	906	372	531	339	495
Nutrients											
Ammonia	mg/L (as N)	0.18	0.46	0.53	0.64	0.03	0.25	0.075	0.18	0.075	0.18
Nitrate	mg/L (as N)	5.8	9.9	9.3	14	9.4	25	9.3	17	7.8	16
Nitrite	mg/L (as N)	0.086	0.15	0.057	0.23	0.041	0.5	0.034	0.32	0.034	0.26
Total Phosphorus	mg/L	0.028	0.04	0.032	0.036	0.02	0.037	0.022	0.034	0.02	0.034
Total Metals											
Aluminum	mg/L	0.53	0.56	0.82	0.88	0.57	0.65	0.58	0.68	0.58	0.67
Antimony	mg/L	0.0014	0.0021	0.0018	0.0022	0.00025	0.0006	0.00039	0.00076	0.00039	0.00077
Arsenic	mg/L	0.0026	0.0026	0.012	0.014	0.0007	0.0011	0.00097	0.0014	0.001	0.0015
Barium	mg/L	0.066	0.078	0.11	0.12	0.063	0.12	0.04	0.065	0.037	0.063
Beryllium	mg/L	0.00025	0.00038	0.00095	0.0012	0.00007	0.00035	0.00012	0.00034	0.00013	0.00026
Boron	mg/L	0.13	0.17	0.15	0.2	0.051	0.11	0.088	0.15	0.089	0.15
Cadmium	mg/L	0.000064	0.00022	0.00013	0.00026	0.000062	0.00036	0.000046	0.00025	0.000046	0.00024
Chromium	mg/L	0.001	0.0011	0.0018	0.002	0.0012	0.0014	0.0013	0.0016	0.0013	0.0016
Cobalt	mg/L	0.00067	0.0013	0.00084	0.0023	0.0012	0.0052	0.00063	0.0018	0.00051	0.0017
Copper	mg/L	0.017	0.038	0.025	0.049	0.014	0.072	0.013	0.053	0.013	0.051
Iron	mg/L	0.59	0.63	0.63	0.69	0.65	0.78	0.66	0.77	0.66	0.77
Lead	mg/L	0.00019	0.0002	0.00039	0.00041	0.00018	0.0002	0.00018	0.00021	0.00018	0.00021
Lithium	mg/L	0.0084	0.018	0.013	0.018	0.002	0.007	0.0026	0.0069	0.0026	0.0063
Manganese	mg/L	0.5	0.72	0.33	1.0	1.0	2.5	0.24	1.0	0.064	0.96
Mercury	mg/L	0.0000044	0.0000044	0.0000032	0.0000035	0.0000023	0.0000025	0.0000023	0.0000023	0.0000021	0.0000022
Molybdenum	mg/L	0.2	0.21	0.15	0.18	0.093	0.22	0.064	0.12	0.064	0.12
Nickel	mg/L	0.0012	0.0016	0.002	0.0024	0.0014	0.0027	0.0014	0.002	0.0014	0.0019
Selenium	mg/L	0.021	0.05	0.054	0.079	0.05	0.14	0.017	0.069	0.017	0.066
Silver	mg/L	0.000039	0.000051	0.000094	0.00012	0.00001	0.000025	0.000012	0.000025	0.000010	0.000022
Strontium	mg/L	2.0	2.4	2.8	3.5	1.4	4.0	1.5	3.2	1.4	3.0
Thallium	mg/L	0.000061	0.000082	0.00021	0.00026	0.00011	0.00012	0.00011	0.00012	0.000045	0.000062
Tin	mg/L	0.000069	0.00018	0.000064	0.00019	0.000067	0.0002	0.000063	0.00019	0.00006	0.00018
Titanium	mg/L	0.036	0.036	0.03	0.033	0.033	0.04	0.029	0.033	0.029	0.032
Uranium	mg/L	0.0017	0.0023	0.0024	0.0031	0.0011	0.0026	0.0013	0.0025	0.0013	0.0026
Vanadium	mg/L	0.0051	0.008	0.031	0.036	0.0019	0.003	0.002	0.0025	0.002	0.0026
Zinc	mg/L	0.0053	0.0086	0.022	0.026	0.005	0.017	0.0046	0.011	0.0044	0.011
Dissolved Metals											
Aluminum	mg/L	0.041	0.074	0.33	0.39	0.079	0.16	0.092	0.19	0.09	0.18
Antimony	mg/L	0.0013	0.0019	0.0017	0.002	0.00023	0.00039	0.00037	0.00058	0.00037	0.00059
Arsenic	mg/L	0.0024	0.0024	0.012	0.014	0.0005	0.0009	0.00078	0.0012	0.00078	0.0013
Barium	mg/L	0.06	0.072	0.10	0.12	0.057	0.11	0.034	0.059	0.031	0.057
Beryllium	mg/L	0.00025	0.0003	0.00095	0.0012	0.00007	0.00027	0.00012	0.00026	0.00013	0.00018
Boron	mg/L	0.13	0.13	0.15	0.16	0.048	0.07	0.085	0.12	0.086	0.12
Cadmium	mg/L	0.00006	0.00013	0.00012	0.00017	0.000058	0.00026	0.000042	0.00015	0.000042	0.00015
Chromium	mg/L	0.00038	0.00049	0.0012	0.0014	0.00053	0.00078	0.00065	0.00095	0.00064	0.00093
Cobalt	mg/L	0.00035	0.00098	0.00051	0.002	0.0009	0.0049	0.0003	0.0015	0.00018	0.0013
Copper	mg/L	0.013	0.023	0.021	0.034	0.01	0.057	0.0089	0.037	0.0088	0.035
Iron	mg/L	0.04	0.083	0.086	0.15	0.11	0.24	0.11	0.23	0.11	0.23
Lead	mg/L	0.000046	0.000055	0.00024	0.00026	0.000033	0.000059	0.000034	0.000063	0.000031	0.000062
Lithium	mg/L	0.0081	0.015	0.012	0.015	0.0017	0.0041	0.0023	0.004	0.0023	0.0033
Manganese	mg/L	0.48	0.71	0.32	1.0	0.96	2.5	0.23	1.0	0.049	0.94
Mercury	mg/L	0.0000044	0.0000044	0.0000032	0.0000035	0.0000023	0.0000025	0.0000023	0.0000023	0.0000021	0.0000022
Molybdenum	mg/L	0.2	0.2	0.15	0.16	0.093	0.2	0.064	0.11	0.064	0.11
Nickel	mg/L	0.00065	0.00098	0.0014	0.0018	0.00085	0.0021	0.00081	0.0015	0.0008	0.0013
Selenium	mg/L	0.021	0.046	0.054	0.074	0.05	0.14	0.017	0.064	0.017	0.062
Silver	mg/L	0.000039	0.000041	0.000094	0.00011	0.00001	0.000015	0.000012	0.000015	0.000010	0.000012
Strontium	mg/L	2.0	2.0	2.8	3.1	1.4	3.6	1.5	2.8	1.4	2.6
Thallium	mg/L	0.000061	0.000072	0.00021	0.00025	0.00011	0.00011	0.00011	0.00011	0.000045	0.000052
Tin	mg/L	0.000069	0.000082	0.000064	0.000085	0.000067	0.0001	0.000063	0.000093	0.00006	0.000079
Titanium	mg/L	0.014	0.014	0.0078	0.011	0.010	0.018	0.0071	0.011	0.0067	0.010
Uranium	mg/L	0.0017	0.0017	0.0023	0.0024	0.0011	0.0019	0.0013	0.0019	0.0013	0.0019
Vanadium	mg/L	0.0038	0.0067	0.029	0.035	0.0006	0.0014	0.00073	0.0012	0.00072	0.0013
Zinc	mg/L	0.0038	0.0071	0.02	0.025	0.0035	0.015	0.003	0.01	0.0029	0.0093

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

Table B2b:
Predicted PETBP Water Quality - Scenario 2

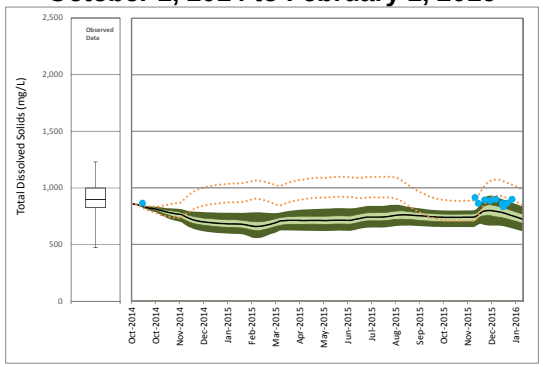
Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	682	737	864	901	1143	1189	720	775	587	632
Total Dissolved Solids	mg/L	1034	1107	1173	1205	1479	1530	949	1011	804	860
Major Ions											
Calcium	mg/L	210	227	264	272	350	362	219	232	179	192
Chloride	mg/L	23	25	17	19	15.0	17.0	9.8	13.0	10.0	13.0
Fluoride	mg/L	1.8	1.8	17.0	17.0	0.5	0.5	0.4	0.42	0.38	0.4
Magnesium	mg/L	38	41	50	54	65	69	42	48	34	37
Potassium	mg/L	13	14	15.0	15	6.5	6.8	4.2	4.7	3.5	3.9
Sodium	mg/L	80	80	51	54	30	32	23	27	19	21
Sulphate	mg/L	597	660	695	708	906	934	576	617	471	502
Nutrients											
Ammonia	mg/L (as N)	0.17	0.2	1.0	1.0	0.16	0.16	0.11	0.11	0.093	0.1
Nitrate	mg/L (as N)	15.0	16.0	21.0	22	4.7	5	3.0	4	2.7	4
Nitrite	mg/L (as N)	0.25	0.3	0.29	0.3	1.70	1.7	1.10	1.1	0.93	0.93
Total Phosphorus	mg/L	0.042	0.049	0.064	0.072	0.08	0.088	0.059	0.071	0.16	0.17
Total Metals											
Aluminum	mg/L	0.82	1.1	1.3	1.4	0.62	0.7	0.62	0.69	0.64	0.72
Antimony	mg/L	0.0013	0.0016	0.0033	0.0035	0.0018	0.002	0.0014	0.0016	0.0012	0.0013
Arsenic	mg/L	0.0029	0.0031	0.024	0.025	0.0026	0.0029	0.0023	0.0025	0.0024	0.0028
Barium	mg/L	0.084	0.095	0.19	0.2	0.12	0.12	0.07	0.072	0.06	0.065
Beryllium	mg/L	0.00032	0.00049	0.0021	0.0022	0.0001	0.00023	0.00008	0.00021	0.00017	0.00026
Boron	mg/L	0.16	0.21	0.25	0.3	0.20	0.24	0.14	0.18	0.14	0.19
Cadmium	mg/L	0.00020	0.00033	0.00039	0.0005	0.00024	0.00034	0.00017	0.00027	0.00015	0.00025
Chromium	mg/L	0.0018	0.0024	0.0032	0.0034	0.0013	0.0016	0.0013	0.0016	0.0013	0.0016
Cobalt	mg/L	0.0035	0.0036	0.0058	0.0058	0.011	0.011	0.0053	0.0053	0.0088	0.0088
Copper	mg/L	0.042	0.056	0.083	0.096	0.037	0.049	0.059	0.07	0.14	0.16
Iron	mg/L	1.0	1.3	0.82	0.99	0.66	0.78	0.66	0.78	0.66	0.78
Lead	mg/L	0.00039	0.00057	0.00065	0.00069	0.00023	0.00024	0.00021	0.00023	0.00025	0.00028
Lithium	mg/L	0.0086	0.012	0.025	0.028	0.0081	0.011	0.007	0.010	0.0067	0.010
Manganese	mg/L	1.5	1.6	2.4	2.4	4.5	4.5	2.3	2.3	1.30	1.3
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000021	0.0000021
Molybdenum	mg/L	0.23	0.27	0.34	0.36	0.38	0.4	0.26	0.3	0.21	0.24
Nickel	mg/L	0.0026	0.003	0.0048	0.0051	0.0031	0.0034	0.0028	0.0032	0.0033	0.0038
Selenium	mg/L	0.10	0.11	0.19	0.20	0.25	0.26	0.17	0.17	0.12	0.13
Silver	mg/L	0.000028	0.000041	0.00021	0.00022	0.000019	0.000032	0.000015	0.000029	0.000025	0.000039
Strontium	mg/L	3.9	4.7	6.4	6.9	6.8	7.3	5.2	5.7	3.8	4.3
Thallium	mg/L	0.000072	0.000097	0.00042	0.00043	0.00005	0.00006	0.00004	0.00005	0.000037	0.000049
Tin	mg/L	0.000081	0.0002	0.000091	0.00021	0.000093	0.0002	0.000075	0.00019	0.00017	0.00029
Titanium	mg/L	0.041	0.047	0.039	0.042	0.044	0.045	0.036	0.038	0.034	0.035
Uranium	mg/L	0.0033	0.0044	0.0043	0.0052	0.0049	0.0057	0.0035	0.0045	0.0026	0.0034
Vanadium	mg/L	0.0048	0.0053	0.061	0.062	0.0039	0.004	0.0032	0.0036	0.0032	0.0036
Zinc	mg/L	0.015	0.017	0.057	0.058	0.011	0.012	0.015	0.016	0.032	0.033
Dissolved Metals											
Aluminum	mg/L	0.33	0.56	0.8	0.86	0.13	0.21	0.13	0.2	0.15	0.23
Antimony	mg/L	0.0013	0.0014	0.0033	0.0034	0.0018	0.0018	0.0014	0.0014	0.0011	0.0011
Arsenic	mg/L	0.0027	0.0029	0.024	0.024	0.0024	0.0027	0.0021	0.0023	0.0022	0.0026
Barium	mg/L	0.078	0.09	0.19	0.19	0.11	0.12	0.065	0.067	0.054	0.059
Beryllium	mg/L	0.00032	0.00041	0.0021	0.0021	0.0001	0.00015	0.00008	0.00013	0.00017	0.00018
Boron	mg/L	0.16	0.17	0.25	0.27	0.20	0.21	0.14	0.15	0.14	0.15
Cadmium	mg/L	0.00019	0.00023	0.00039	0.0004	0.00024	0.00024	0.00016	0.00018	0.00015	0.00016
Chromium	mg/L	0.0012	0.0018	0.0026	0.0027	0.00068	0.00097	0.00066	0.00096	0.00066	0.00095
Cobalt	mg/L	0.0032	0.0033	0.0055	0.0055	0.0110	0.011	0.0050	0.005	0.0084	0.0085
Copper	mg/L	0.038	0.041	0.079	0.08	0.033	0.034	0.054	0.055	0.140	0.14
Iron	mg/L	0.45	0.78	0.27	0.45	0.11	0.23	0.11	0.23	0.11	0.23
Lead	mg/L	0.00024	0.00042	0.00051	0.00054	0.00008	0.000096	0.000066	0.00009	0.00011	0.00013
Lithium	mg/L	0.0083	0.009	0.025	0.025	0.0078	0.0085	0.0067	0.0076	0.0064	0.0071
Manganese	mg/L	1.5	1.6	2.3	2.4	4.5	4.5	2.3	2.3	1.30	1.3
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000021	0.0000021
Molybdenum	mg/L	0.23	0.25	0.34	0.35	0.38	0.38	0.26	0.29	0.21	0.22
Nickel	mg/L	0.0020	0.0024	0.0042	0.0045	0.0026	0.0028	0.0023	0.0027	0.0028	0.0032
Selenium	mg/L	0.10	0.11	0.19	0.19	0.25	0.26	0.17	0.17	0.12	0.13
Silver	mg/L	0.000028	0.000031	0.00021	0.00021	0.000019	0.000022	0.000015	0.000019	0.000025	0.000029
Strontium	mg/L	3.9	4.3	6.4	6.5	6.8	6.9	5.2	5.3	3.8	3.9
Thallium	mg/L	0.000072	0.000087	0.00042	0.00042	0.00005	0.00005	0.00004	0.00005	0.000037	0.00004
Tin	mg/L	0.000081	0.000096	0.000091	0.00011	0.000093	0.0001	0.000075	0.000087	0.00017	0.00019
Titanium	mg/L	0.019	0.024	0.017	0.02	0.021	0.023	0.014	0.016	0.011	0.013
Uranium	mg/L	0.0032	0.0037	0.0043	0.0046	0.0048	0.0051	0.0035	0.0038	0.0026	0.0028
Vanadium	mg/L	0.0035	0.004	0.06	0.06	0.0026	0.0027	0.0019	0.0023	0.0019	0.0023
Zinc	mg/L	0.014	0.016	0.056	0.057	0.0097	0.011	0.014	0.015	0.030	0.031

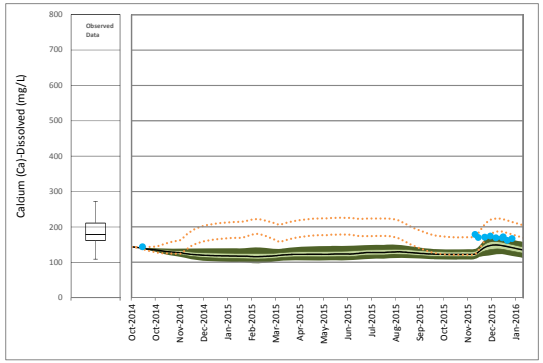
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

ATTACHMENT B

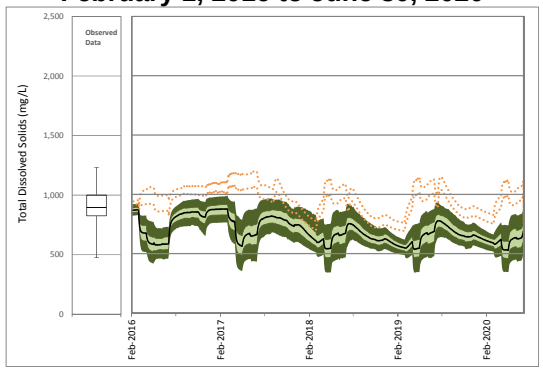
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

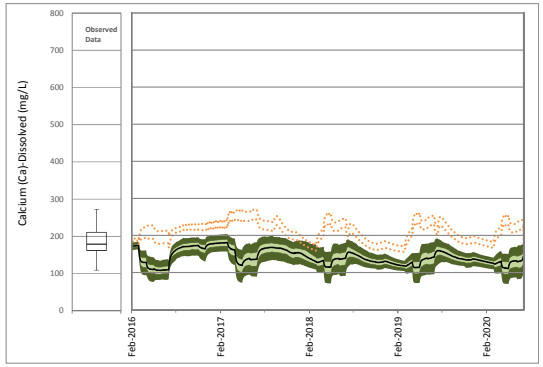
Calibration
October 1, 2014 to February 1, 2016



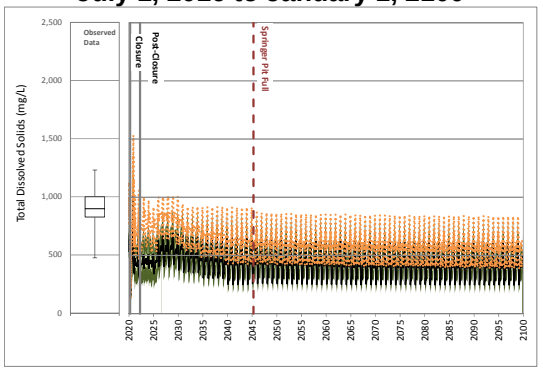


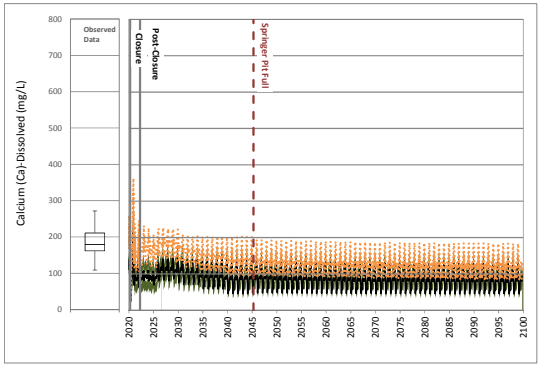
Operations
February 1, 2016 to June 30, 2020



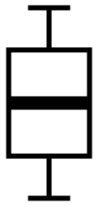


Closure and Post-closure
July 1, 2016 to January 1, 2100



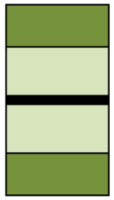


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

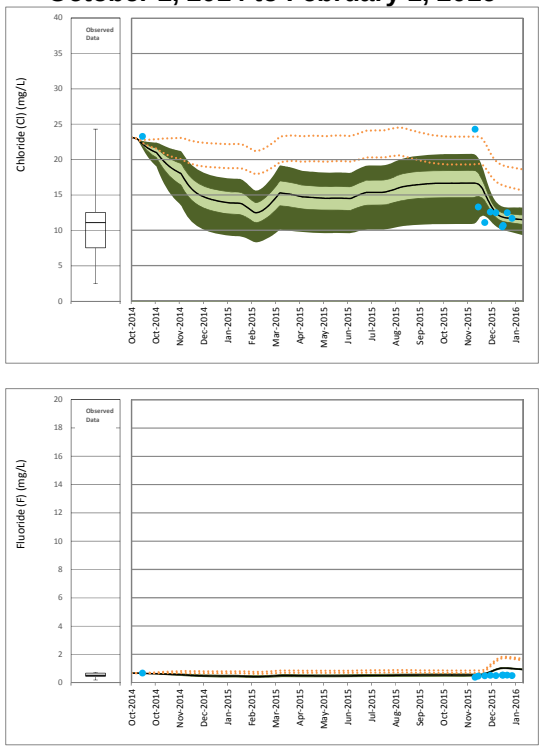
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

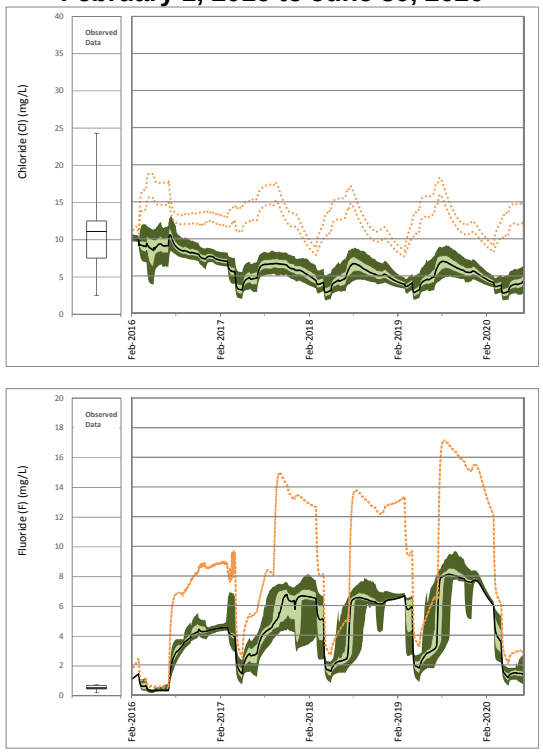
ATTACHMENT B

Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

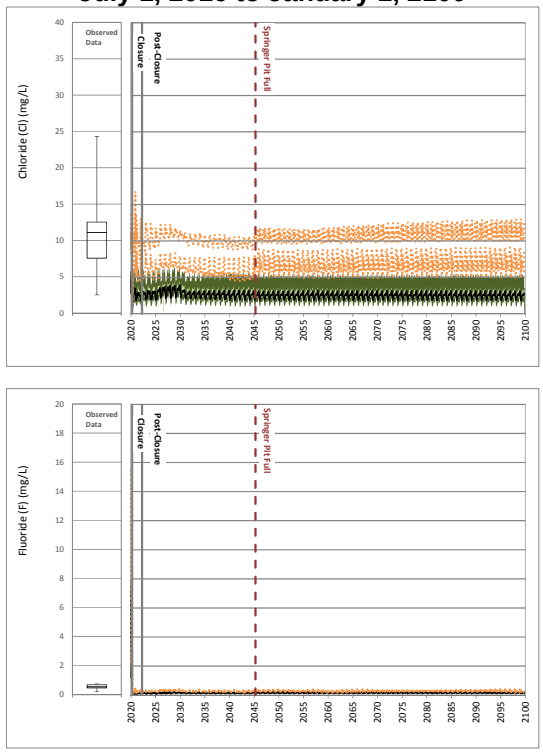
Calibration
October 1, 2014 to February 1, 2016



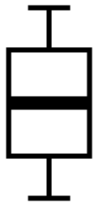
Operations
February 1, 2016 to June 30, 2020



Closure and Post-closure
July 1, 2016 to January 1, 2100

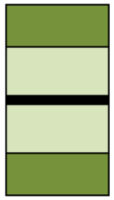


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

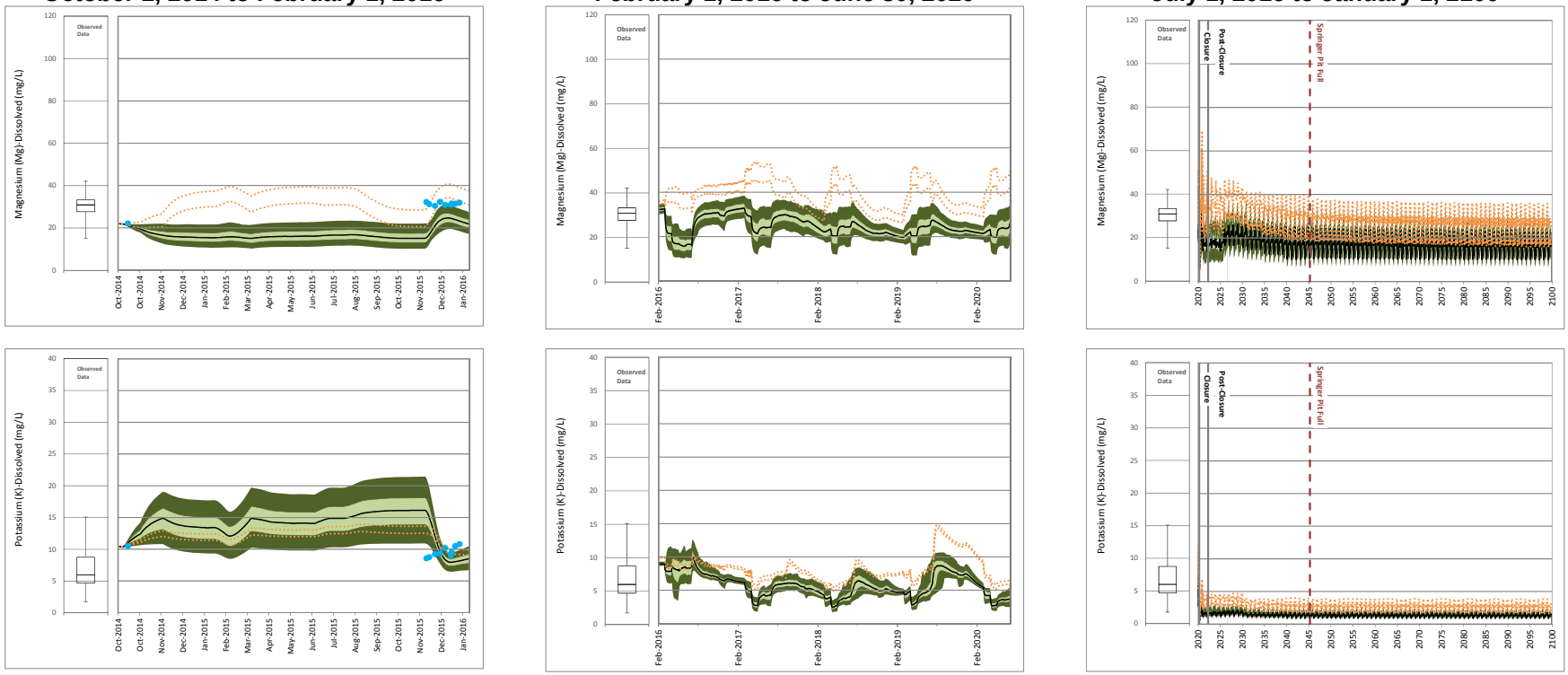
95th Percentile High, 5th Percentile Low

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

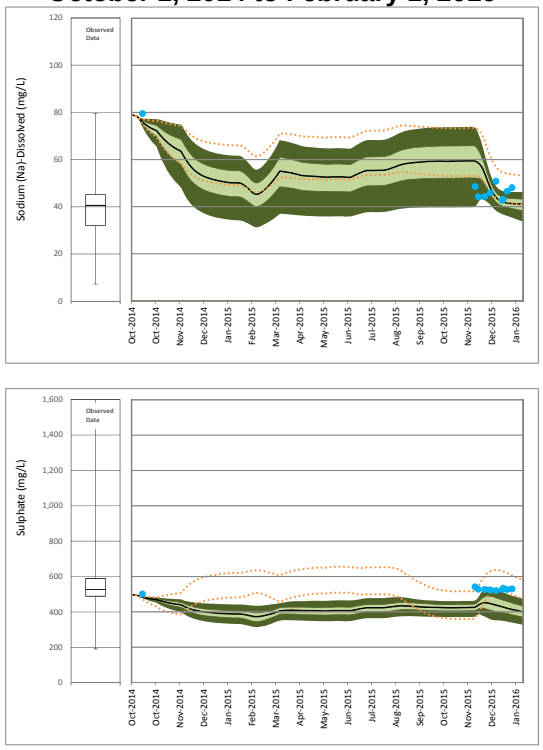
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

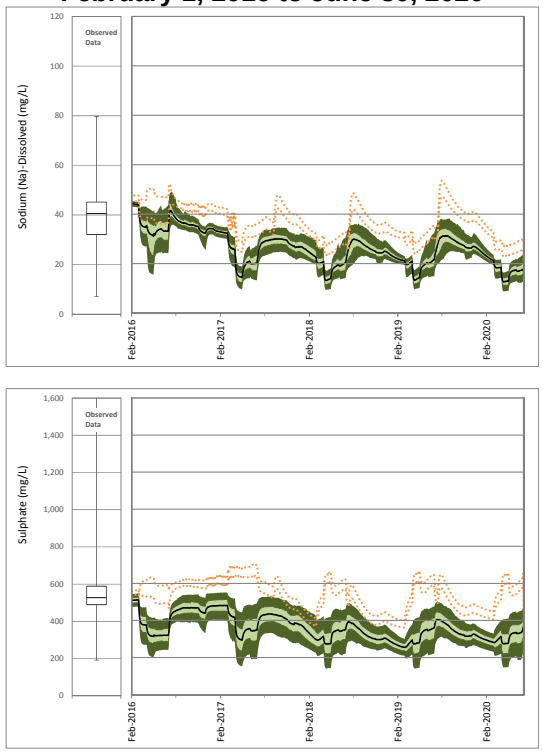
ATTACHMENT B

Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

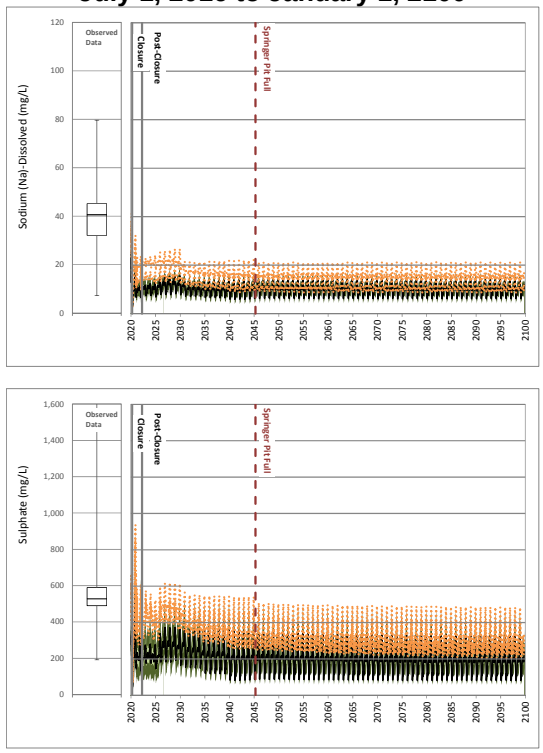
Calibration
October 1, 2014 to February 1, 2016



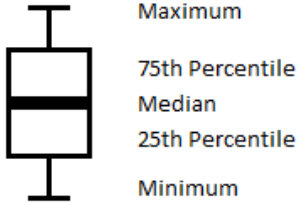
Operations
February 1, 2016 to June 30, 2020



Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

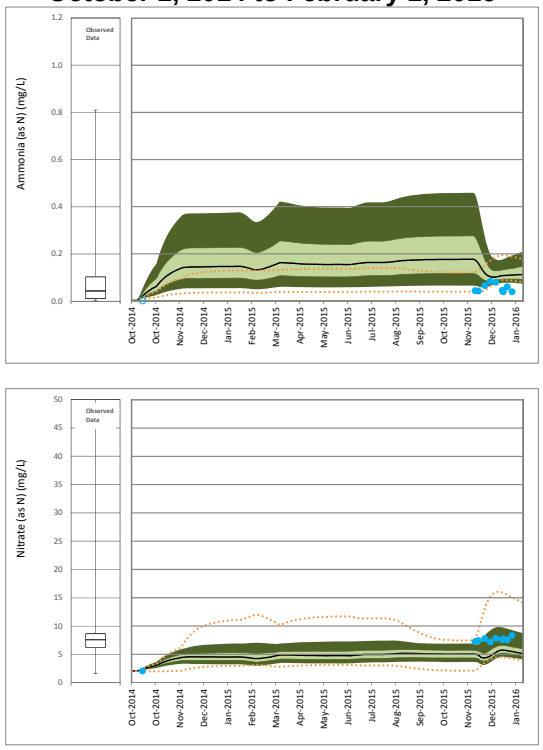
95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

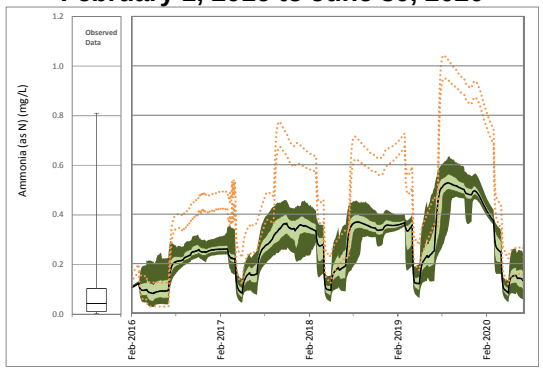
Golder Associates

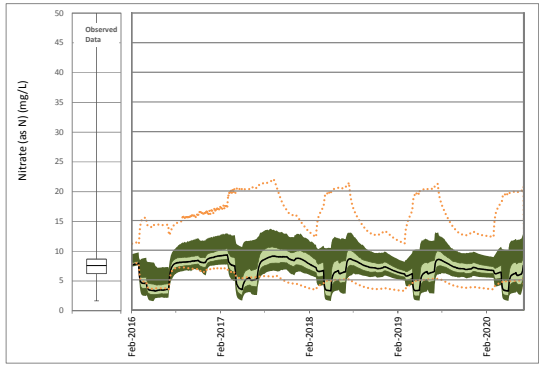
ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

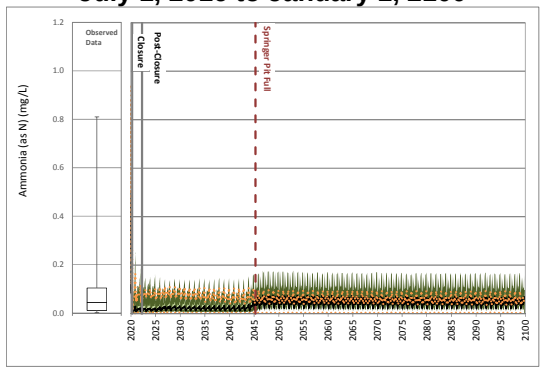


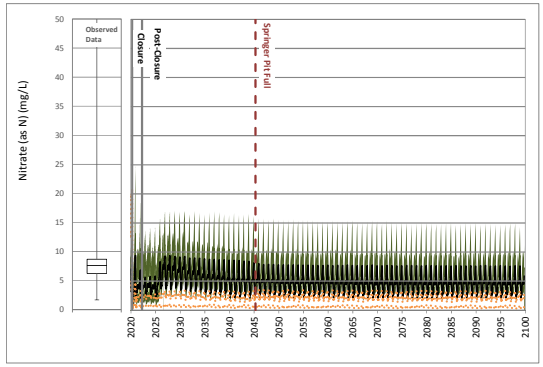
Operations
February 1, 2016 to June 30, 2020



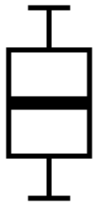


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

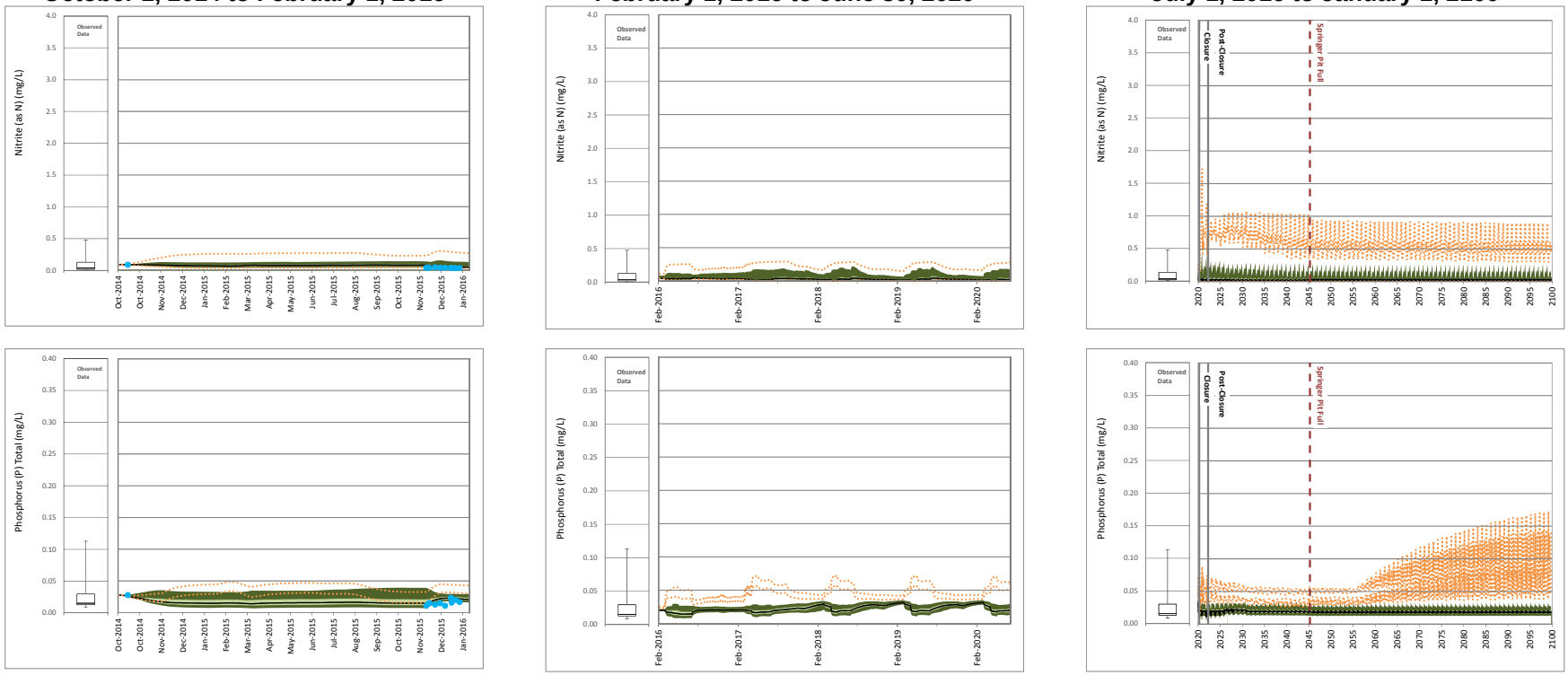
Golder Associates

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

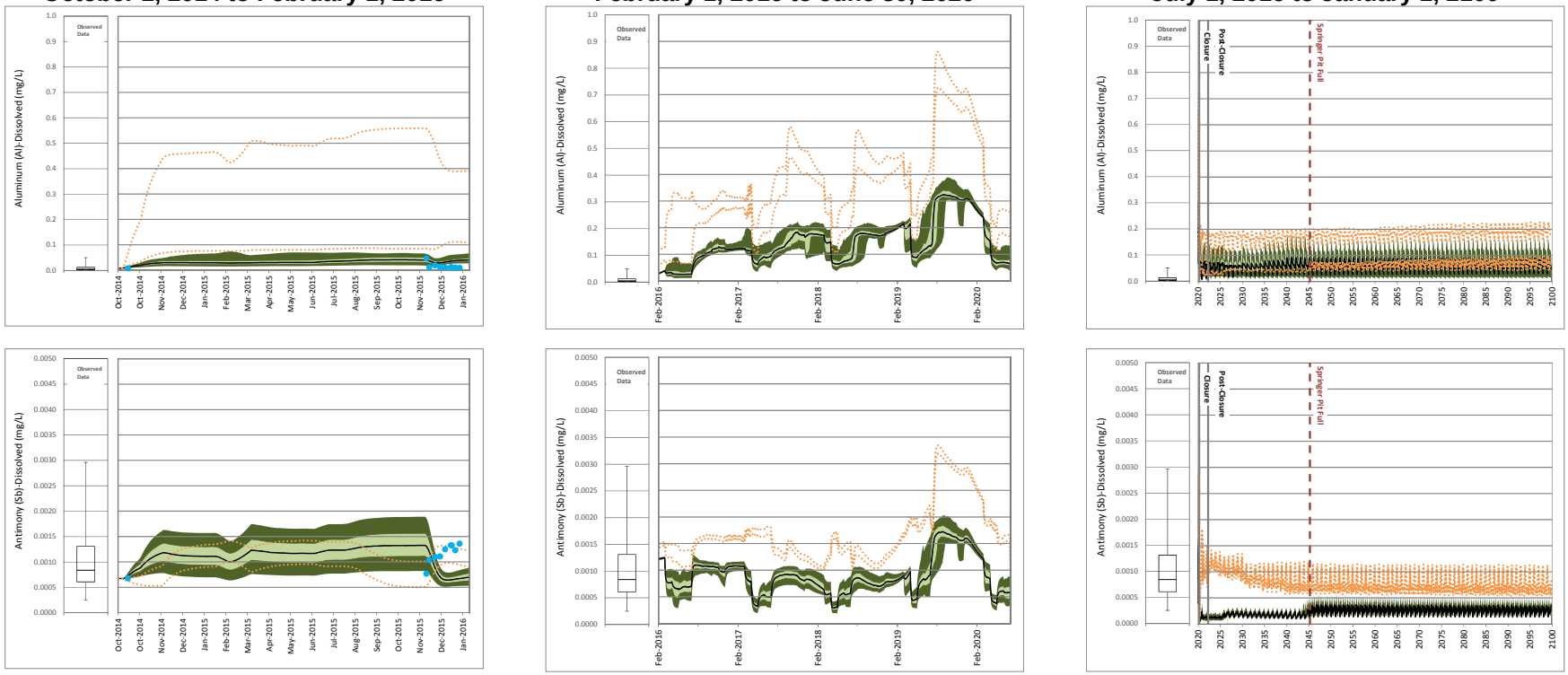
ATTACHMENT B

Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

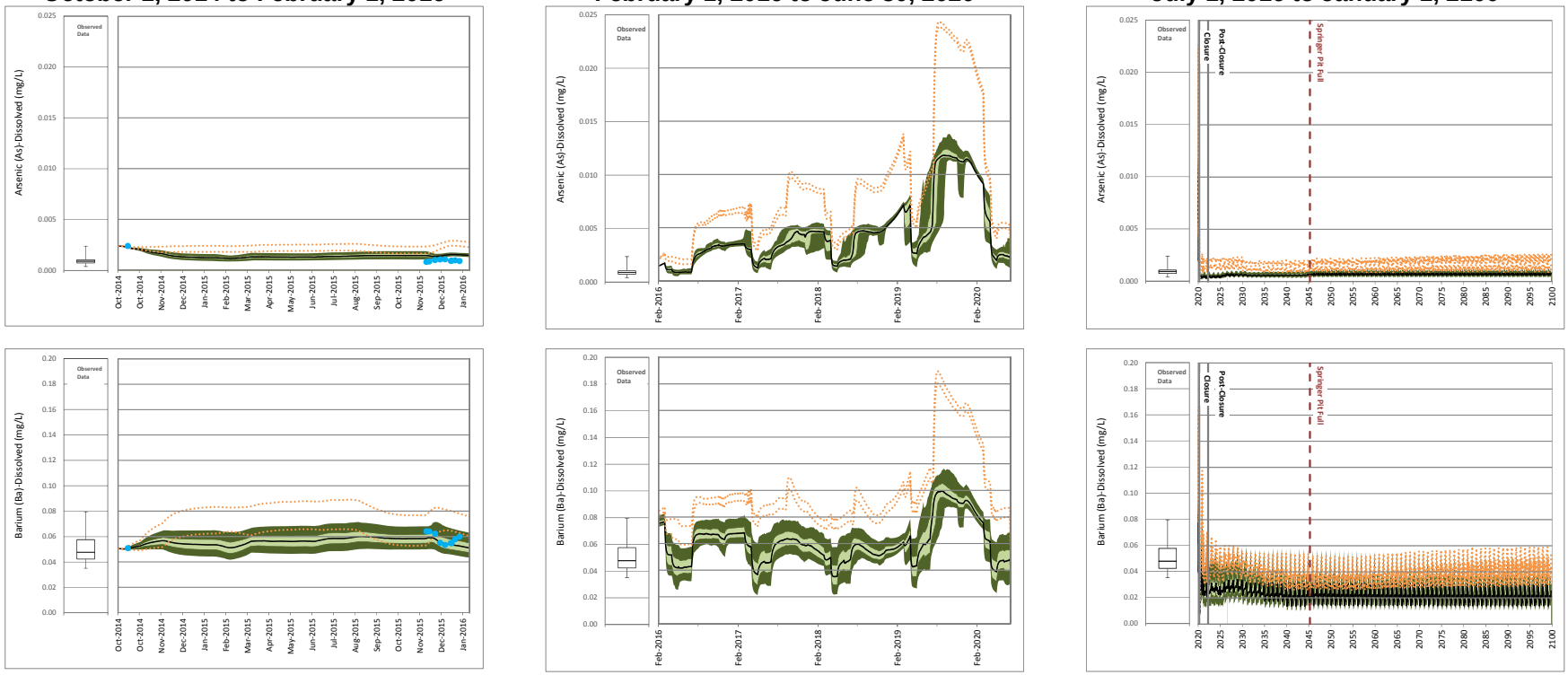
Golder Associates

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

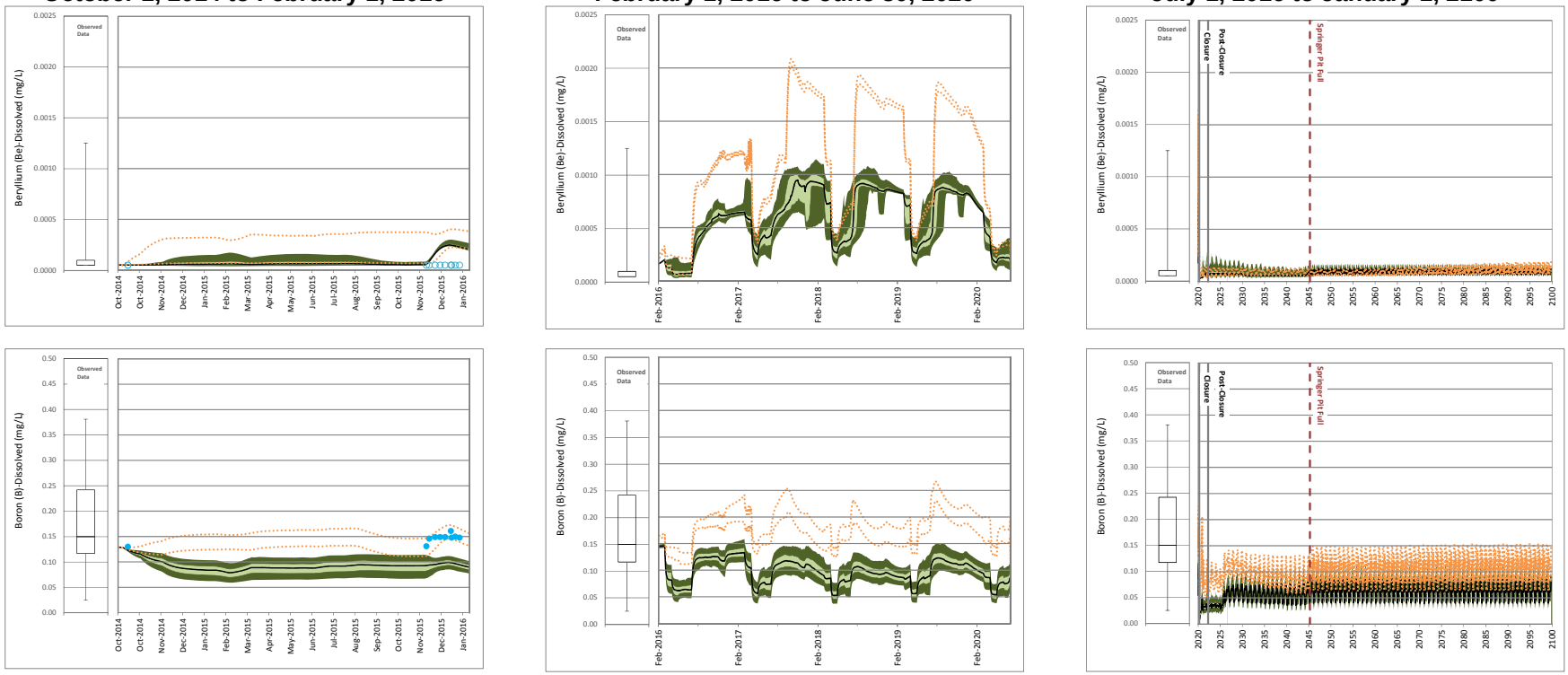
Golder Associates

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

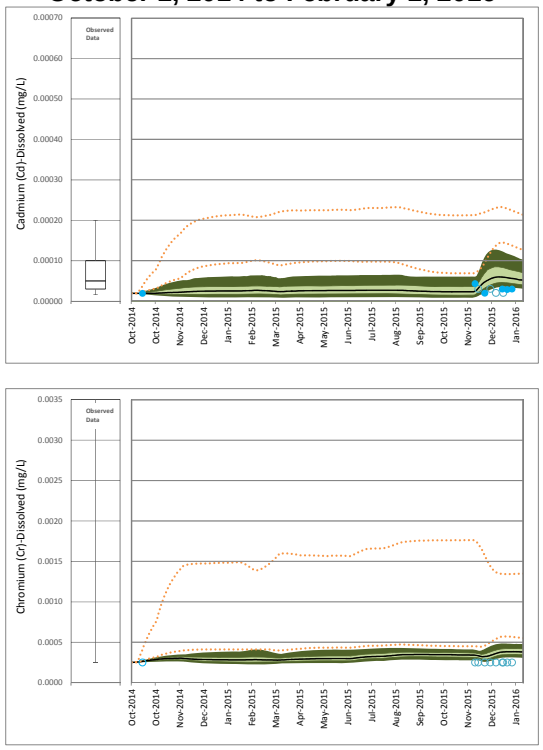
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

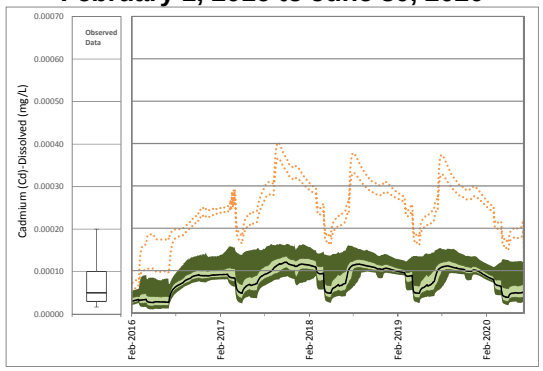
ATTACHMENT B

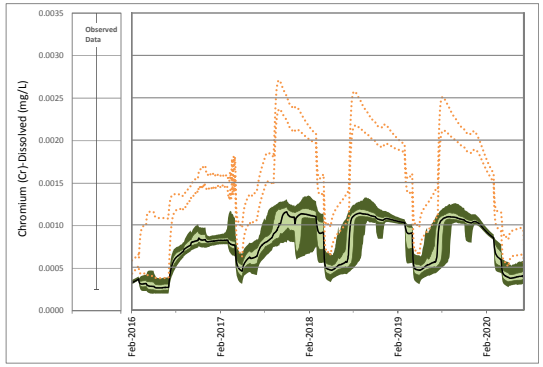
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

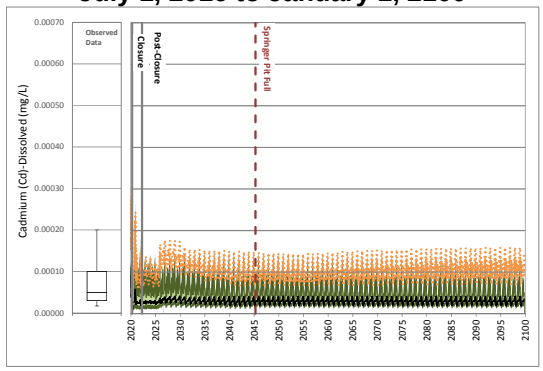


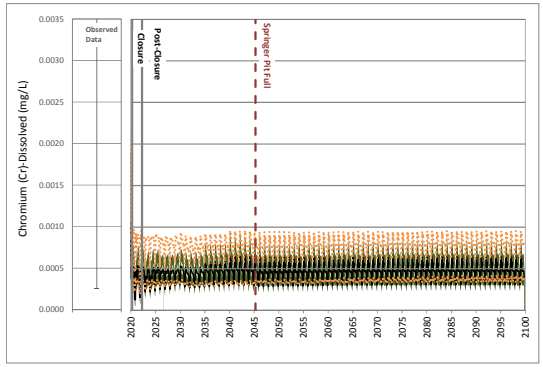
Operations
February 1, 2016 to June 30, 2020



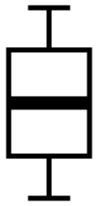


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

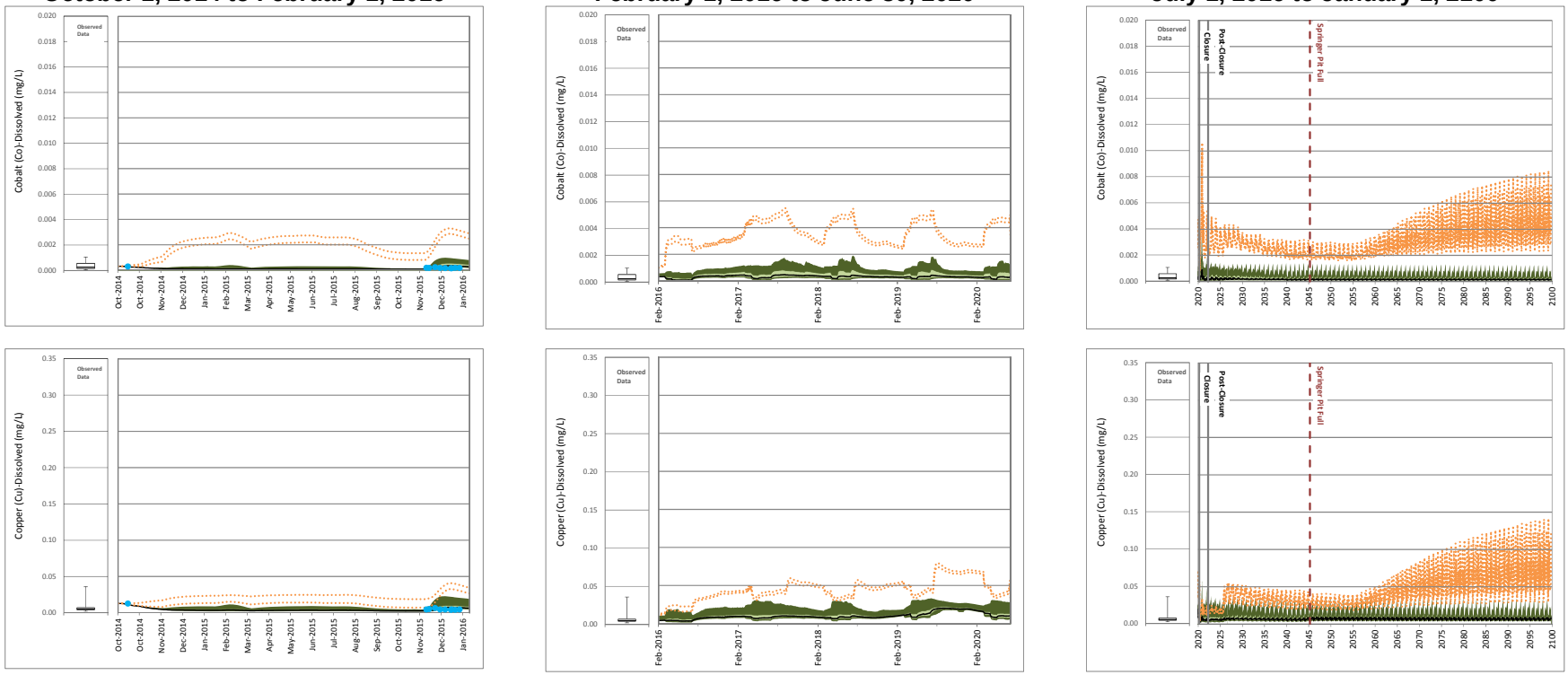
ATTACHMENT B

Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

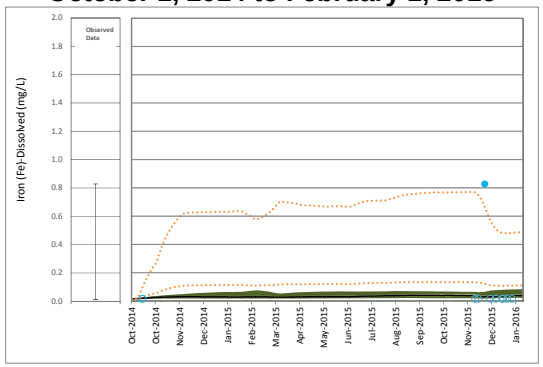
95th Percentile High, 5th Percentile Low

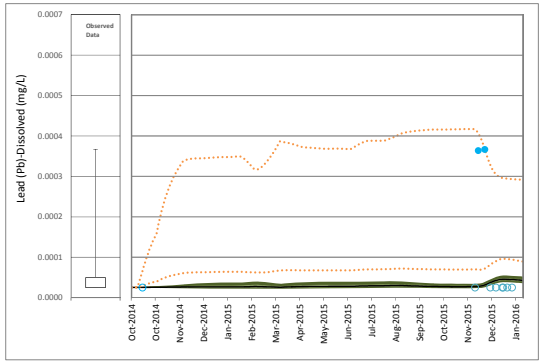
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

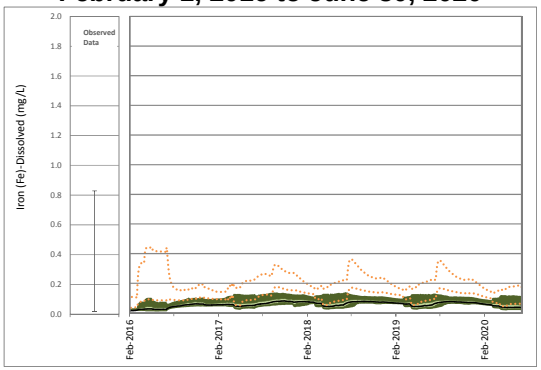
ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

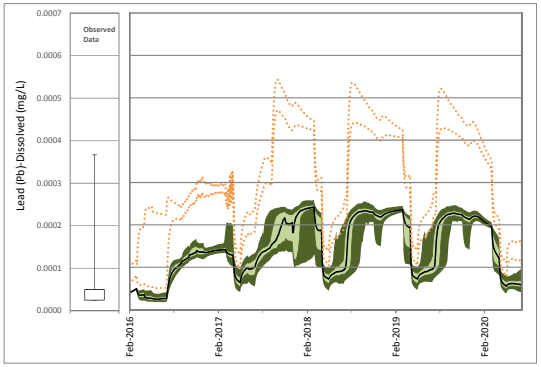
Calibration
October 1, 2014 to February 1, 2016



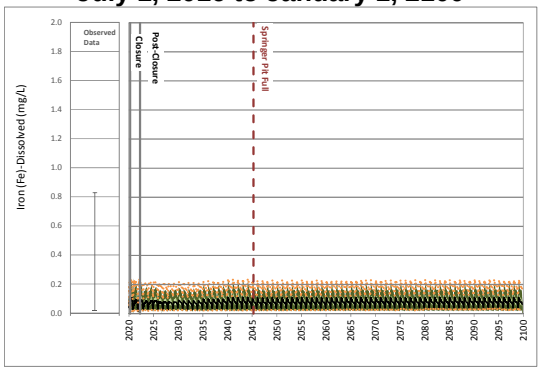


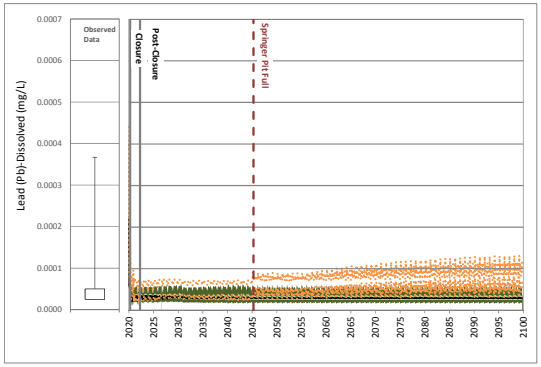
Operations
February 1, 2016 to June 30, 2020



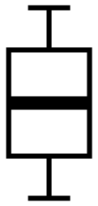


Closure and Post-closure
July 1, 2016 to January 1, 2100



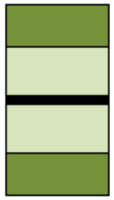


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

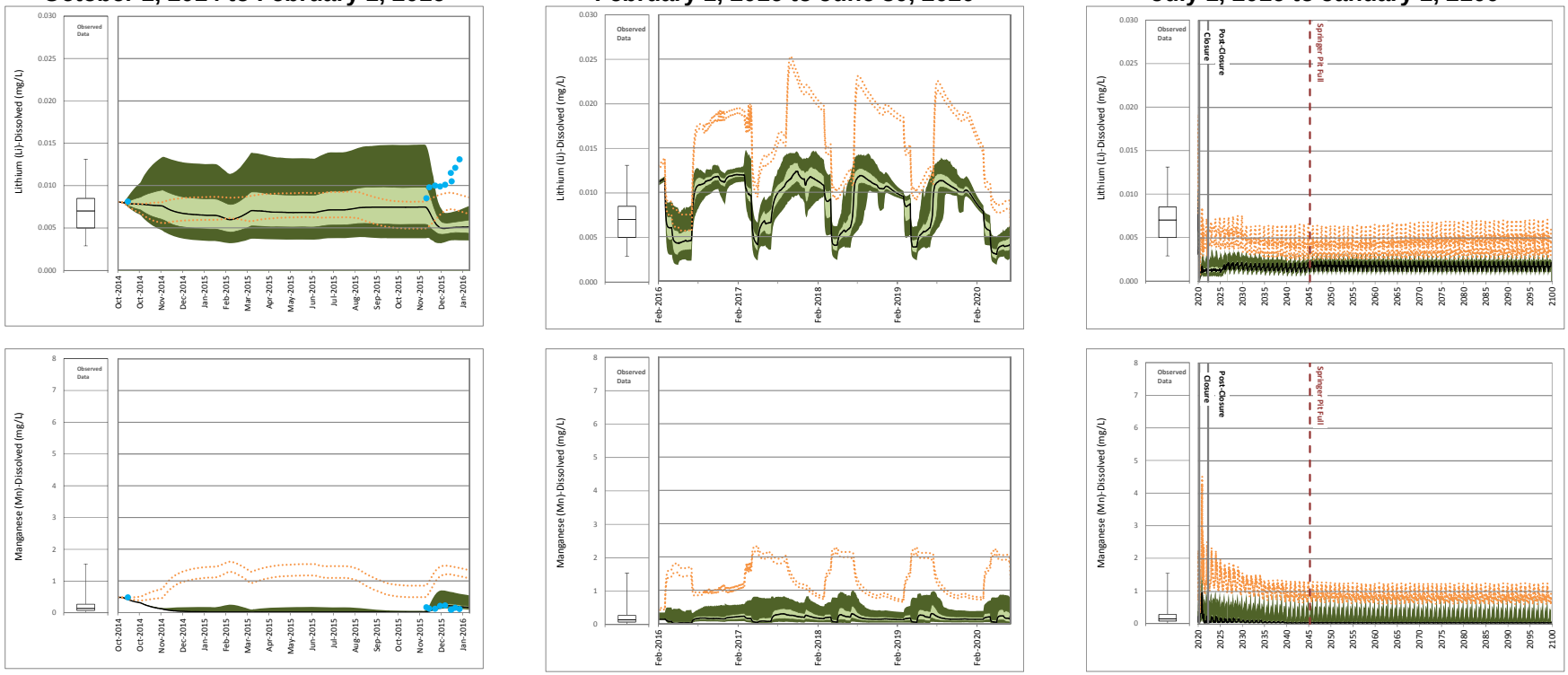
Golder Associates

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

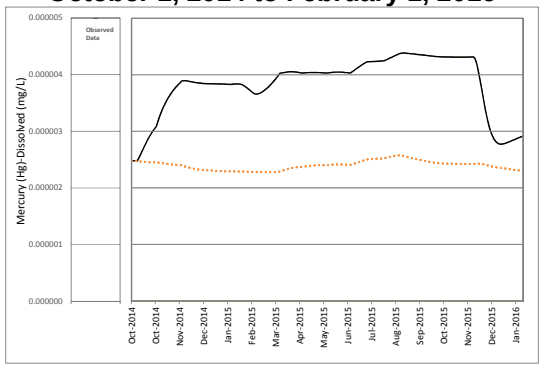
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

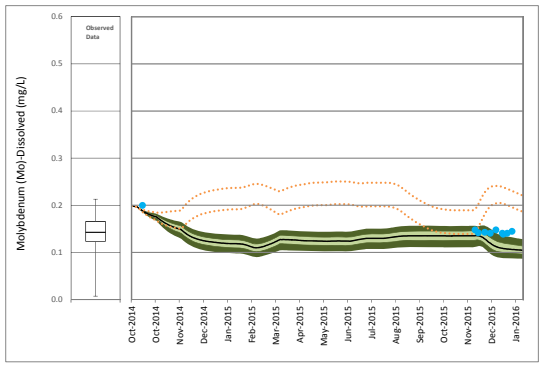
Golder Associates

ATTACHMENT B

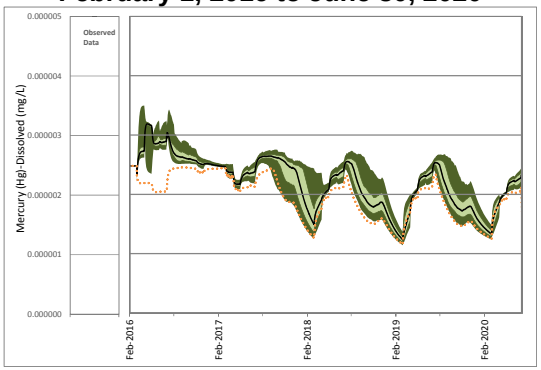
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

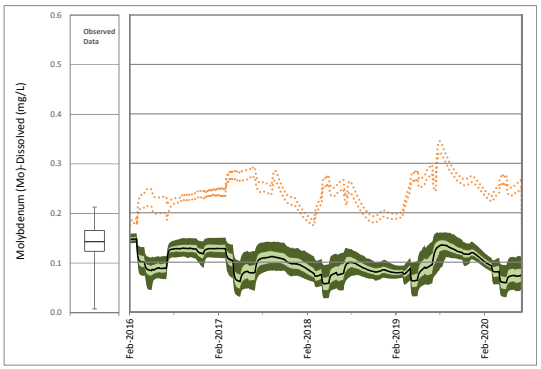
Calibration
October 1, 2014 to February 1, 2016



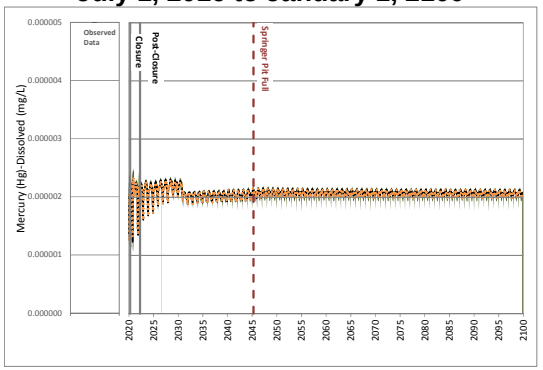


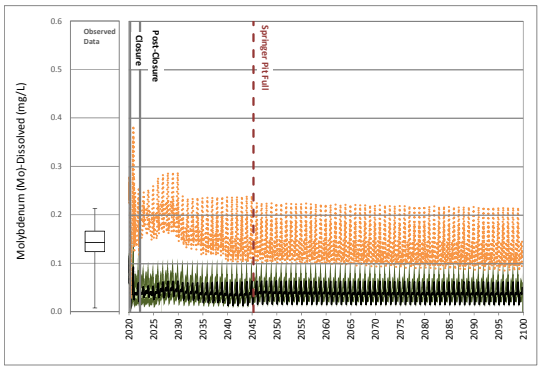
Operations
February 1, 2016 to June 30, 2020



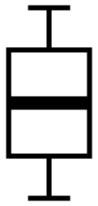


Closure and Post-closure
July 1, 2016 to January 1, 2100



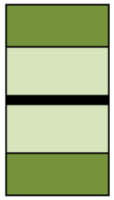


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

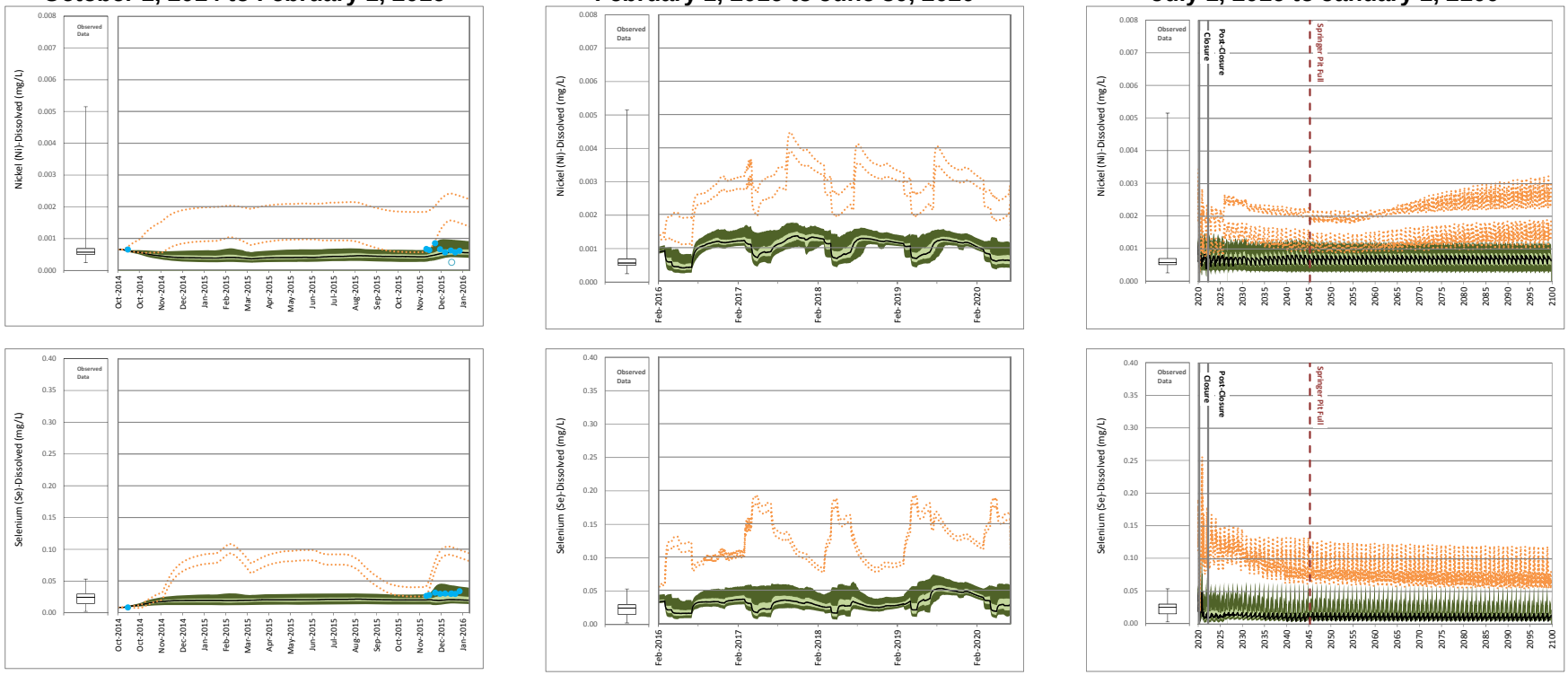
ATTACHMENT B

Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

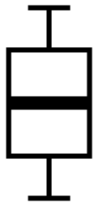
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

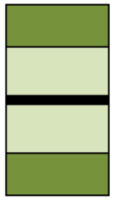


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

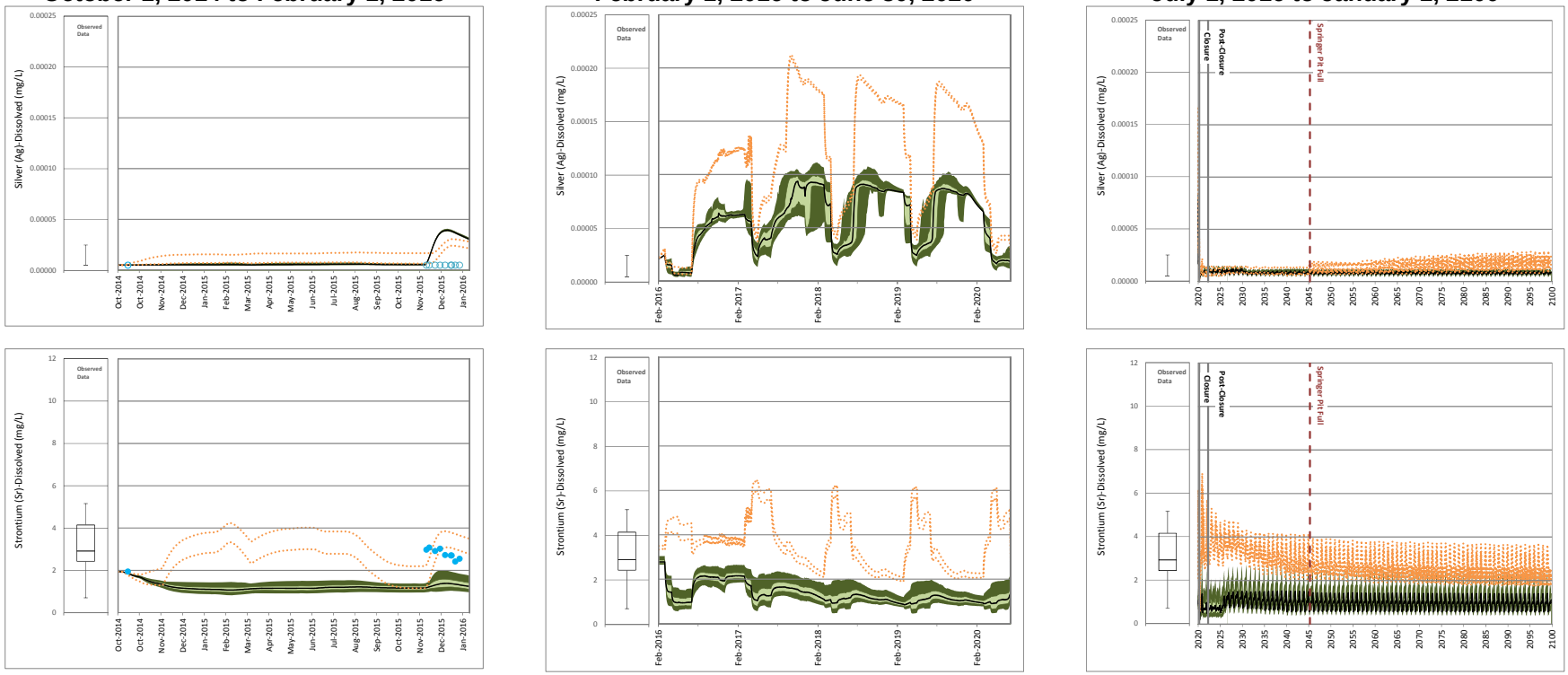
Golder Associates

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

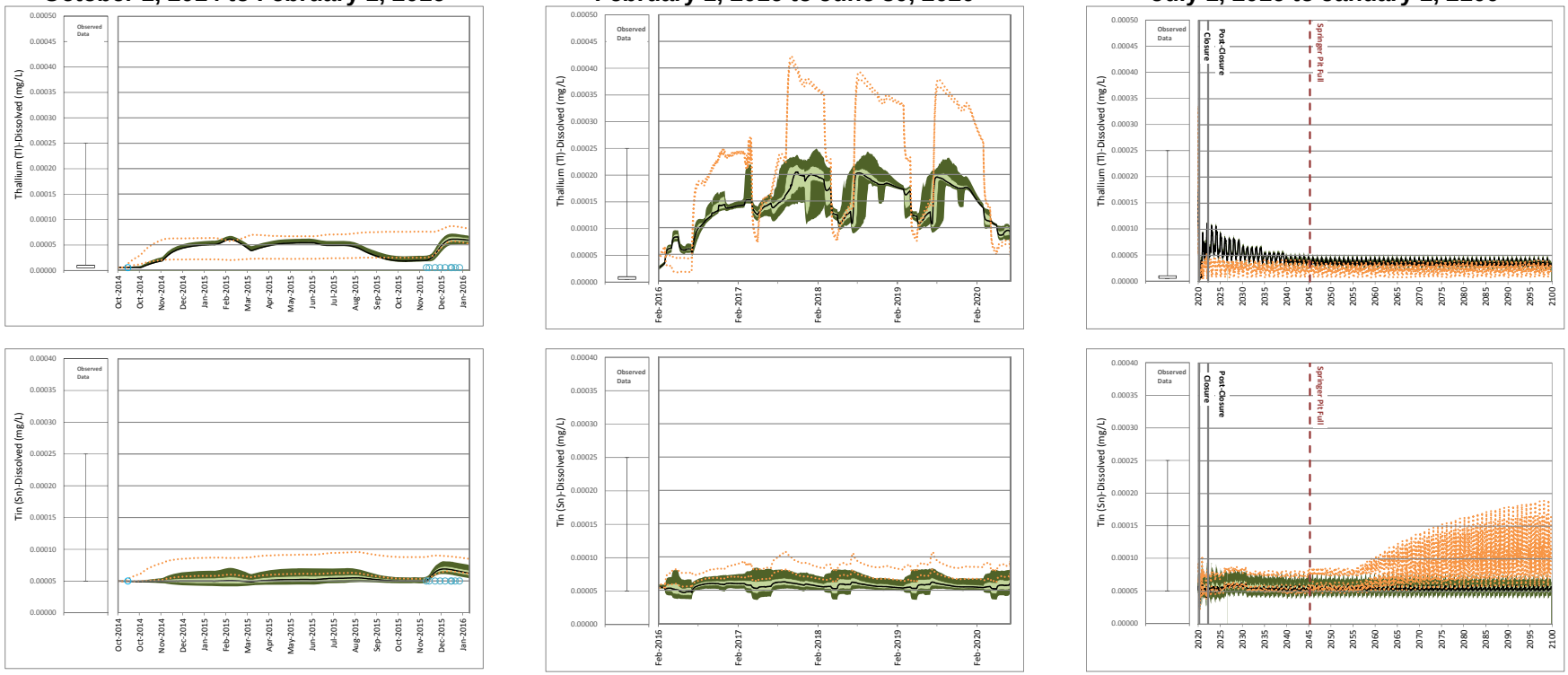
ATTACHMENT B

Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

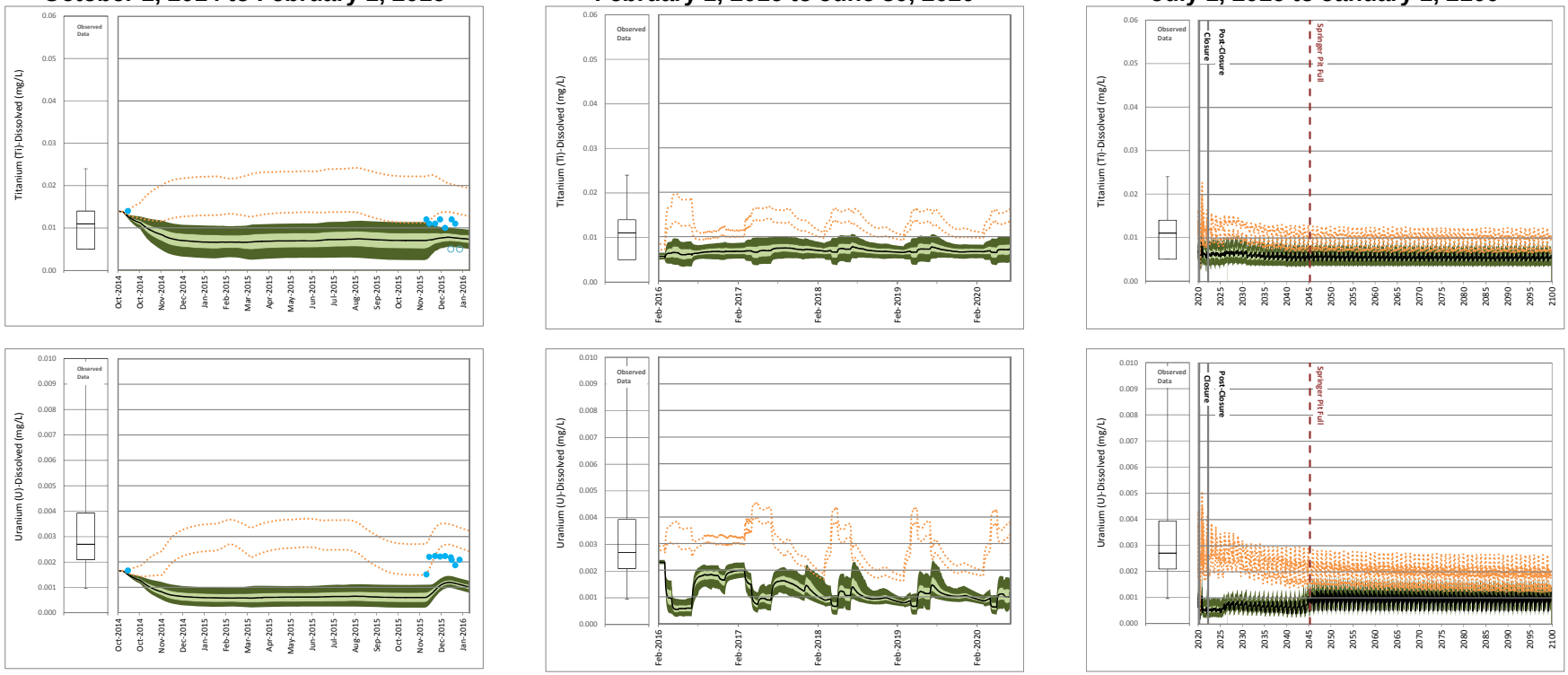
Golder Associates

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

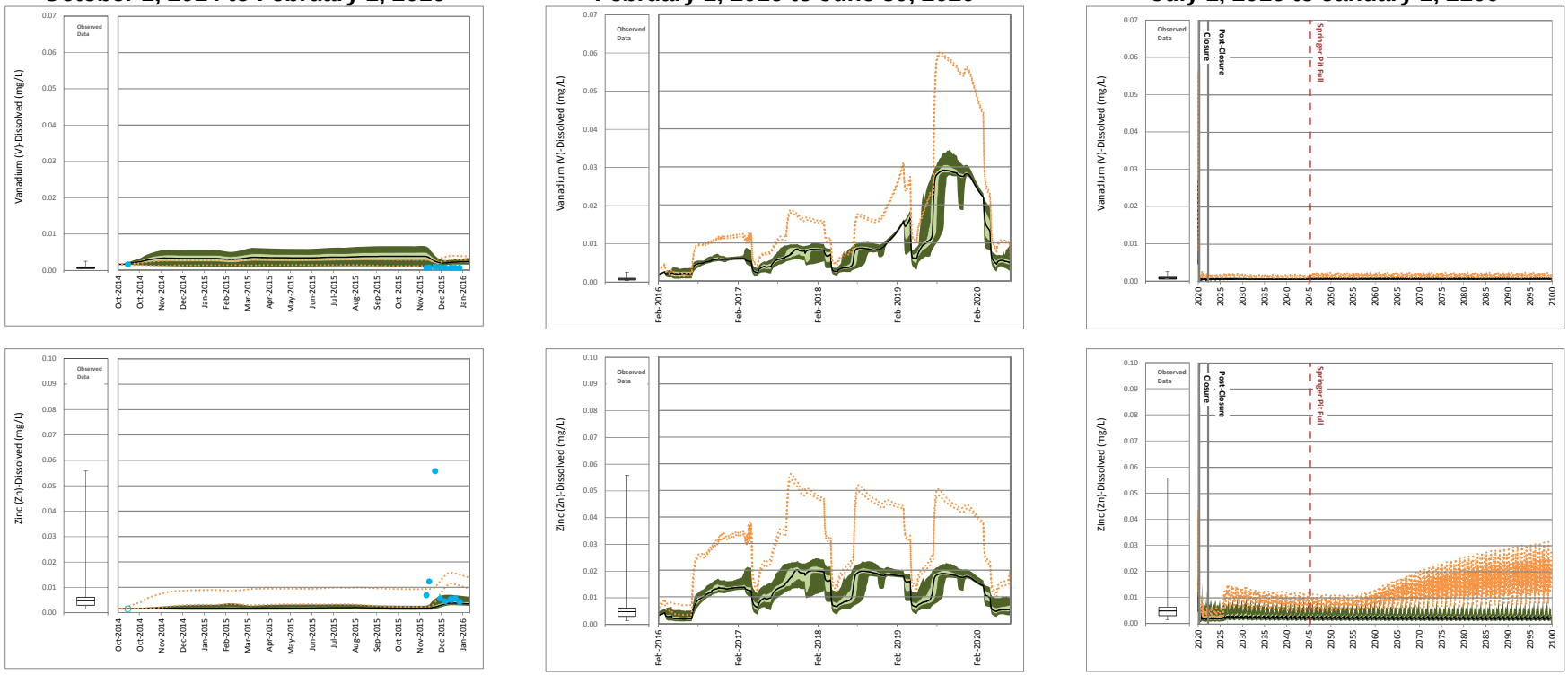
Golder Associates

ATTACHMENT B
Figure B2: Time Series Plots of Predicted Perimeter Embankment Till Borrow Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

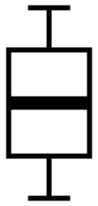
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig2-petbp.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.3 Central Collection Sump (CCS)

Table B3 presents the maximum predicted median and 95th percentile results for the CCS, calculated based on 500 realizations for Scenario 1 (Table B3a) and Scenario 2 (Table B3b). Time series plots for each modelled parameter are provided in Figure B3.

Table B3a:
Predicted CCS Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	610	755	605	1072	826	1158	676	922	586	798
Total Dissolved Solids	mg/L	995	1223	883	1607	1178	1701	976	1327	848	1159
Major Ions											
Calcium	mg/L	188	233	185	327	254	349	208	276	180	240
Chloride	mg/L	18	20	10	11	3.8	9.8	3.3	8.1	2.8	6.7
Fluoride	mg/L	1.1	1.2	2.3	2.7	0.16	0.41	0.22	0.4	0.22	0.39
Magnesium	mg/L	34	42	35	62	47	70	38	57	33	49
Potassium	mg/L	10	13	9.1	9.4	3.0	5.2	1.9	4.2	1.8	3.3
Sodium	mg/L	62	69	44	46	19	28	15	21	15	19
Sulphate	mg/L	553	726	516	952	668	1032	544	822	463	690
Nutrients											
Ammonia	mg/L (as N)	0.096	0.2	0.17	0.38	0.035	0.29	0.11	0.29	0.11	0.25
Nitrate	mg/L (as N)	10	15	8.6	19	11.0	27	15	27	11	23
Nitrite	mg/L (as N)	0.045	0.25	0.065	0.39	0.047	0.63	0.048	0.63	0.048	0.39
Total Phosphorus	mg/L	0.033	0.039	0.021	0.035	0.022	0.04	0.023	0.036	0.022	0.034
Total Metals											
Aluminum	mg/L	0.53	0.57	0.56	0.61	0.56	0.63	0.58	0.67	0.58	0.67
Antimony	mg/L	0.00076	0.0011	0.0013	0.0015	0.00029	0.00062	0.00053	0.00094	0.00053	0.00094
Arsenic	mg/L	0.0018	0.0022	0.0024	0.0026	0.00067	0.0011	0.0011	0.0016	0.0011	0.0016
Barium	mg/L	0.07	0.1	0.083	0.097	0.073	0.13	0.049	0.1	0.045	0.082
Beryllium	mg/L	0.00037	0.00045	0.00032	0.00047	0.00007	0.00036	0.00014	0.00036	0.00015	0.00029
Boron	mg/L	0.18	0.23	0.15	0.22	0.058	0.12	0.11	0.2	0.11	0.19
Cadmium	mg/L	0.00012	0.00035	0.00006	0.00032	0.000072	0.00039	0.000061	0.00036	0.000057	0.0003
Chromium	mg/L	0.0011	0.0013	0.0012	0.0013	0.0011	0.0014	0.0013	0.0016	0.0013	0.0016
Cobalt	mg/L	0.00095	0.002	0.001	0.0036	0.0014	0.0059	0.00068	0.003	0.00055	0.0023
Copper	mg/L	0.013	0.053	0.017	0.069	0.016	0.084	0.016	0.084	0.016	0.067
Iron	mg/L	0.59	0.64	0.6	0.74	0.63	0.83	0.66	0.77	0.65	0.76
Lead	mg/L	0.00019	0.00021	0.00023	0.00024	0.00018	0.00021	0.00018	0.00022	0.00018	0.00022
Lithium	mg/L	0.0055	0.011	0.012	0.015	0.0023	0.0074	0.0032	0.0075	0.0031	0.0073
Manganese	mg/L	0.36	1.3	0.71	1.9	1.2	3.0	0.3	1.9	0.063	1.4
Mercury	mg/L	0.0000032	0.0000032	0.0000025	0.0000031	0.0000025	0.0000025	0.0000025	0.0000025	0.0000024	0.0000024
Molybdenum	mg/L	0.14	0.21	0.15	0.23	0.11	0.24	0.087	0.2	0.082	0.16
Nickel	mg/L	0.0012	0.0019	0.0016	0.0026	0.0014	0.0029	0.0014	0.0028	0.0014	0.0023
Selenium	mg/L	0.021	0.076	0.041	0.12	0.058	0.16	0.026	0.12	0.023	0.094
Silver	mg/L	0.000074	0.000085	0.000033	0.000047	0.0000075	0.000024	0.000008	0.000022	0.0000077	0.000022
Strontium	mg/L	2.2	3.4	2.8	4.5	1.6	4.5	2.3	4.5	2.0	4.1
Thallium	mg/L	0.000072	0.000093	0.000097	0.00011	0.00011	0.00012	0.00011	0.00012	0.000062	0.000081
Tin	mg/L	0.000089	0.00021	0.000069	0.00021	0.000076	0.00021	0.000077	0.00021	0.000074	0.0002
Titanium	mg/L	0.031	0.035	0.032	0.041	0.035	0.043	0.032	0.039	0.031	0.036
Uranium	mg/L	0.0018	0.0026	0.0024	0.0041	0.0013	0.0028	0.0018	0.0032	0.0018	0.0032
Vanadium	mg/L	0.0032	0.0043	0.005	0.0055	0.002	0.0028	0.0022	0.0028	0.0022	0.0028
Zinc	mg/L	0.0058	0.012	0.0091	0.018	0.0055	0.02	0.0059	0.019	0.0055	0.015
Dissolved Metals											
Aluminum	mg/L	0.044	0.076	0.074	0.12	0.066	0.14	0.09	0.18	0.087	0.18
Antimony	mg/L	0.00074	0.00096	0.0012	0.0013	0.00027	0.00044	0.00051	0.00076	0.00051	0.00076
Arsenic	mg/L	0.0016	0.002	0.0022	0.0025	0.00048	0.0009	0.00087	0.0014	0.00089	0.0014
Barium	mg/L	0.064	0.095	0.077	0.091	0.067	0.12	0.044	0.097	0.039	0.077
Beryllium	mg/L	0.00037	0.00037	0.00032	0.00039	0.00007	0.00028	0.00014	0.00028	0.00015	0.00021
Boron	mg/L	0.17	0.19	0.15	0.18	0.055	0.083	0.11	0.16	0.11	0.15
Cadmium	mg/L	0.00012	0.00026	0.000056	0.00023	0.000068	0.00029	0.000057	0.00027	0.000053	0.0002
Chromium	mg/L	0.00041	0.00061	0.00054	0.00061	0.00043	0.00073	0.00066	0.00094	0.00063	0.00091
Cobalt	mg/L	0.00063	0.0017	0.0007	0.0033	0.0010	0.0056	0.00036	0.0027	0.00023	0.0019
Copper	mg/L	0.0085	0.038	0.013	0.054	0.011	0.069	0.012	0.068	0.012	0.051
Iron	mg/L	0.042	0.1	0.055	0.19	0.084	0.28	0.11	0.22	0.11	0.22
Lead	mg/L	0.00005	0.00006	0.000081	0.000092	0.000038	0.000064	0.000037	0.000071	0.000034	0.000073
Lithium	mg/L	0.0052	0.008	0.012	0.012	0.002	0.0044	0.0029	0.0046	0.0028	0.0044
Manganese	mg/L	0.35	1.3	0.7	1.9	1.2	3.0	0.29	1.9	0.048	1.3
Mercury	mg/L	0.0000032	0.0000032	0.0000025	0.0000031	0.0000025	0.0000025	0.0000025	0.0000025	0.0000024	0.0000024
Molybdenum	mg/L	0.14	0.2	0.15	0.22	0.11	0.23	0.087	0.18	0.082	0.15
Nickel	mg/L	0.00062	0.0014	0.001	0.0021	0.00083	0.0024	0.00084	0.0023	0.00081	0.0017
Selenium	mg/L	0.021	0.072	0.041	0.11	0.058	0.15	0.026	0.12	0.023	0.089
Silver	mg/L	0.000074	0.000075	0.000033	0.000037	0.0000075	0.000014	0.000008	0.000012	0.0000077	0.000012
Strontium	mg/L	2.2	3.0	2.8	4.1	1.6	4.1	2.2	4.1	2.0	3.6
Thallium	mg/L	0.000072	0.000083	0.000097	0.00010	0.00011	0.00011	0.00011	0.00011	0.000062	0.000072
Tin	mg/L	0.000089	0.00011	0.000069	0.00011	0.000076	0.00011	0.000077	0.00011	0.000074	0.0001
Titanium	mg/L	0.0082	0.012	0.0094	0.019	0.012	0.02	0.010	0.017	0.0087	0.014
Uranium	mg/L	0.0018	0.0019	0.0023	0.0034	0.0013	0.0022	0.0017	0.0026	0.0017	0.0026
Vanadium	mg/L	0.0019	0.003	0.0037	0.0042	0.00067	0.0015	0.00088	0.0015	0.00087	0.0015
Zinc	mg/L	0.0042	0.01	0.0076	0.017	0.004	0.018	0.0044	0.018	0.0039	0.014

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

Table B3b:
Predicted CCS Water Quality - Scenario 2

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	835	886	896	938	1247	1297	935	1020	775	839
Total Dissolved Solids	mg/L	1263	1319	1188	1221	1610	1667	1252	1351	1032	1117
Major Ions											
Calcium	mg/L	252	269	272	282	382	395	281	308	234	253
Chloride	mg/L	23	25	15	17	16.0	18.0	13.0	15.0	14.0	16.0
Fluoride	mg/L	2.0	2.1	5.1	5.1	0.49	0.51	0.48	0.5	0.44	0.46
Magnesium	mg/L	50	52	53	56	71	75	57	61	46	50
Potassium	mg/L	13	14	10.0	10.0	7.1	7.4	4.7	5.2	3.7	4.1
Sodium	mg/L	65	75	47	48	33	35	23	25	20	22
Sulphate	mg/L	772	821	720	731	988	1019	768	820	607	653
Nutrients											
Ammonia	mg/L (as N)	0.19	0.21	0.32	0.32	0.18	0.18	0.18	0.18	0.13	0.13
Nitrate	mg/L (as N)	20	21	29.0	30	5.2	5	5	5	4	5
Nitrite	mg/L (as N)	0.33	0.39	0.40	0.42	1.90	1.9	1.90	1.9	1.40	1.4
Total Phosphorus	mg/L	0.05	0.056	0.072	0.08	0.088	0.095	0.075	0.087	0.21	0.21
Total Metals											
Aluminum	mg/L	0.8	1.0	0.68	0.73	0.64	0.71	0.63	0.7	0.66	0.73
Antimony	mg/L	0.0015	0.0019	0.0019	0.0021	0.0020	0.0021	0.0018	0.0021	0.0013	0.0015
Arsenic	mg/L	0.003	0.0032	0.0045	0.0046	0.0028	0.003	0.0022	0.0026	0.0029	0.0033
Barium	mg/L	0.095	0.1	0.096	0.097	0.13	0.13	0.085	0.1	0.076	0.083
Beryllium	mg/L	0.00034	0.0005	0.00067	0.00076	0.00011	0.00032	0.0001	0.00032	0.00022	0.00034
Boron	mg/L	0.21	0.26	0.23	0.33	0.22	0.26	0.19	0.24	0.19	0.24
Cadmium	mg/L	0.00028	0.00042	0.00021	0.00031	0.00026	0.00036	0.00023	0.00033	0.00019	0.00029
Chromium	mg/L	0.0017	0.0023	0.0016	0.0017	0.0013	0.0015	0.0013	0.0016	0.0013	0.0016
Cobalt	mg/L	0.0041	0.0042	0.0076	0.0077	0.012	0.012	0.0056	0.0056	0.0120	0.012
Copper	mg/L	0.095	0.11	0.069	0.081	0.04	0.052	0.089	0.10	0.19	0.21
Iron	mg/L	0.96	1.3	0.67	0.75	0.65	0.77	0.66	0.77	0.66	0.77
Lead	mg/L	0.00038	0.00055	0.00031	0.00031	0.00023	0.00025	0.00023	0.00025	0.00028	0.0003
Lithium	mg/L	0.0091	0.013	0.016	0.019	0.0087	0.012	0.0079	0.012	0.0072	0.011
Manganese	mg/L	1.8	2.0	3.1	3.2	5.0	5.0	2.6	2.6	1.80	1.8
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000024	0.0000024
Molybdenum	mg/L	0.27	0.31	0.29	0.31	0.41	0.43	0.29	0.31	0.24	0.26
Nickel	mg/L	0.0038	0.0042	0.0034	0.0037	0.0034	0.0036	0.0038	0.0041	0.0042	0.0045
Selenium	mg/L	0.13	0.14	0.22	0.22	0.28	0.28	0.21	0.22	0.16	0.17
Silver	mg/L	0.000031	0.000044	0.000069	0.00008	0.000021	0.000034	0.000020	0.000032	0.000032	0.000045
Strontium	mg/L	4.8	5.6	7.2	7.7	7.5	8.0	7.1	7.9	5.4	6.0
Thallium	mg/L	0.000077	0.00010	0.00013	0.00014	0.00008	0.00009	0.00008	0.00009	0.000053	0.000065
Tin	mg/L	0.000095	0.00021	0.000096	0.00023	0.00010	0.00021	0.000098	0.00022	0.00022	0.00034
Titanium	mg/L	0.043	0.047	0.039	0.04	0.046	0.047	0.04	0.041	0.037	0.039
Uranium	mg/L	0.0039	0.005	0.0047	0.0056	0.0053	0.0062	0.0047	0.0056	0.0037	0.0045
Vanadium	mg/L	0.0052	0.0056	0.0091	0.0092	0.0041	0.0043	0.0036	0.0043	0.0036	0.0042
Zinc	mg/L	0.027	0.03	0.021	0.022	0.012	0.013	0.023	0.024	0.043	0.044
Dissolved Metals											
Aluminum	mg/L	0.31	0.53	0.19	0.24	0.15	0.22	0.14	0.21	0.17	0.24
Antimony	mg/L	0.0015	0.0017	0.0019	0.0019	0.0019	0.0020	0.0018	0.0019	0.0013	0.0013
Arsenic	mg/L	0.0028	0.003	0.0043	0.0044	0.0026	0.0028	0.0020	0.0024	0.0027	0.0031
Barium	mg/L	0.089	0.099	0.091	0.092	0.12	0.13	0.079	0.091	0.07	0.077
Beryllium	mg/L	0.00034	0.00042	0.00067	0.00068	0.00011	0.00024	0.0001	0.00024	0.00022	0.00026
Boron	mg/L	0.21	0.23	0.23	0.29	0.22	0.22	0.19	0.2	0.18	0.21
Cadmium	mg/L	0.00028	0.00032	0.00021	0.00021	0.00026	0.00027	0.00023	0.00024	0.00018	0.00019
Chromium	mg/L	0.0011	0.0017	0.00096	0.0010	0.00066	0.0009	0.00067	0.00096	0.00068	0.00095
Cobalt	mg/L	0.0037	0.0039	0.0072	0.0073	0.0120	0.012	0.0053	0.0053	0.0110	0.011
Copper	mg/L	0.091	0.094	0.064	0.065	0.036	0.037	0.084	0.085	0.19	0.19
Iron	mg/L	0.42	0.72	0.13	0.21	0.11	0.23	0.11	0.23	0.11	0.23
Lead	mg/L	0.00024	0.00040	0.00016	0.00017	0.000087	0.00010	0.000084	0.00010	0.00014	0.00015
Lithium	mg/L	0.0088	0.010	0.016	0.016	0.0084	0.0095	0.0076	0.0095	0.0069	0.0078
Manganese	mg/L	1.8	2.0	3.1	3.2	4.9	5.0	2.6	2.6	1.80	1.8
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000024	0.0000024
Molybdenum	mg/L	0.27	0.3	0.29	0.29	0.41	0.42	0.29	0.3	0.24	0.24
Nickel	mg/L	0.0032	0.0036	0.0028	0.0031	0.0028	0.0031	0.0032	0.0035	0.0036	0.0039
Selenium	mg/L	0.13	0.13	0.22	0.22	0.28	0.28	0.21	0.22	0.16	0.17
Silver	mg/L	0.000031	0.000034	0.000069	0.00007	0.000021	0.000024	0.000020	0.000022	0.000032	0.000035
Strontium	mg/L	4.8	5.2	7.2	7.3	7.4	7.6	7.1	7.4	5.4	5.6
Thallium	mg/L	0.000077	0.00009	0.00013	0.00013	0.00008	0.00008	0.00008	0.00008	0.000053	0.000056
Tin	mg/L	0.000095	0.00011	0.000096	0.00013	0.00010	0.00011	0.000098	0.00012	0.00022	0.00024
Titanium	mg/L	0.021	0.025	0.016	0.018	0.023	0.025	0.017	0.019	0.015	0.016
Uranium	mg/L	0.0039	0.0044	0.0047	0.005	0.0053	0.0055	0.0046	0.005	0.0036	0.0039
Vanadium	mg/L	0.0039	0.0043	0.0078	0.0079	0.0028	0.003	0.0023	0.003	0.0023	0.0029
Zinc	mg/L	0.026	0.028	0.020	0.02	0.011	0.012	0.022	0.023	0.041	0.042

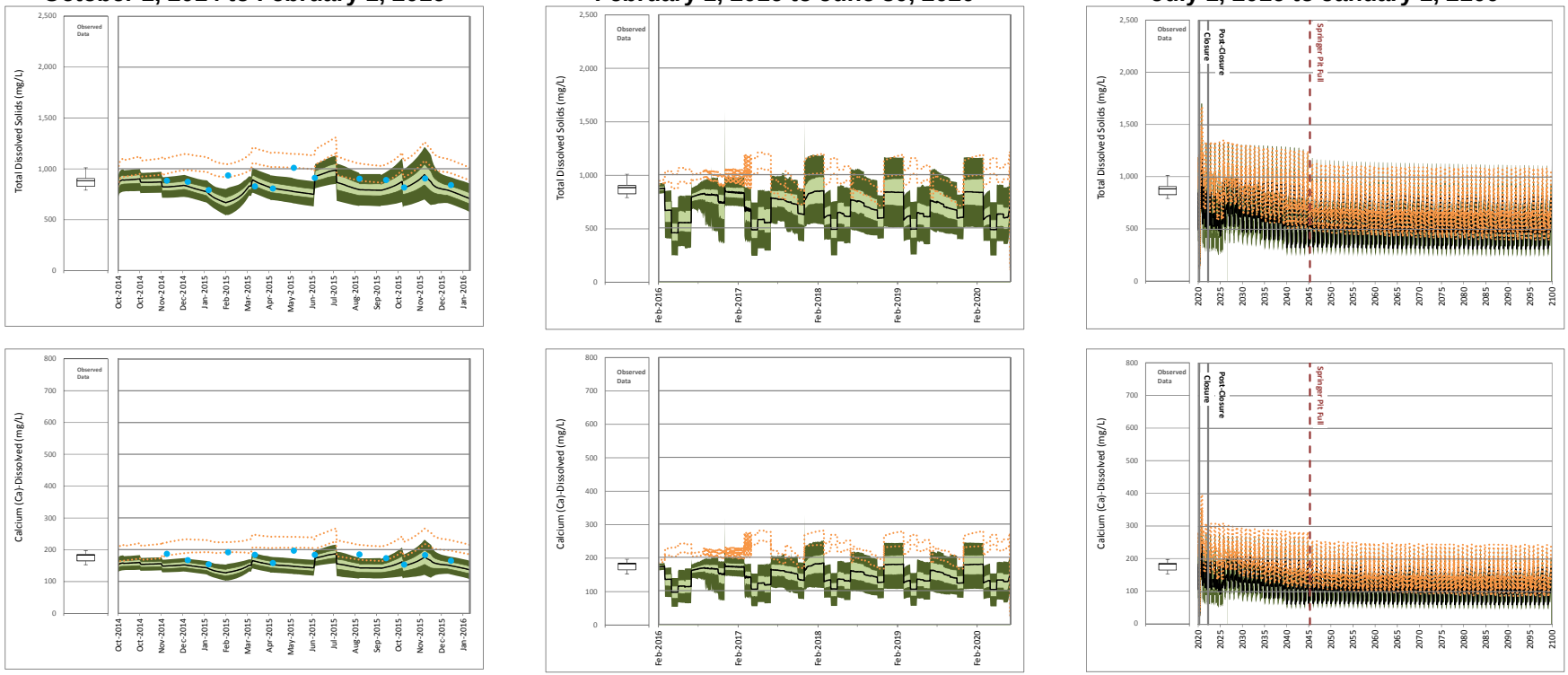
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

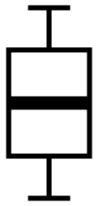
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

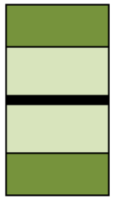


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

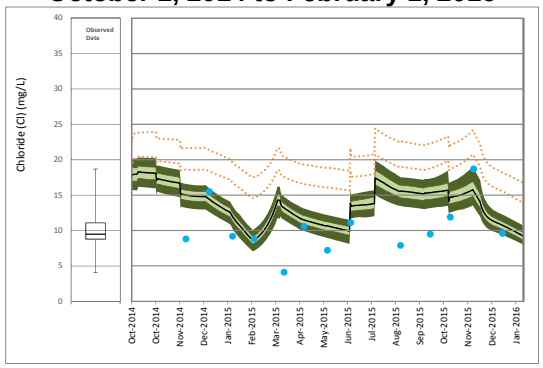
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

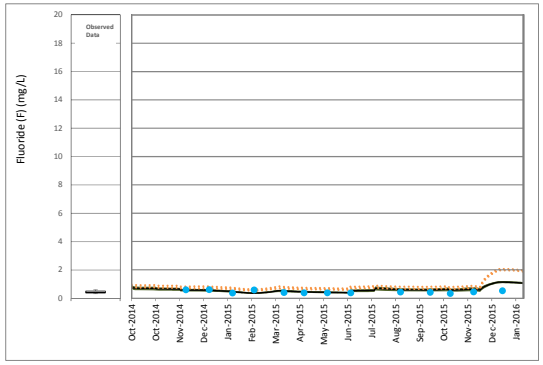
Golder Associates

ATTACHMENT B

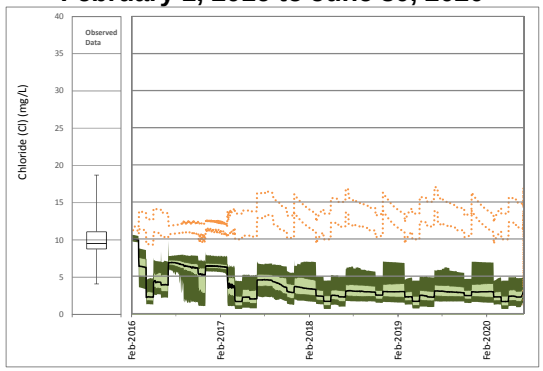
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

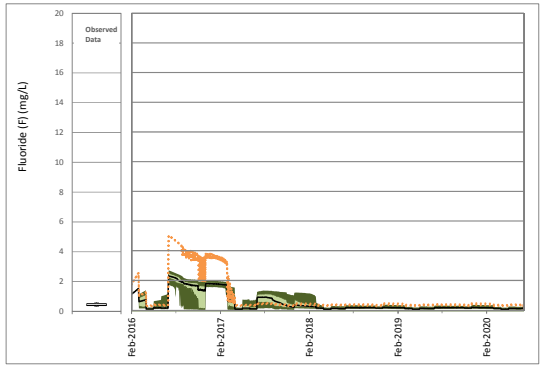
Calibration
October 1, 2014 to February 1, 2016



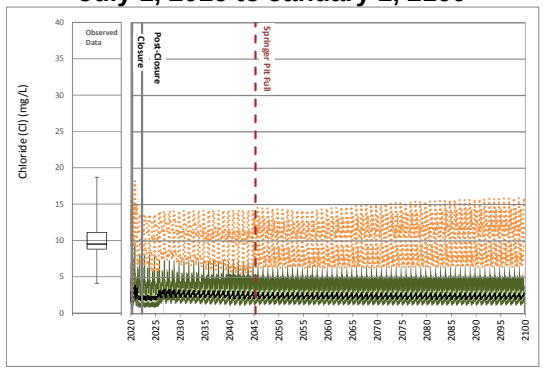


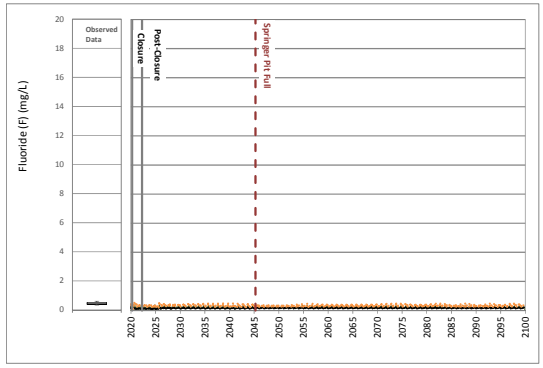
Operations
February 1, 2016 to June 30, 2020



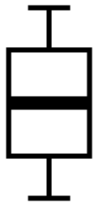


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

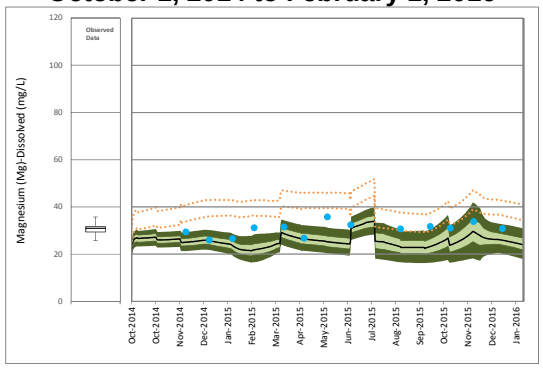
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

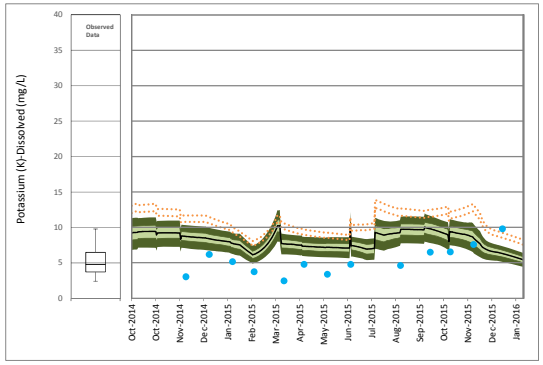
Golder Associates

ATTACHMENT B

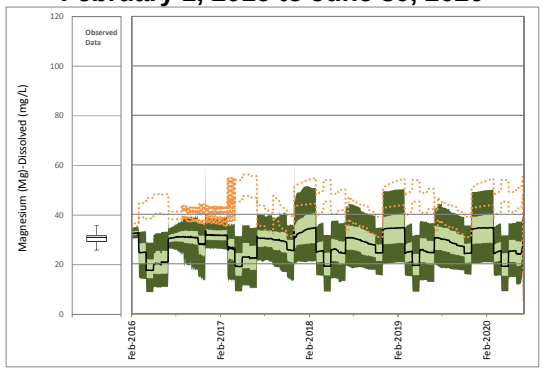
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

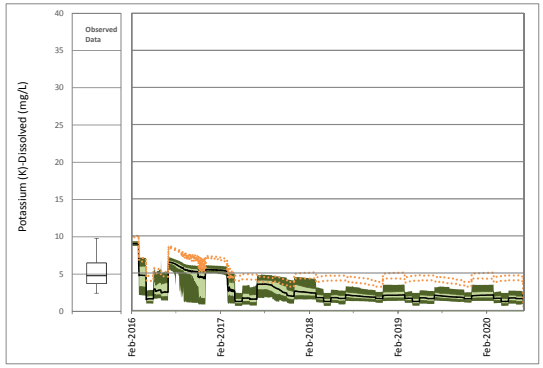
Calibration
October 1, 2014 to February 1, 2016



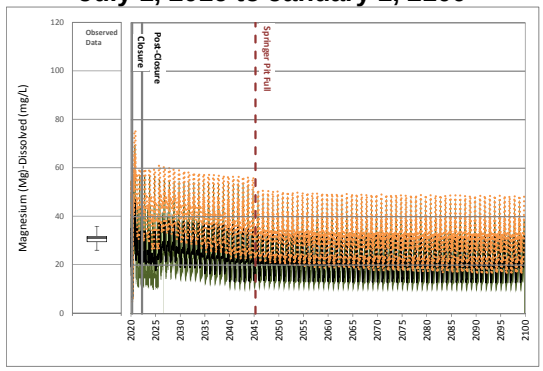


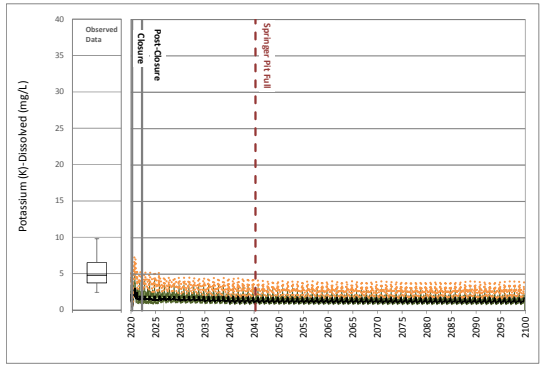
Operations
February 1, 2016 to June 30, 2020



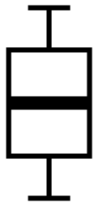


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

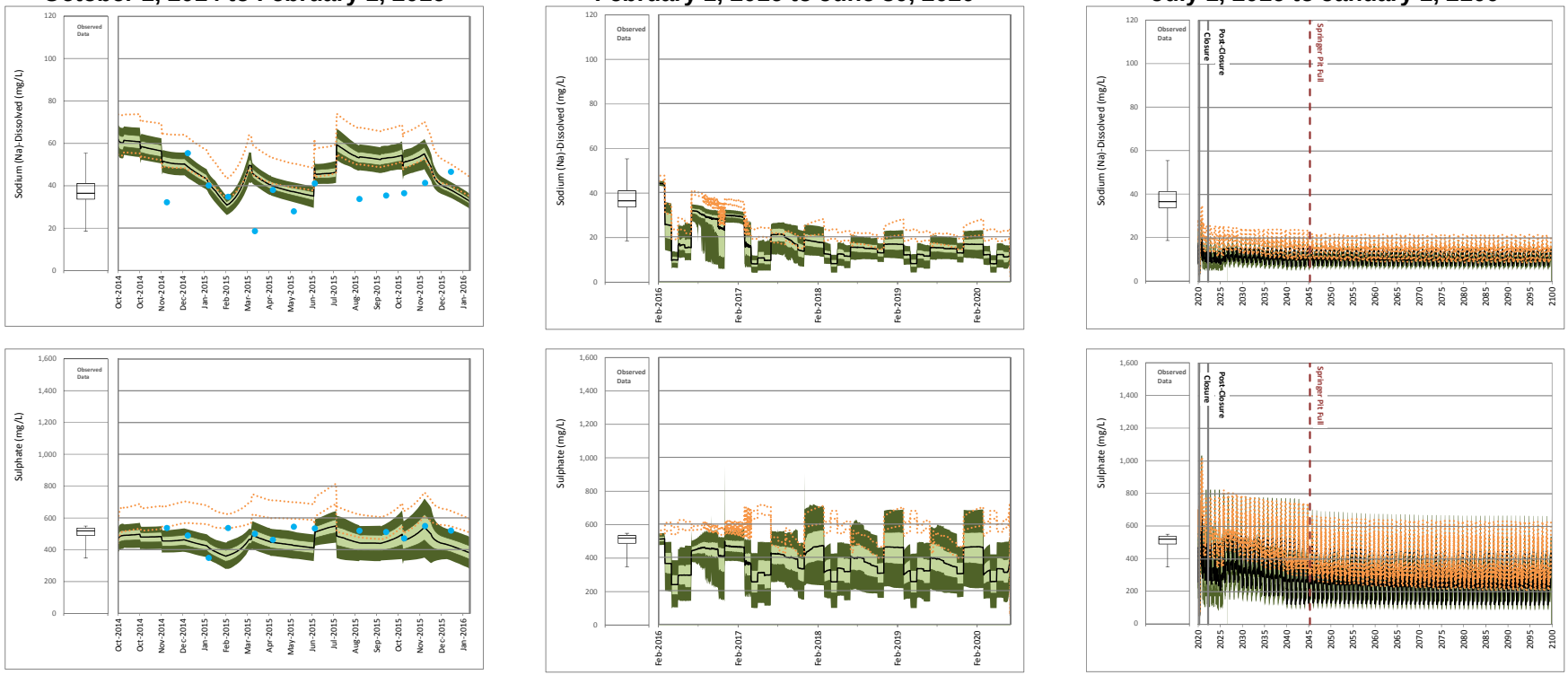
Golder Associates

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

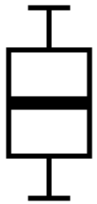
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

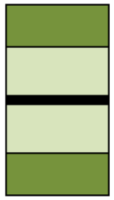


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

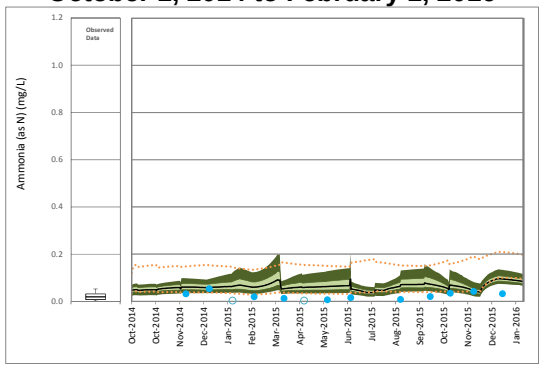
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

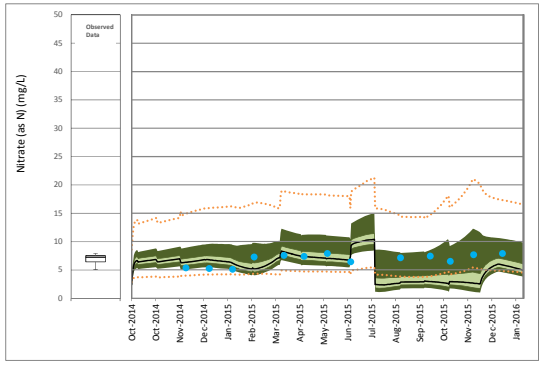
Golder Associates

ATTACHMENT B

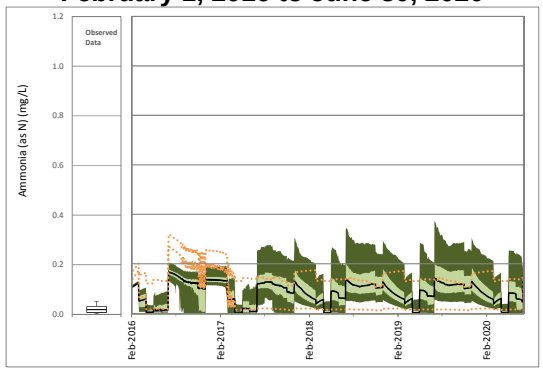
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

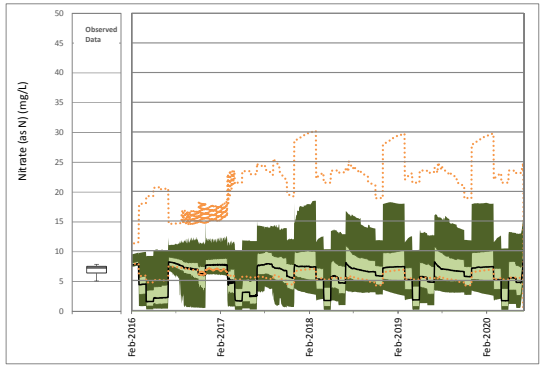
Calibration
October 1, 2014 to February 1, 2016



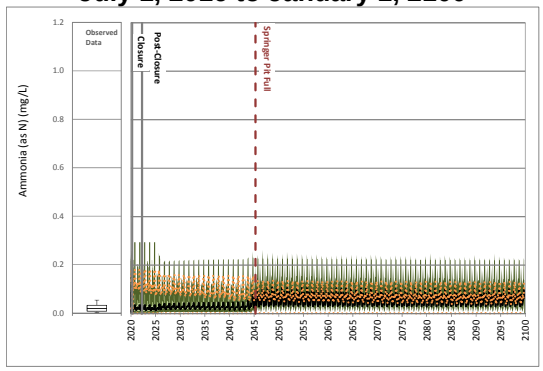


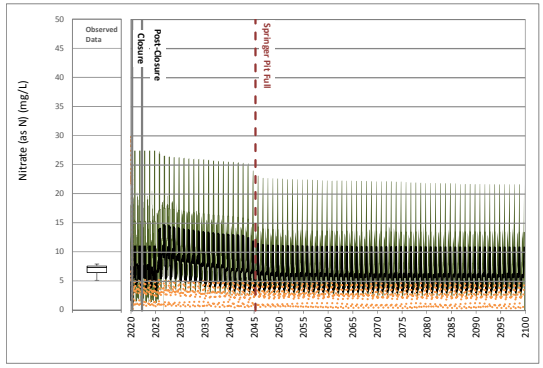
Operations
February 1, 2016 to June 30, 2020



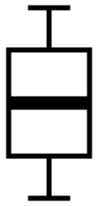


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

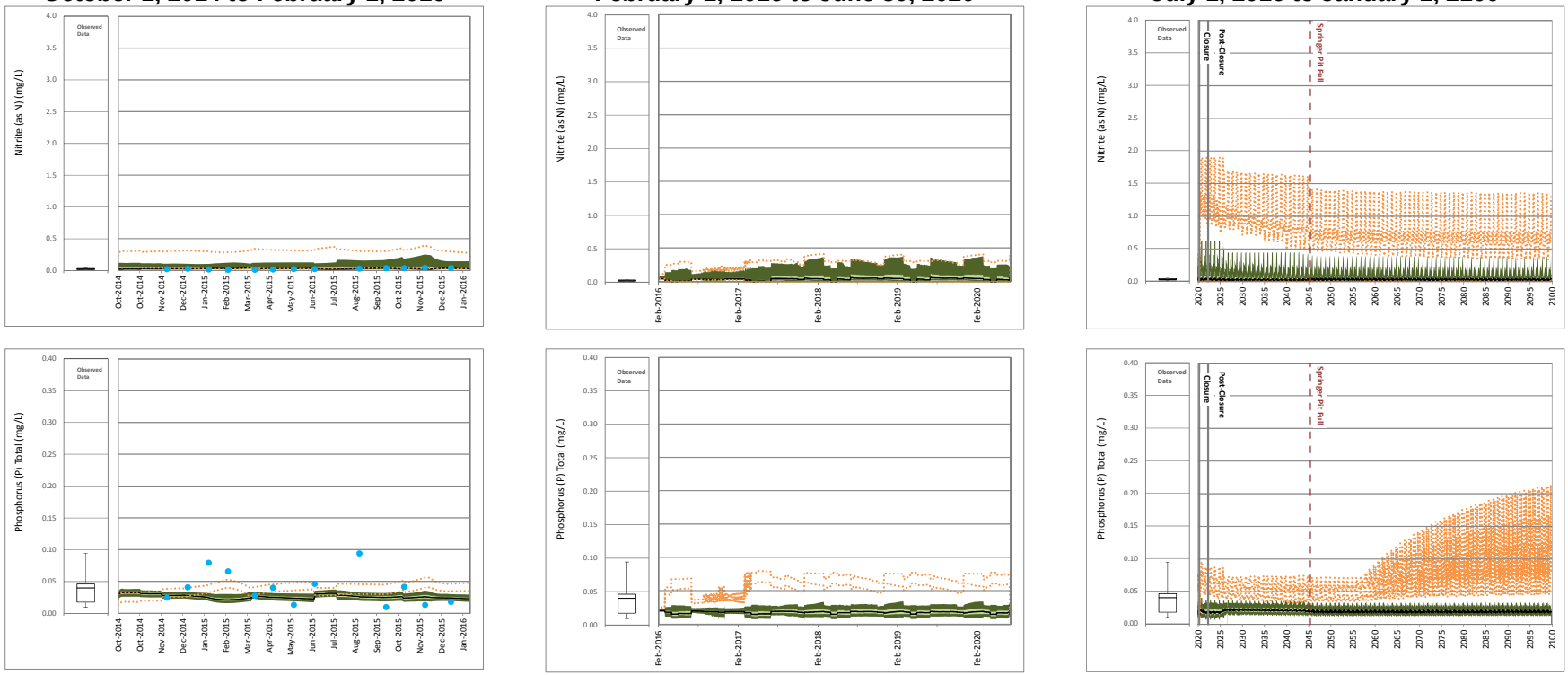
Golder Associates

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

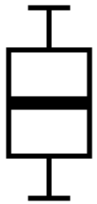
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

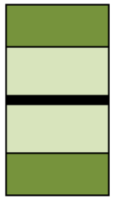


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

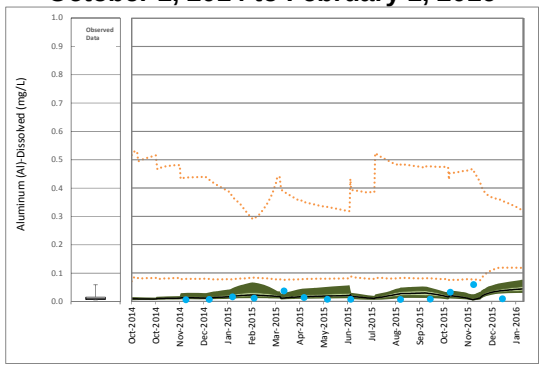
Scenario 2

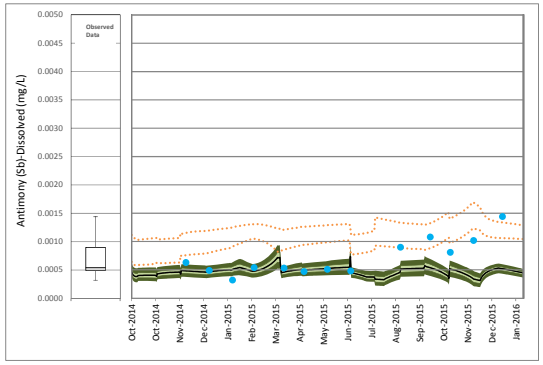
95th Percentile High, 5th Percentile Low

Golder Associates

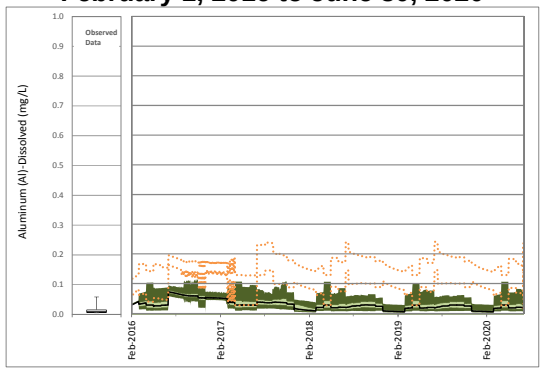
ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

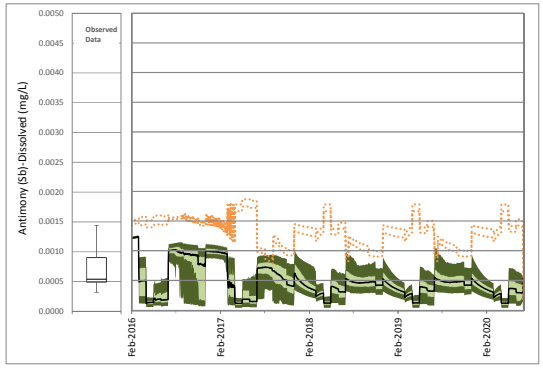
Calibration
October 1, 2014 to February 1, 2016



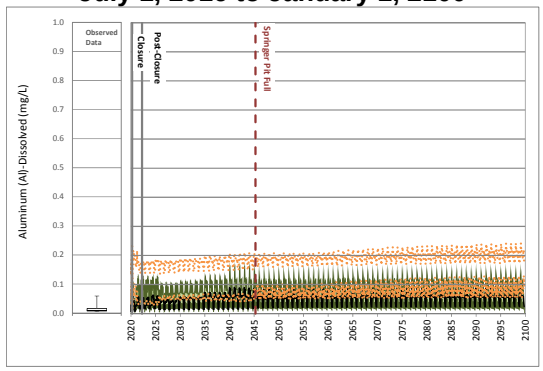


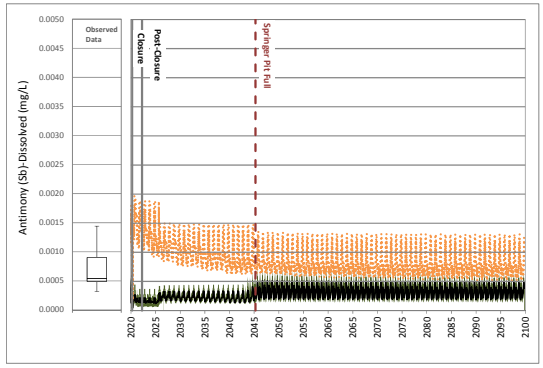
Operations
February 1, 2016 to June 30, 2020



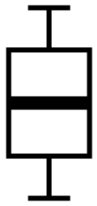


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

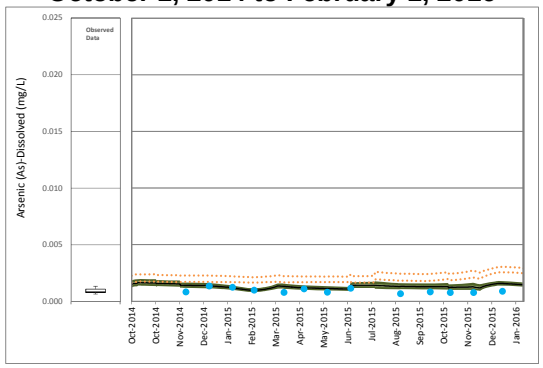
95th Percentile High, 5th Percentile Low

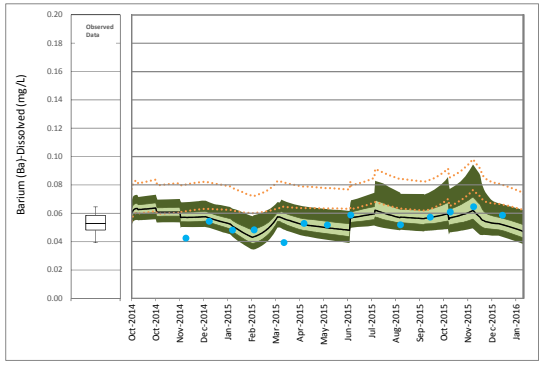
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

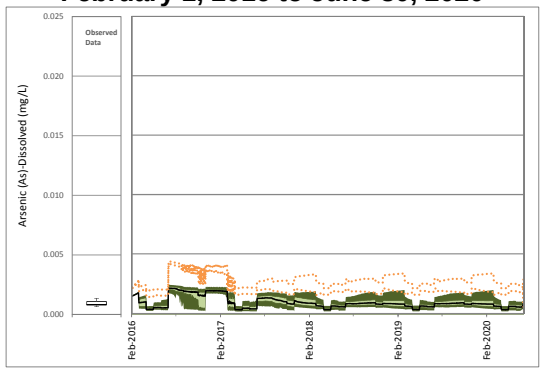
ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

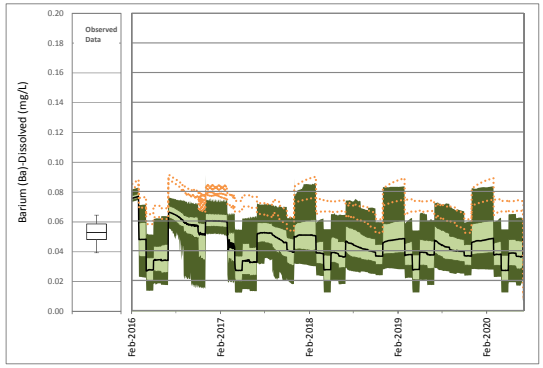
Calibration
October 1, 2014 to February 1, 2016



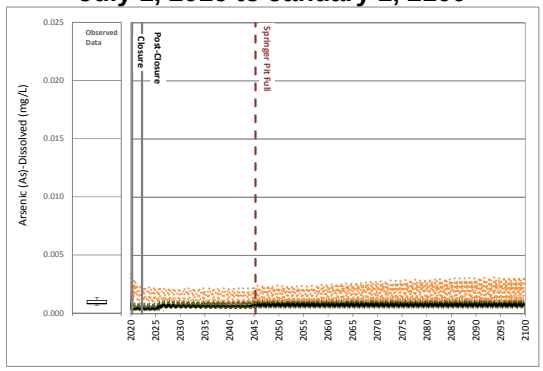


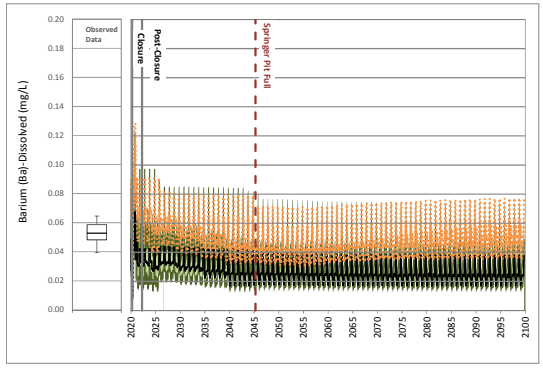
Operations
February 1, 2016 to June 30, 2020



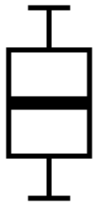


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

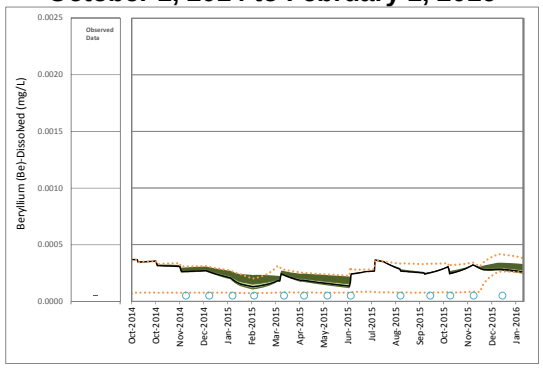
95th Percentile High, 5th Percentile Low

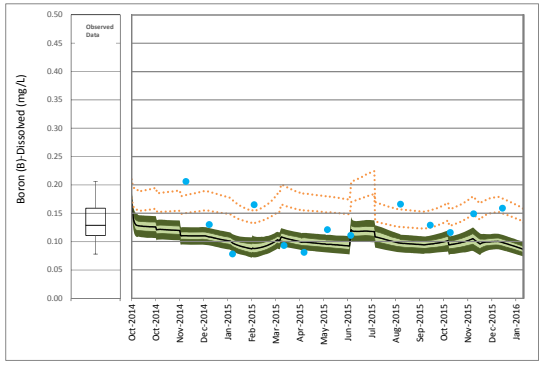
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

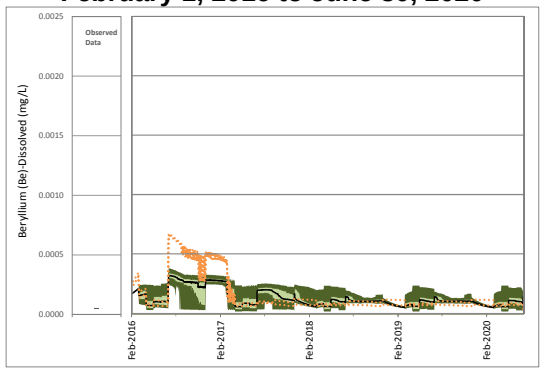
ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

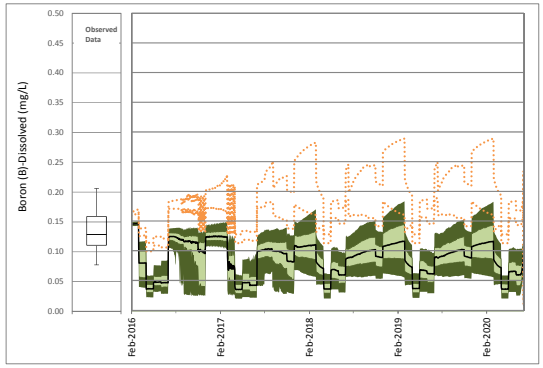
Calibration
October 1, 2014 to February 1, 2016



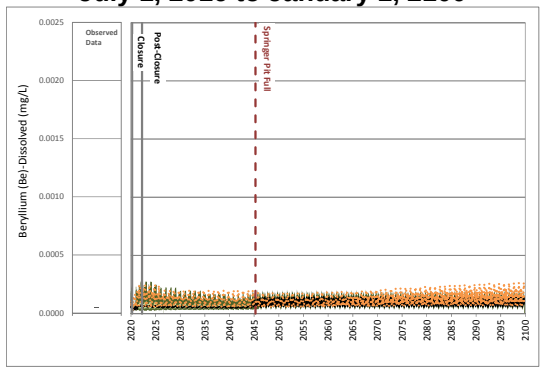


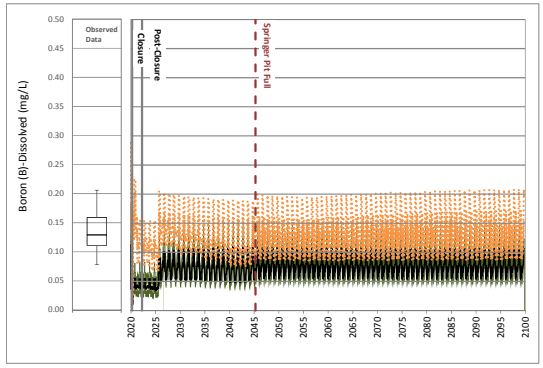
Operations
February 1, 2016 to June 30, 2020



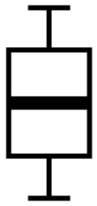


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

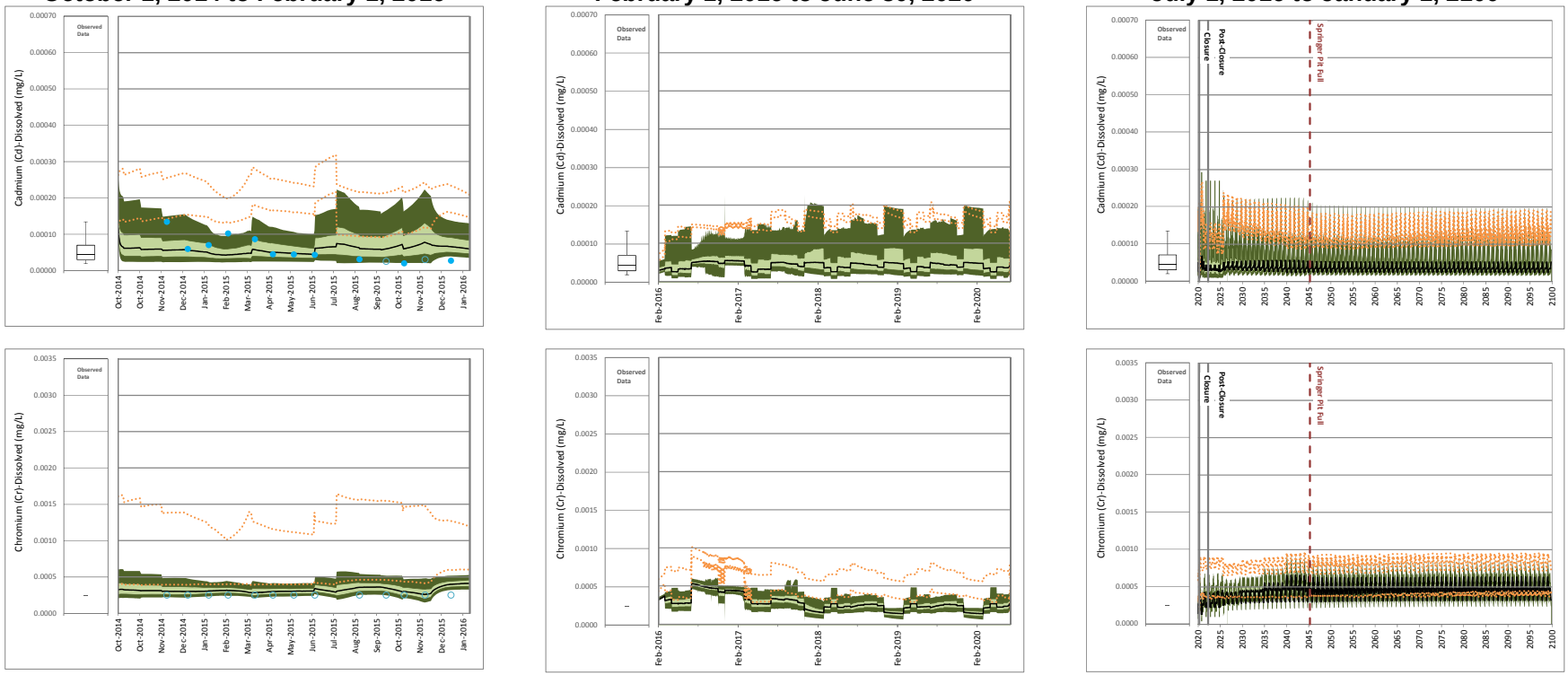
Golder Associates

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

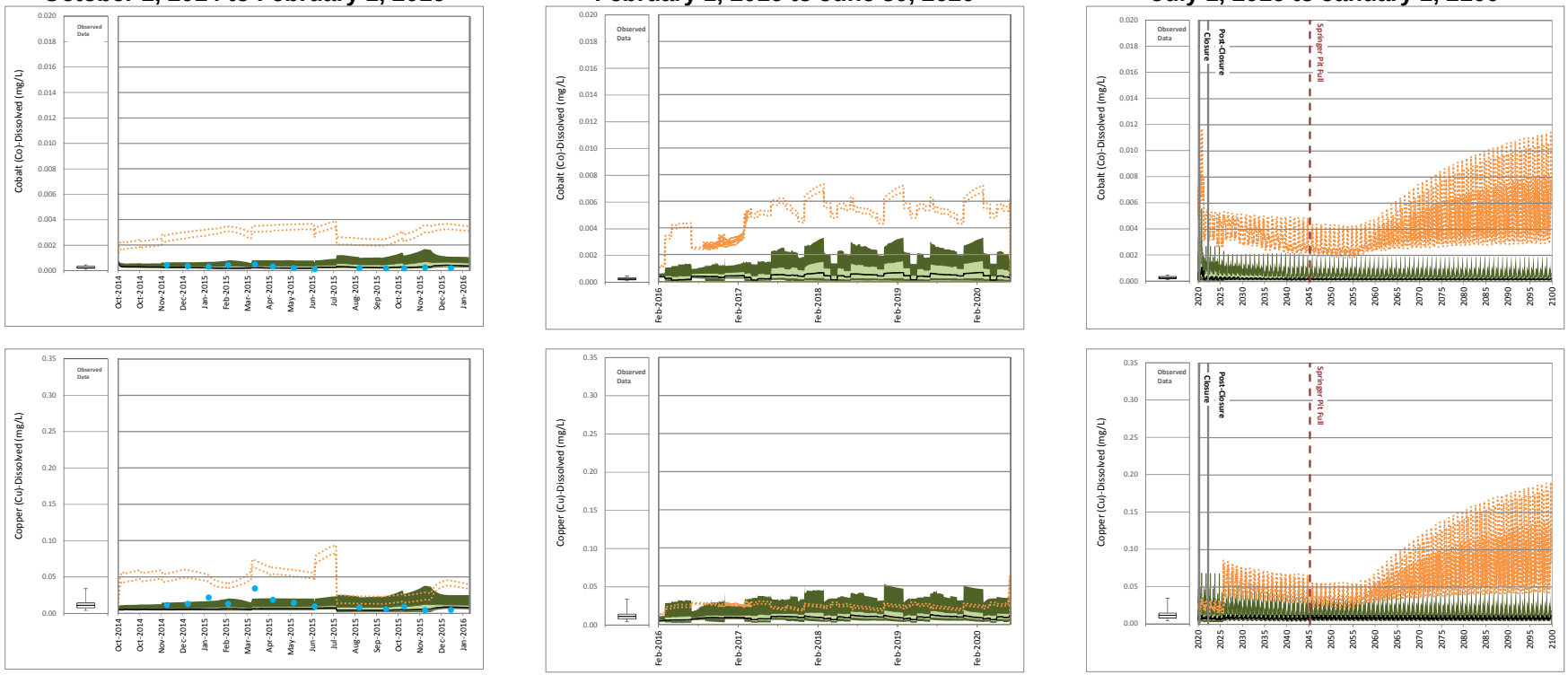
ATTACHMENT B

Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

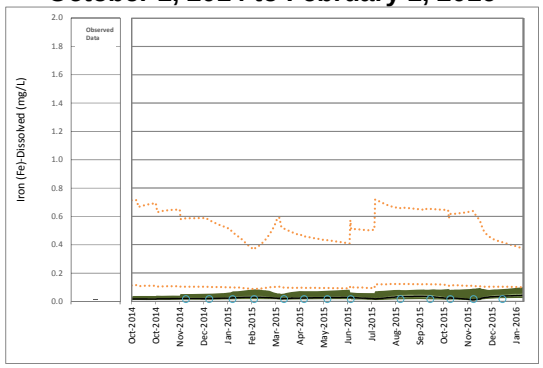
- Detected Values
- Non- Detected Values

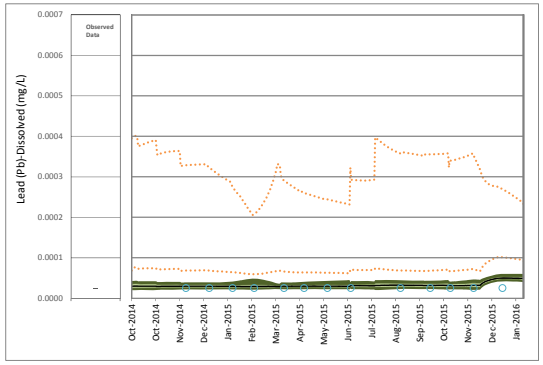
Scenario 2

- 95th Percentile High, 5th Percentile Low

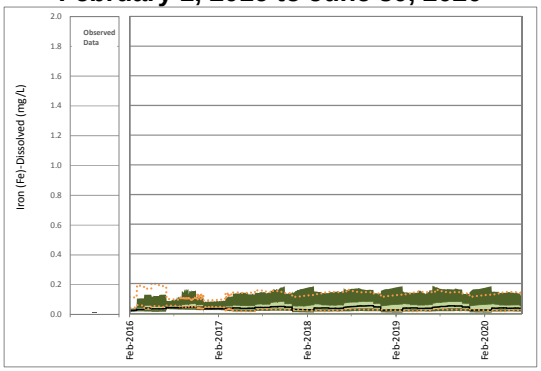
ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

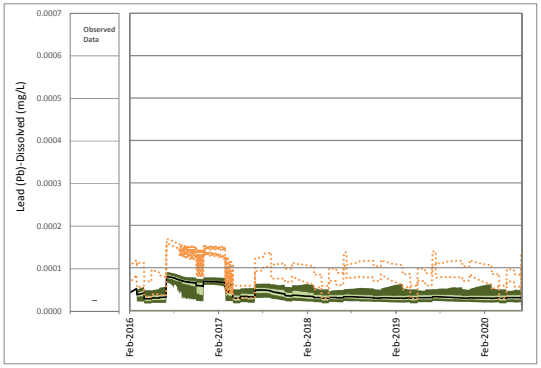
Calibration
October 1, 2014 to February 1, 2016



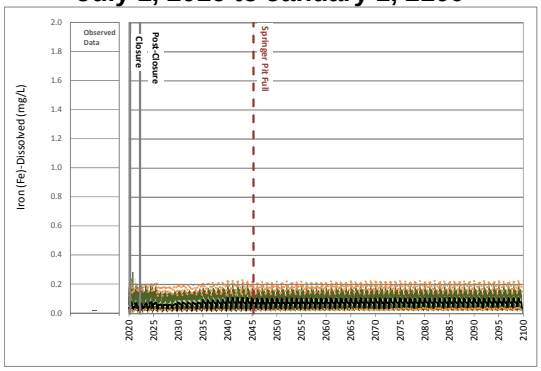


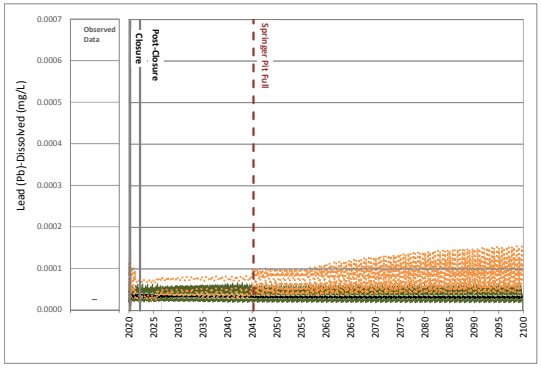
Operations
February 1, 2016 to June 30, 2020



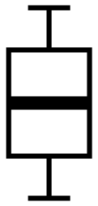


Closure and Post-closure
July 1, 2016 to January 1, 2100



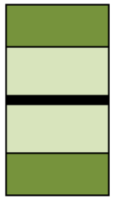


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

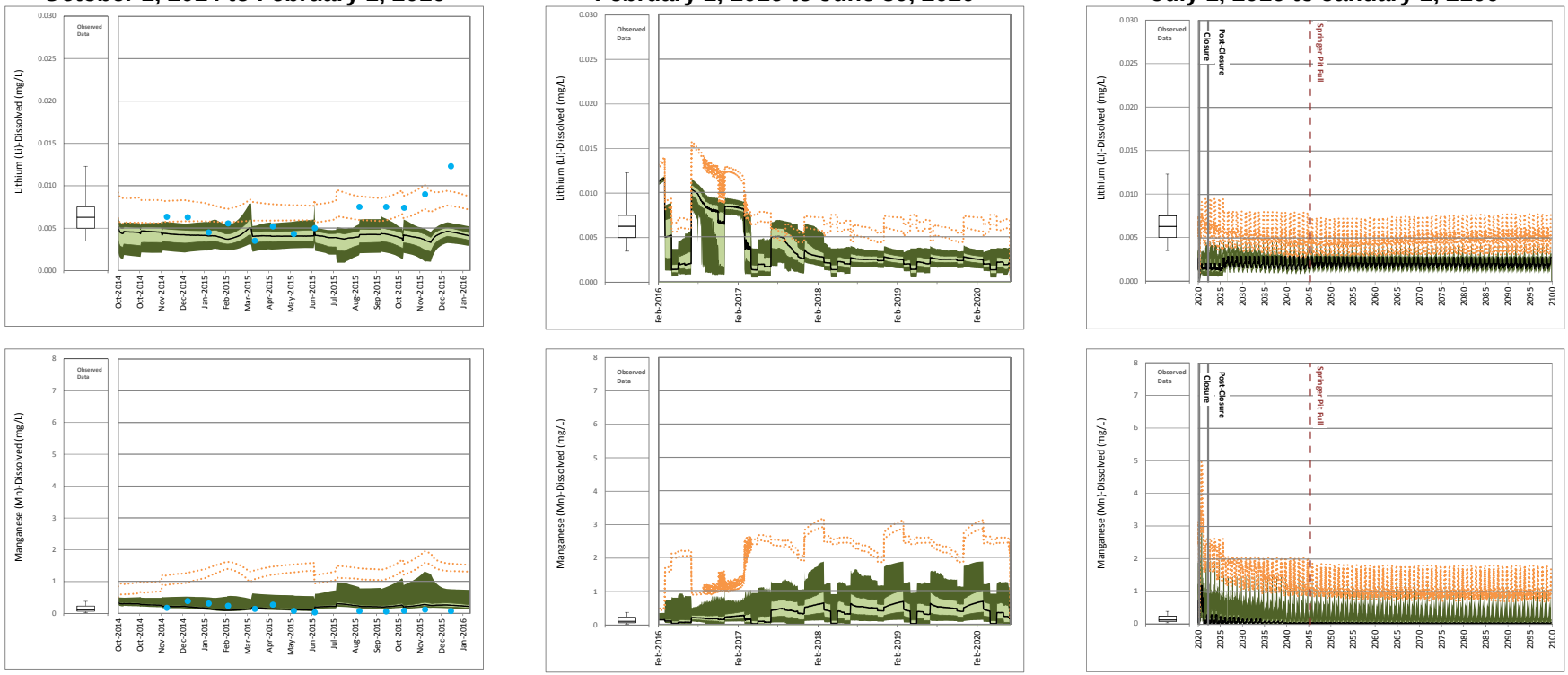
95th Percentile High, 5th Percentile Low

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

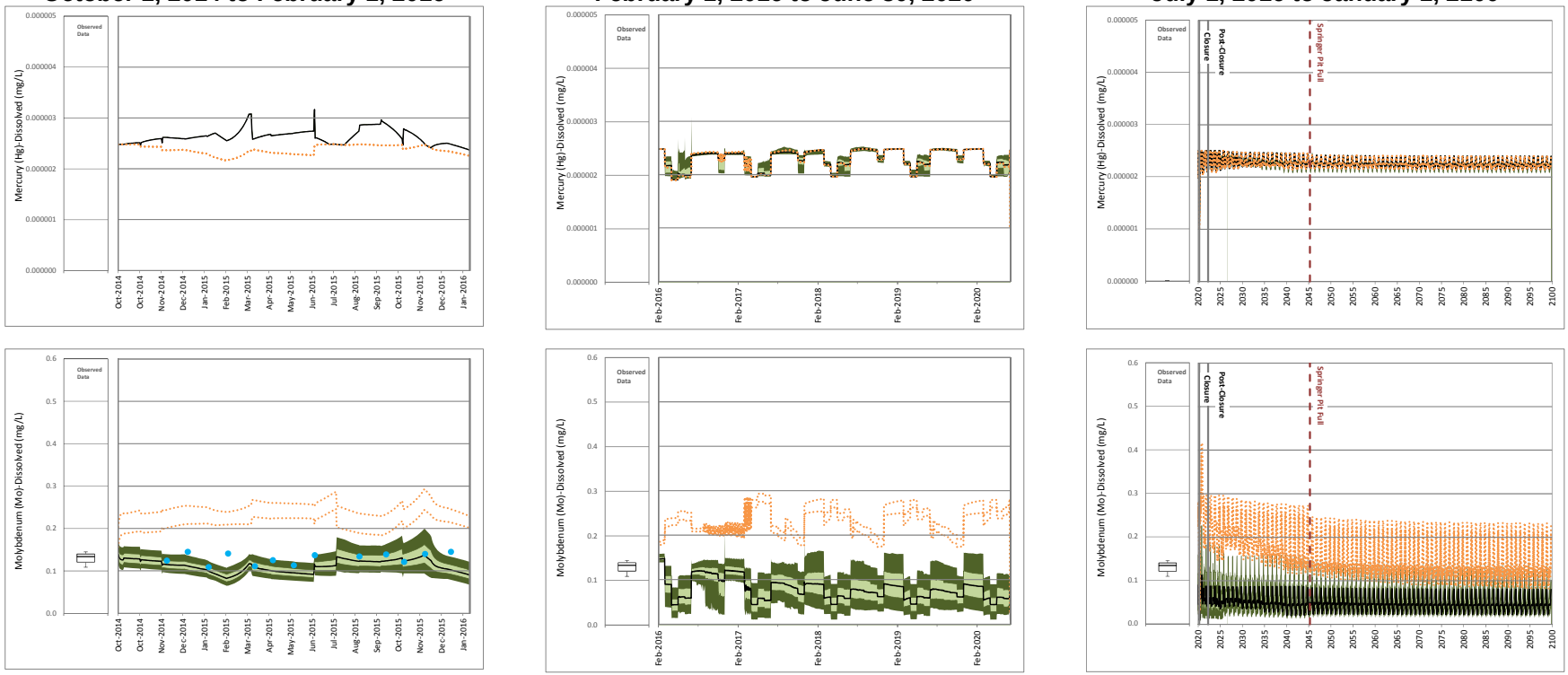
Golder Associates

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

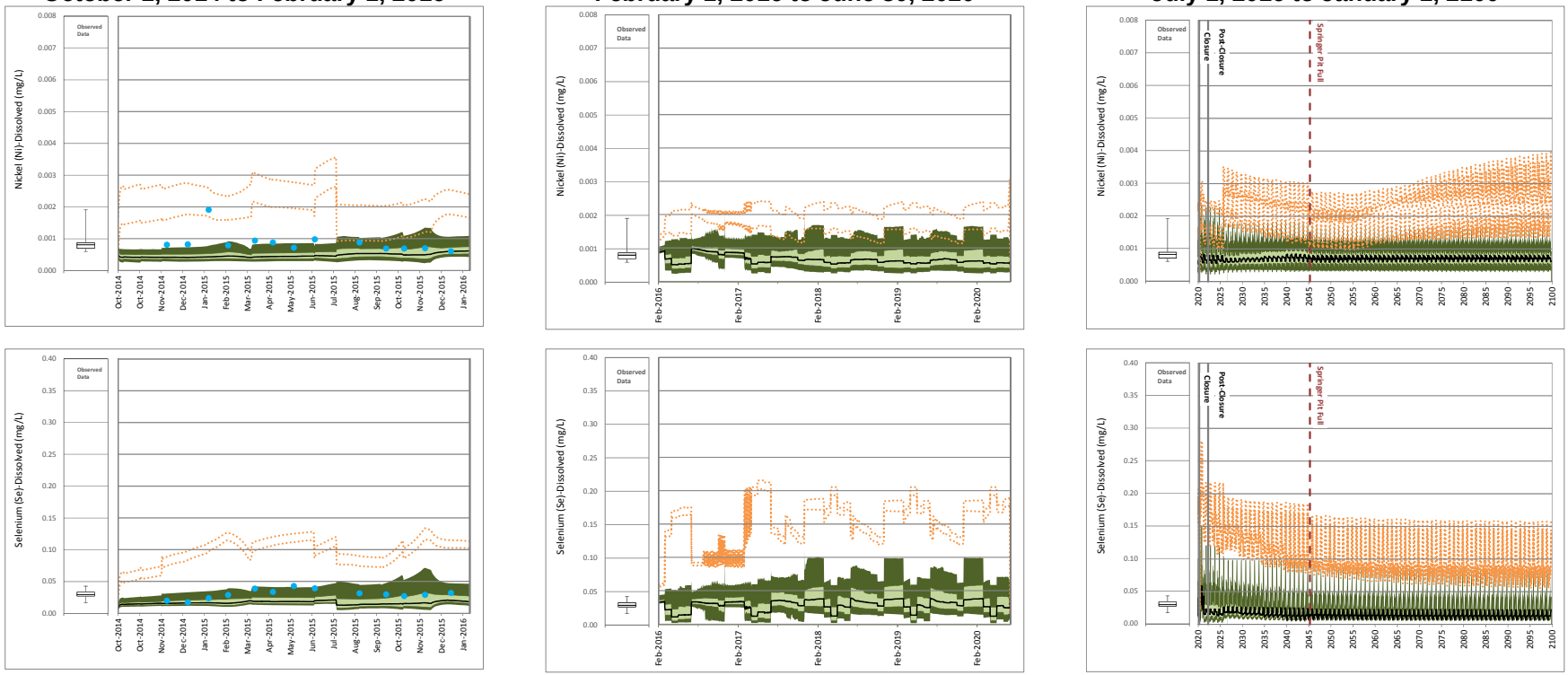
Golder Associates

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

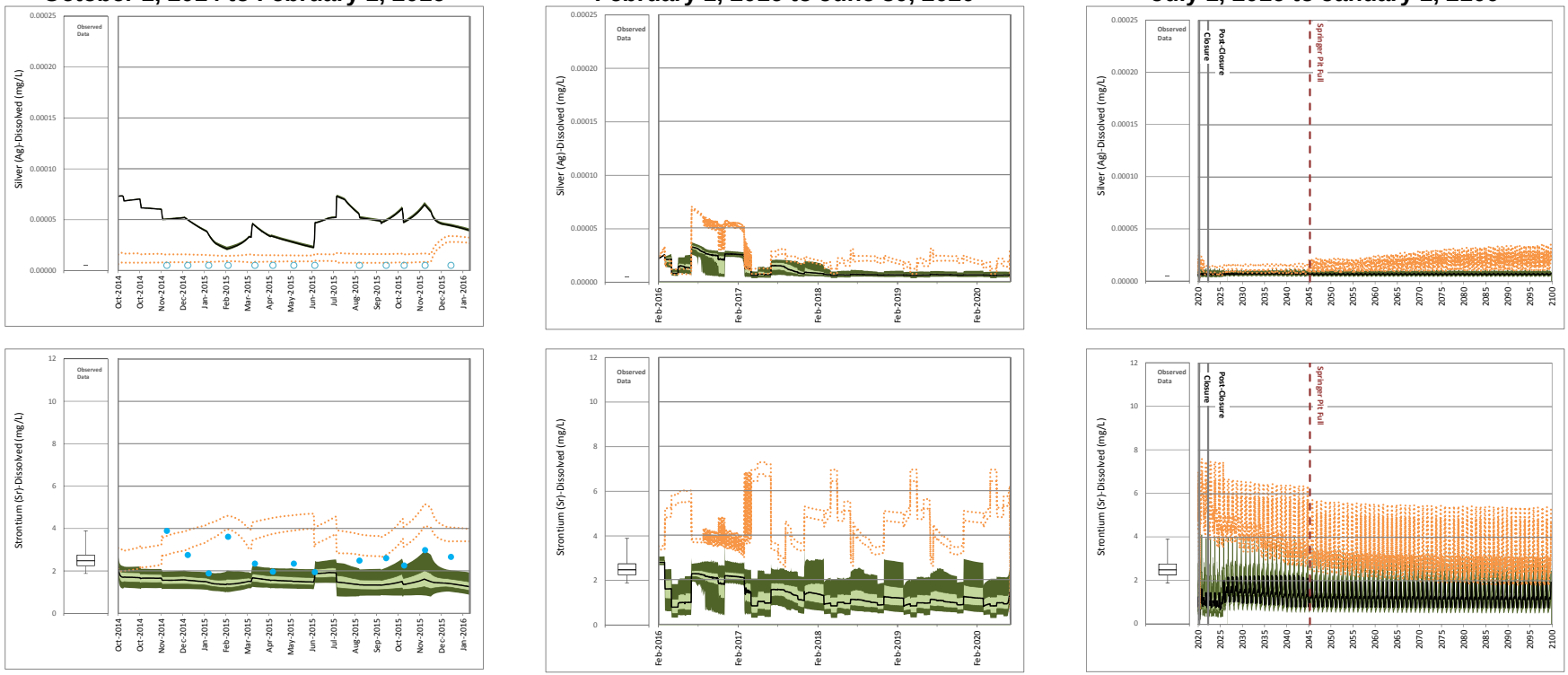
Golder Associates

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

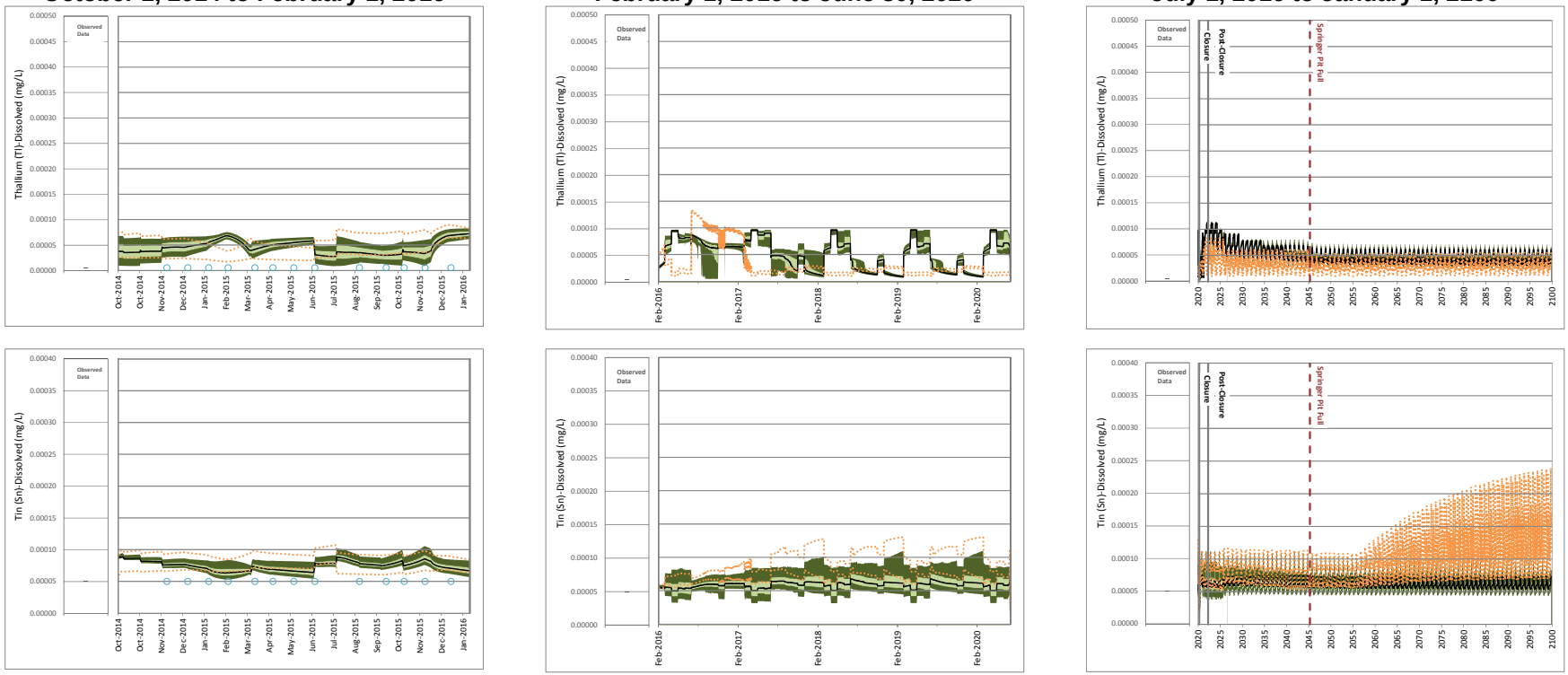
Golder Associates

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

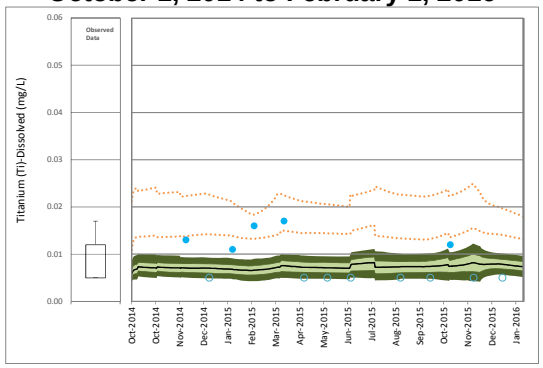
95th Percentile High, 5th Percentile Low

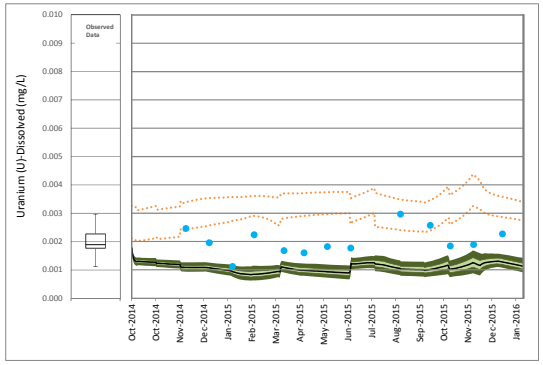
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

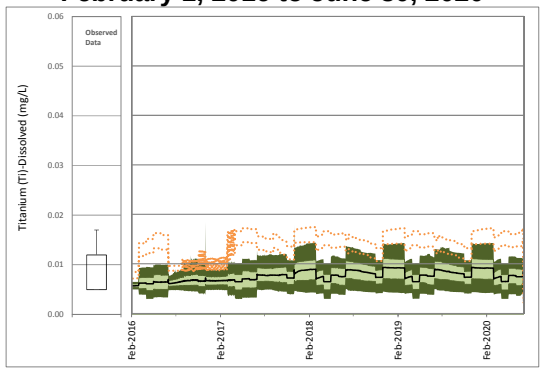
ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

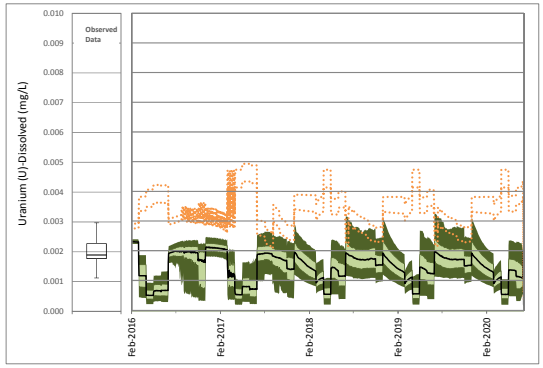
Calibration
October 1, 2014 to February 1, 2016



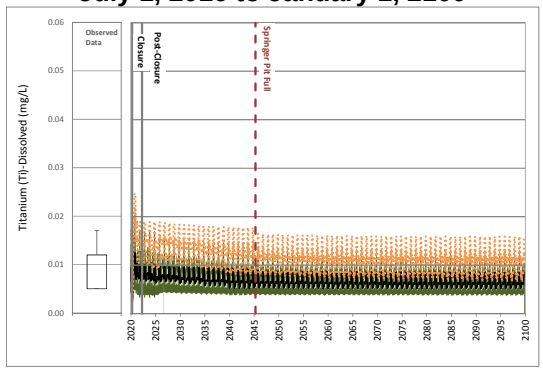


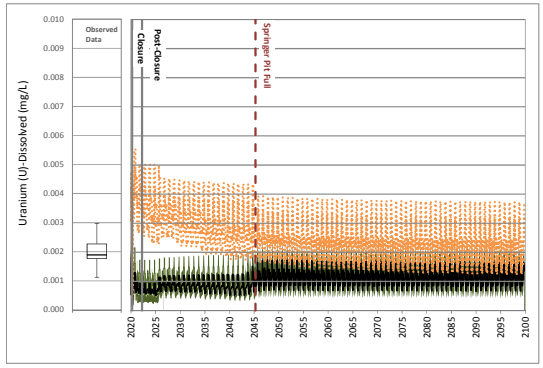
Operations
February 1, 2016 to June 30, 2020



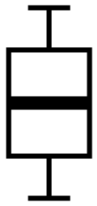


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

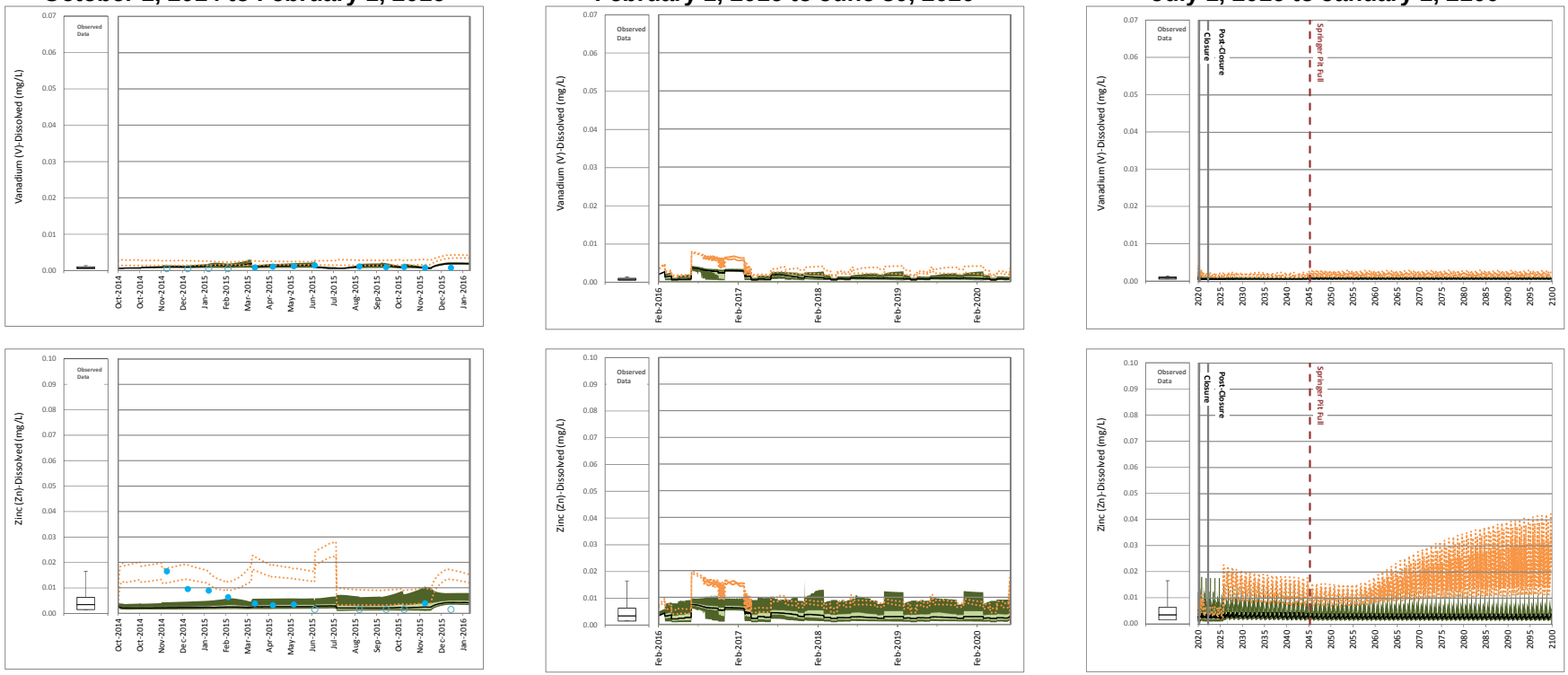
95th Percentile High, 5th Percentile Low

ATTACHMENT B
Figure B3: Time Series Plots of Predicted Central Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig3-ccs.docm

Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.4 Cariboo Pit

Table B4 presents the maximum predicted median and 95th percentile results for the Cariboo Pit, calculated based on 500 realizations for Scenario 1 (Table B4a) and Scenario 2 (Table B4b). Time series plots for each modelled parameter are provided in Figure B4. Results are provided for Calibration and Operations. In Closure and Post-closure the Cariboo Pit is incorporated into the combined Cariboo-Springer Pit, which is modelled as Springer Pit (see Section 1.1)

Table B4a:
Predicted Cariboo Pit Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)	
		Maximum of Median Predicted	Maximum of 95th Percentile Predicted	Maximum of Median Predicted	Maximum of 95th Percentile Predicted
Physical Parameters					
Hardness[a]	mg $CaCO_3$/L	529	751	765	985
Total Dissolved Solids	mg/L	755	1088	1170	1441
Major Ions					
Calcium	mg/L	162	224	244	295
Chloride	mg/L	3	7	10	10
Fluoride	mg/L	0.4	0.5	0.6	0.6
Magnesium	mg/L	30	47	38	60
Potassium	mg/L	2	3	3.2	4.5
Sodium	mg/L	17	24	36	37
Sulphate	mg/L	422	636	671	880
Nutrients					
Ammonia	mg/L (as N)	0.015	0.28	0.02	0.32
Nitrate	mg/L (as N)	4	15	5.2	22
Nitrite	mg/L (as N)	0.028	0.3	0.034	0.43
Total Phosphorus	mg/L	0.015	0.042	0.019	0.054
Total Metals					
Aluminum	mg/L	0.5	0.52	0.5	0.53
Antimony	mg/L	0.0007	0.0011	0.002	0.0021
Arsenic	mg/L	0.0016	0.0045	0.0026	0.0053
Barium	mg/L	0.044	0.08	0.051	0.11
Beryllium	mg/L	0.00042	0.0005	0.00048	0.00085
Boron	mg/L	0.22	0.41	0.24	0.48
Cadmium	mg/L	0.00005	0.0003	0.00011	0.00038
Chromium	mg/L	0.0008	0.0008	0.0011	0.0011
Cobalt	mg/L	0.00054	0.0022	0.0006	0.003
Copper	mg/L	0.015	0.063	0.03	0.084
Iron	mg/L	0.56	0.72	0.56	0.77
Lead	mg/L	0.00017	0.00023	0.00019	0.00025
Lithium	mg/L	0.0039	0.009	0.005	0.009
Manganese	mg/L	0.07	1.4	0.07	1.9
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000026
Molybdenum	mg/L	0.1	0.18	0.19	0.23
Nickel	mg/L	0.0011	0.0024	0.0012	0.0027
Selenium	mg/L	0.022	0.092	0.033	0.13
Silver	mg/L	0.000007	0.00002	0.00001	0.000022
Strontium	mg/L	1.4	3.5	2.9	4.7
Thallium	mg/L	0.000009	0.000021	0.000012	0.00003
Tin	mg/L	0.000061	0.00027	0.000098	0.0003
Titanium	mg/L	0.031	0.036	0.033	0.04
Uranium	mg/L	0.0022	0.0037	0.0043	0.005
Vanadium	mg/L	0.0023	0.0068	0.0024	0.0082
Zinc	mg/L	0.0043	0.014	0.005	0.019
Dissolved Metals					
Aluminum	mg/L	0.006	0.03	0.007	0.04
Antimony	mg/L	0.00068	0.00092	0.0019	0.0019
Arsenic	mg/L	0.0014	0.0043	0.0024	0.0051
Barium	mg/L	0.038	0.075	0.045	0.10
Beryllium	mg/L	0.00042	0.00042	0.00048	0.00077
Boron	mg/L	0.21	0.38	0.24	0.44
Cadmium	mg/L	0.00005	0.0002	0.00011	0.00028
Chromium	mg/L	0.00012	0.0002	0.00049	0.00049
Cobalt	mg/L	0.00022	0.0018	0.00024	0.0027
Copper	mg/L	0.010	0.047	0.025	0.068
Iron	mg/L	0.012	0.18	0.015	0.23
Lead	mg/L	0.000026	0.000089	0.000049	0.00011
Lithium	mg/L	0.0036	0.0055	0.004	0.006
Manganese	mg/L	0.05	1.3	0.05	1.9
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000026
Molybdenum	mg/L	0.1	0.16	0.19	0.22
Nickel	mg/L	0.00056	0.0018	0.0006	0.0021
Selenium	mg/L	0.022	0.088	0.033	0.12
Silver	mg/L	0.000007	0.00001	0.00001	0.000012
Strontium	mg/L	1.4	3.1	2.8	4.3
Thallium	mg/L	0.000009	0.000011	0.000012	0.000015
Tin	mg/L	0.000061	0.00017	0.000098	0.0002
Titanium	mg/L	0.0085	0.013	0.011	0.017
Uranium	mg/L	0.0022	0.0031	0.0043	0.0043
Vanadium	mg/L	0.001	0.0055	0.0011	0.0069
Zinc	mg/L	0.0028	0.012	0.0035	0.017

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

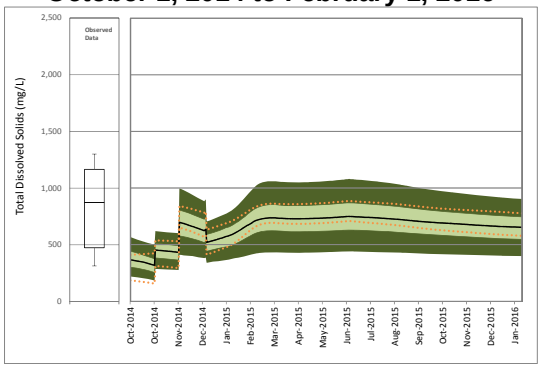
Table B4b:
Predicted Cariboo Pit Water Quality - Scenario 2

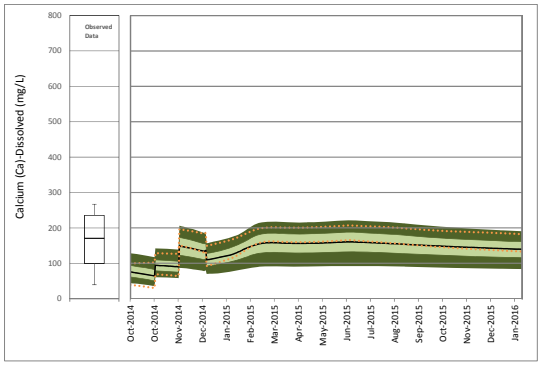
Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)	
		Maximum of Median Predicted	Maximum of 95th Percentile Predicted	Maximum of Median Predicted	Maximum of 95th Percentile Predicted
Physical Parameters					
Hardness[a]	mg $CaCO_3$/L	614	692	794	826
Total Dissolved Solids	mg/L	803	892	1170	1178
Major Ions					
Calcium	mg/L	185	208	244	251
Chloride	mg/L	13	14	17	19
Fluoride	mg/L	0.4	0.5	0.6	0.6
Magnesium	mg/L	37	42	45	49
Potassium	mg/L	4	4	4.3	4.6
Sodium	mg/L	17	22	36	37
Sulphate	mg/L	422	491	671	677
Nutrients					
Ammonia	mg/L (as N)	0.12	0.13	0.17	0.18
Nitrate	mg/L (as N)	20	22	29.0	31
Nitrite	mg/L (as N)	0.27	0.3	0.39	0.4
Total Phosphorus	mg/L	0.057	0.07	0.081	0.088
Total Metals					
Aluminum	mg/L	0.6	0.63	0.66	0.7
Antimony	mg/L	0.0012	0.0014	0.002	0.0021
Arsenic	mg/L	0.0026	0.005	0.0029	0.0053
Barium	mg/L	0.058	0.06	0.075	0.076
Beryllium	mg/L	0.00007	0.00015	0.0001	0.00018
Boron	mg/L	0.27	0.45	0.27	0.48
Cadmium	mg/L	0.00016	0.00026	0.00017	0.00027
Chromium	mg/L	0.0011	0.0012	0.0012	0.0014
Cobalt	mg/L	0.0034	0.0035	0.0047	0.0048
Copper	mg/L	0.027	0.039	0.035	0.046
Iron	mg/L	0.6	0.73	0.62	0.77
Lead	mg/L	0.00024	0.0003	0.00026	0.00031
Lithium	mg/L	0.0066	0.01	0.008	0.011
Manganese	mg/L	1.5	1.6	2.2	2.2
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000025
Molybdenum	mg/L	0.19	0.21	0.25	0.27
Nickel	mg/L	0.002	0.0026	0.0025	0.0028
Selenium	mg/L	0.14	0.15	0.18	0.19
Silver	mg/L	0.000024	0.000034	0.000028	0.000038
Strontium	mg/L	4.1	4.6	5.9	6.3
Thallium	mg/L	0.000011	0.000023	0.000014	0.00003
Tin	mg/L	0.000082	0.00028	0.00010	0.0003
Titanium	mg/L	0.033	0.035	0.038	0.039
Uranium	mg/L	0.003	0.0038	0.0043	0.0049
Vanadium	mg/L	0.0037	0.0078	0.0044	0.0082
Zinc	mg/L	0.0086	0.01	0.010	0.011
Dissolved Metals					
Aluminum	mg/L	0.11	0.14	0.17	0.21
Antimony	mg/L	0.0012	0.0013	0.0019	0.0019
Arsenic	mg/L	0.0024	0.0048	0.0027	0.0051
Barium	mg/L	0.052	0.058	0.069	0.071
Beryllium	mg/L	0.00007	0.00008	0.0001	0.0001
Boron	mg/L	0.26	0.41	0.27	0.44
Cadmium	mg/L	0.00016	0.00016	0.00017	0.00017
Chromium	mg/L	0.00046	0.00058	0.0006	0.00074
Cobalt	mg/L	0.0031	0.0032	0.0044	0.0044
Copper	mg/L	0.023	0.024	0.03	0.031
Iron	mg/L	0.059	0.18	0.077	0.23
Lead	mg/L	0.000094	0.00016	0.00011	0.00017
Lithium	mg/L	0.0063	0.0069	0.007	0.008
Manganese	mg/L	1.5	1.6	2.2	2.2
Mercury	mg/L	0.0000026	0.0000026	0.0000025	0.0000025
Molybdenum	mg/L	0.19	0.2	0.25	0.25
Nickel	mg/L	0.0014	0.002	0.0019	0.0022
Selenium	mg/L	0.14	0.14	0.18	0.18
Silver	mg/L	0.000024	0.000024	0.000028	0.000028
Strontium	mg/L	4.1	4.2	5.9	5.9
Thallium	mg/L	0.000011	0.000014	0.000014	0.000017
Tin	mg/L	0.000082	0.00018	0.00010	0.0002
Titanium	mg/L	0.011	0.012	0.016	0.017
Uranium	mg/L	0.003	0.0032	0.0043	0.0043
Vanadium	mg/L	0.0024	0.0065	0.0031	0.0069
Zinc	mg/L	0.0071	0.008	0.0089	0.01

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

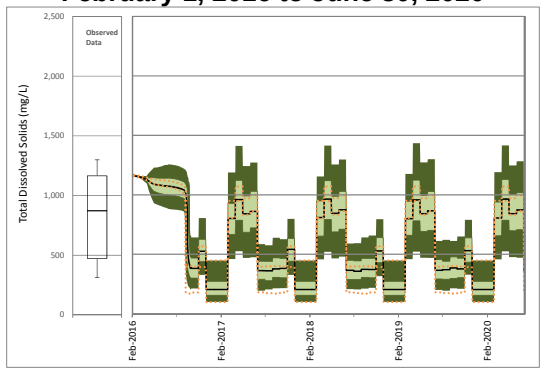
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

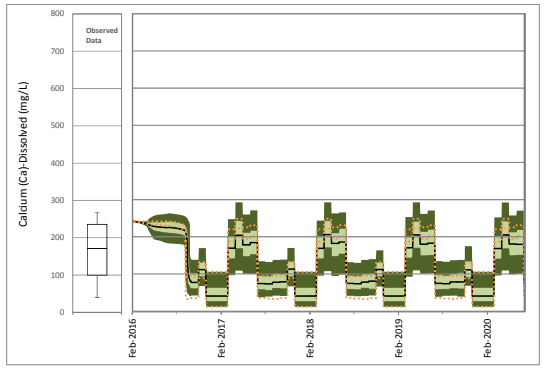
Calibration
October 1, 2014 to February 1, 2016



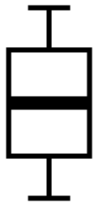


Operations
February 1, 2016 to June 30, 2020





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

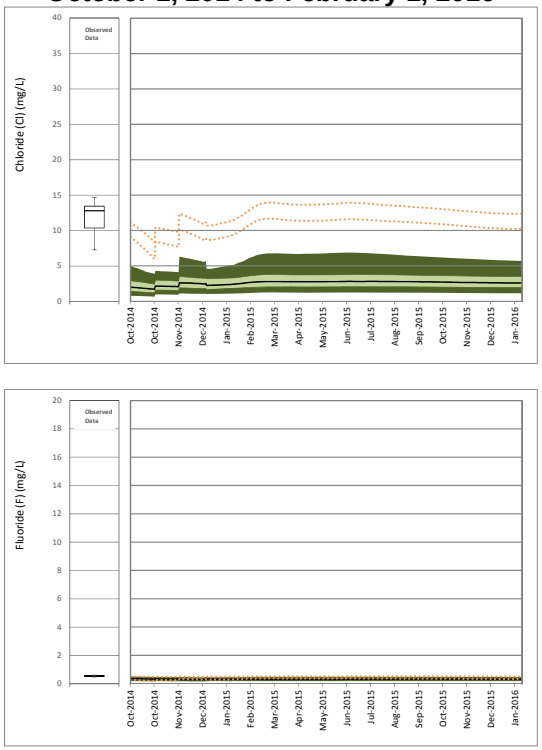
Scenario 2

95th Percentile High, 5th Percentile Low

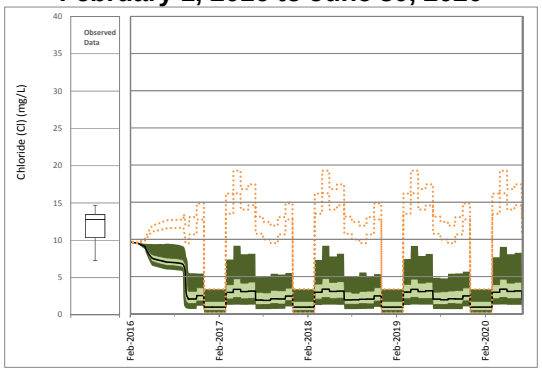
Golder Associates

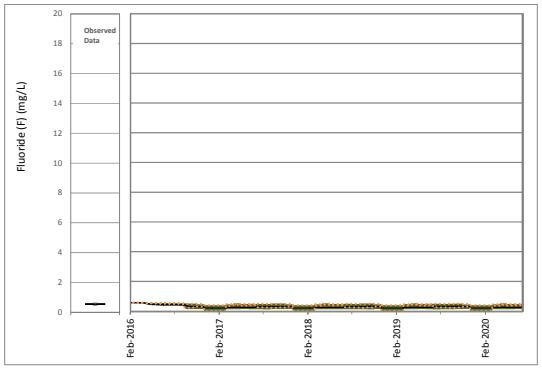
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

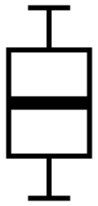


Operations
February 1, 2016 to June 30, 2020



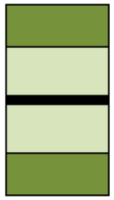


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

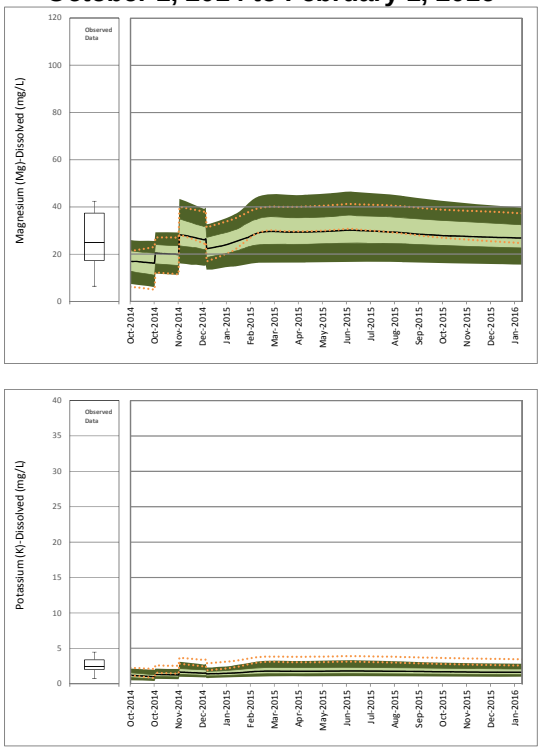
Detected Values
Non- Detected Values

Scenario 2

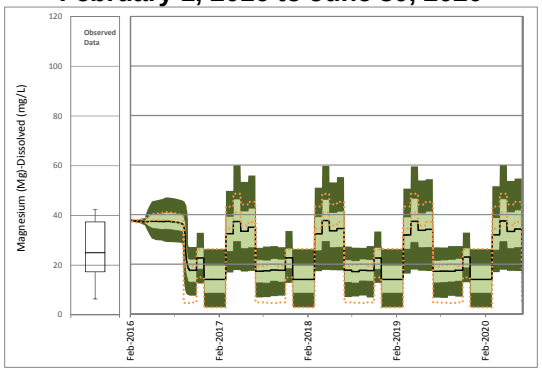
95th Percentile High, 5th Percentile Low

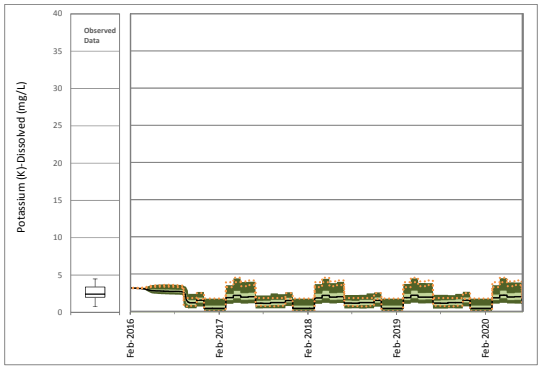
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

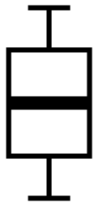


Operations
February 1, 2016 to June 30, 2020





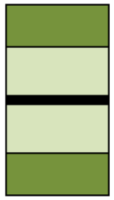
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



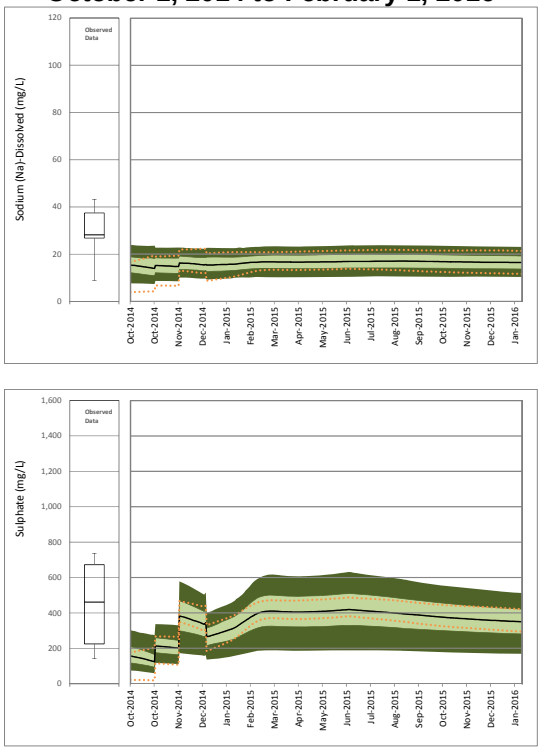
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

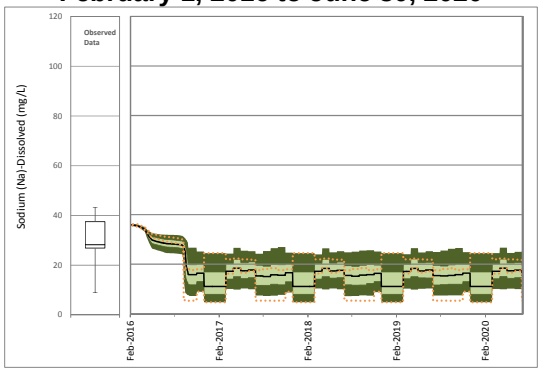
95th Percentile High, 5th Percentile Low

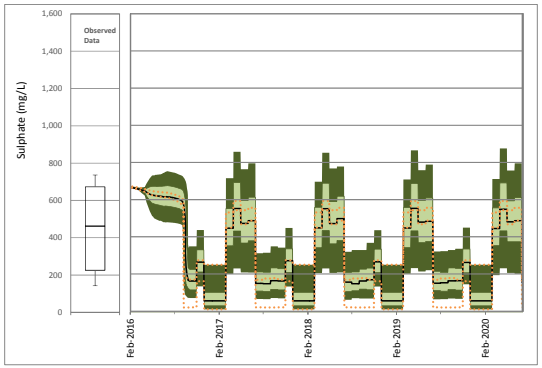
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

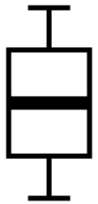


Operations
February 1, 2016 to June 30, 2020





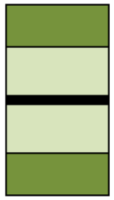
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



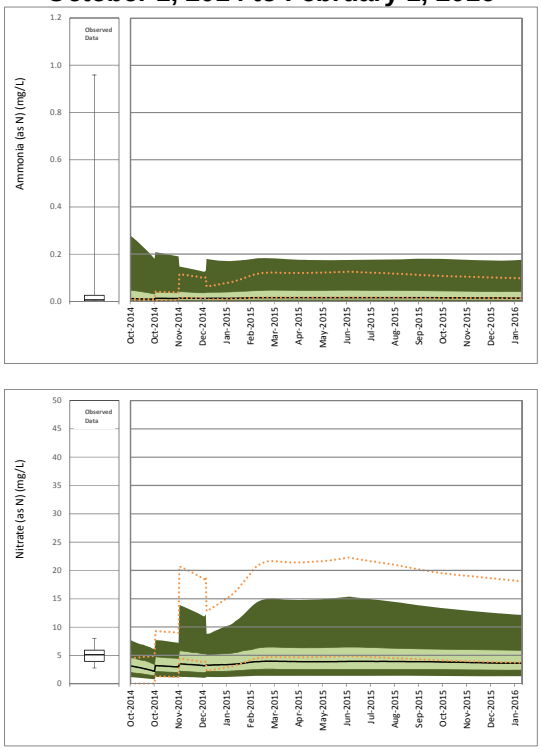
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

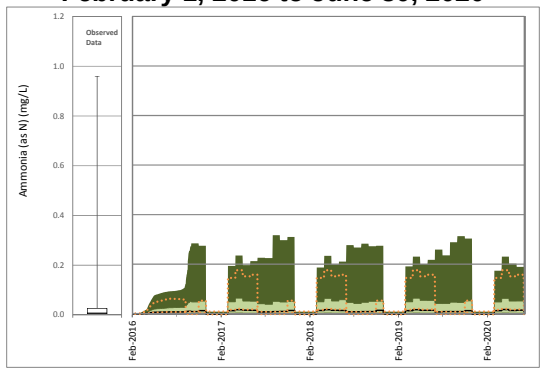
95th Percentile High, 5th Percentile Low

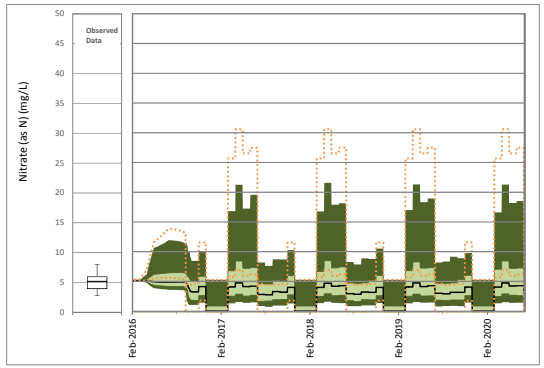
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

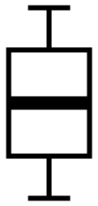


Operations
February 1, 2016 to June 30, 2020





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

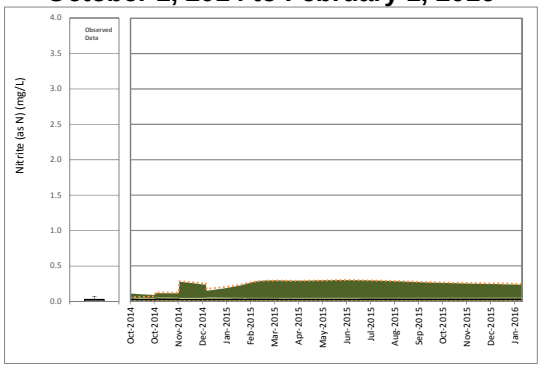
Scenario 2

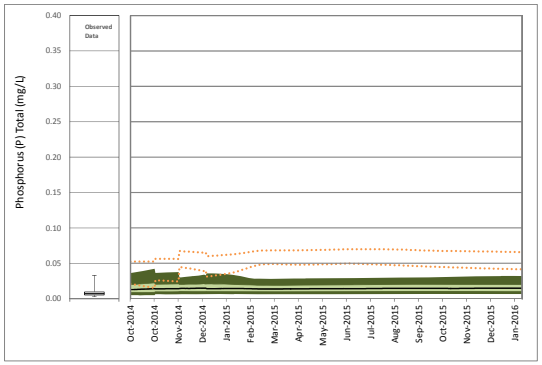
95th Percentile High, 5th Percentile Low

Golder Associates

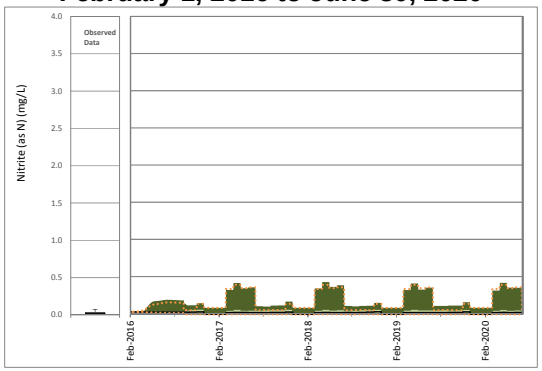
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

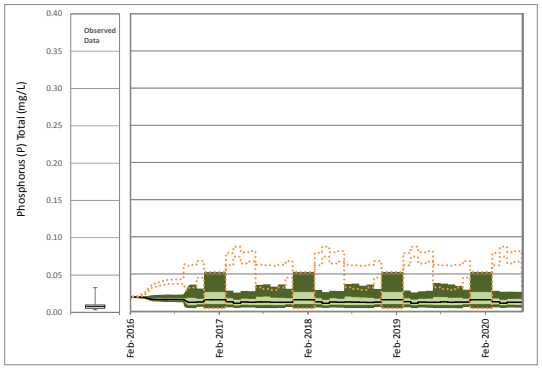
Calibration
October 1, 2014 to February 1, 2016



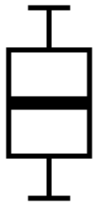


Operations
February 1, 2016 to June 30, 2020





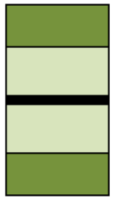
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



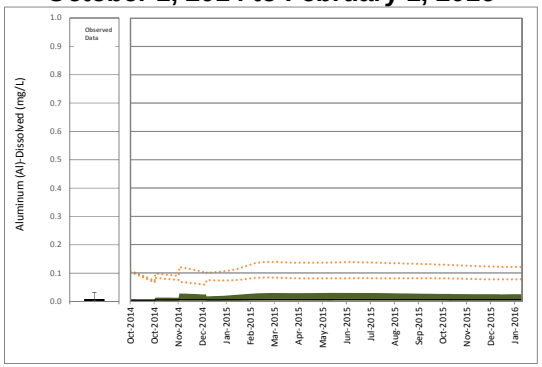
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

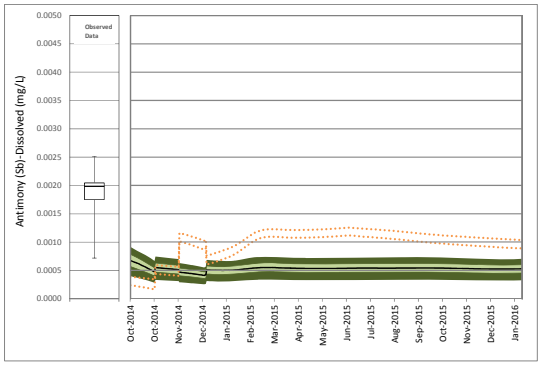
Scenario 2

95th Percentile High, 5th Percentile Low

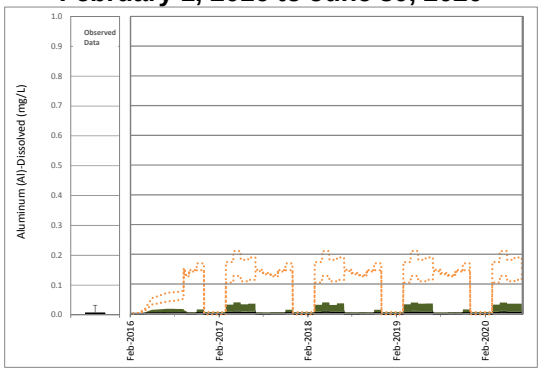
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

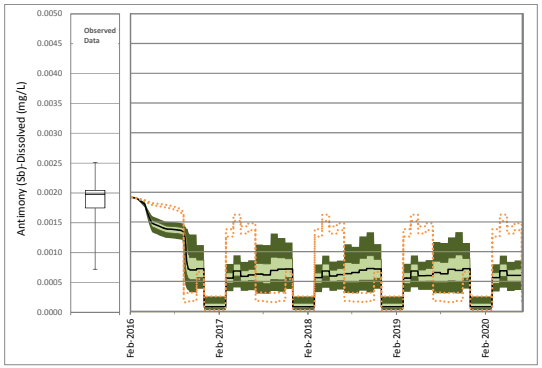
Calibration
October 1, 2014 to February 1, 2016



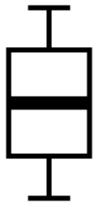


Operations
February 1, 2016 to June 30, 2020





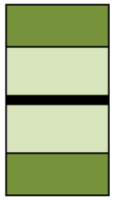
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

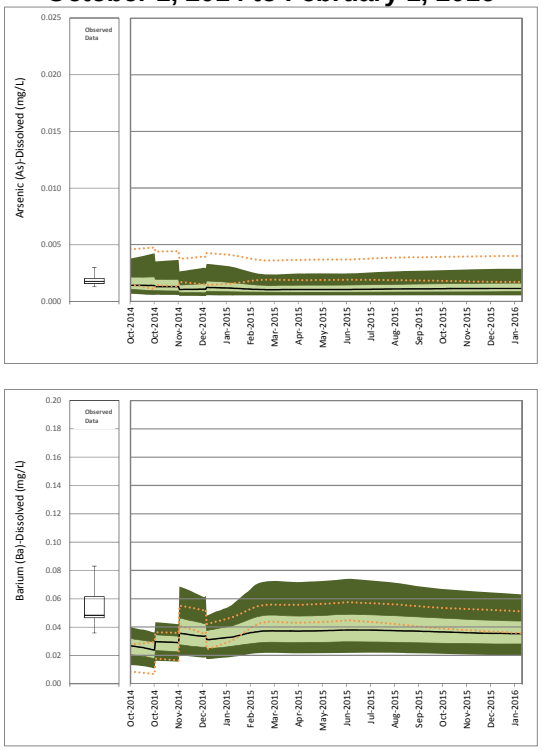
Scenario 2

95th Percentile High, 5th Percentile Low

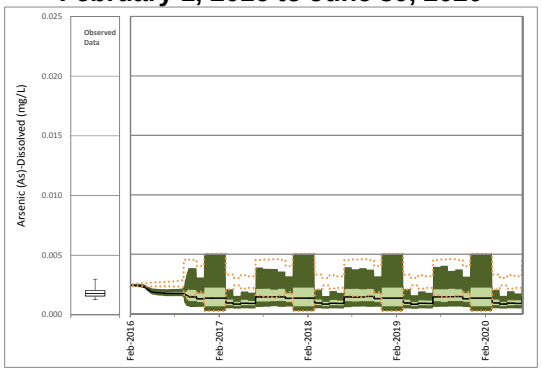
Golder Associates

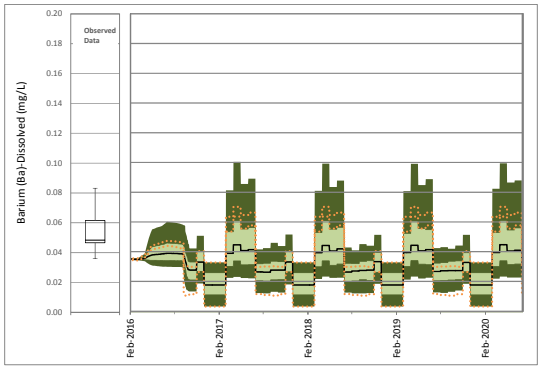
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

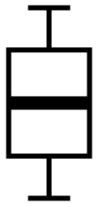


Operations
February 1, 2016 to June 30, 2020





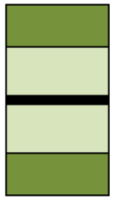
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



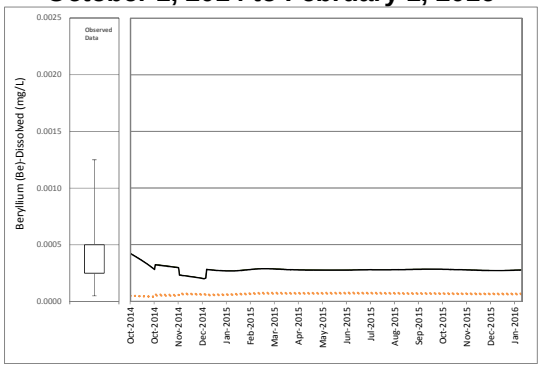
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

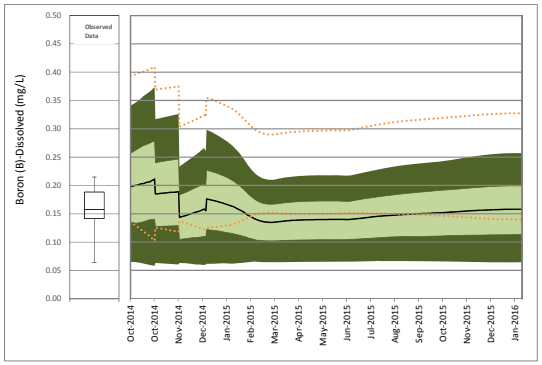
Scenario 2

95th Percentile High, 5th Percentile Low

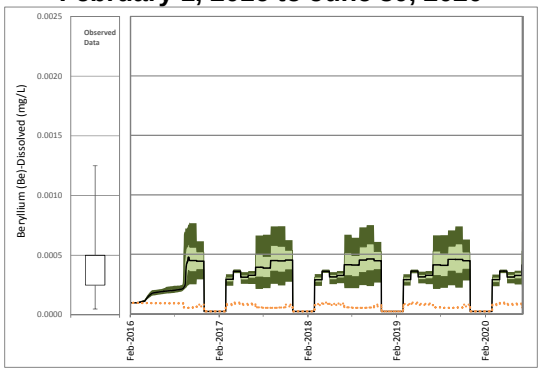
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

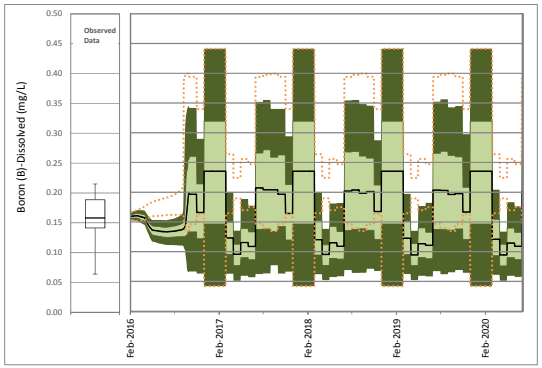
Calibration
October 1, 2014 to February 1, 2016



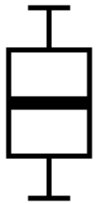


Operations
February 1, 2016 to June 30, 2020



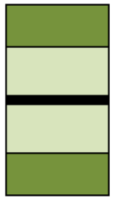


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

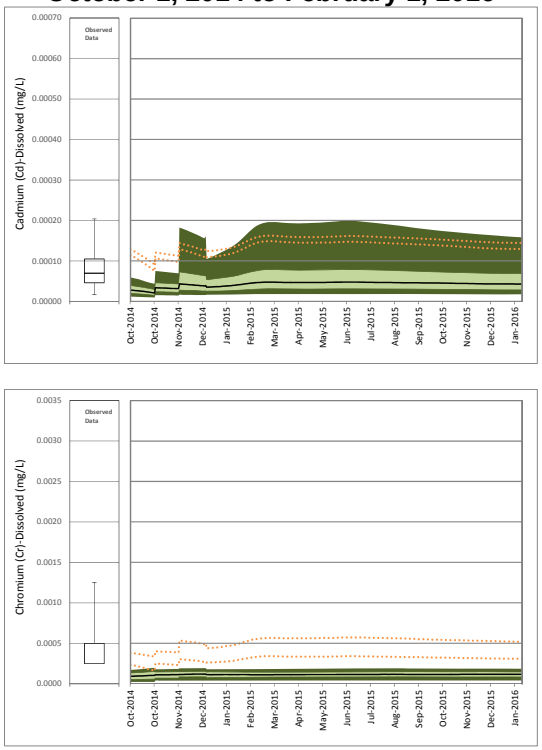
95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

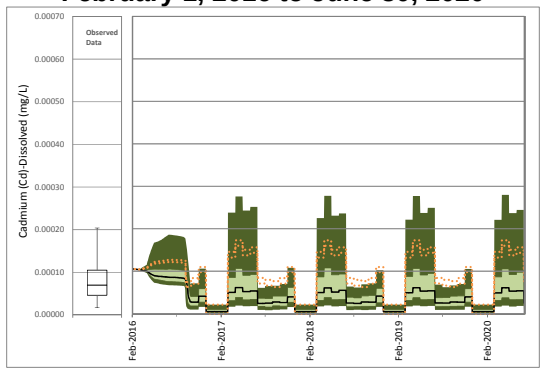
Golder Associates

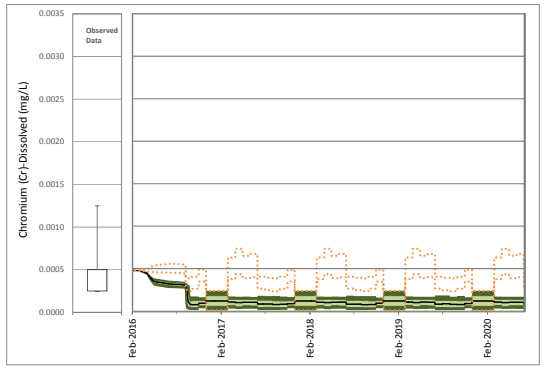
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

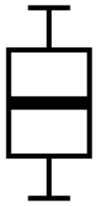


Operations
February 1, 2016 to June 30, 2020





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

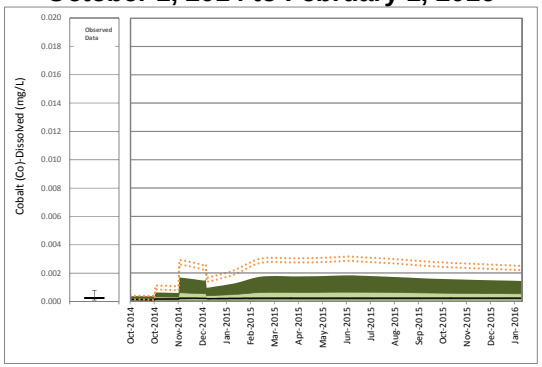
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

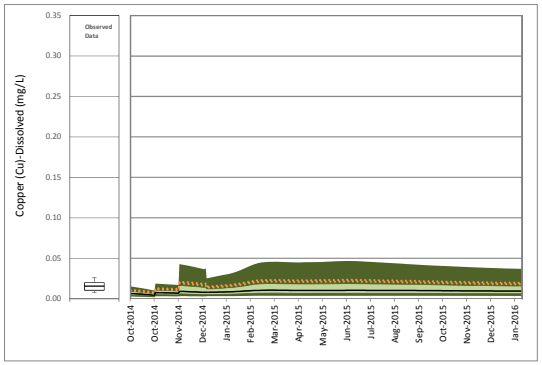
Scenario 2

95th Percentile High, 5th Percentile Low

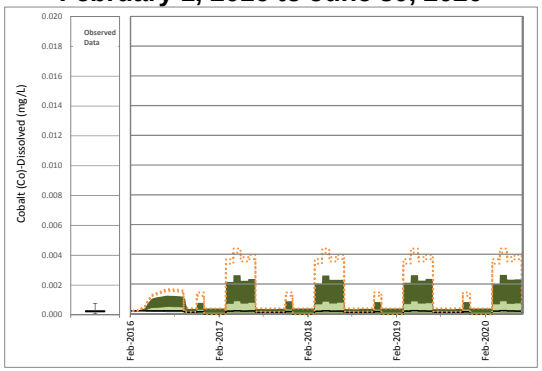
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

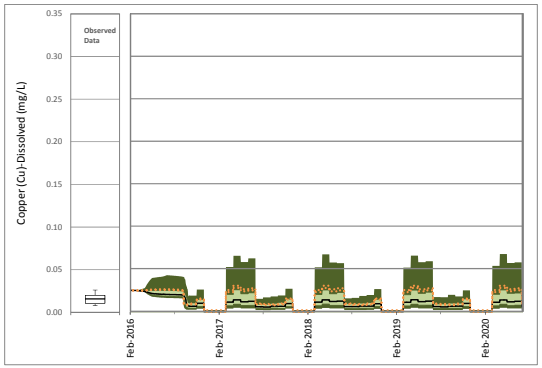
Calibration
October 1, 2014 to February 1, 2016



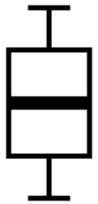


Operations
February 1, 2016 to June 30, 2020





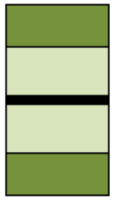
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



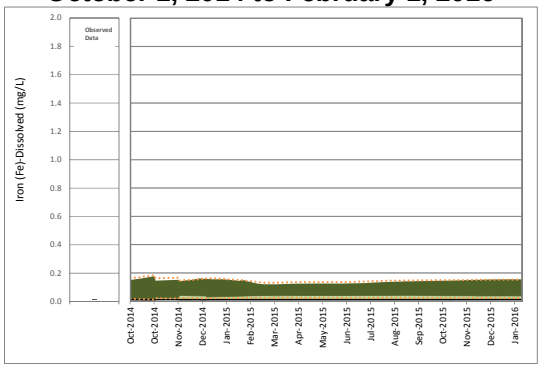
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

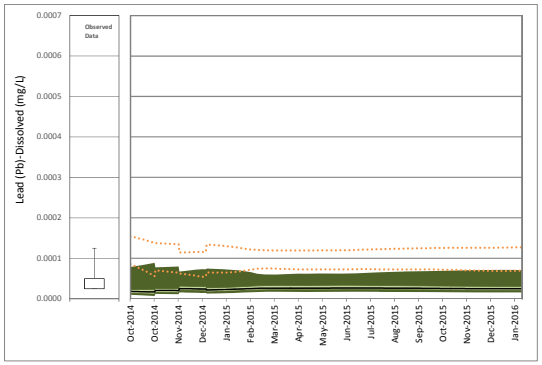
Scenario 2

95th Percentile High, 5th Percentile Low

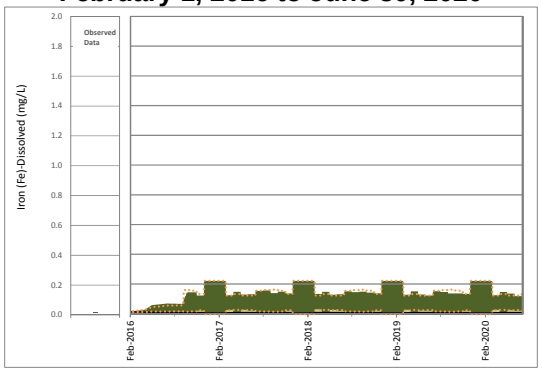
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

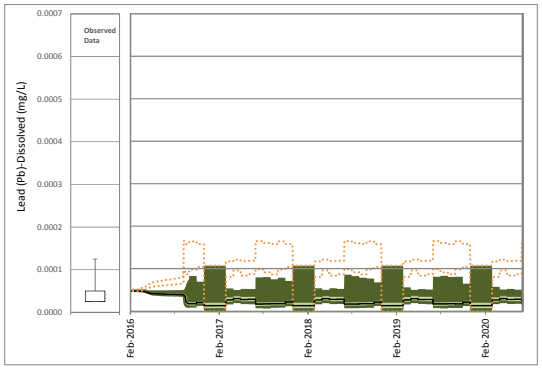
Calibration
October 1, 2014 to February 1, 2016



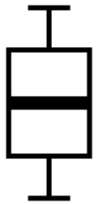


Operations
February 1, 2016 to June 30, 2020





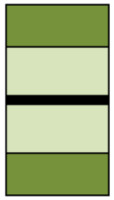
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



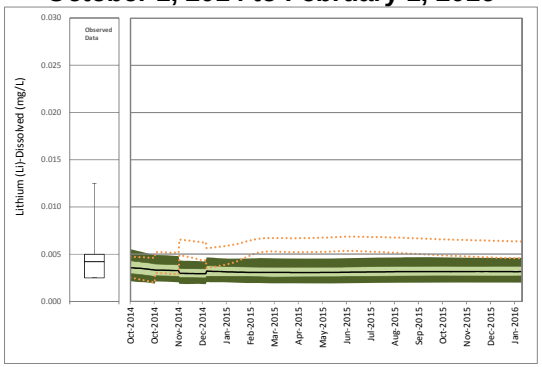
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

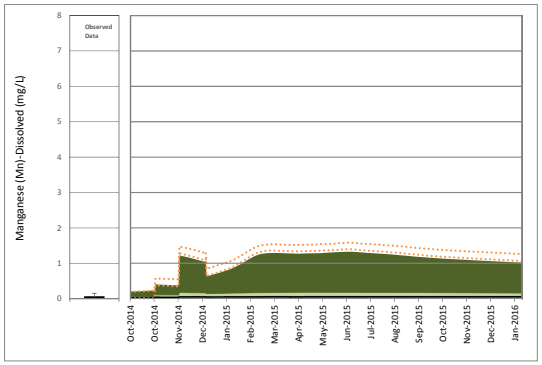
Scenario 2

95th Percentile High, 5th Percentile Low

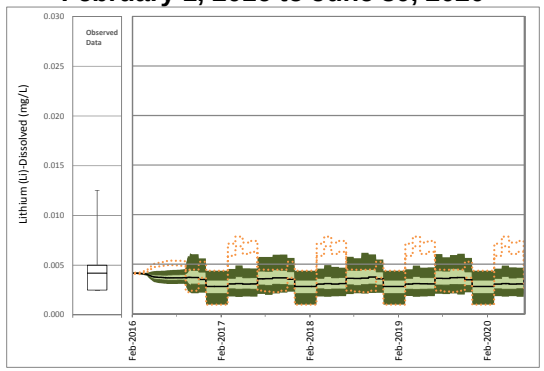
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

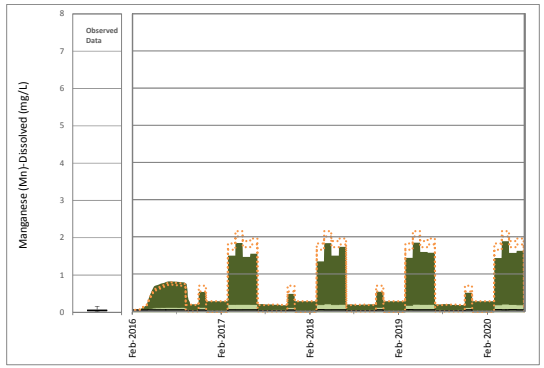
Calibration
October 1, 2014 to February 1, 2016



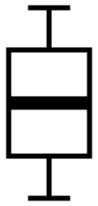


Operations
February 1, 2016 to June 30, 2020





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

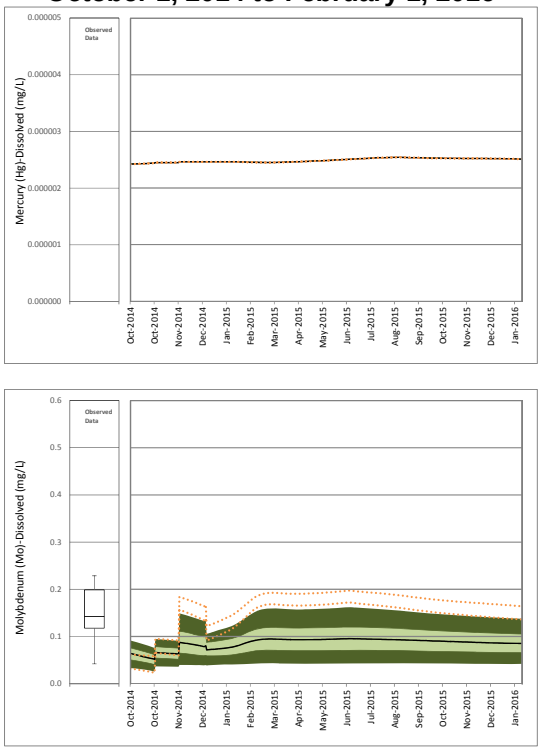
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

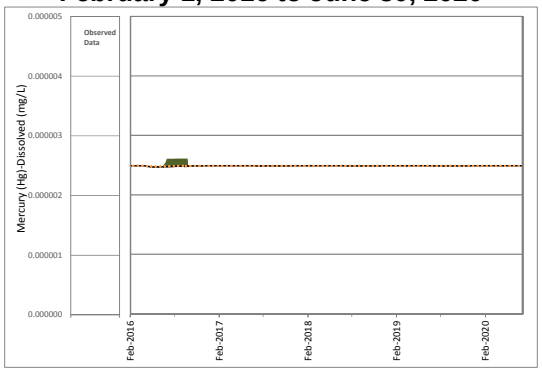
95th Percentile High, 5th Percentile Low

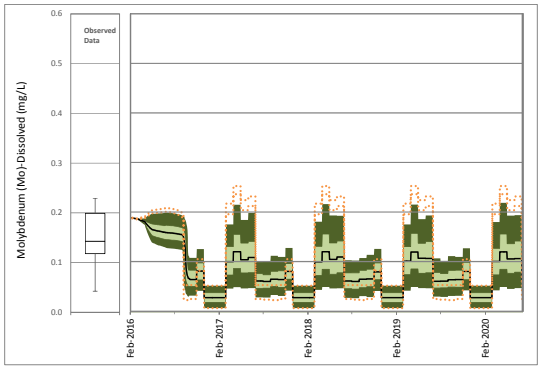
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

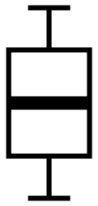


Operations
February 1, 2016 to June 30, 2020



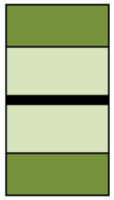


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

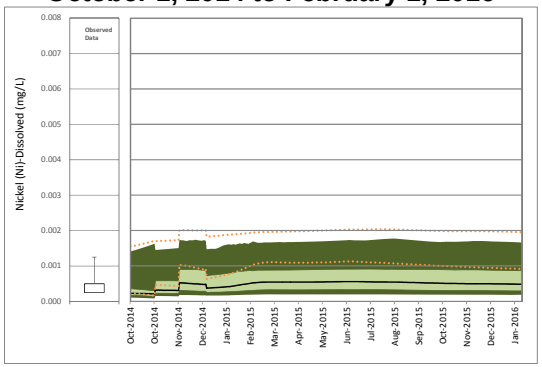
Scenario 2

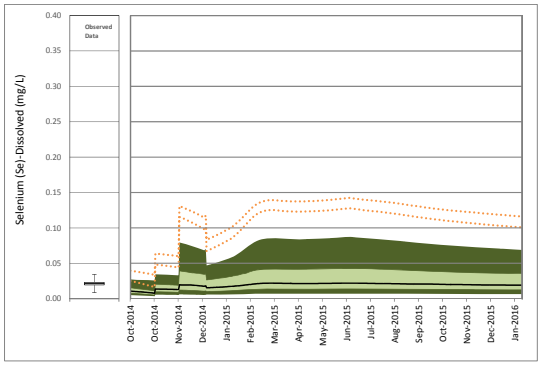
95th Percentile High, 5th Percentile Low

Golder Associates

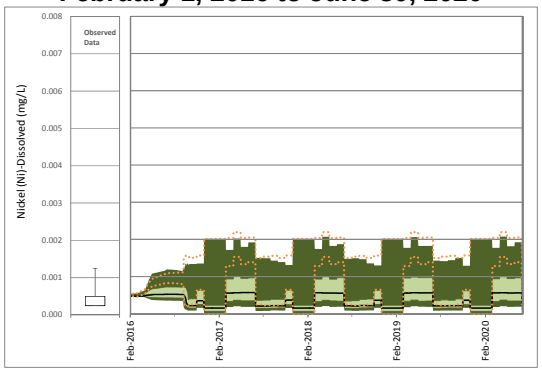
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

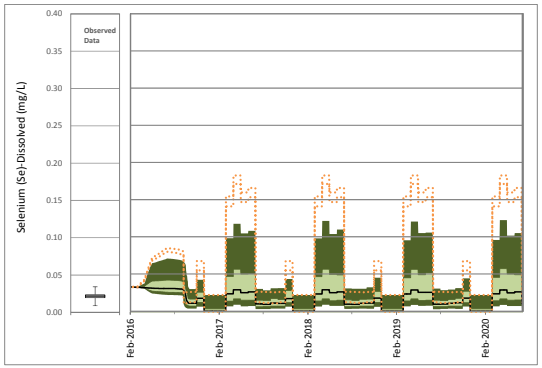
Calibration
October 1, 2014 to February 1, 2016



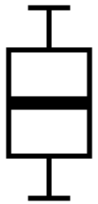


Operations
February 1, 2016 to June 30, 2020





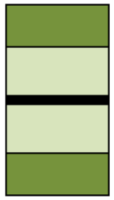
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

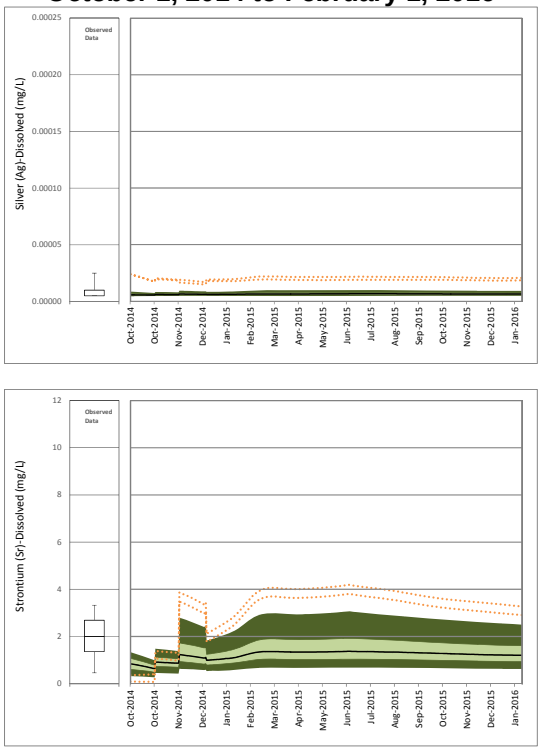
95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

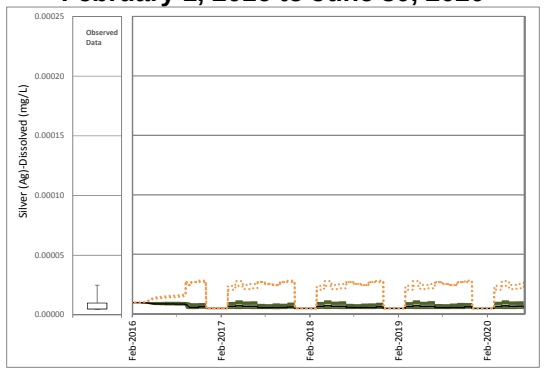
Golder Associates

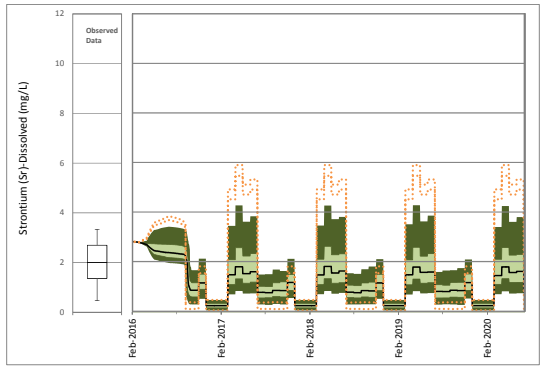
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

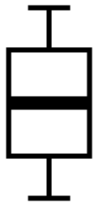


Operations
February 1, 2016 to June 30, 2020





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

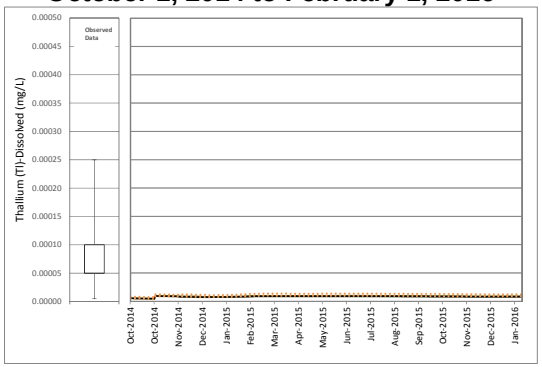
95th Percentile High, 5th Percentile Low

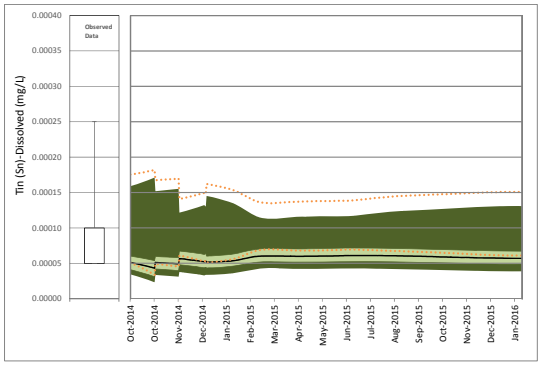
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

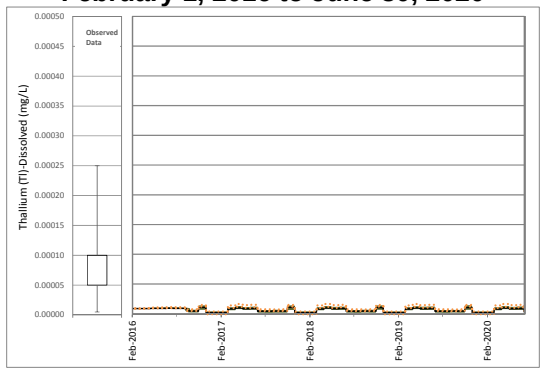
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

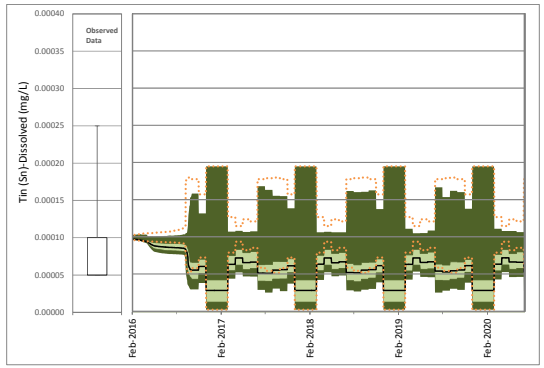
Calibration
October 1, 2014 to February 1, 2016



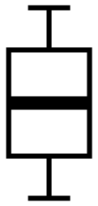


Operations
February 1, 2016 to June 30, 2020





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

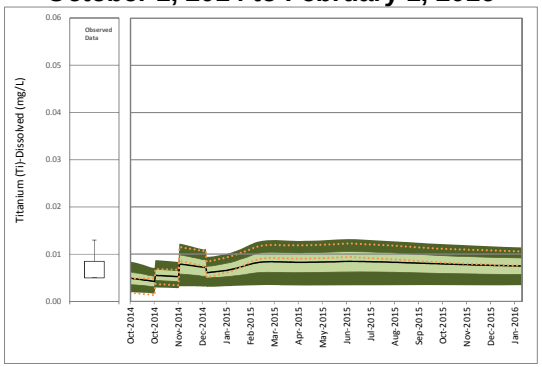
Scenario 2

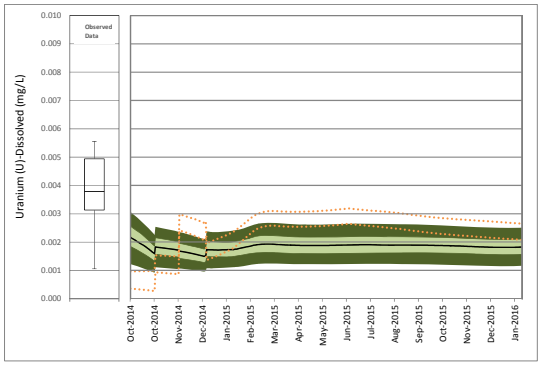
95th Percentile High, 5th Percentile Low

Golder Associates

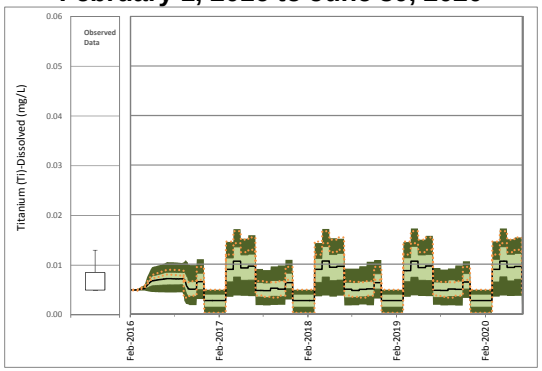
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

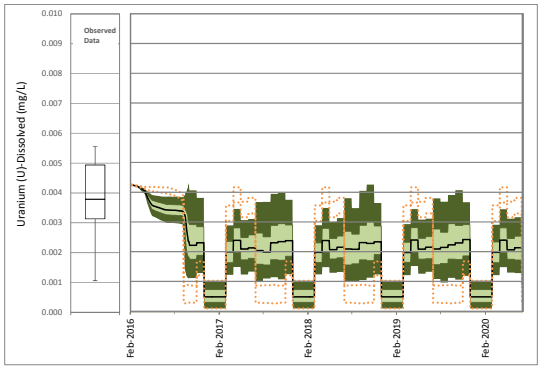
Calibration
October 1, 2014 to February 1, 2016



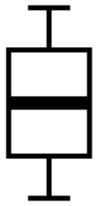


Operations
February 1, 2016 to June 30, 2020





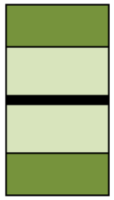
Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1



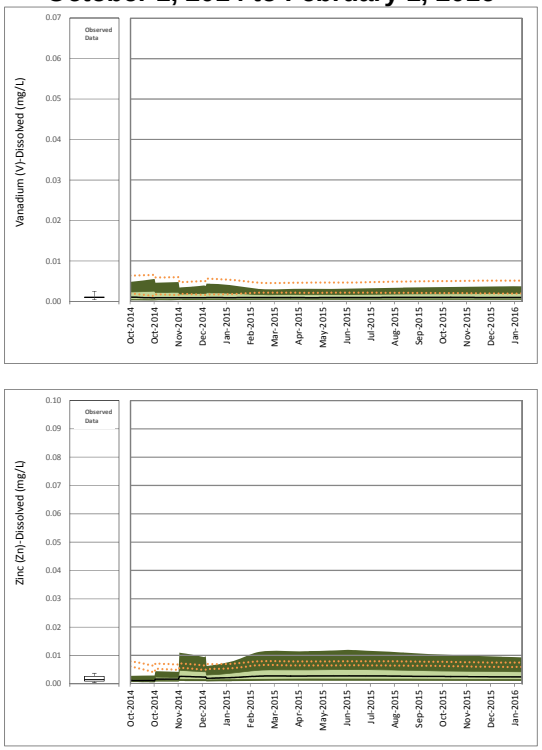
95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

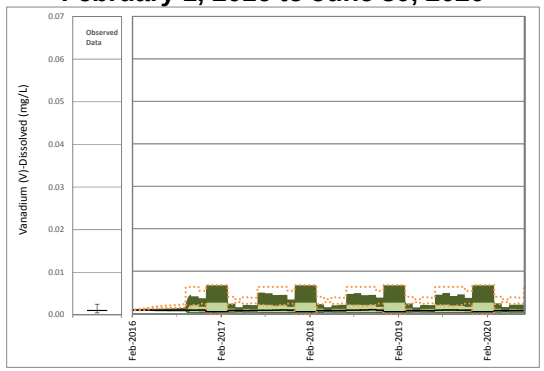
95th Percentile High, 5th Percentile Low

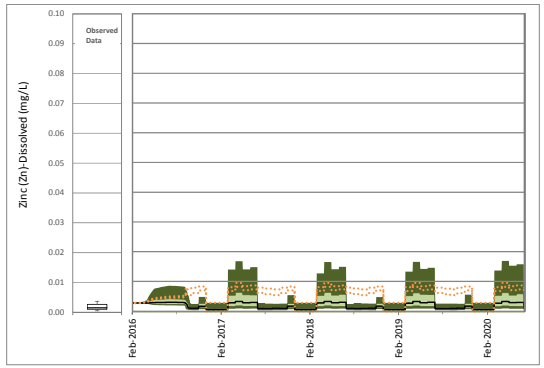
ATTACHMENT B
Figure B4: Time Series Plots of Predicted Cariboo Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016



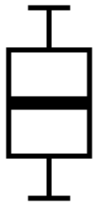
Operations
February 1, 2016 to June 30, 2020





o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig4-cps.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

1.5 9K Sump

Table B5 presents the maximum predicted median and 95th percentile results for the 9K Sump, calculated based on 500 realizations for Scenario 1 (Table B5a) and Scenario 2 (Table B5b). Time series plots for each modelled parameter are provided in Figure B5.

Table B5a:
Predicted 9km Sump Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	798	1264	798	1264	798	1264	553	868	155	508
Total Dissolved Solids	mg/L	1178	1848	1178	1848	1178	1848	812	1246	214	780
Major Ions											
Calcium	mg/L	245	392	245	392	245	392	168	270	47	154
Chloride	mg/L	4.1	11	4.1	11	4.1	11	3.2	7.6	1.7	7.0
Fluoride	mg/L	0.098	0.19	0.098	0.19	0.098	0.19	0.09	0.15	0.074	0.12
Magnesium	mg/L	45	69	45	69	45	69	32	47	9.0	30
Potassium	mg/L	4.1	6.4	4.1	6.4	4.1	6.4	3.0	4.5	0.94	2.4
Sodium	mg/L	20	34	20	34	20	34	15	24	4.8	12
Sulphate	mg/L	572	996	572	996	572	996	374	654	37	318
Nutrients											
Ammonia	mg/L (as N)	0.057	0.72	0.057	0.72	0.057	0.72	0.057	0.72	0.057	0.72
Nitrate	mg/L (as N)	21	43	21	43	21	43	21	43	21	43
Nitrite	mg/L (as N)	0.072	1.2	0.072	1.2	0.072	1.2	0.072	1.2	0.072	1.2
Total Phosphorus	mg/L	0.033	0.074	0.033	0.074	0.033	0.074	0.03	0.056	0.024	0.053
Total Metals											
Aluminum	mg/L	0.53	0.56	0.52	0.57	0.54	0.72	0.61	0.75	0.61	0.75
Antimony	mg/L	0.00028	0.00063	0.00028	0.00063	0.00028	0.00063	0.00022	0.00049	0.000097	0.0004
Arsenic	mg/L	0.00076	0.001	0.00076	0.001	0.00076	0.001	0.00078	0.0015	0.00078	0.0015
Barium	mg/L	0.098	0.15	0.098	0.15	0.098	0.15	0.072	0.11	0.029	0.071
Beryllium	mg/L	0.000059	0.00019	0.000059	0.0002	0.00013	0.00068	0.00013	0.00068	0.00013	0.00068
Boron	mg/L	0.049	0.11	0.049	0.11	0.049	0.13	0.045	0.13	0.042	0.13
Cadmium	mg/L	0.000049	0.00036	0.000049	0.00036	0.000049	0.00036	0.000037	0.00027	0.000015	0.00014
Chromium	mg/L	0.00095	0.0011	0.00092	0.0012	0.0011	0.0016	0.0015	0.0019	0.0015	0.0019
Cobalt	mg/L	0.0015	0.013	0.0015	0.013	0.0015	0.013	0.0011	0.0088	0.0004	0.00054
Copper	mg/L	0.012	0.034	0.012	0.034	0.012	0.034	0.011	0.029	0.01	0.028
Iron	mg/L	0.62	1.0	0.62	1.0	0.62	1.0	0.7	0.88	0.7	0.86
Lead	mg/L	0.00018	0.00023	0.00018	0.00023	0.00018	0.00024	0.00018	0.00024	0.00018	0.00024
Lithium	mg/L	0.0021	0.0062	0.0021	0.0062	0.0021	0.011	0.002	0.011	0.0016	0.011
Manganese	mg/L	2.7	6.1	2.7	6.1	2.7	6.1	1.7	3.9	0.022	0.058
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.036	0.33	0.036	0.33	0.036	0.33	0.025	0.23	0.0057	0.051
Nickel	mg/L	0.0013	0.0024	0.0013	0.0024	0.0013	0.0024	0.0016	0.0023	0.0016	0.0023
Selenium	mg/L	0.1	0.2	0.1	0.2	0.1	0.2	0.061	0.13	0.002	0.028
Silver	mg/L	0.0000079	0.00003	0.0000079	0.00003	0.0000079	0.00003	0.0000078	0.000026	0.0000073	0.000026
Strontium	mg/L	1.0	1.8	1.0	1.8	1.0	2.0	0.77	2.0	0.34	2.0
Thallium	mg/L	0.000036	0.000047	0.000039	0.00005	0.00025	0.00026	0.00025	0.00026	0.00025	0.00026
Tin	mg/L	0.0001	0.0002	0.0001	0.0002	0.0001	0.00025	0.000085	0.00025	0.000064	0.00025
Titanium	mg/L	0.035	0.046	0.035	0.046	0.035	0.046	0.032	0.04	0.028	0.033
Uranium	mg/L	0.0014	0.003	0.0014	0.003	0.0014	0.003	0.001	0.0022	0.00031	0.0019
Vanadium	mg/L	0.0019	0.0036	0.0019	0.0036	0.002	0.0036	0.002	0.003	0.002	0.0029
Zinc	mg/L	0.0042	0.01	0.0042	0.01	0.0042	0.01	0.0038	0.0078	0.0031	0.0058
Dissolved Metals											
Aluminum	mg/L	0.037	0.069	0.03	0.076	0.05	0.23	0.13	0.26	0.13	0.26
Antimony	mg/L	0.00026	0.00045	0.00026	0.00045	0.00026	0.00045	0.0002	0.00031	0.000077	0.00022
Arsenic	mg/L	0.00057	0.00082	0.00057	0.00083	0.00057	0.00086	0.00059	0.0013	0.00059	0.0013
Barium	mg/L	0.093	0.15	0.093	0.15	0.093	0.15	0.067	0.1	0.024	0.065
Beryllium	mg/L	0.000059	0.00011	0.000059	0.00012	0.00013	0.0006	0.00013	0.0006	0.00013	0.0006
Boron	mg/L	0.046	0.074	0.046	0.074	0.046	0.098	0.042	0.098	0.039	0.098
Cadmium	mg/L	0.000044	0.00027	0.000044	0.00027	0.000044	0.00027	0.000032	0.00017	0.000011	0.000049
Chromium	mg/L	0.00031	0.00046	0.00028	0.00051	0.00049	0.00094	0.00084	0.0013	0.00084	0.0013
Cobalt	mg/L	0.0012	0.013	0.0012	0.013	0.0012	0.013	0.0008	0.0085	0.000077	0.00022
Copper	mg/L	0.0079	0.019	0.0079	0.019	0.0079	0.019	0.0067	0.014	0.0054	0.012
Iron	mg/L	0.076	0.48	0.071	0.48	0.072	0.48	0.15	0.34	0.15	0.32
Lead	mg/L	0.000038	0.000083	0.000038	0.000083	0.000038	0.000091	0.000039	0.000091	0.000038	0.000091
Lithium	mg/L	0.0018	0.0033	0.0018	0.0033	0.0018	0.008	0.0017	0.008	0.0013	0.008
Manganese	mg/L	2.7	6.1	2.7	6.1	2.7	6.1	1.7	3.9	0.0068	0.043
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.036	0.32	0.036	0.32	0.036	0.32	0.025	0.21	0.0057	0.037
Nickel	mg/L	0.00072	0.0018	0.00072	0.0018	0.00071	0.0018	0.001	0.0018	0.001	0.0018
Selenium	mg/L	0.1	0.2	0.1	0.2	0.1	0.2	0.061	0.12	0.002	0.024
Silver	mg/L	0.0000079	0.00002	0.0000079	0.00002	0.0000079	0.00002	0.0000078	0.000016	0.0000073	0.000016
Strontium	mg/L	1.0	1.4	1.0	1.4	1.0	1.6	0.75	1.6	0.32	1.6
Thallium	mg/L	0.000036	0.000038	0.000039	0.00004	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Tin	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.00015	0.000085	0.00015	0.000064	0.00015
Titanium	mg/L	0.012	0.024	0.012	0.024	0.012	0.024	0.0098	0.017	0.0052	0.011
Uranium	mg/L	0.0013	0.0023	0.0013	0.0023	0.0013	0.0023	0.001	0.0016	0.00027	0.0013
Vanadium	mg/L	0.00061	0.0023	0.00061	0.0023	0.00068	0.0023	0.00067	0.0017	0.00067	0.0016
Zinc	mg/L	0.0027	0.0089	0.0027	0.0089	0.0027	0.0089	0.0023	0.0063	0.0015	0.0042

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

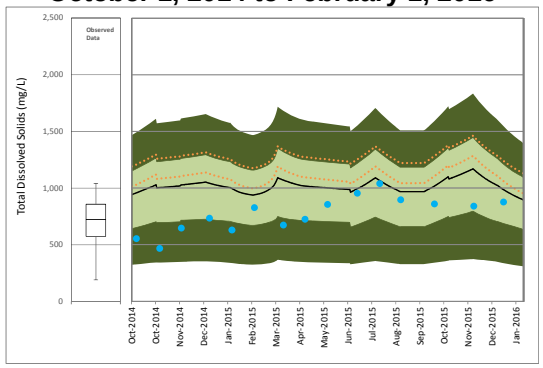
Table B5b:
Predicted 9km Sump Water Quality - Scenario 2

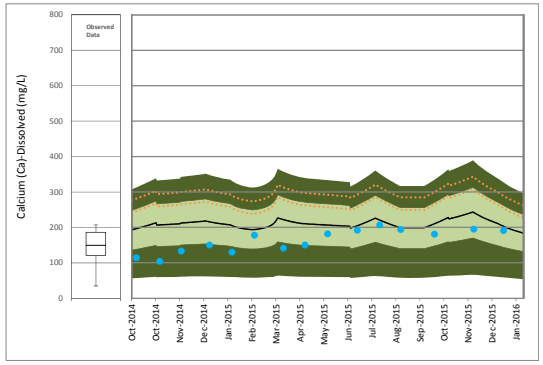
Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	1077	1134	1077	1134	1077	1134	718	789	118	304
Total Dissolved Solids	mg/L	1423	1472	1423	1472	1403	1452	954	1013	186	453
Major Ions											
Calcium	mg/L	333	346	333	346	333	346	220	237	34	90
Chloride	mg/L	15.0	18	15	18	15	18	9.9	14	1.7	7.3
Fluoride	mg/L	0.37	0.4	0.37	0.4	0.37	0.4	0.26	0.3	0.07	0.12
Magnesium	mg/L	60	66	60	66	60	66	41	48	8.2	19
Potassium	mg/L	7.5	7.9	7.5	7.9	7.5	7.9	5.1	5.6	0.92	1.8
Sodium	mg/L	33	35	33	35	33	35	22	26	4.8	9.7
Sulphate	mg/L	849	855	849	855	849	855	545	561	22	161
Nutrients											
Ammonia	mg/L (as N)	0.27	0.27	0.27	0.27	0.18	0.18	0.18	0.18	0.18	0.18
Nitrate	mg/L (as N)	45	45	45	45	5.2	5.2	5.2	5.2	5.2	5.2
Nitrite	mg/L (as N)	0.61	0.6	1.5	1.5	1.9	1.9	1.9	1.9	1.9	1.9
Total Phosphorus	mg/L	0.059	0.071	0.059	0.071	0.059	0.071	0.046	0.061	0.024	0.045
Total Metals											
Aluminum	mg/L	0.77	0.85	0.77	0.85	0.77	0.85	0.71	0.81	0.62	0.76
Antimony	mg/L	0.00041	0.00059	0.00041	0.00059	0.00041	0.00059	0.00029	0.00047	0.000085	0.00032
Arsenic	mg/L	0.0025	0.0029	0.0025	0.0029	0.0025	0.0029	0.0019	0.0024	0.00079	0.0015
Barium	mg/L	0.15	0.15	0.15	0.15	0.15	0.15	0.10	0.1	0.021	0.042
Beryllium	mg/L	0.00010	0.00018	0.0001	0.00018	0.0001	0.0004	0.000088	0.0004	0.000088	0.0004
Boron	mg/L	0.26	0.3	0.26	0.3	0.26	0.3	0.17	0.22	0.03	0.094
Cadmium	mg/L	0.00034	0.00044	0.00034	0.00044	0.00034	0.00044	0.00022	0.00032	0.000015	0.00013
Chromium	mg/L	0.0015	0.0018	0.0015	0.0017	0.0015	0.0017	0.0015	0.0019	0.0015	0.0019
Cobalt	mg/L	0.019	0.019	0.019	0.019	0.019	0.019	0.012	0.012	0.0004	0.00048
Copper	mg/L	0.024	0.037	0.024	0.037	0.024	0.037	0.019	0.031	0.0088	0.023
Iron	mg/L	0.67	0.79	0.67	0.78	0.67	0.79	0.7	0.88	0.7	0.88
Lead	mg/L	0.00029	0.00032	0.00029	0.00032	0.00029	0.00032	0.00025	0.00028	0.00018	0.00023
Lithium	mg/L	0.0036	0.0068	0.0036	0.0068	0.0036	0.0072	0.0027	0.0072	0.0013	0.0072
Manganese	mg/L	6.7	6.7	6.7	6.7	6.7	6.7	4.3	4.3	0.022	0.04
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.36	0.38	0.36	0.38	0.36	0.38	0.23	0.25	0.0037	0.033
Nickel	mg/L	0.0032	0.0036	0.0032	0.0036	0.0032	0.0036	0.0026	0.0031	0.0016	0.0024
Selenium	mg/L	0.19	0.2	0.19	0.2	0.19	0.2	0.12	0.13	0.0013	0.017
Silver	mg/L	0.000035	0.000049	0.000035	0.000049	0.000035	0.000049	0.000025	0.00004	0.0000073	0.000024
Strontium	mg/L	1.2	1.8	1.2	1.8	1.2	1.8	0.88	1.4	0.28	1.3
Thallium	mg/L	0.000011	0.000025	0.000011	0.000025	0.00013	0.00014	0.00013	0.00014	0.00013	0.00014
Tin	mg/L	0.0001	0.00021	0.0001	0.00021	0.0001	0.00021	0.000083	0.0002	0.000058	0.0002
Titanium	mg/L	0.046	0.048	0.046	0.048	0.046	0.048	0.039	0.041	0.027	0.031
Uranium	mg/L	0.0022	0.0032	0.0022	0.0032	0.0022	0.0032	0.0015	0.0026	0.0003	0.0016
Vanadium	mg/L	0.0045	0.0048	0.0045	0.0048	0.0045	0.0048	0.0036	0.0039	0.0019	0.0025
Zinc	mg/L	0.018	0.019	0.018	0.019	0.018	0.019	0.012	0.014	0.003	0.0053
Dissolved Metals											
Aluminum	mg/L	0.28	0.36	0.28	0.36	0.28	0.36	0.22	0.32	0.13	0.27
Antimony	mg/L	0.00039	0.00041	0.00039	0.00041	0.00039	0.00041	0.00027	0.00029	0.000065	0.00014
Arsenic	mg/L	0.0023	0.0027	0.0023	0.0027	0.0023	0.0027	0.0017	0.0022	0.0006	0.0014
Barium	mg/L	0.14	0.14	0.14	0.14	0.14	0.14	0.094	0.098	0.016	0.036
Beryllium	mg/L	0.00010	0.0001	0.0001	0.0001	0.0001	0.00032	0.000088	0.00032	0.000088	0.00032
Boron	mg/L	0.26	0.26	0.26	0.26	0.26	0.26	0.17	0.18	0.027	0.057
Cadmium	mg/L	0.00034	0.00034	0.00034	0.00034	0.00034	0.00034	0.00022	0.00023	0.000011	0.00003
Chromium	mg/L	0.00082	0.0011	0.00082	0.0011	0.00082	0.0011	0.00088	0.0013	0.00088	0.0013
Cobalt	mg/L	0.0180	0.018	0.018	0.018	0.018	0.018	0.012	0.012	0.000071	0.00015
Copper	mg/L	0.020	0.021	0.02	0.021	0.02	0.021	0.014	0.015	0.0042	0.0079
Iron	mg/L	0.12	0.24	0.12	0.24	0.12	0.24	0.16	0.33	0.16	0.33
Lead	mg/L	0.00015	0.00017	0.00015	0.00017	0.00015	0.00017	0.00011	0.00014	0.000038	0.000083
Lithium	mg/L	0.0033	0.0039	0.0033	0.0039	0.0033	0.0043	0.0024	0.0043	0.001	0.0043
Manganese	mg/L	6.7	6.7	6.7	6.7	6.7	6.7	4.3	4.3	0.0067	0.025
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.36	0.36	0.36	0.36	0.36	0.36	0.23	0.23	0.0037	0.02
Nickel	mg/L	0.0026	0.0031	0.0026	0.0031	0.0026	0.0031	0.002	0.0026	0.001	0.0018
Selenium	mg/L	0.19	0.19	0.19	0.19	0.19	0.19	0.12	0.12	0.0013	0.012
Silver	mg/L	0.000035	0.000039	0.000035	0.000039	0.000035	0.000039	0.000025	0.00003	0.0000073	0.000014
Strontium	mg/L	1.2	1.3	1.2	1.3	1.2	1.3	0.86	1.0	0.26	0.9
Thallium	mg/L	0.000011	0.000016	0.000011	0.000016	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Tin	mg/L	0.0001	0.00011	0.0001	0.00011	0.0001	0.00011	0.000083	0.00010	0.000058	0.00010
Titanium	mg/L	0.024	0.025	0.024	0.025	0.024	0.025	0.017	0.019	0.0051	0.0086
Uranium	mg/L	0.0021	0.0025	0.0021	0.0025	0.0021	0.0025	0.0015	0.0019	0.00026	0.00091
Vanadium	mg/L	0.0032	0.0035	0.0032	0.0035	0.0032	0.0035	0.0023	0.0026	0.00063	0.0012
Zinc	mg/L	0.016	0.017	0.016	0.017	0.016	0.017	0.011	0.012	0.0015	0.0038

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

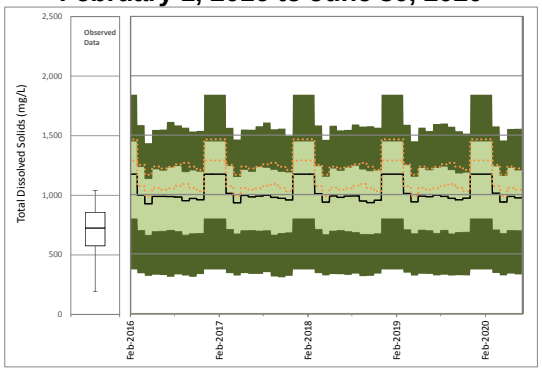
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

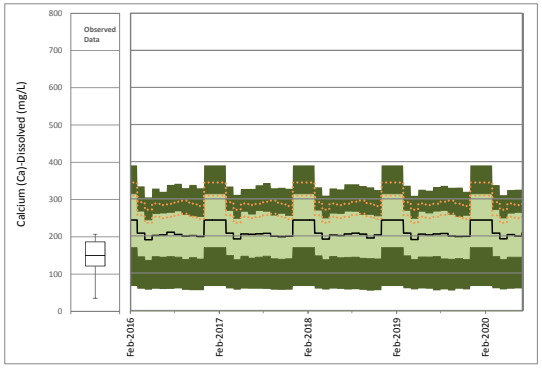
Calibration
October 1, 2014 to February 1, 2016



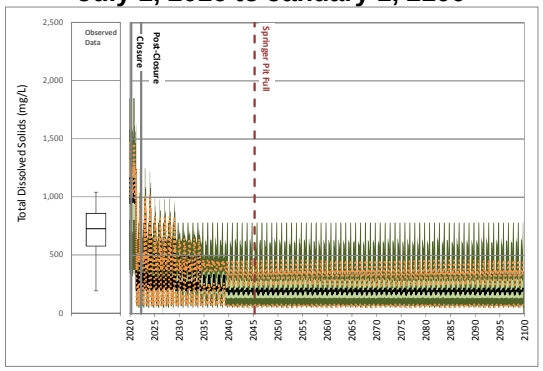


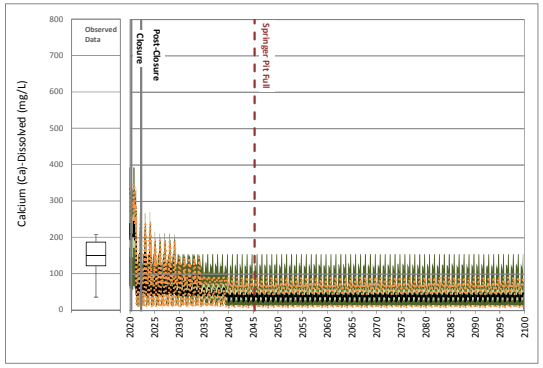
Operations
February 1, 2016 to June 30, 2020



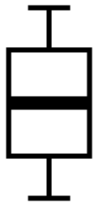


Closure and Post-closure
July 1, 2016 to January 1, 2100



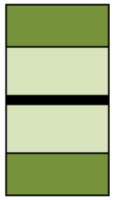


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

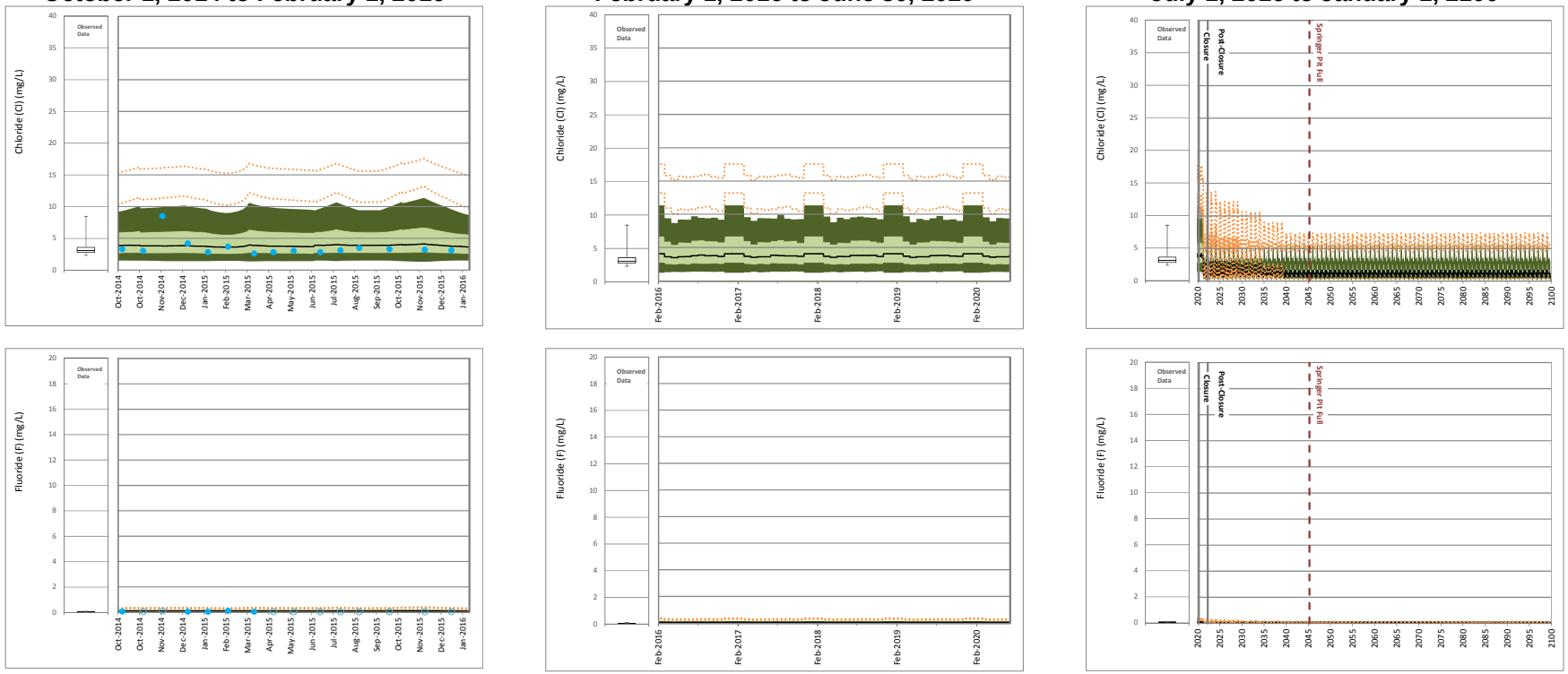
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

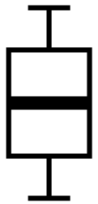
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

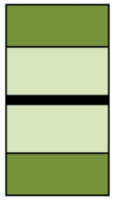


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

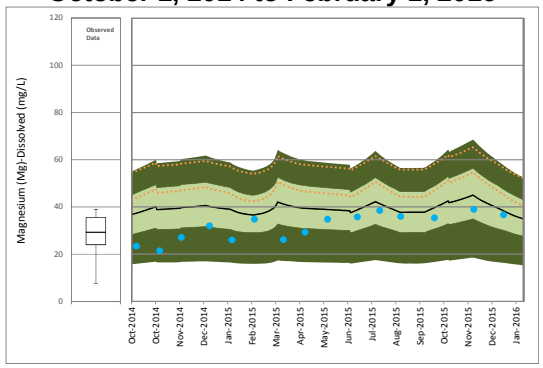
Scenario 2

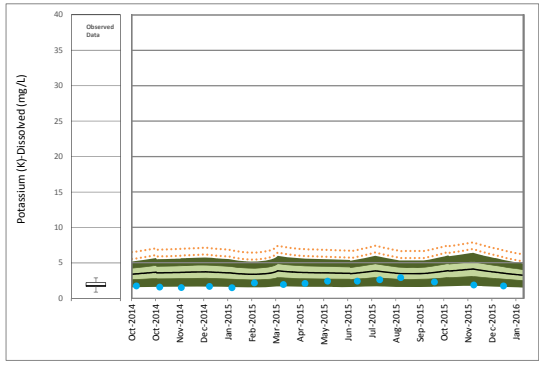
95th Percentile High, 5th Percentile Low

Golder Associates

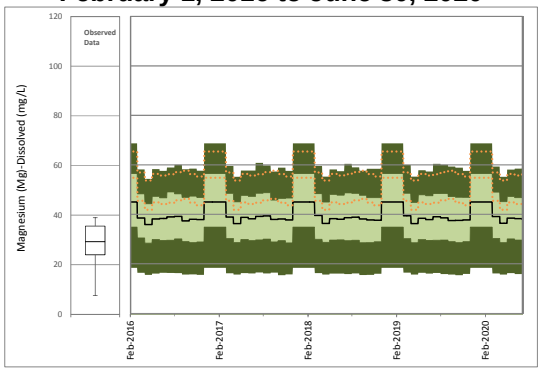
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

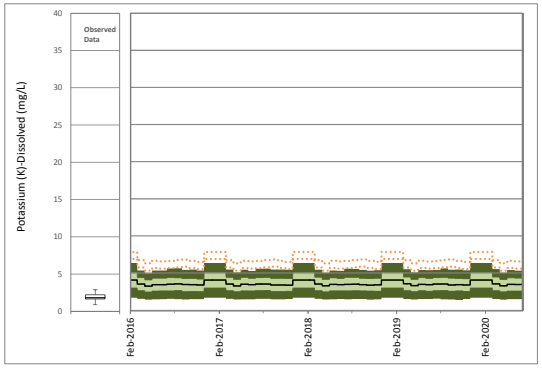
Calibration
October 1, 2014 to February 1, 2016



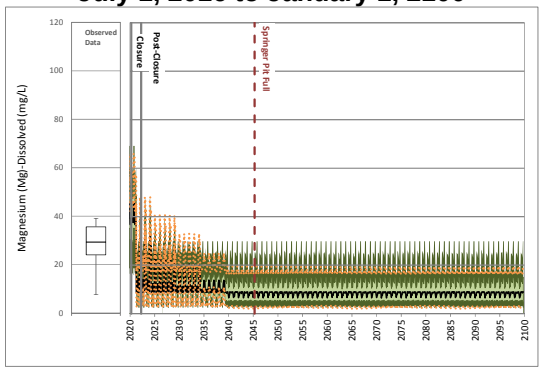


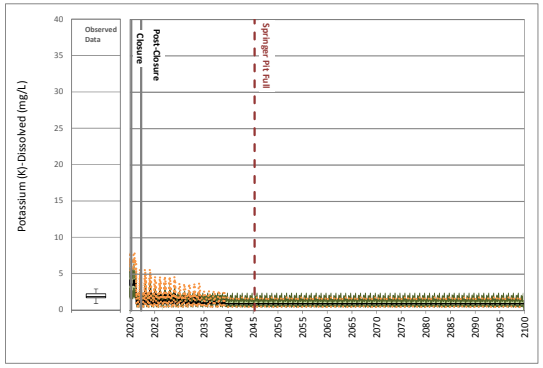
Operations
February 1, 2016 to June 30, 2020



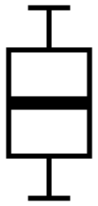


Closure and Post-closure
July 1, 2016 to January 1, 2100



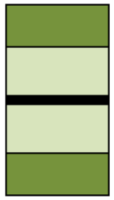


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

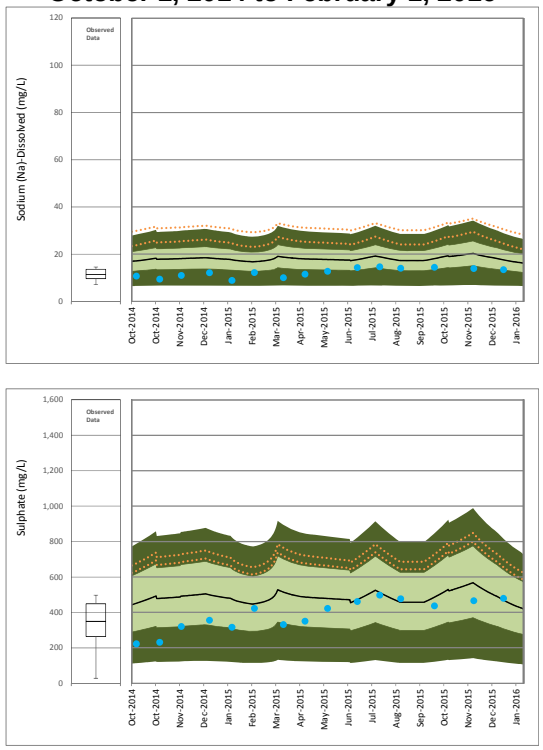
95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

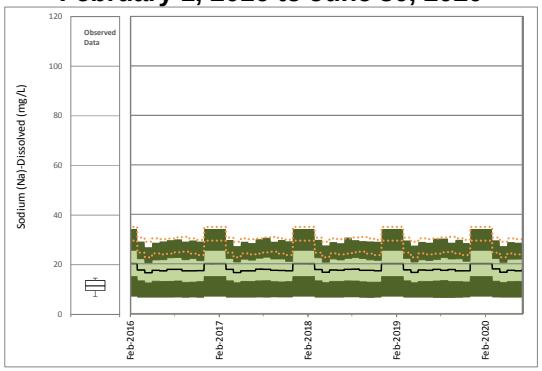
Golder Associates

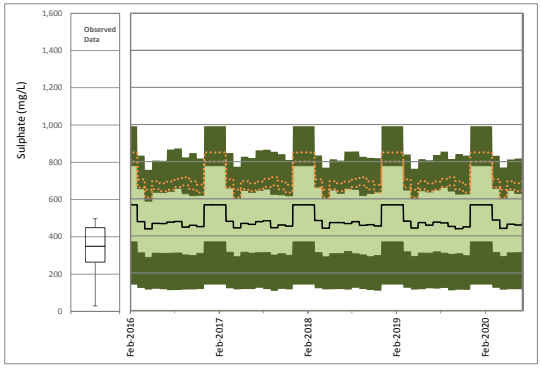
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

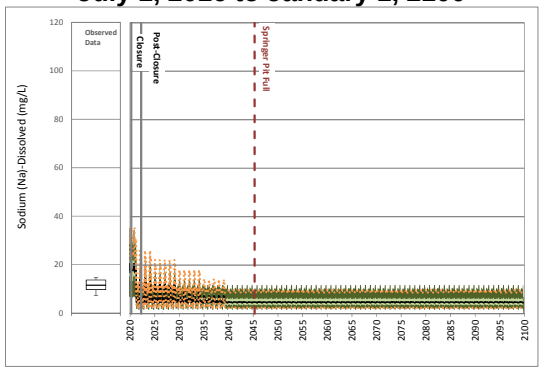


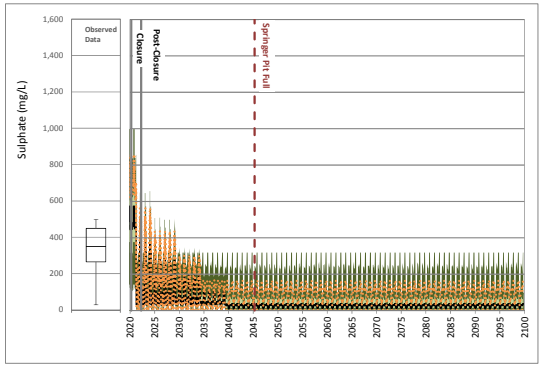
Operations
February 1, 2016 to June 30, 2020



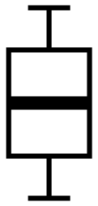


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

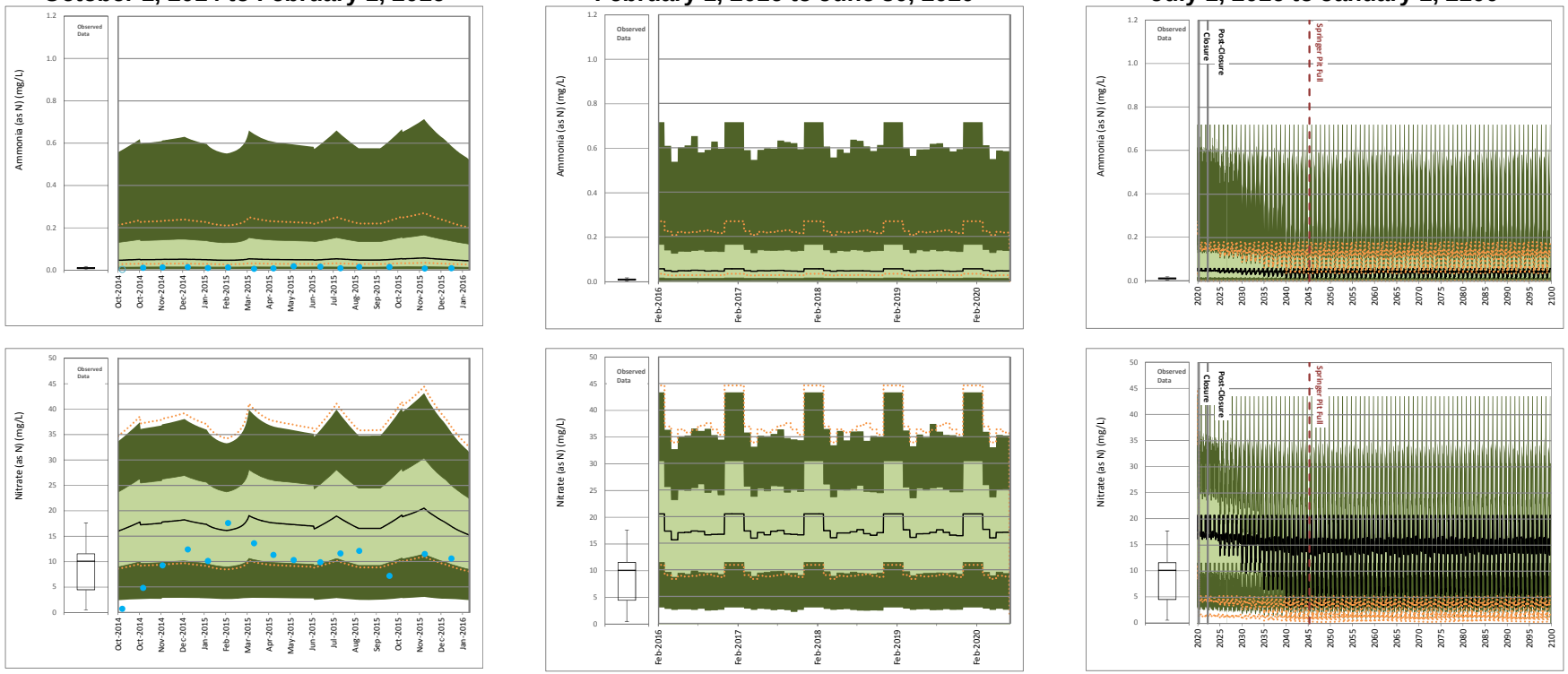
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

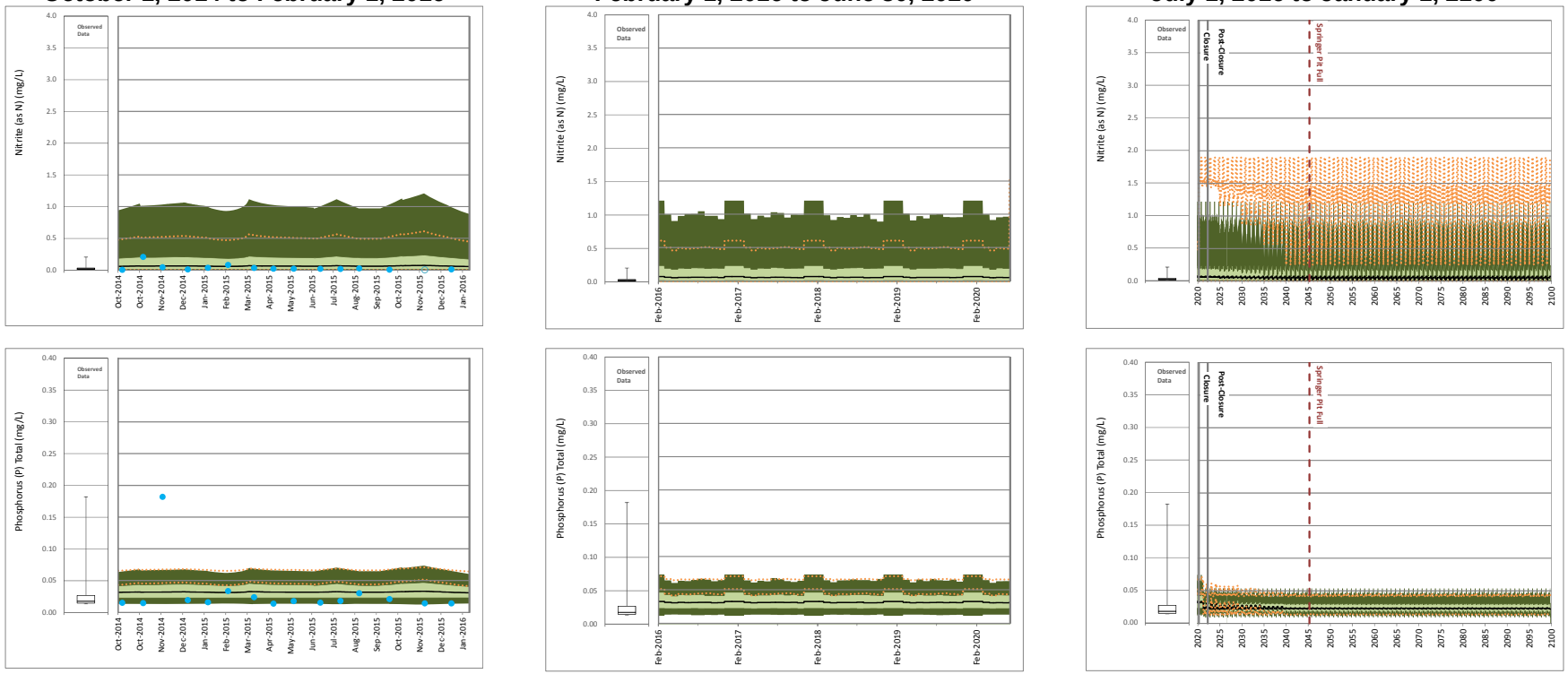
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

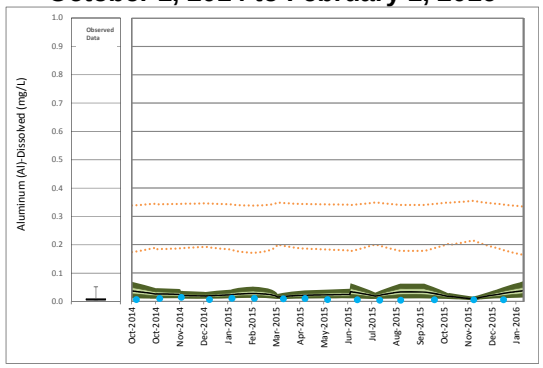
95th Percentile High, 5th Percentile Low

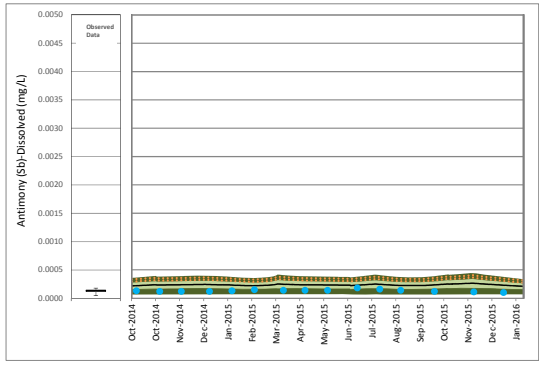
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

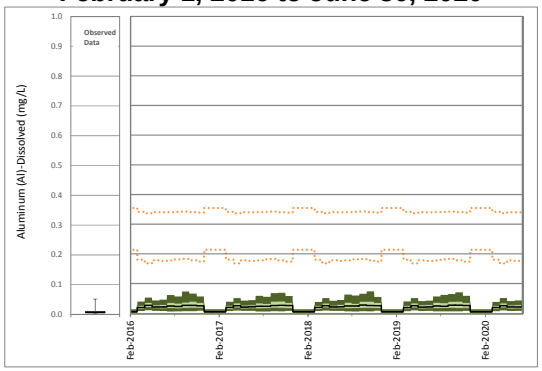
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

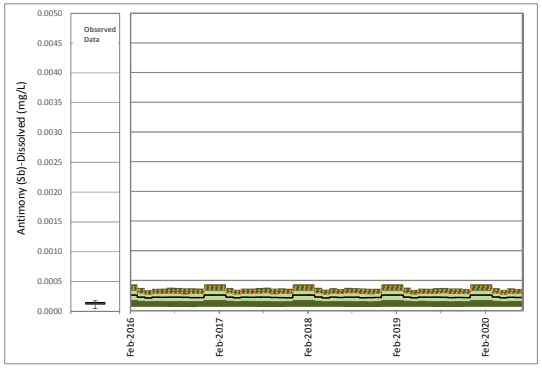
Calibration
October 1, 2014 to February 1, 2016



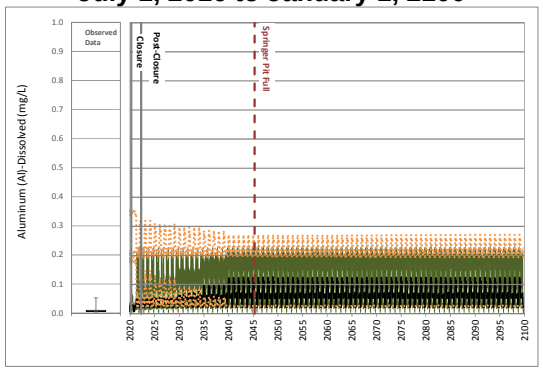


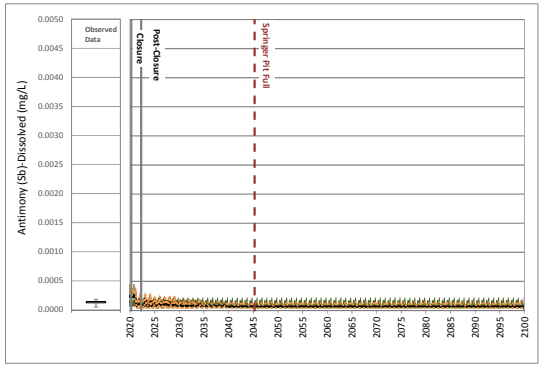
Operations
February 1, 2016 to June 30, 2020



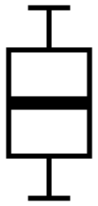


Closure and Post-closure
July 1, 2016 to January 1, 2100



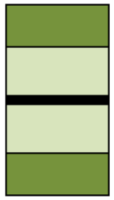


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

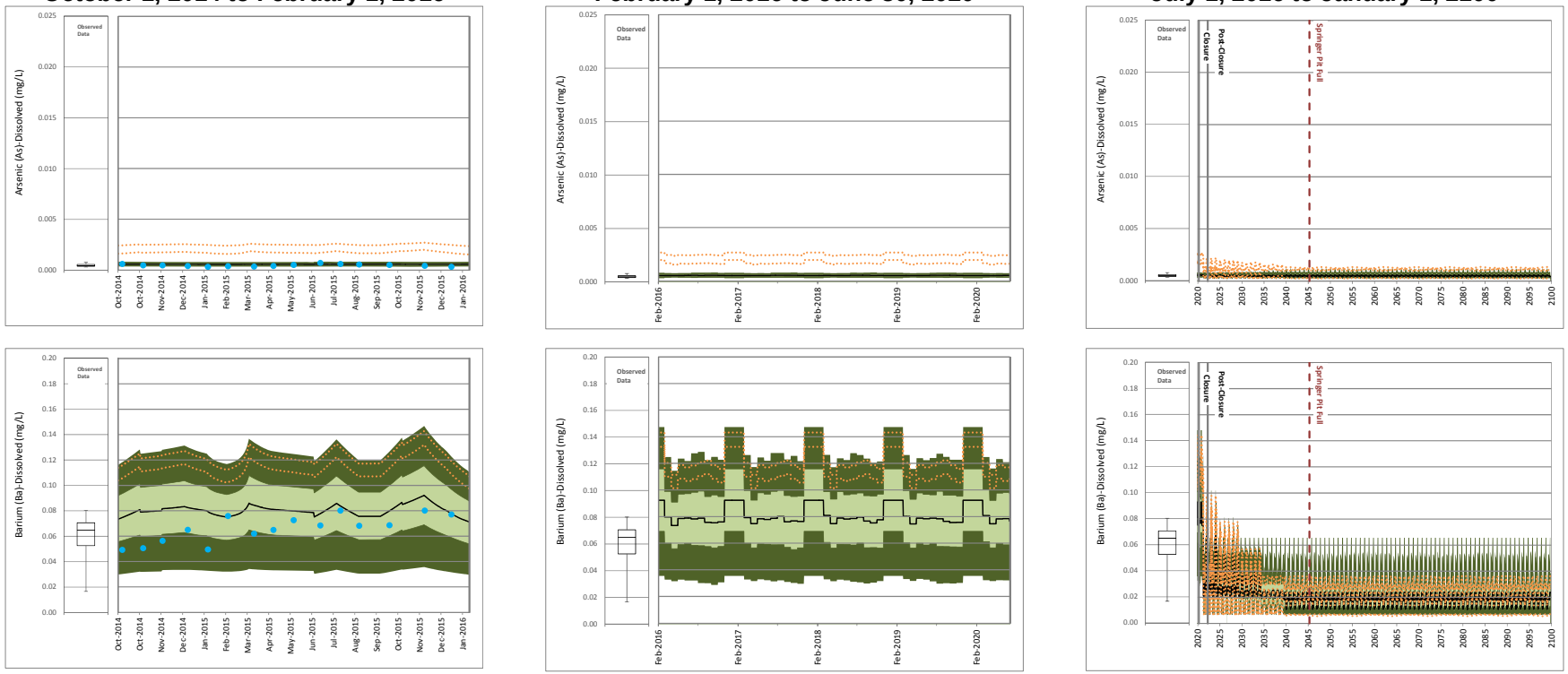
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

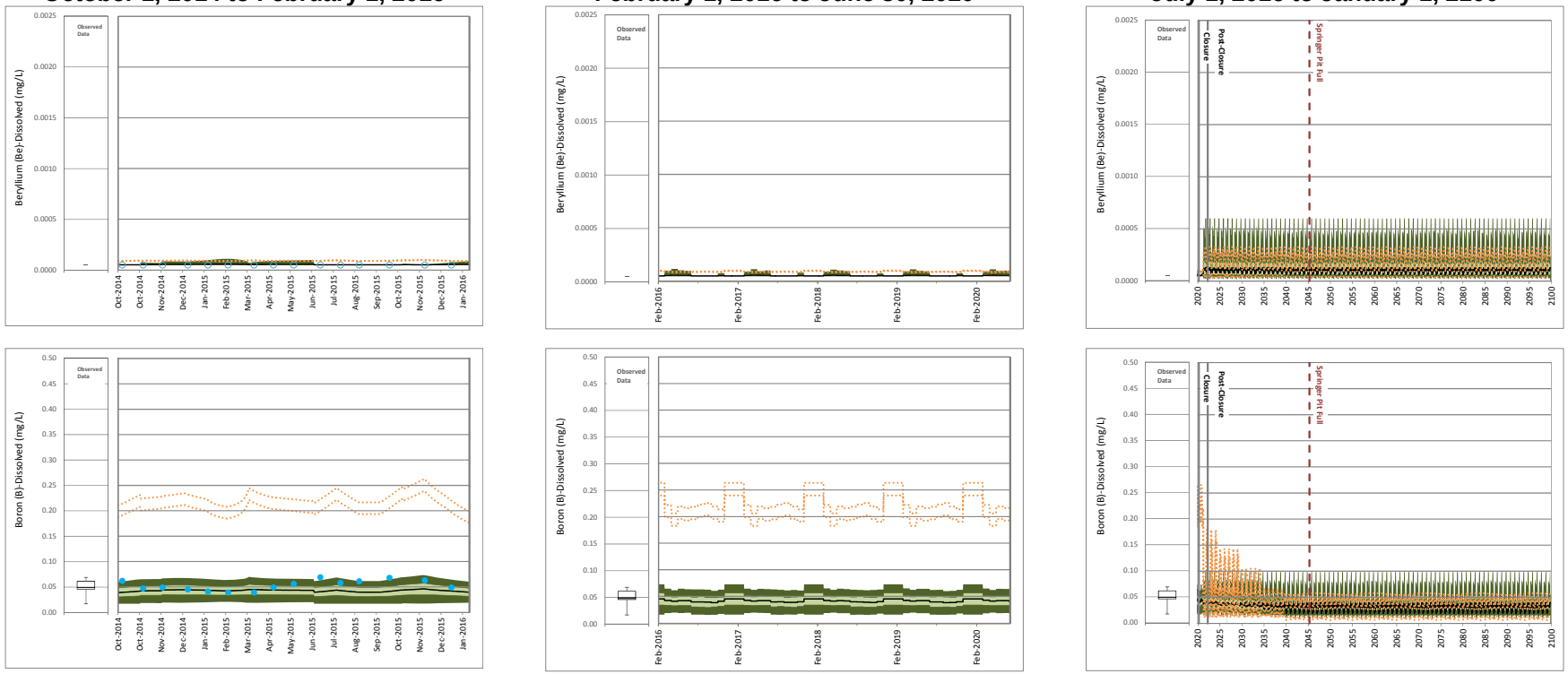
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

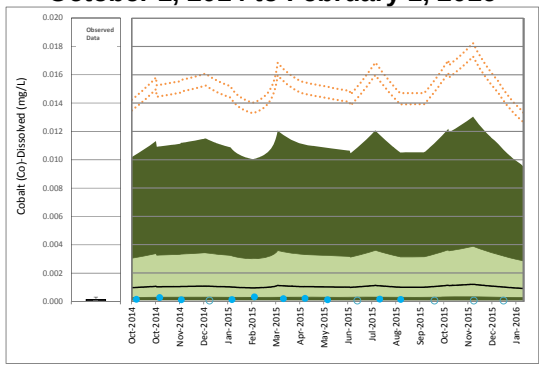
95th Percentile High, 5th Percentile Low

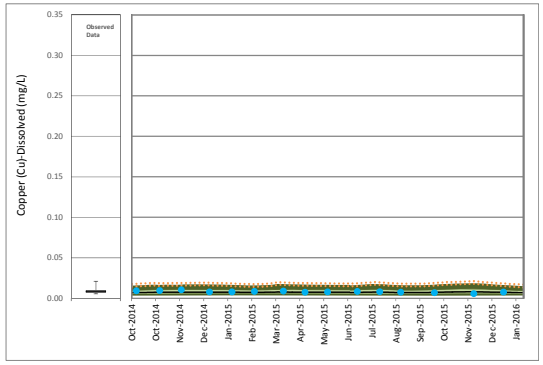
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

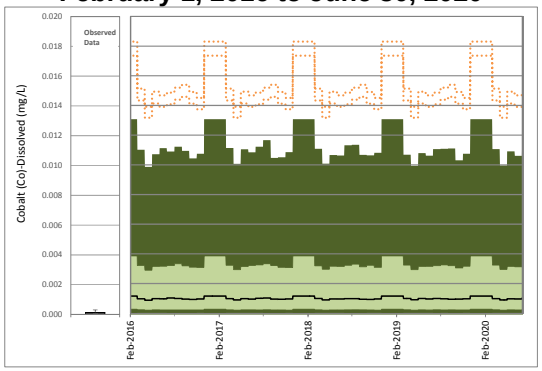
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

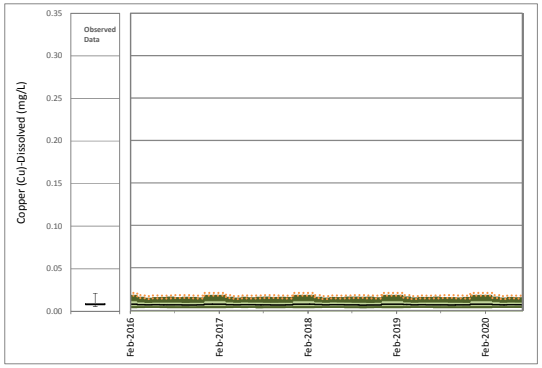
Calibration
October 1, 2014 to February 1, 2016



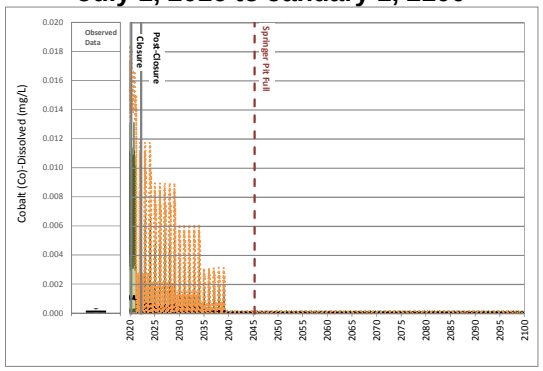


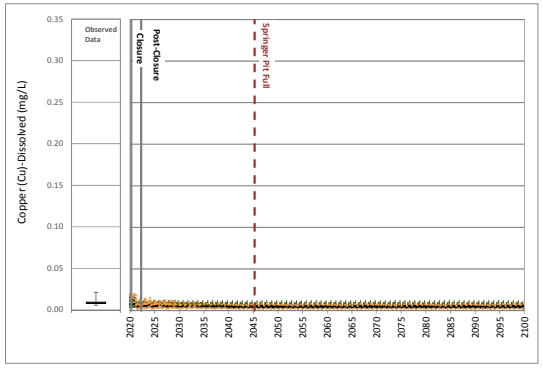
Operations
February 1, 2016 to June 30, 2020



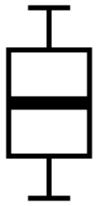


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

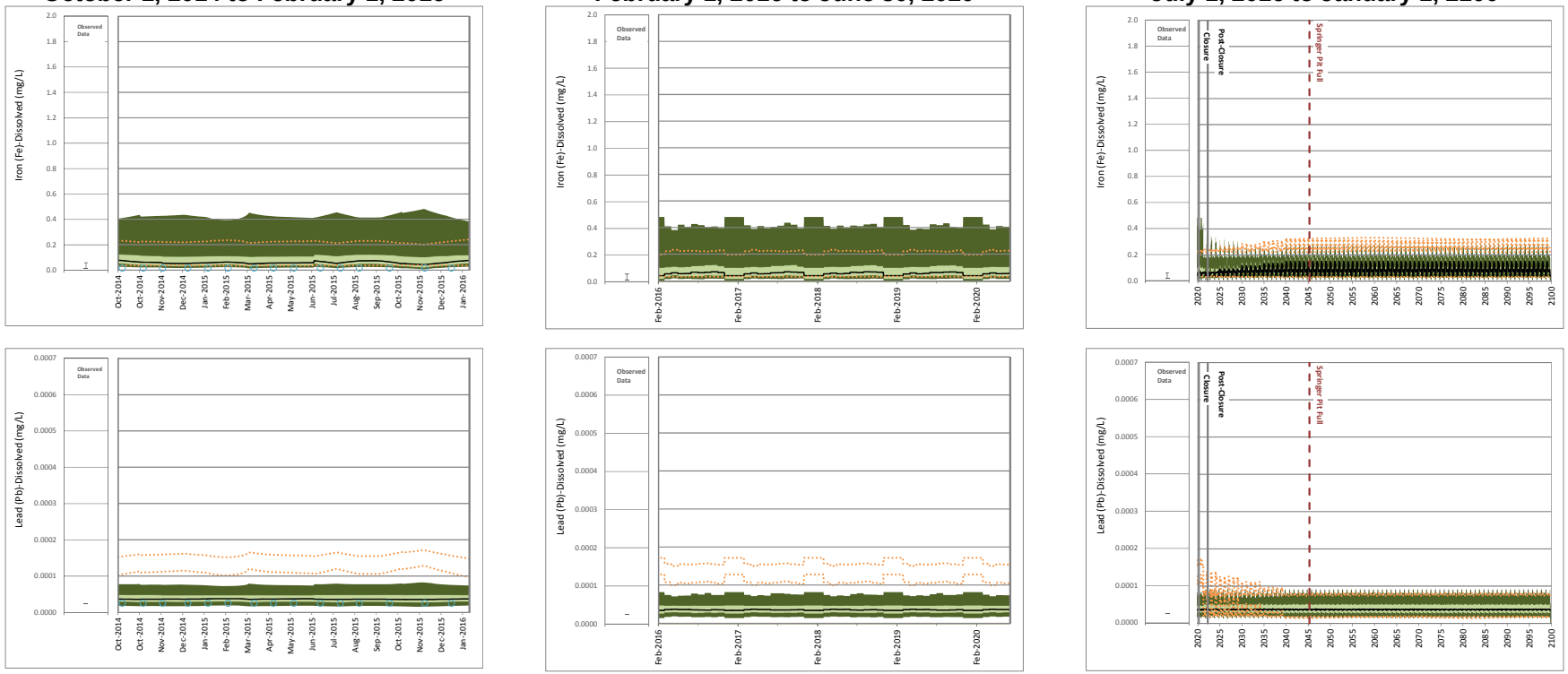
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

- Detected Values
- Non- Detected Values

Scenario 2

- 95th Percentile High, 5th Percentile Low

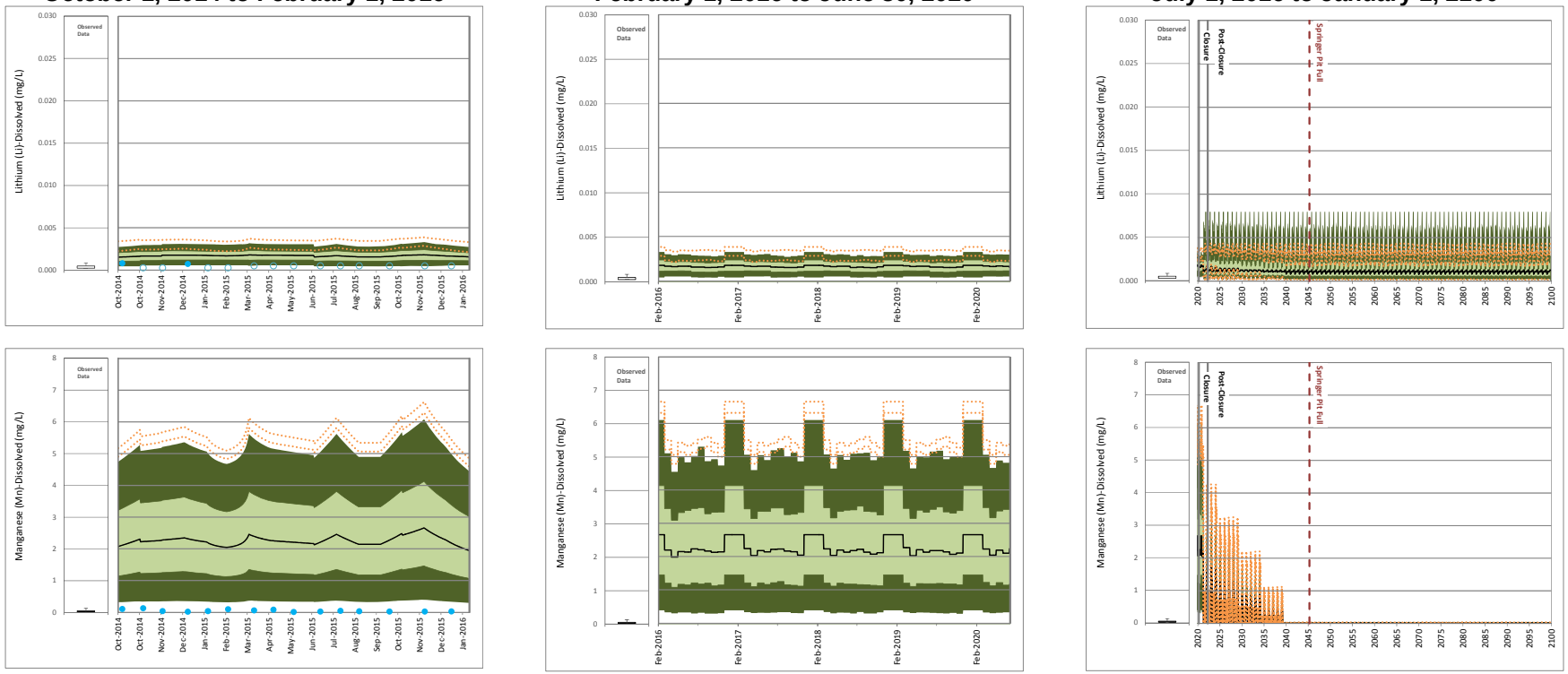
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

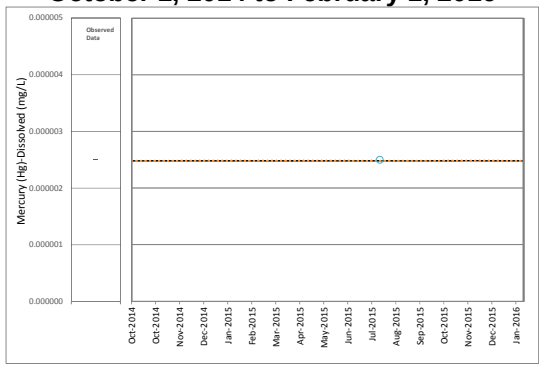
95th Percentile High, 5th Percentile Low

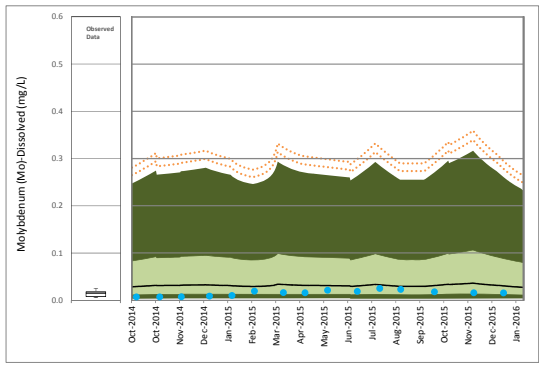
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

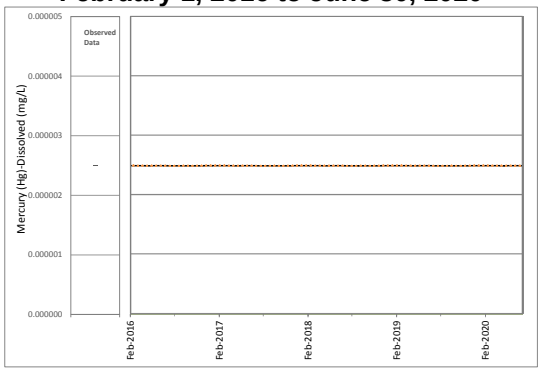
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

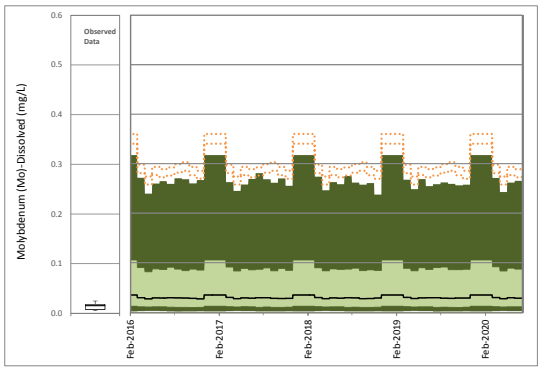
Calibration
October 1, 2014 to February 1, 2016



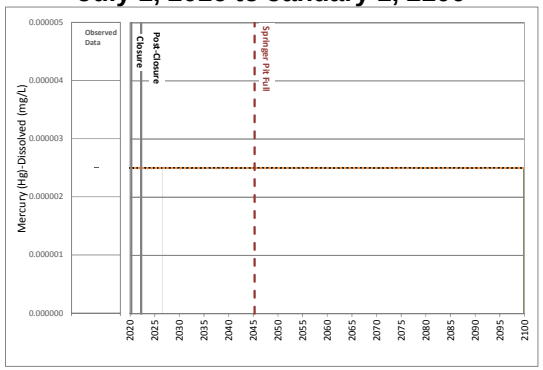


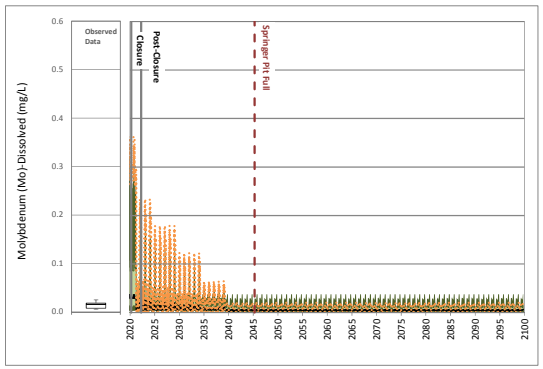
Operations
February 1, 2016 to June 30, 2020



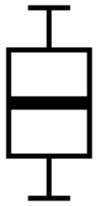


Closure and Post-closure
July 1, 2016 to January 1, 2100



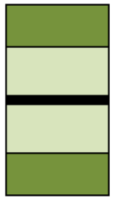


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

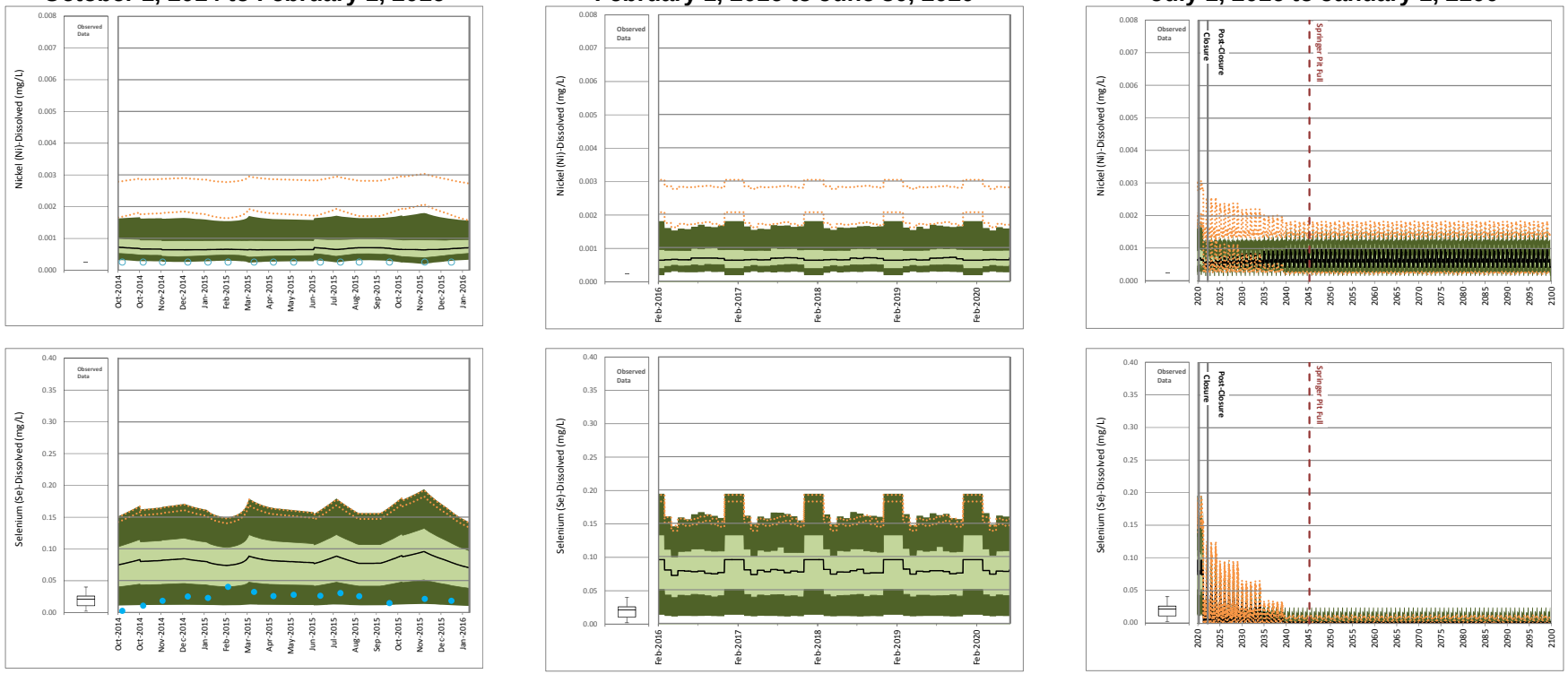
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

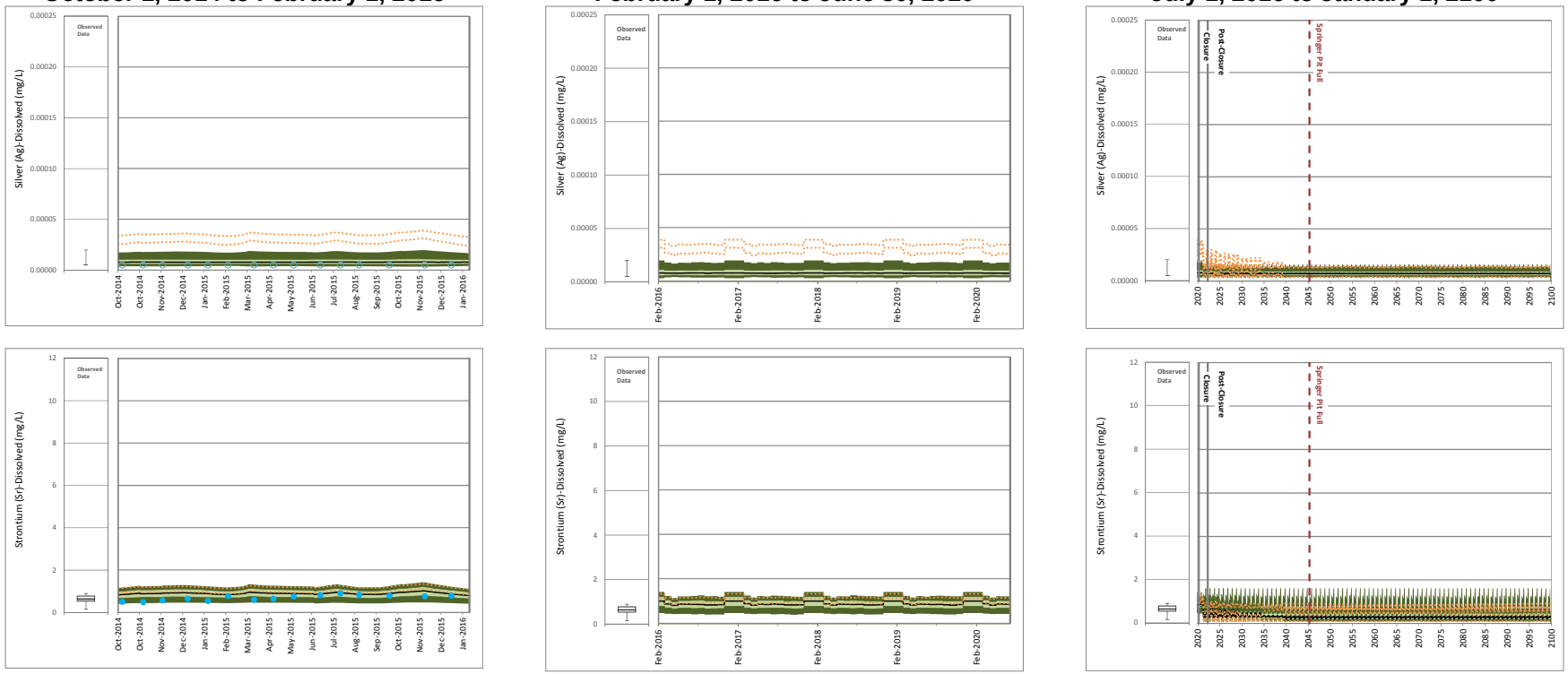
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

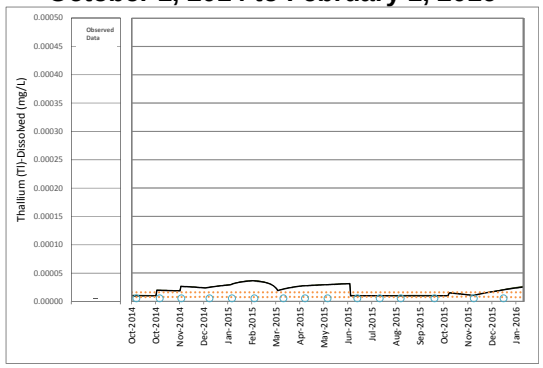
95th Percentile High, 5th Percentile Low

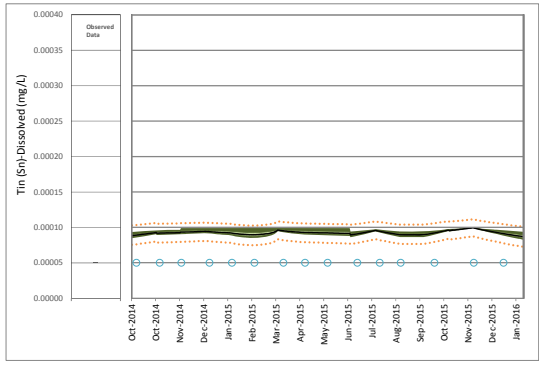
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

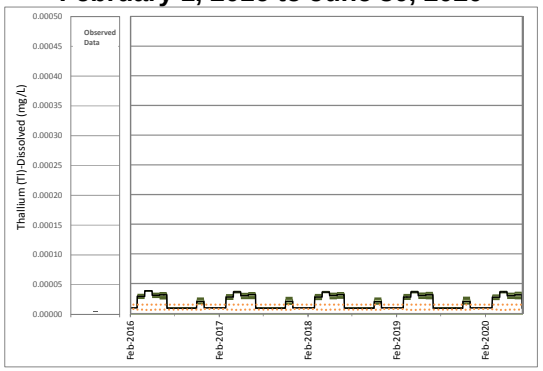
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

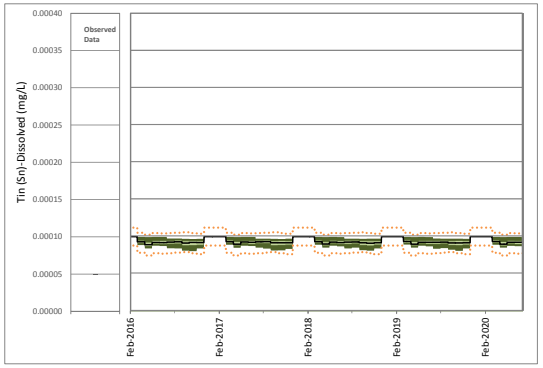
Calibration
October 1, 2014 to February 1, 2016



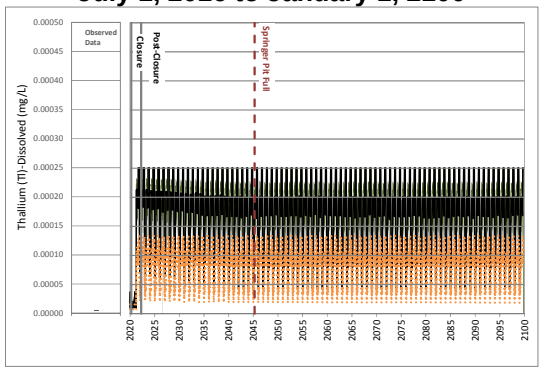


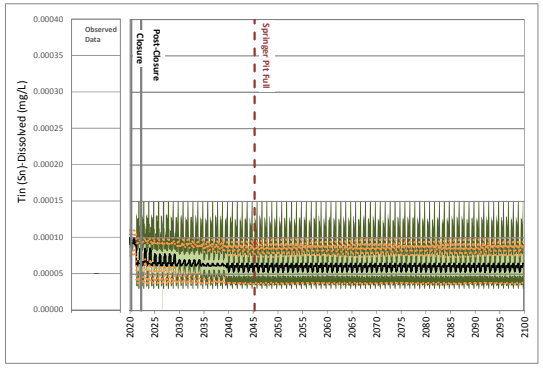
Operations
February 1, 2016 to June 30, 2020



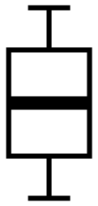


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

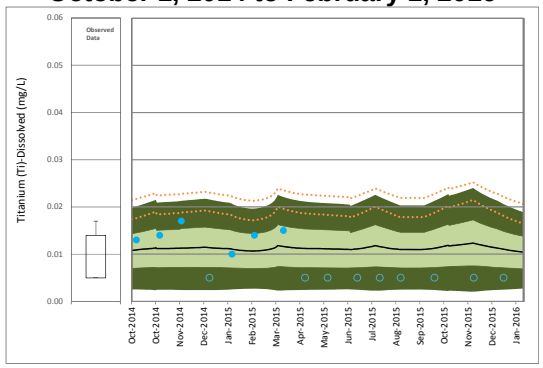
95th Percentile High, 5th Percentile Low

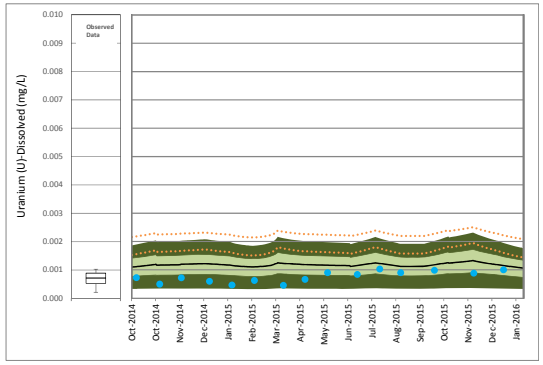
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

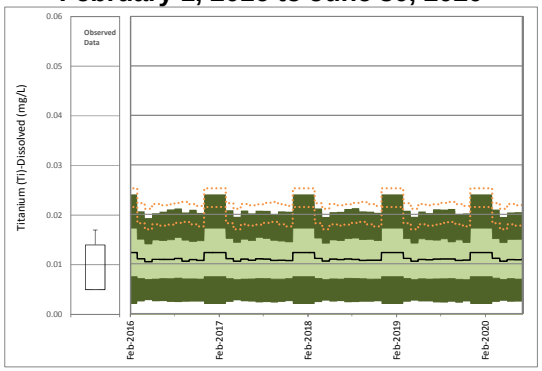
ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

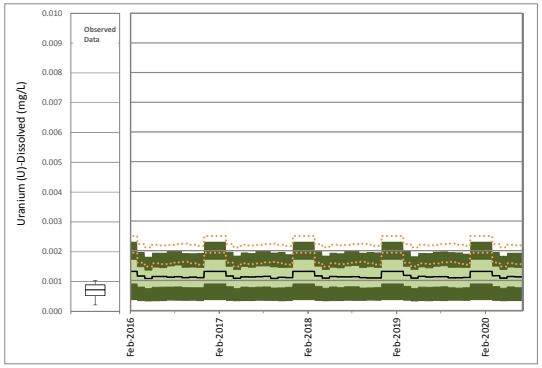
Calibration
October 1, 2014 to February 1, 2016



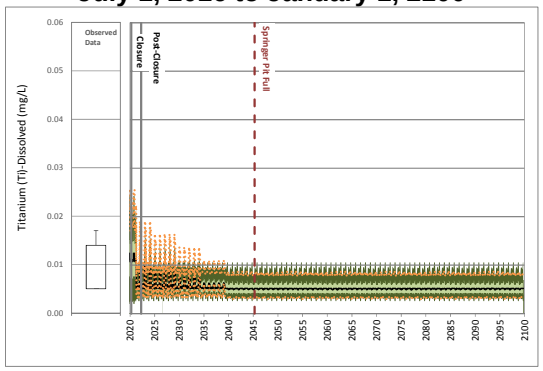


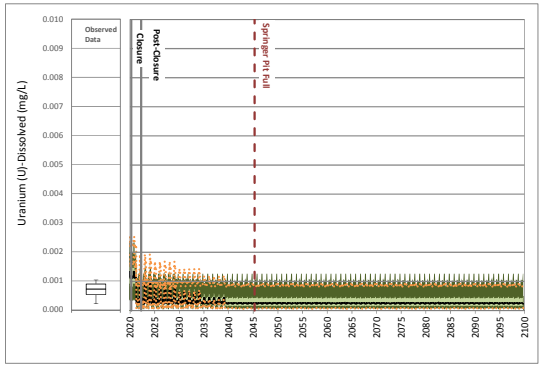
Operations
February 1, 2016 to June 30, 2020



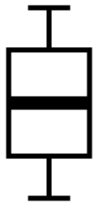


Closure and Post-closure
July 1, 2016 to January 1, 2100



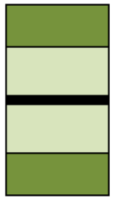


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

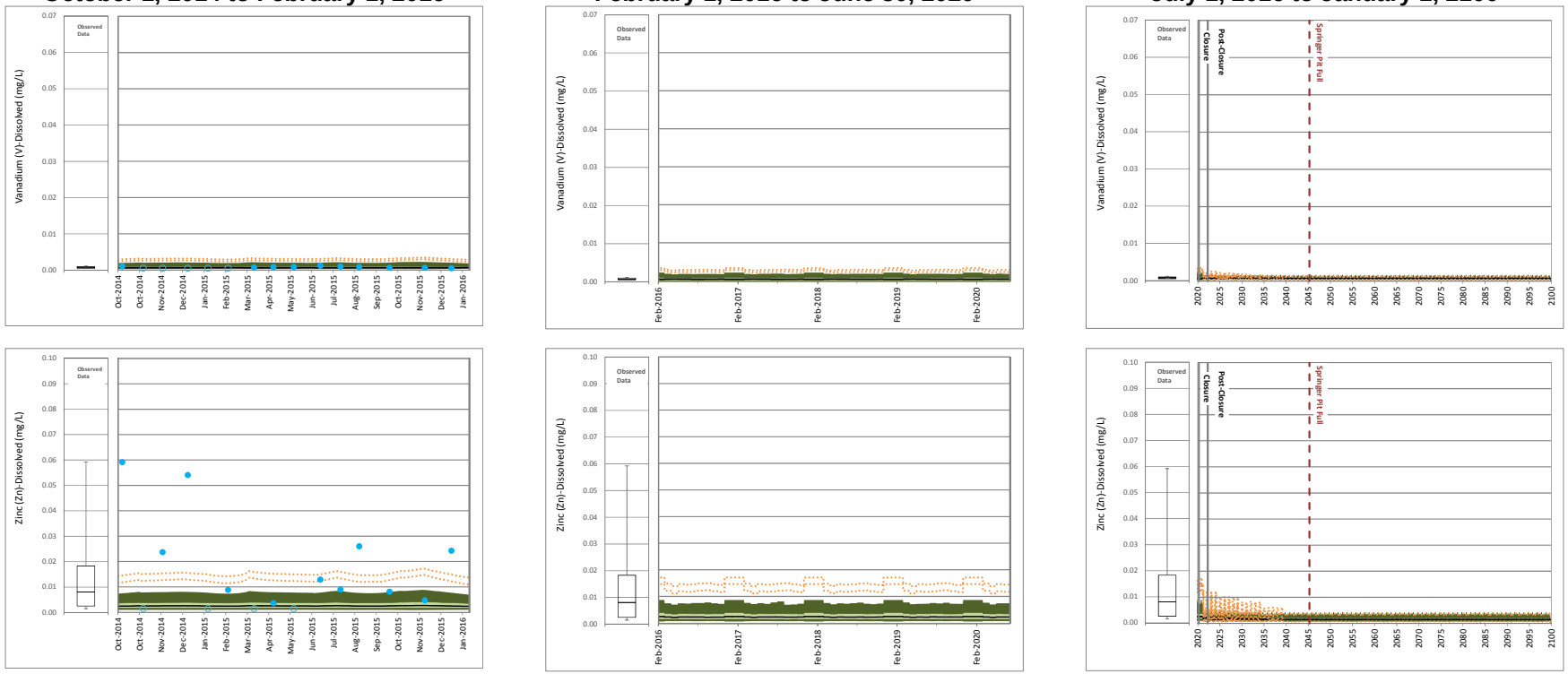
Golder Associates

ATTACHMENT B
Figure B5: Time Series Plots of Predicted 9K Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

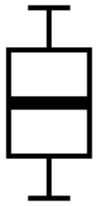
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig5-9ks.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.6 Northwest (NW) Sump

Table B6 presents the maximum predicted median and 95th percentile results for the NW Sump, calculated based on 500 realizations for Scenario 1 (Table B6a) and Scenario 2 (Table B6b). Time series plots for each modelled parameter are provided in Figure B6.

Table B6a:
Predicted Northwest Sump Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	798	1264	798	1264	798	1264	524	823	156	508
Total Dissolved Solids	mg/L	1178	1848	1178	1848	1178	1848	771	1167	214	780
Major Ions											
Calcium	mg/L	245	392	245	392	245	392	160	256	47	154
Chloride	mg/L	4.1	11	4.1	11	4.1	11	3.0	7.0	1.6	6.5
Fluoride	mg/L	0.098	0.19	0.098	0.19	0.098	0.19	0.089	0.14	0.074	0.11
Magnesium	mg/L	45	69	45	69	45	69	30	45	9.0	30
Potassium	mg/L	4.1	6.4	4.1	6.4	4.1	6.4	2.8	4.2	0.94	2.4
Sodium	mg/L	20	34	20	34	20	34	14	22	4.9	12
Sulphate	mg/L	572	996	572	996	572	996	352	606	37	318
Nutrients											
Ammonia	mg/L (as N)	0.057	0.72	0.057	0.72	0.057	0.72	0.057	0.72	0.057	0.72
Nitrate	mg/L (as N)	21	43	21	43	21	43	21	43	21	43
Nitrite	mg/L (as N)	0.072	1.2	0.072	1.2	0.072	1.2	0.072	1.2	0.072	1.2
Total Phosphorus	mg/L	0.033	0.074	0.033	0.074	0.033	0.074	0.03	0.054	0.024	0.053
Total Metals											
Aluminum	mg/L	0.52	0.56	0.51	0.56	0.53	0.72	0.61	0.74	0.61	0.74
Antimony	mg/L	0.00028	0.00063	0.00028	0.00063	0.00028	0.00063	0.00021	0.00047	0.000097	0.0004
Arsenic	mg/L	0.00075	0.001	0.00076	0.001	0.00075	0.001	0.00077	0.0014	0.00077	0.0014
Barium	mg/L	0.098	0.15	0.098	0.15	0.098	0.15	0.069	0.1	0.029	0.071
Beryllium	mg/L	0.000067	0.00025	0.000068	0.00026	0.00013	0.00068	0.00013	0.00068	0.00013	0.00068
Boron	mg/L	0.049	0.11	0.049	0.11	0.049	0.13	0.046	0.13	0.042	0.13
Cadmium	mg/L	0.000049	0.00036	0.000049	0.00036	0.000049	0.00036	0.000035	0.00025	0.000015	0.00014
Chromium	mg/L	0.00092	0.0011	0.00091	0.0011	0.0011	0.0016	0.0014	0.0018	0.0015	0.0018
Cobalt	mg/L	0.0015	0.013	0.0015	0.013	0.0015	0.013	0.0011	0.0081	0.0004	0.00054
Copper	mg/L	0.012	0.034	0.012	0.034	0.012	0.034	0.011	0.029	0.01	0.028
Iron	mg/L	0.61	1.0	0.61	1.0	0.61	1.0	0.69	0.87	0.69	0.84
Lead	mg/L	0.00018	0.00023	0.00018	0.00023	0.00018	0.00024	0.00018	0.00024	0.00018	0.00024
Lithium	mg/L	0.0021	0.0062	0.0021	0.0062	0.0021	0.011	0.002	0.011	0.0016	0.011
Manganese	mg/L	2.7	6.1	2.7	6.1	2.7	6.1	1.6	3.5	0.022	0.058
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.036	0.33	0.036	0.33	0.036	0.33	0.025	0.21	0.0057	0.051
Nickel	mg/L	0.0013	0.0024	0.0013	0.0024	0.0013	0.0024	0.0015	0.0022	0.0015	0.0023
Selenium	mg/L	0.1	0.2	0.1	0.2	0.1	0.2	0.056	0.12	0.002	0.028
Silver	mg/L	0.0000079	0.00003	0.0000079	0.00003	0.0000079	0.00003	0.0000078	0.000026	0.0000073	0.000026
Strontium	mg/L	1.0	1.8	1.0	1.8	1.0	2.0	0.75	2.0	0.34	2.0
Thallium	mg/L	0.000062	0.000073	0.000067	0.000078	0.00025	0.00026	0.00025	0.00026	0.00025	0.00026
Tin	mg/L	0.0001	0.00021	0.0001	0.00021	0.0001	0.00025	0.000084	0.00025	0.000064	0.00025
Titanium	mg/L	0.035	0.046	0.035	0.046	0.035	0.046	0.032	0.039	0.028	0.033
Uranium	mg/L	0.0014	0.003	0.0014	0.003	0.0014	0.003	0.001	0.0022	0.00031	0.0019
Vanadium	mg/L	0.0019	0.0036	0.0019	0.0036	0.002	0.0036	0.002	0.0029	0.002	0.0029
Zinc	mg/L	0.0042	0.01	0.0042	0.01	0.0042	0.01	0.0038	0.0075	0.0031	0.0058
Dissolved Metals											
Aluminum	mg/L	0.03	0.068	0.024	0.072	0.043	0.23	0.12	0.25	0.12	0.25
Antimony	mg/L	0.00026	0.00045	0.00026	0.00045	0.00026	0.00045	0.00019	0.00029	0.000077	0.00022
Arsenic	mg/L	0.00057	0.00081	0.00057	0.00082	0.00056	0.00084	0.00058	0.0012	0.00058	0.0012
Barium	mg/L	0.093	0.15	0.093	0.15	0.093	0.15	0.063	0.097	0.024	0.065
Beryllium	mg/L	0.000067	0.00017	0.000068	0.00018	0.00013	0.0006	0.00013	0.0006	0.00013	0.0006
Boron	mg/L	0.046	0.074	0.046	0.074	0.046	0.098	0.043	0.098	0.039	0.098
Cadmium	mg/L	0.000044	0.00027	0.000044	0.00027	0.000044	0.00027	0.000031	0.00016	0.000011	0.000049
Chromium	mg/L	0.00028	0.00041	0.00026	0.00044	0.00047	0.00092	0.0008	0.0012	0.00081	0.0012
Cobalt	mg/L	0.0012	0.013	0.0012	0.013	0.0012	0.013	0.00074	0.0077	0.000077	0.00022
Copper	mg/L	0.0079	0.019	0.0079	0.019	0.0079	0.019	0.0067	0.014	0.0054	0.012
Iron	mg/L	0.067	0.48	0.064	0.48	0.065	0.48	0.14	0.33	0.15	0.3
Lead	mg/L	0.000038	0.000083	0.000038	0.000083	0.000038	0.000091	0.000039	0.000091	0.000039	0.000091
Lithium	mg/L	0.0018	0.0033	0.0018	0.0033	0.0018	0.008	0.0017	0.008	0.0013	0.008
Manganese	mg/L	2.7	6.1	2.7	6.1	2.7	6.1	1.5	3.5	0.0068	0.043
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.036	0.32	0.036	0.32	0.036	0.32	0.025	0.2	0.0057	0.037
Nickel	mg/L	0.00069	0.0018	0.0007	0.0018	0.00069	0.0018	0.001	0.0017	0.001	0.0017
Selenium	mg/L	0.1	0.2	0.1	0.2	0.1	0.2	0.056	0.11	0.002	0.024
Silver	mg/L	0.0000079	0.00002	0.0000079	0.00002	0.0000079	0.00002	0.0000078	0.000016	0.0000073	0.000016
Strontium	mg/L	1.0	1.4	1.0	1.4	1.0	1.6	0.73	1.6	0.32	1.6
Thallium	mg/L	0.000062	0.000063	0.000067	0.000068	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Tin	mg/L	0.0001	0.00011	0.0001	0.00011	0.0001	0.00015	0.000084	0.00015	0.000064	0.00015
Titanium	mg/L	0.012	0.024	0.012	0.024	0.012	0.024	0.0095	0.017	0.0052	0.011
Uranium	mg/L	0.0013	0.0023	0.0013	0.0023	0.0013	0.0023	0.0009	0.0015	0.00027	0.0013
Vanadium	mg/L	0.00064	0.0023	0.00064	0.0023	0.00068	0.0023	0.00068	0.0017	0.00067	0.0016
Zinc	mg/L	0.0027	0.0089	0.0027	0.0089	0.0027	0.0089	0.0023	0.006	0.0015	0.0042

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

Table B6b:
Predicted Northwest Sump Water Quality - Scenario 2

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	1077	1134	1077	1134	1077	1134	802	869	216	324
Total Dissolved Solids	mg/L	1423	1472	1423	1472	1403	1452	1059	1116	325	453
Major Ions											
Calcium	mg/L	333	346	333	346	333	346	246	262	63	90
Chloride	mg/L	15.0	18	15.0	18	15.0	18	11.0	15.0	3.4	8.7
Fluoride	mg/L	0.37	0.4	0.37	0.4	0.37	0.4	0.30	0.33	0.12	0.17
Magnesium	mg/L	60	66	60	66	60	66	46	52	14.0	24
Potassium	mg/L	7.5	7.9	7.5	7.9	7.5	7.9	5.4	5.9	1.5	2.2
Sodium	mg/L	33	35	33	35	33	35	24	27	7.8	13
Sulphate	mg/L	849	855	849	855	849	855	617	631	127	161
Nutrients											
Ammonia	mg/L (as N)	0.27	0.27	0.27	0.27	0.18	0.18	0.18	0.18	0.18	0.18
Nitrate	mg/L (as N)	45	45	45	45	5	5	5	5	5	5
Nitrite	mg/L (as N)	0.61	0.6	1.70	1.7	1.90	1.9	1.90	1.9	1.90	1.9
Total Phosphorus	mg/L	0.059	0.072	0.059	0.072	0.059	0.072	0.053	0.067	0.032	0.053
Total Metals											
Aluminum	mg/L	0.77	0.85	0.77	0.85	0.77	0.85	0.7	0.79	0.61	0.75
Antimony	mg/L	0.00066	0.00083	0.00067	0.00084	0.00067	0.00084	0.00058	0.00076	0.00038	0.00057
Arsenic	mg/L	0.0025	0.0029	0.0025	0.0029	0.0025	0.0029	0.0020	0.0025	0.0010	0.0017
Barium	mg/L	0.15	0.15	0.15	0.15	0.15	0.15	0.10	0.11	0.026	0.042
Beryllium	mg/L	0.00010	0.00018	0.00010	0.00018	0.0001	0.0004	0.00009	0.0004	0.00009	0.0004
Boron	mg/L	0.26	0.3	0.26	0.3	0.26	0.3	0.18	0.22	0.039	0.09
Cadmium	mg/L	0.00034	0.00044	0.00034	0.00044	0.00034	0.00044	0.00023	0.00033	0.000038	0.00014
Chromium	mg/L	0.0015	0.0017	0.0015	0.0017	0.0015	0.0017	0.0015	0.0019	0.0015	0.0019
Cobalt	mg/L	0.019	0.019	0.019	0.019	0.019	0.019	0.0120	0.012	0.0013	0.0013
Copper	mg/L	0.025	0.037	0.025	0.037	0.025	0.037	0.022	0.034	0.012	0.025
Iron	mg/L	0.66	0.78	0.66	0.77	0.67	0.78	0.69	0.86	0.69	0.86
Lead	mg/L	0.00029	0.00032	0.00029	0.00032	0.00029	0.00032	0.00025	0.00028	0.00018	0.00023
Lithium	mg/L	0.0041	0.0074	0.0041	0.0074	0.0041	0.007	0.0037	0.007	0.0021	0.007
Manganese	mg/L	6.7	6.7	6.7	6.7	6.7	6.7	4.3	4.4	0.48	0.49
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.36	0.38	0.36	0.38	0.36	0.38	0.26	0.28	0.052	0.067
Nickel	mg/L	0.0032	0.0036	0.0032	0.0036	0.0032	0.0036	0.0027	0.0032	0.0018	0.0026
Selenium	mg/L	0.19	0.2	0.19	0.2	0.19	0.2	0.15	0.15	0.037	0.043
Silver	mg/L	0.000035	0.000049	0.000035	0.000049	0.000035	0.000049	0.000024	0.000039	0.0000076	0.000025
Strontium	mg/L	2.3	2.8	2.3	2.8	2.3	2.8	2.0	2.6	1.4	2.0
Thallium	mg/L	0.000011	0.000025	0.000011	0.000025	0.00013	0.00014	0.00013	0.00014	0.00013	0.00014
Tin	mg/L	0.0001	0.00021	0.0001	0.00021	0.0001	0.00021	0.000085	0.0002	0.000058	0.0002
Titanium	mg/L	0.046	0.048	0.046	0.048	0.046	0.048	0.04	0.042	0.029	0.032
Uranium	mg/L	0.0025	0.0035	0.0025	0.0035	0.0025	0.0035	0.0022	0.0032	0.0010	0.0023
Vanadium	mg/L	0.0045	0.0048	0.0045	0.0048	0.0045	0.0048	0.0036	0.0039	0.0021	0.0025
Zinc	mg/L	0.018	0.019	0.018	0.019	0.018	0.019	0.012	0.014	0.0036	0.0059
Dissolved Metals											
Aluminum	mg/L	0.28	0.36	0.28	0.36	0.28	0.36	0.21	0.3	0.12	0.26
Antimony	mg/L	0.00064	0.00065	0.00065	0.00066	0.00065	0.00066	0.00056	0.00058	0.00036	0.00039
Arsenic	mg/L	0.0023	0.0027	0.0023	0.0027	0.0023	0.0027	0.0018	0.0023	0.00085	0.0015
Barium	mg/L	0.14	0.14	0.14	0.14	0.14	0.14	0.098	0.10	0.021	0.036
Beryllium	mg/L	0.00010	0.0001	0.00010	0.0001	0.0001	0.00032	0.00009	0.00032	0.00009	0.00032
Boron	mg/L	0.26	0.26	0.26	0.26	0.26	0.26	0.18	0.18	0.036	0.057
Cadmium	mg/L	0.00034	0.00034	0.00034	0.00034	0.00034	0.00034	0.00022	0.00023	0.000033	0.000047
Chromium	mg/L	0.00081	0.0011	0.00081	0.0011	0.00081	0.0011	0.00084	0.0012	0.00084	0.0012
Cobalt	mg/L	0.0180	0.018	0.0180	0.018	0.0180	0.018	0.0120	0.012	0.00096	0.0010
Copper	mg/L	0.020	0.021	0.020	0.021	0.020	0.021	0.018	0.019	0.0077	0.01
Iron	mg/L	0.12	0.23	0.12	0.23	0.12	0.24	0.15	0.31	0.15	0.31
Lead	mg/L	0.00015	0.00017	0.00015	0.00017	0.00015	0.00017	0.00010	0.00013	0.000038	0.000082
Lithium	mg/L	0.0038	0.0045	0.0038	0.0045	0.0038	0.0045	0.0034	0.0043	0.0018	0.0043
Manganese	mg/L	6.7	6.7	6.7	6.7	6.7	6.7	4.3	4.3	0.460	0.47
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.36	0.36	0.36	0.36	0.36	0.36	0.26	0.26	0.052	0.054
Nickel	mg/L	0.0026	0.0031	0.0026	0.0031	0.0026	0.0031	0.0021	0.0027	0.0012	0.002
Selenium	mg/L	0.19	0.19	0.19	0.19	0.19	0.19	0.15	0.15	0.037	0.038
Silver	mg/L	0.000035	0.000039	0.000035	0.000039	0.000035	0.000039	0.000024	0.000029	0.0000076	0.000015
Strontium	mg/L	2.3	2.4	2.3	2.4	2.3	2.4	2.0	2.2	1.4	1.6
Thallium	mg/L	0.000011	0.000016	0.000011	0.000016	0.00013	0.00013	0.00013	0.00013	0.00013	0.00013
Tin	mg/L	0.0001	0.00011	0.0001	0.00011	0.0001	0.00011	0.000085	0.0001	0.000058	0.0001
Titanium	mg/L	0.024	0.025	0.024	0.025	0.024	0.025	0.018	0.02	0.0069	0.01
Uranium	mg/L	0.0024	0.0029	0.0024	0.0029	0.0024	0.0029	0.0021	0.0025	0.00098	0.0016
Vanadium	mg/L	0.0032	0.0035	0.0032	0.0035	0.0032	0.0035	0.0023	0.0026	0.00079	0.0012
Zinc	mg/L	0.016	0.017	0.016	0.017	0.016	0.017	0.011	0.012	0.002	0.0043

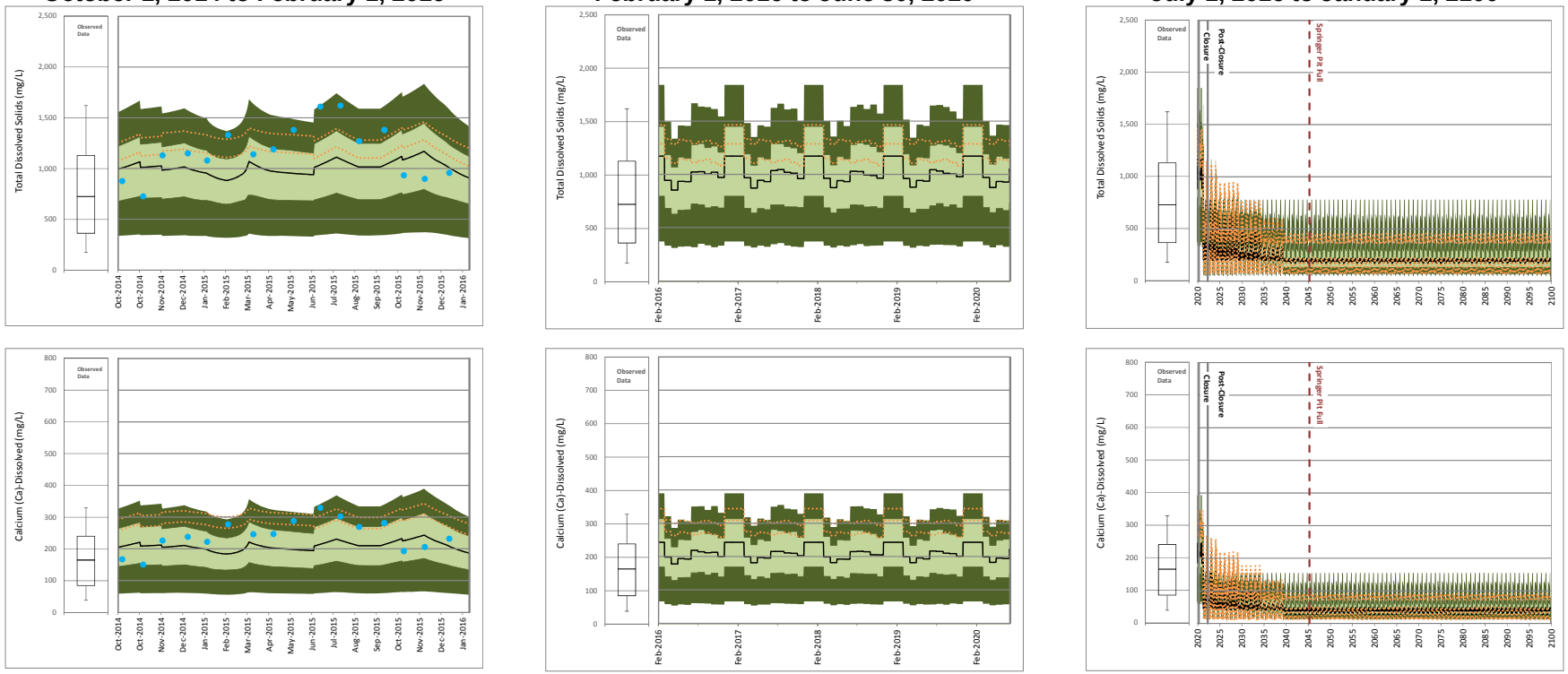
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

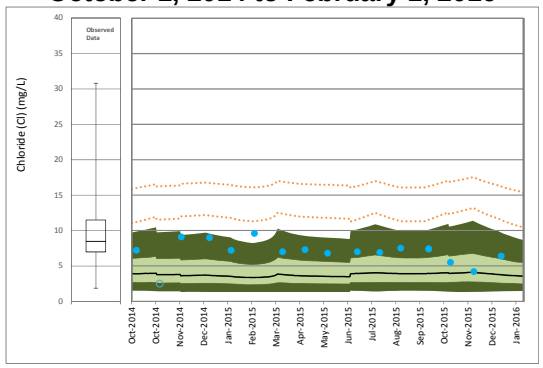
95th Percentile High, 5th Percentile Low

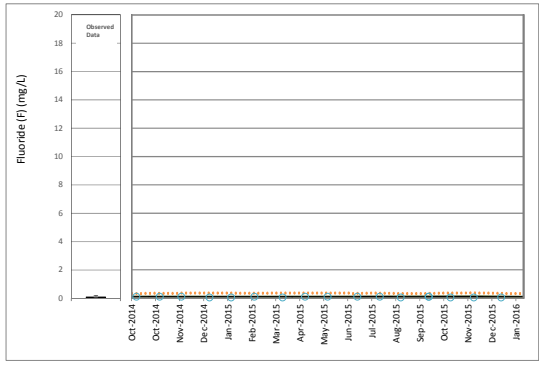
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

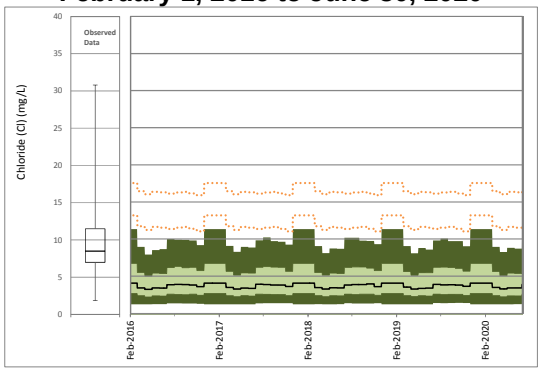
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

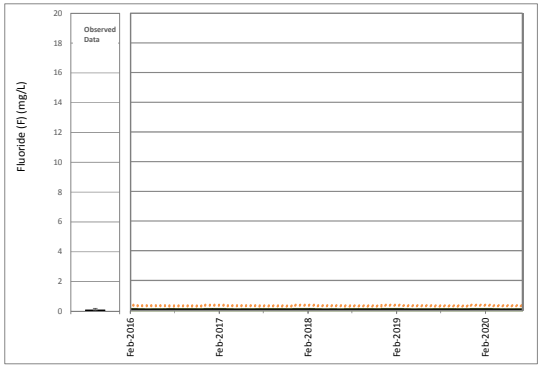
Calibration
October 1, 2014 to February 1, 2016



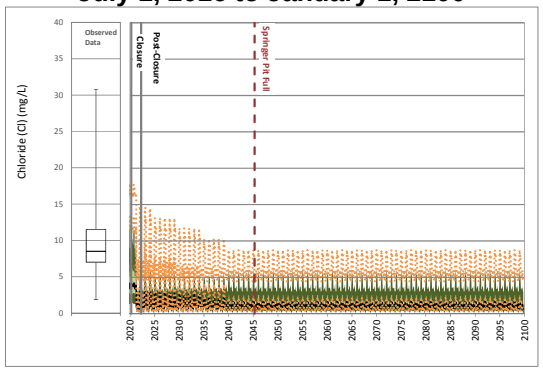


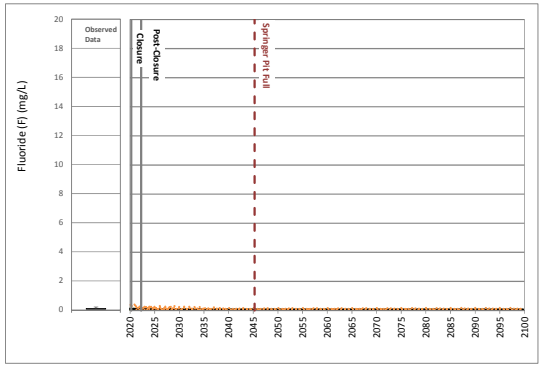
Operations
February 1, 2016 to June 30, 2020



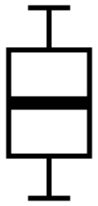


Closure and Post-closure
July 1, 2016 to January 1, 2100



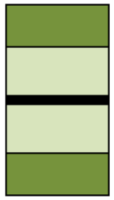


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

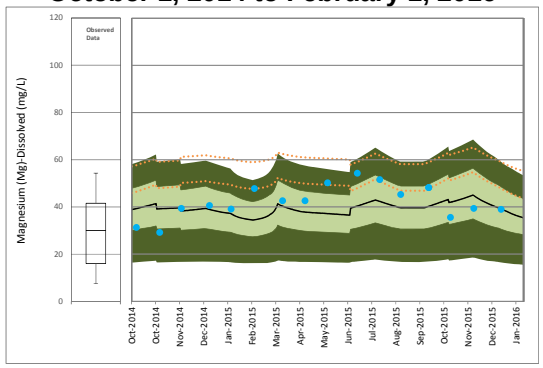
95th Percentile High, 5th Percentile Low

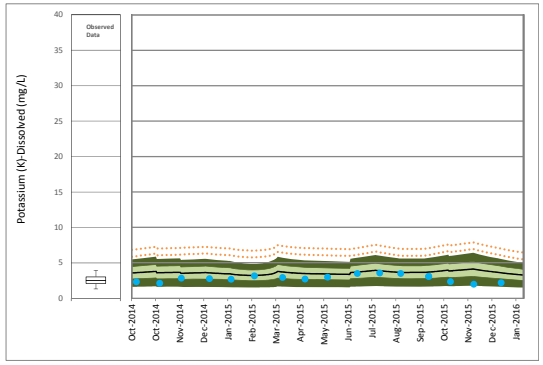
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

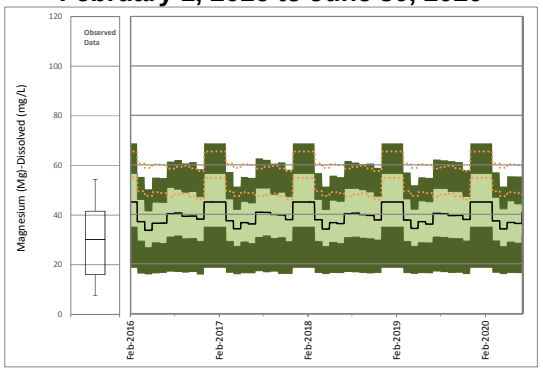
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

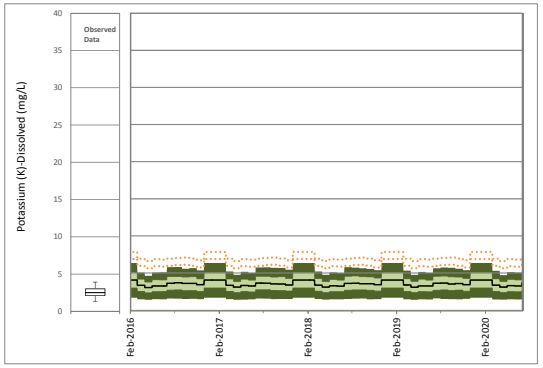
Calibration
October 1, 2014 to February 1, 2016



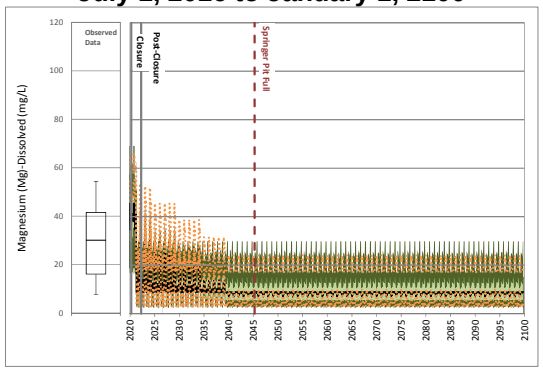


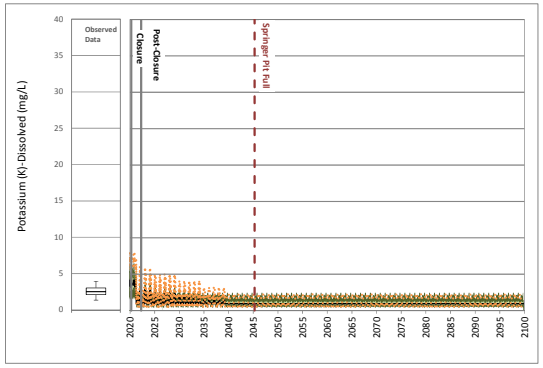
Operations
February 1, 2016 to June 30, 2020



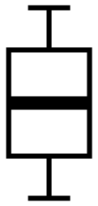


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

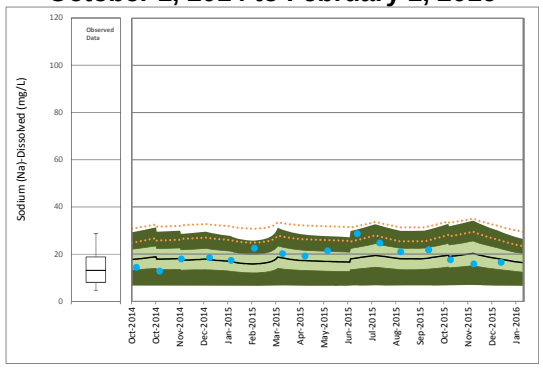
Scenario 2

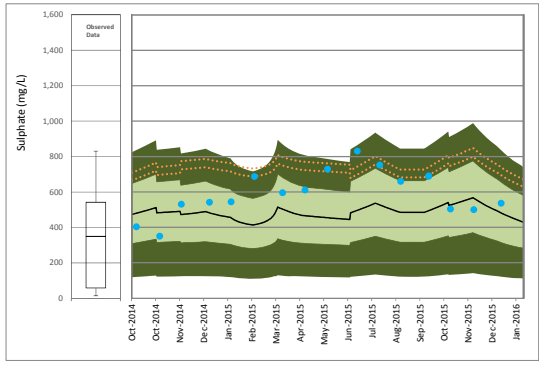
95th Percentile High, 5th Percentile Low

Golder Associates

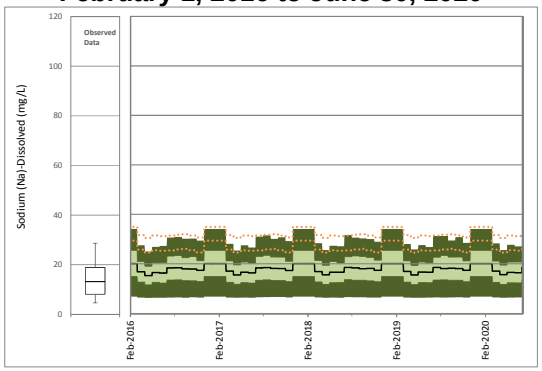
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

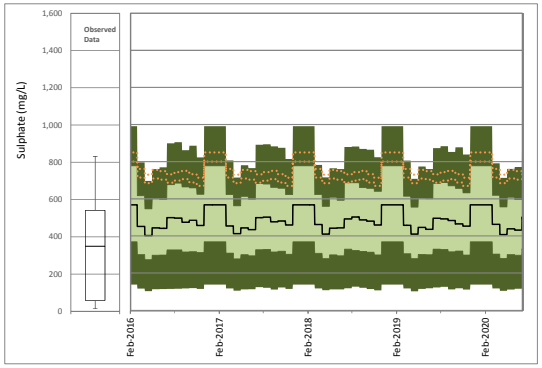
Calibration
October 1, 2014 to February 1, 2016



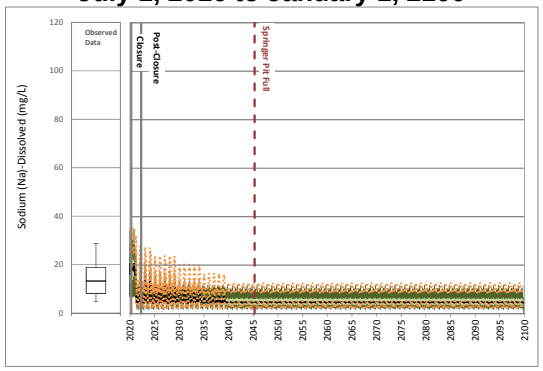


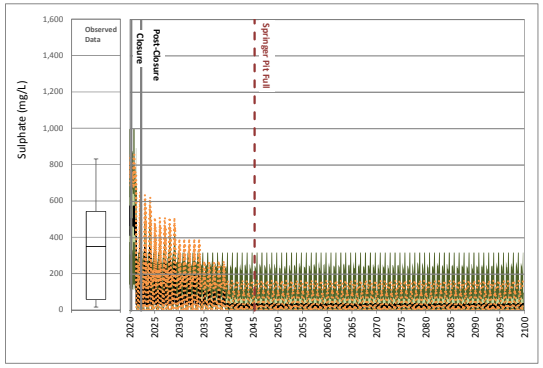
Operations
February 1, 2016 to June 30, 2020



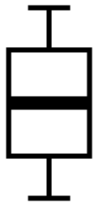


Closure and Post-closure
July 1, 2016 to January 1, 2100



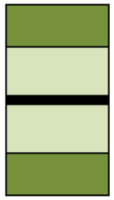


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

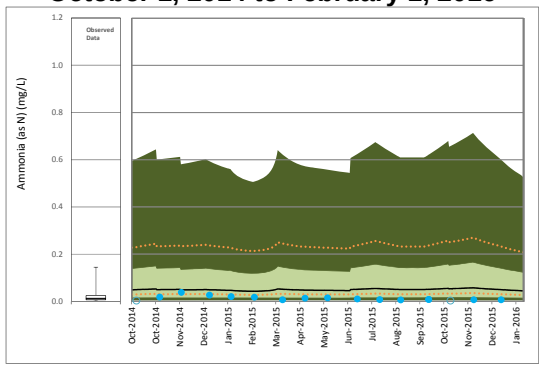
Scenario 2

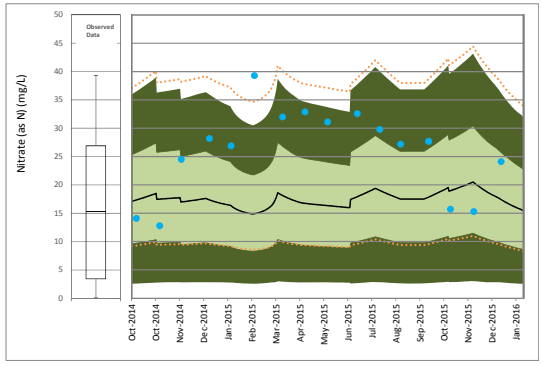
95th Percentile High, 5th Percentile Low

Golder Associates

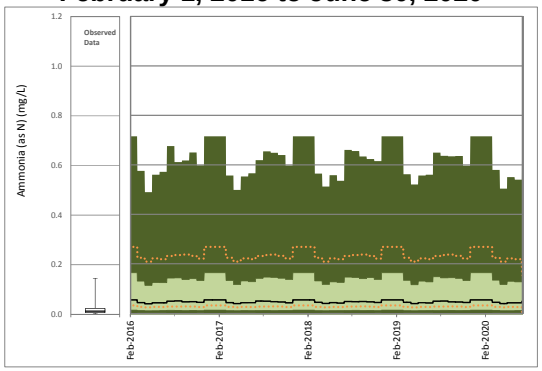
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

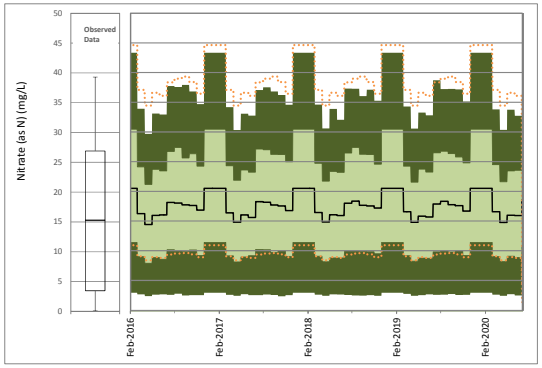
Calibration
October 1, 2014 to February 1, 2016



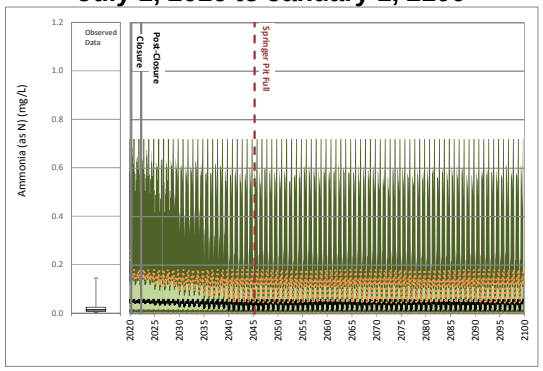


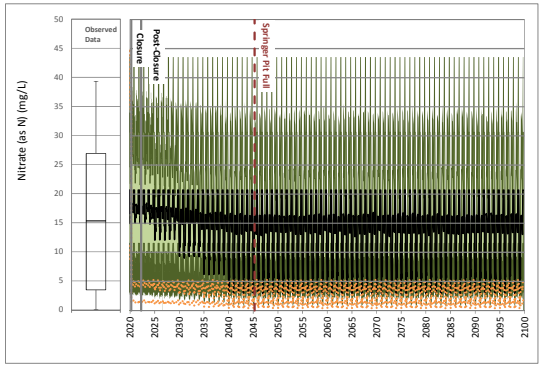
Operations
February 1, 2016 to June 30, 2020



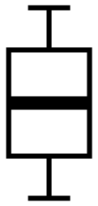


Closure and Post-closure
July 1, 2016 to January 1, 2100



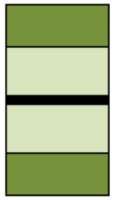


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

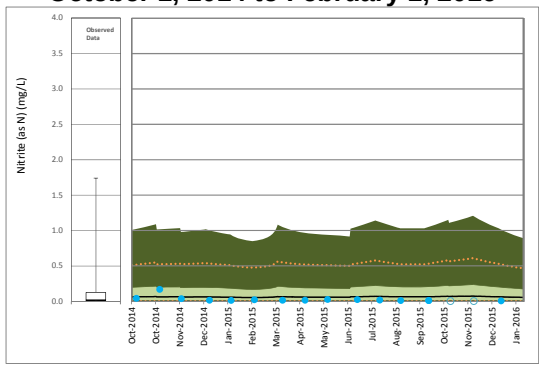
Detected Values
Non- Detected Values

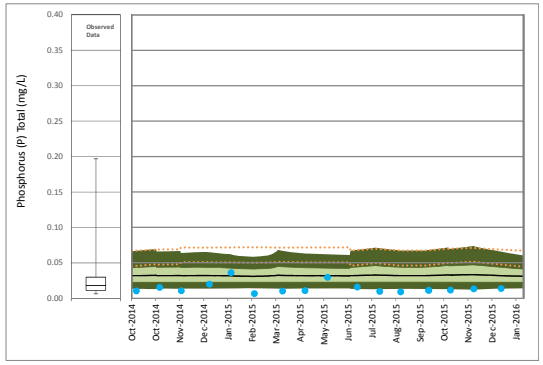
Scenario 2
95th Percentile High, 5th Percentile Low

Golder Associates

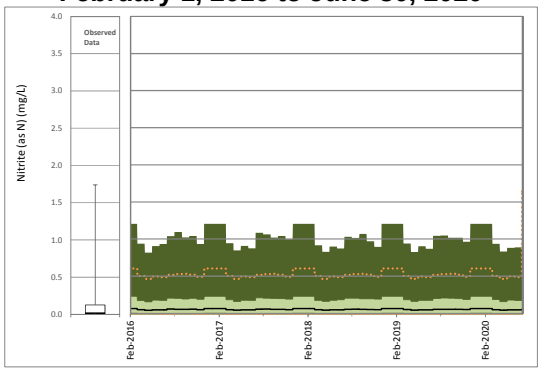
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

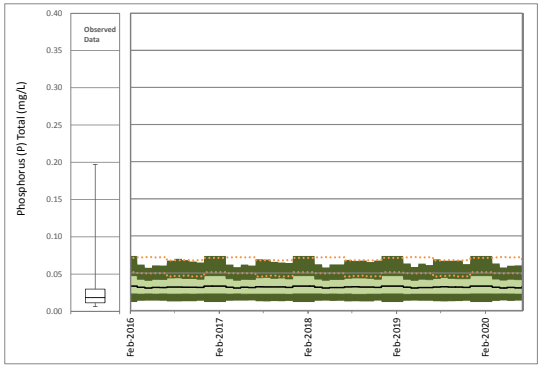
Calibration
October 1, 2014 to February 1, 2016



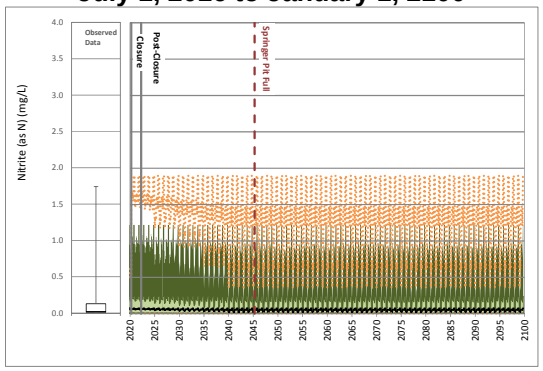


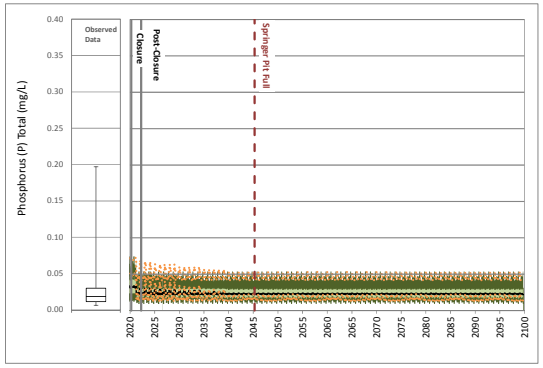
Operations
February 1, 2016 to June 30, 2020



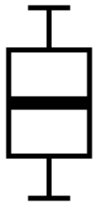


Closure and Post-closure
July 1, 2016 to January 1, 2100



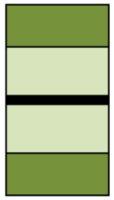


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

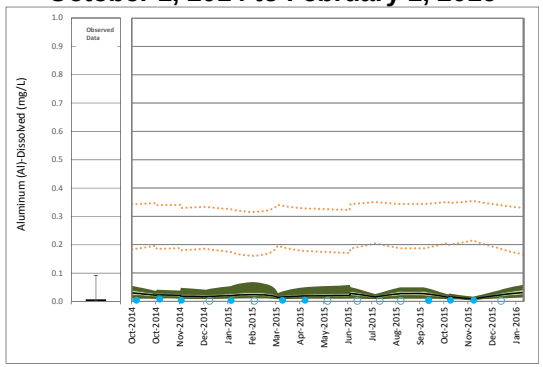
Scenario 2

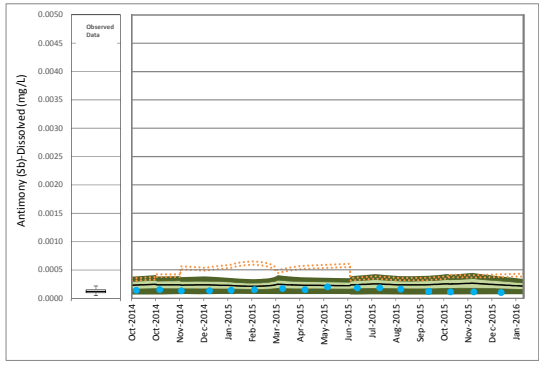
95th Percentile High, 5th Percentile Low

Golder Associates

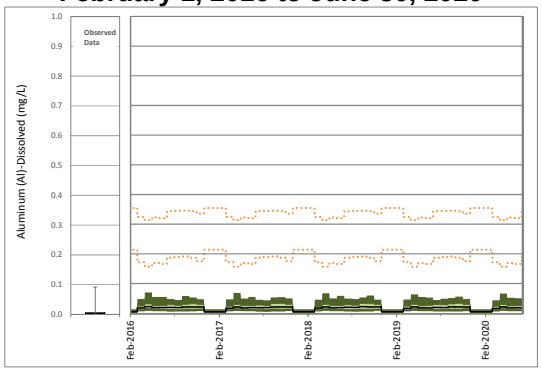
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

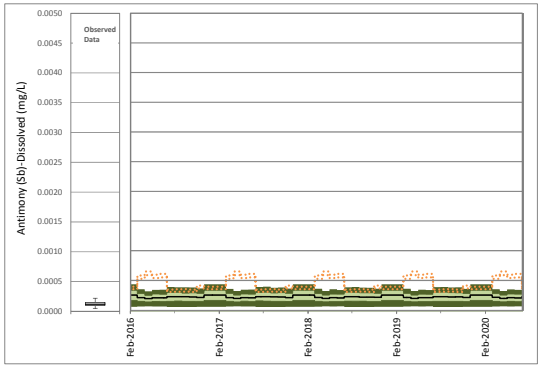
Calibration
October 1, 2014 to February 1, 2016



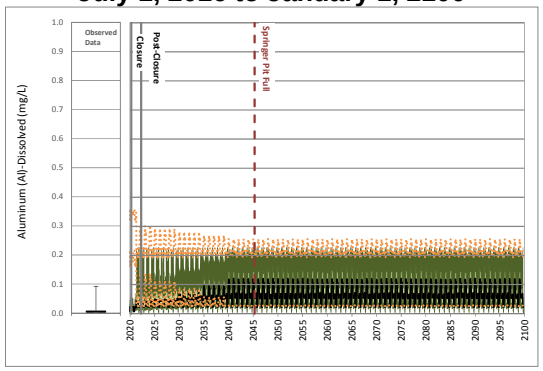


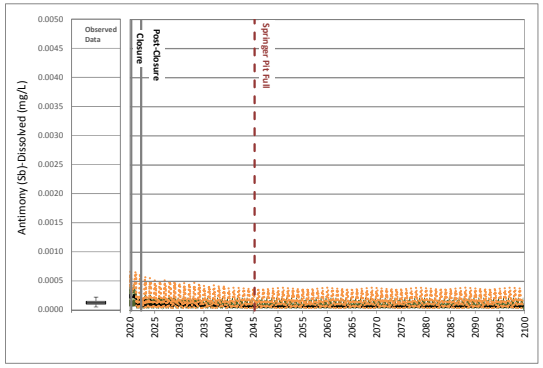
Operations
February 1, 2016 to June 30, 2020



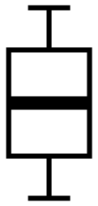


Closure and Post-closure
July 1, 2016 to January 1, 2100



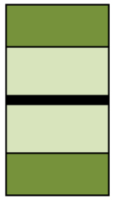


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

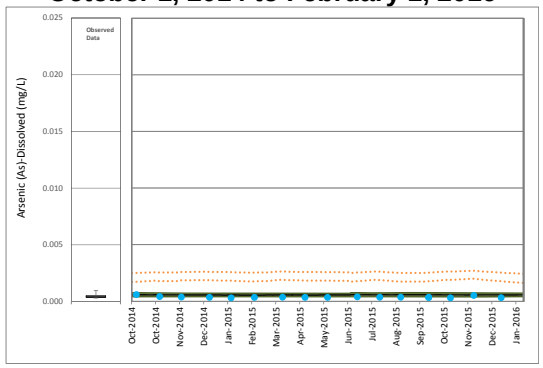
95th Percentile High, 5th Percentile Low

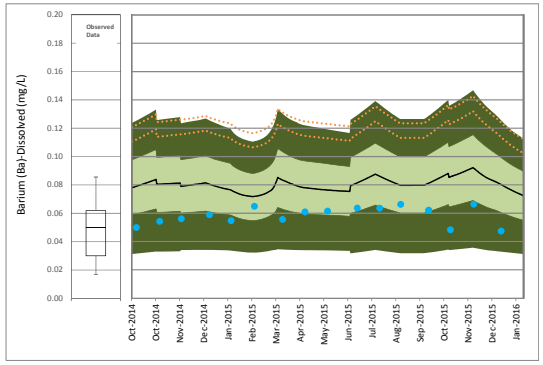
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

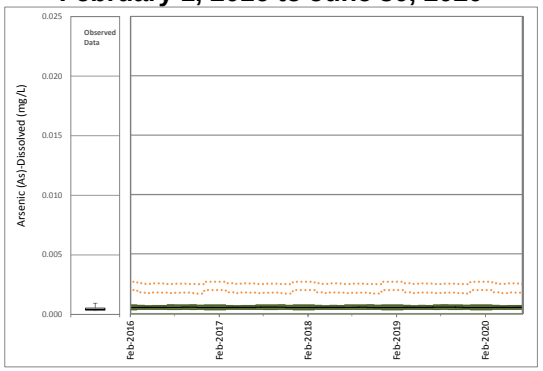
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

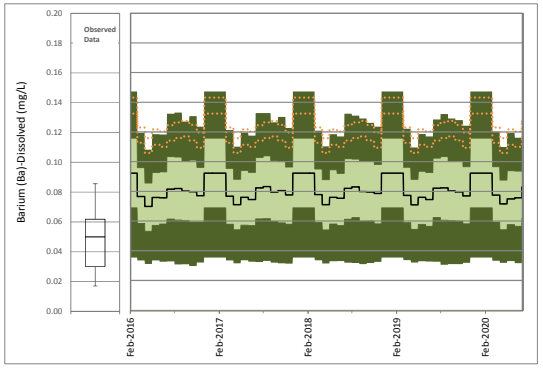
Calibration
October 1, 2014 to February 1, 2016



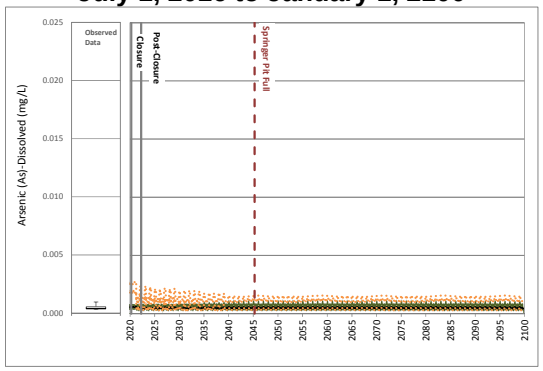


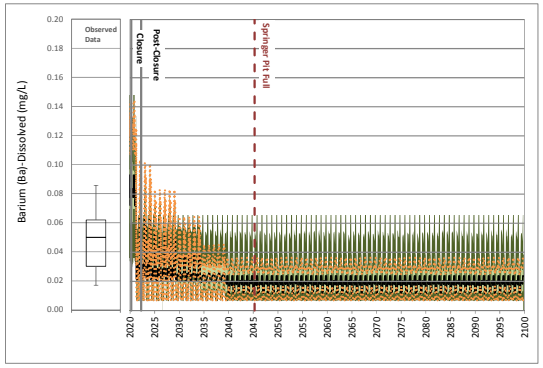
Operations
February 1, 2016 to June 30, 2020



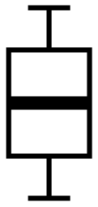


Closure and Post-closure
July 1, 2016 to January 1, 2100



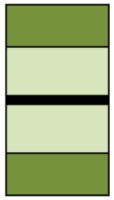


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

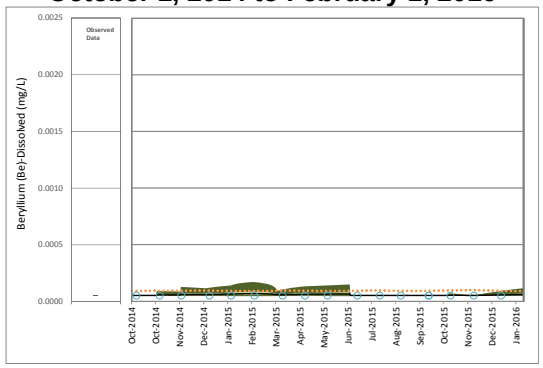
95th Percentile High, 5th Percentile Low

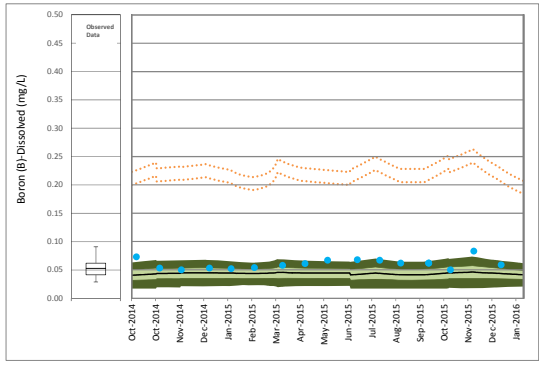
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

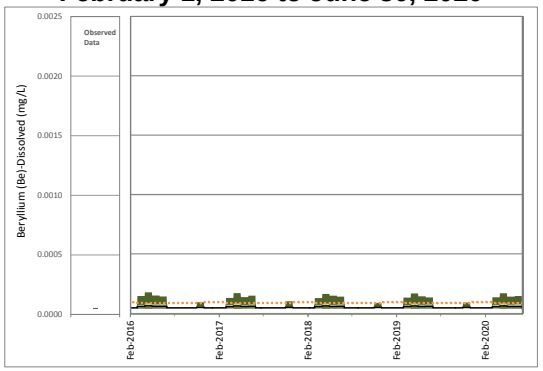
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

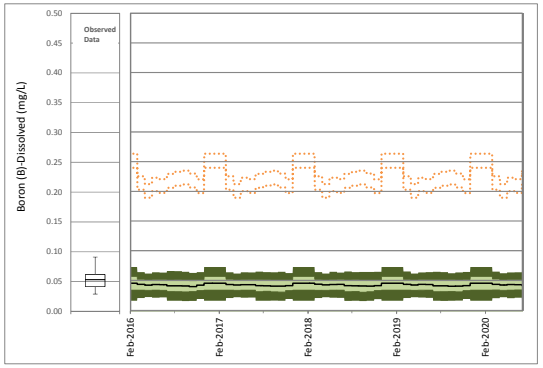
Calibration
October 1, 2014 to February 1, 2016



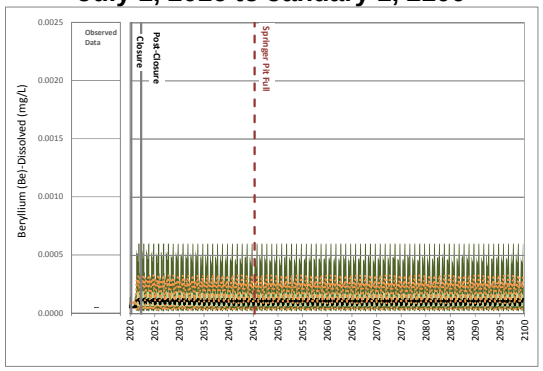


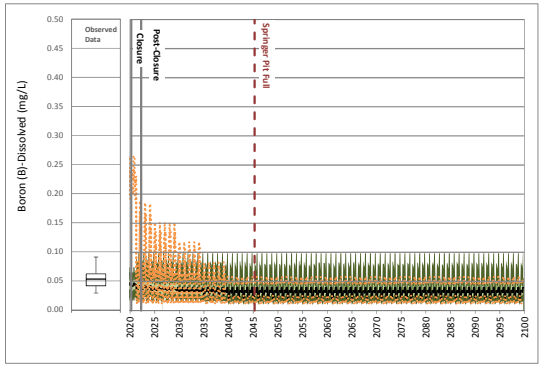
Operations
February 1, 2016 to June 30, 2020



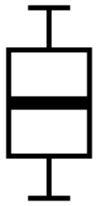


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

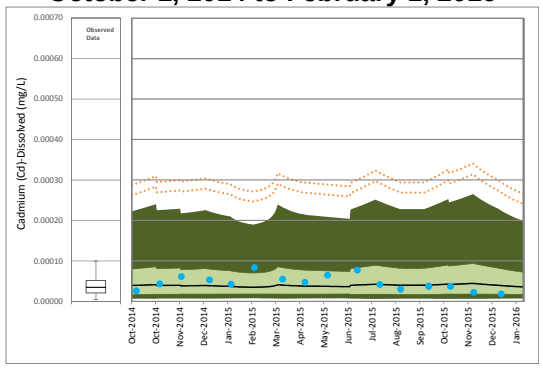
95th Percentile High, 5th Percentile Low

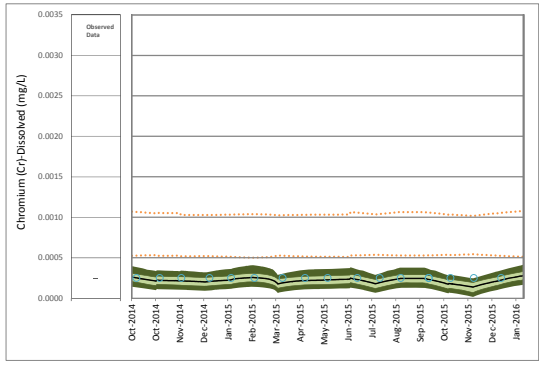
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

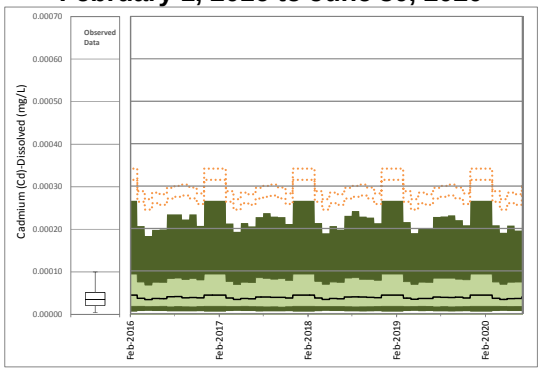
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

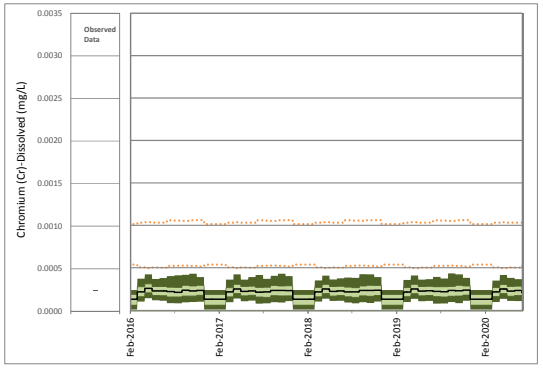
Calibration
October 1, 2014 to February 1, 2016



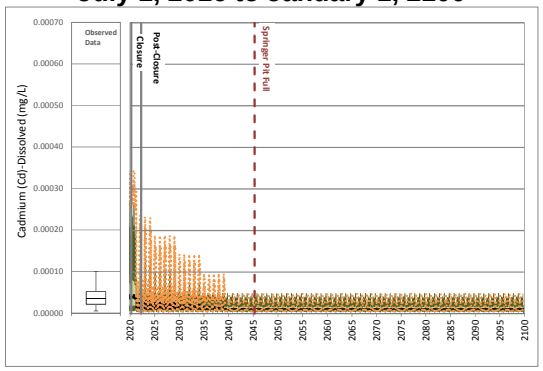


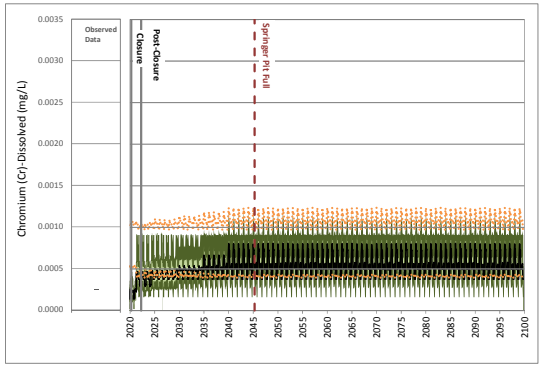
Operations
February 1, 2016 to June 30, 2020



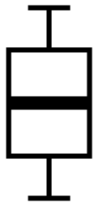


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

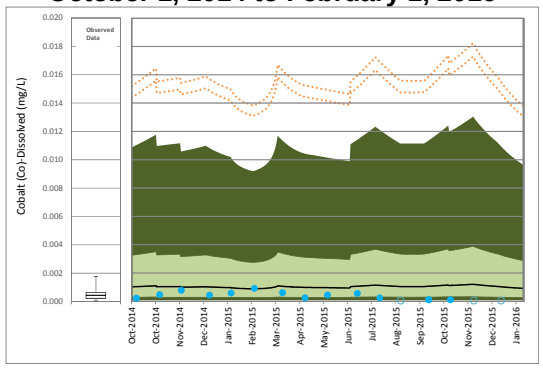
Scenario 2

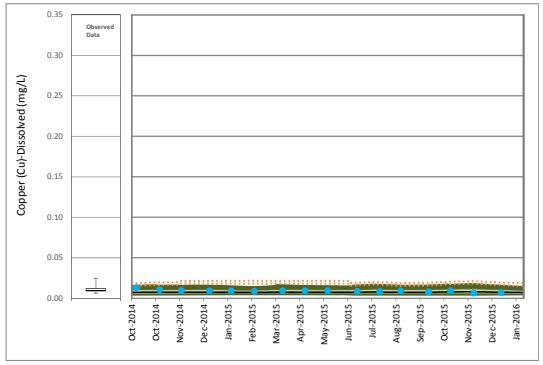
95th Percentile High, 5th Percentile Low

Golder Associates

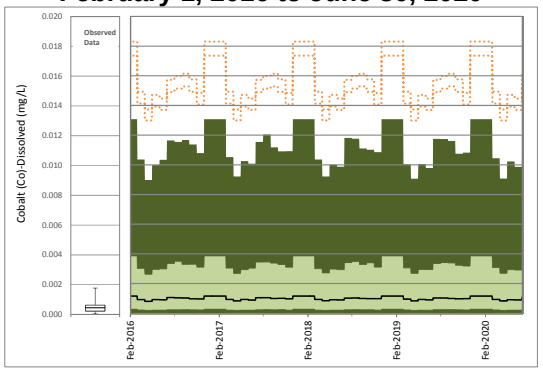
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

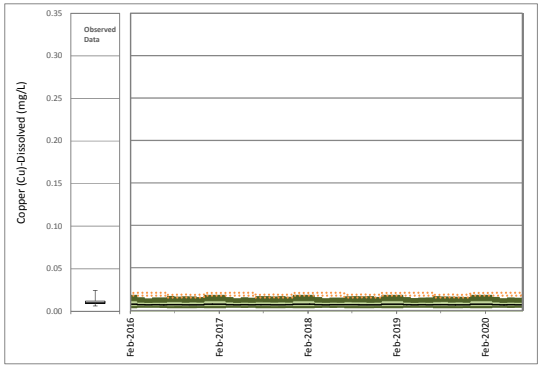
Calibration
October 1, 2014 to February 1, 2016



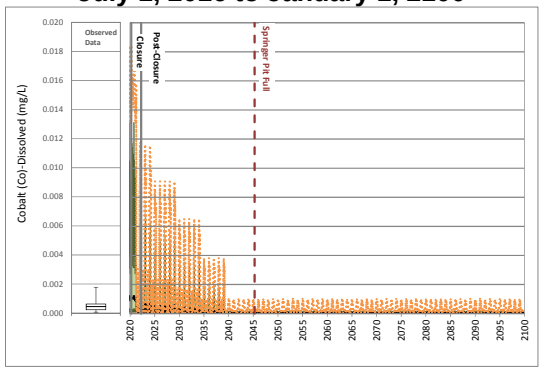


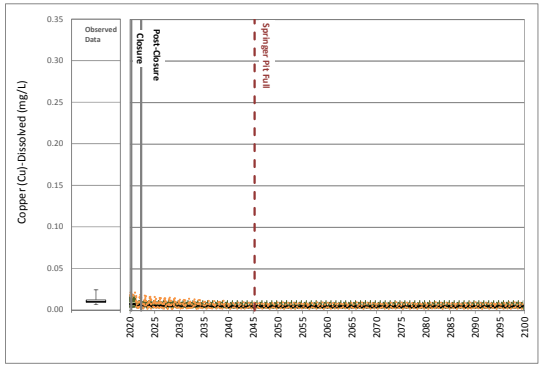
Operations
February 1, 2016 to June 30, 2020



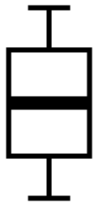


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

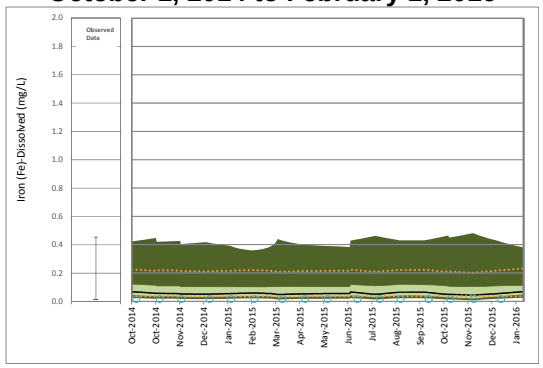
95th Percentile High, 5th Percentile Low

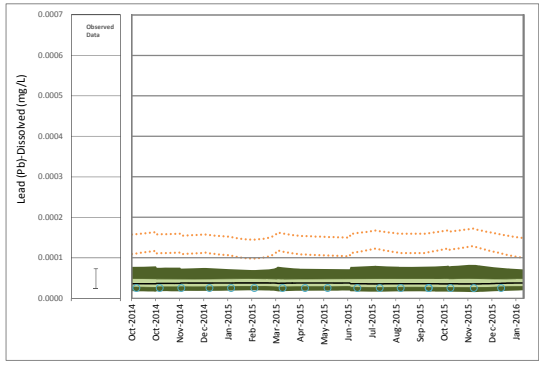
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

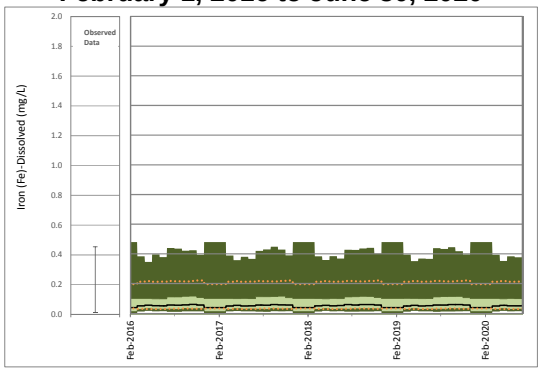
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

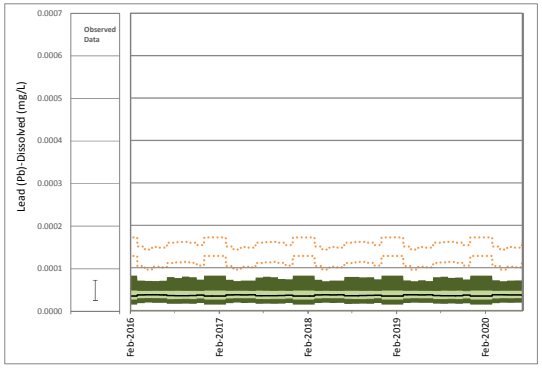
Calibration
October 1, 2014 to February 1, 2016



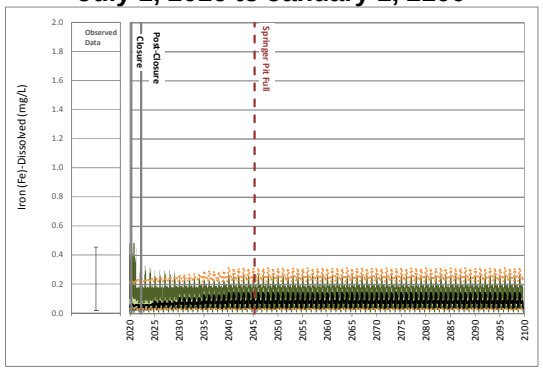


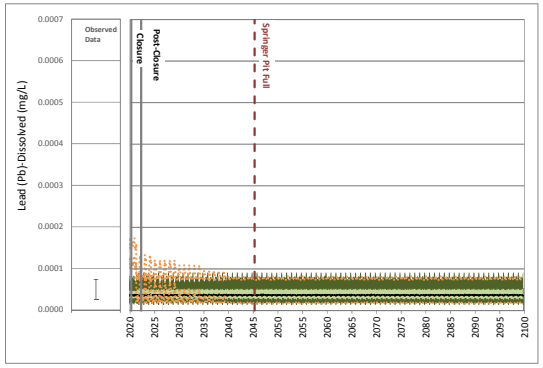
Operations
February 1, 2016 to June 30, 2020



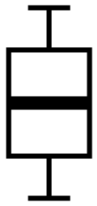


Closure and Post-closure
July 1, 2016 to January 1, 2100



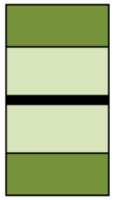


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

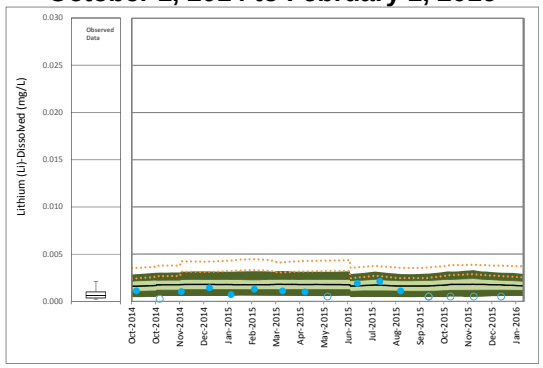
95th Percentile High, 5th Percentile Low

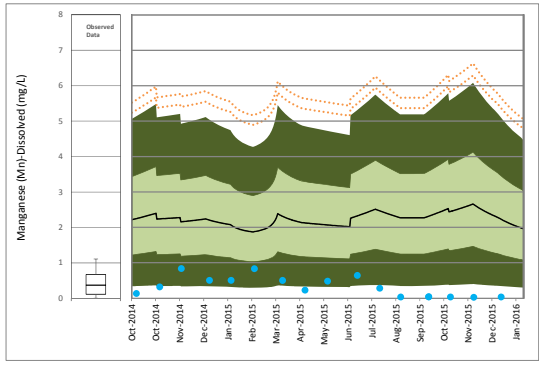
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

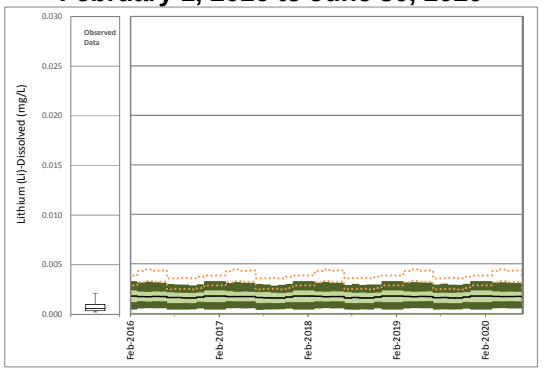
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

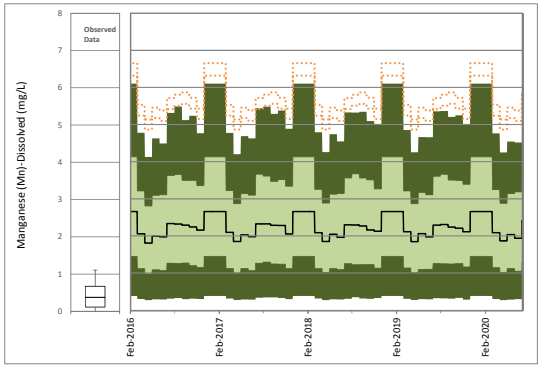
Calibration
October 1, 2014 to February 1, 2016



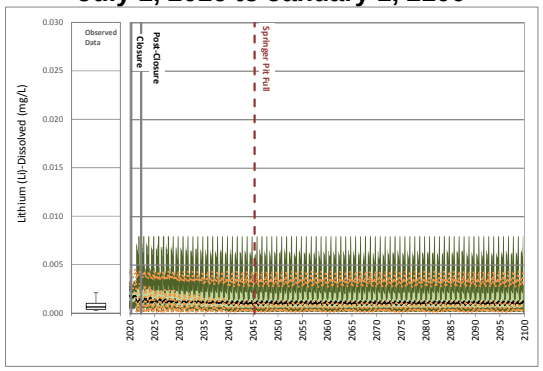


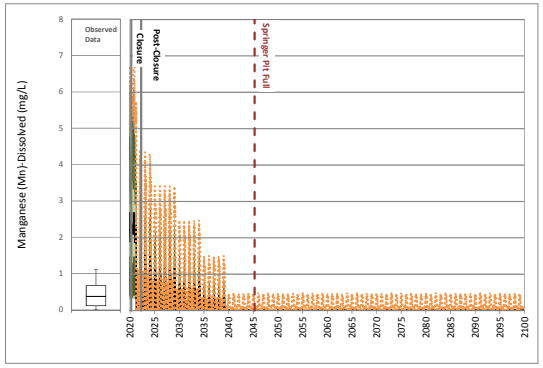
Operations
February 1, 2016 to June 30, 2020



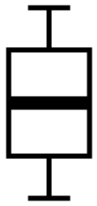


Closure and Post-closure
July 1, 2016 to January 1, 2100



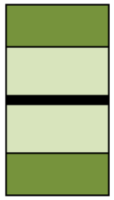


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

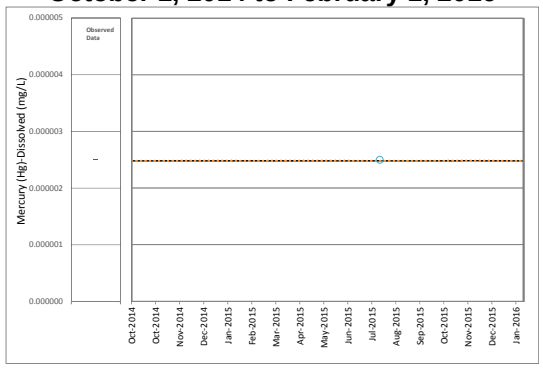
Scenario 2

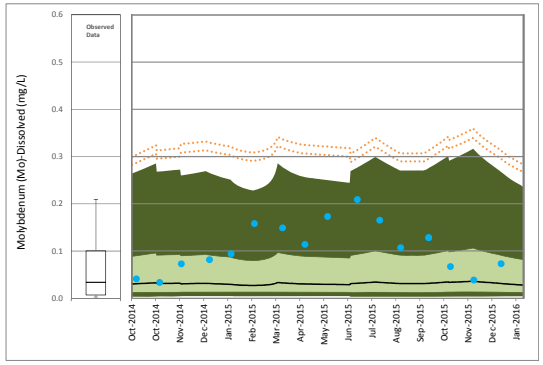
95th Percentile High, 5th Percentile Low

Golder Associates

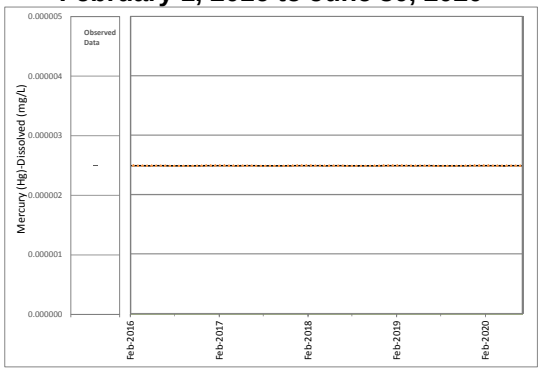
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

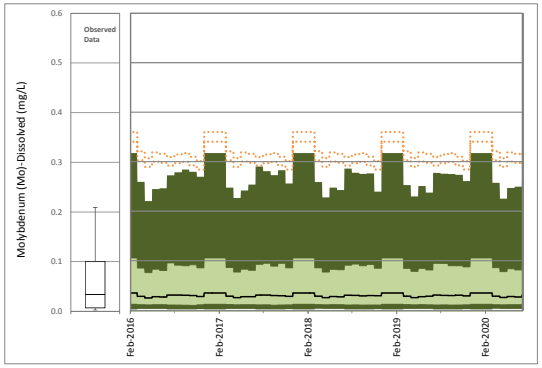
Calibration
October 1, 2014 to February 1, 2016



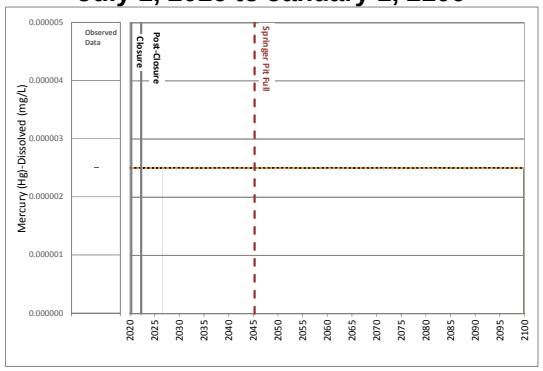


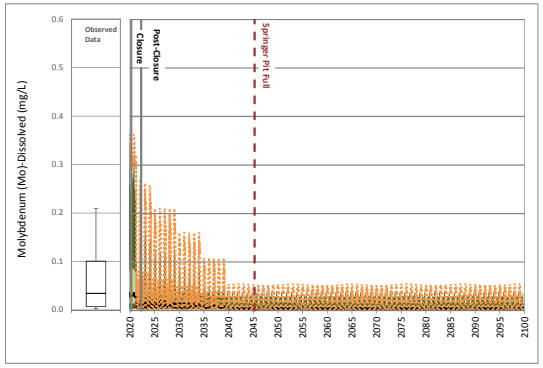
Operations
February 1, 2016 to June 30, 2020



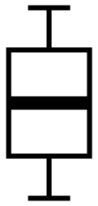


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

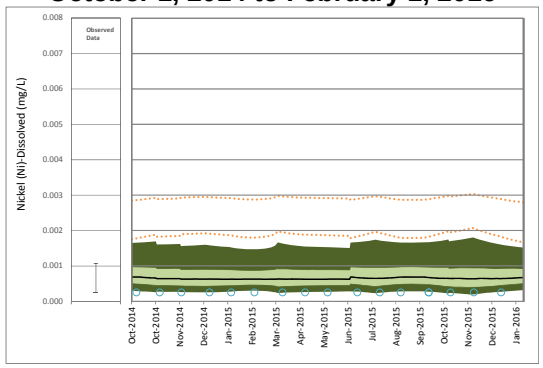
95th Percentile High, 5th Percentile Low

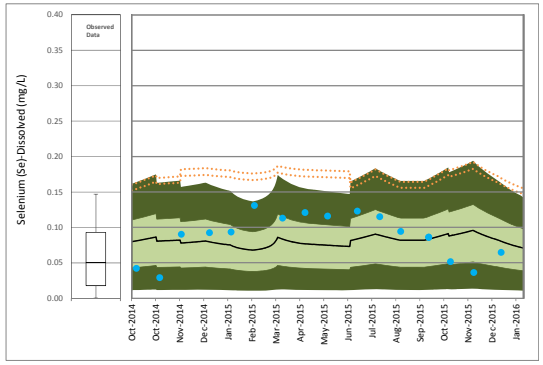
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

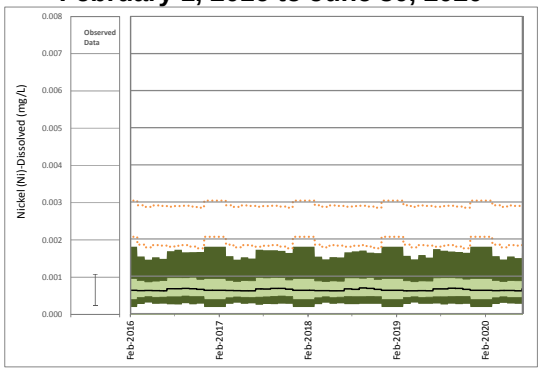
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

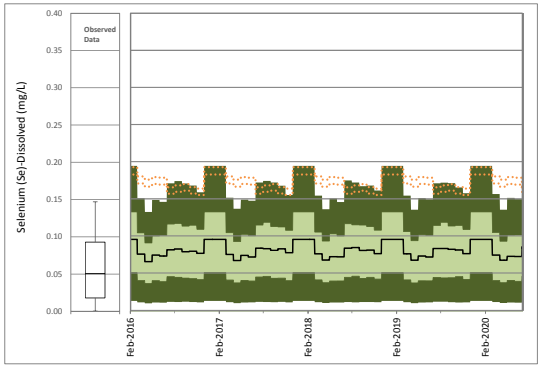
Calibration
October 1, 2014 to February 1, 2016



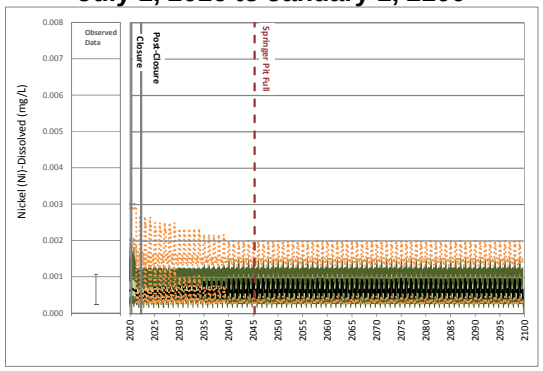


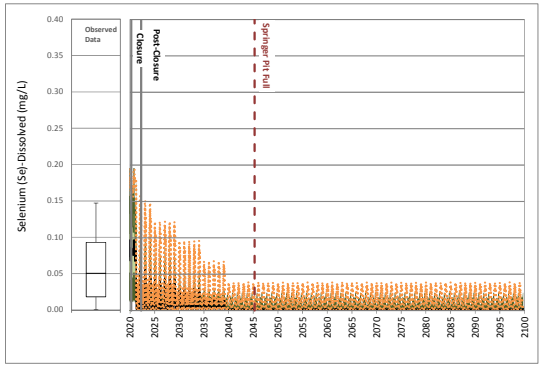
Operations
February 1, 2016 to June 30, 2020



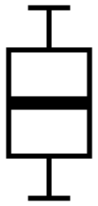


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

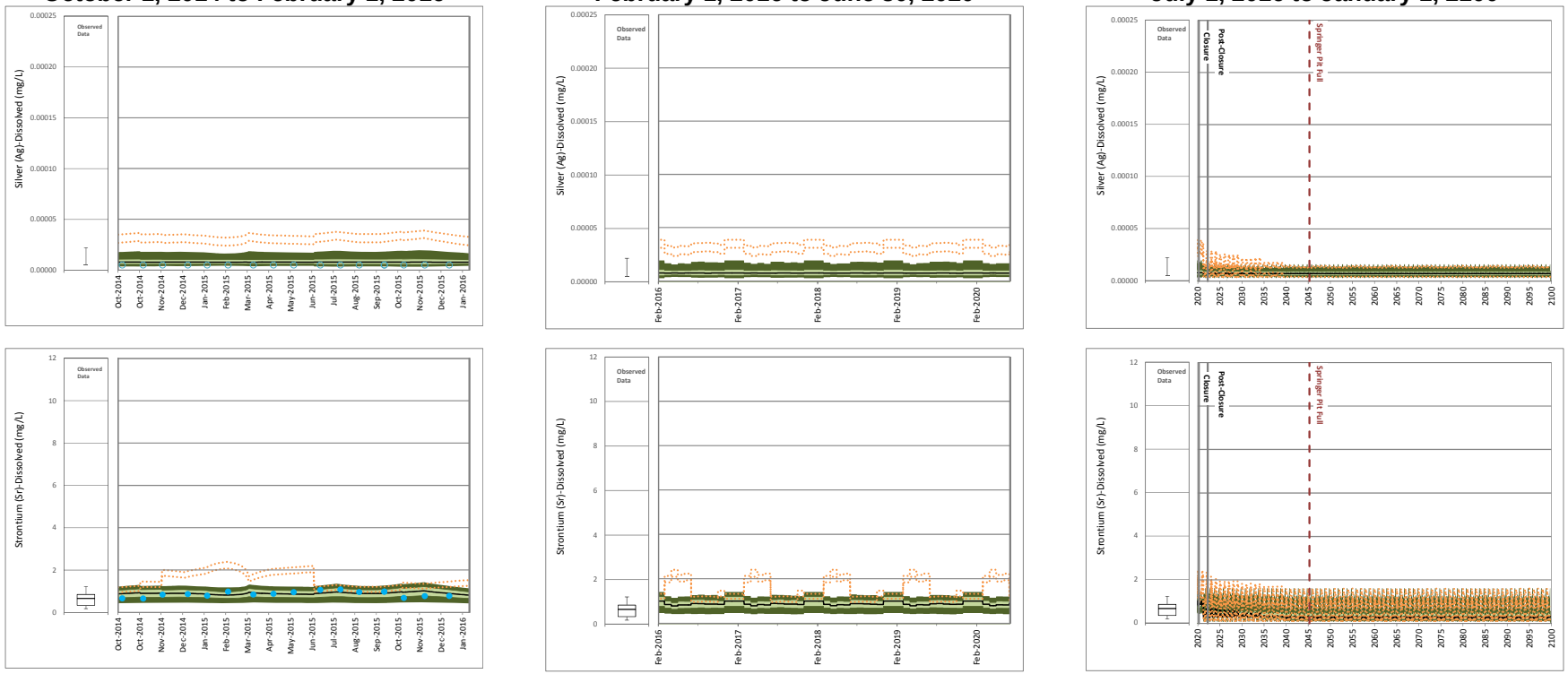
Golder Associates

ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

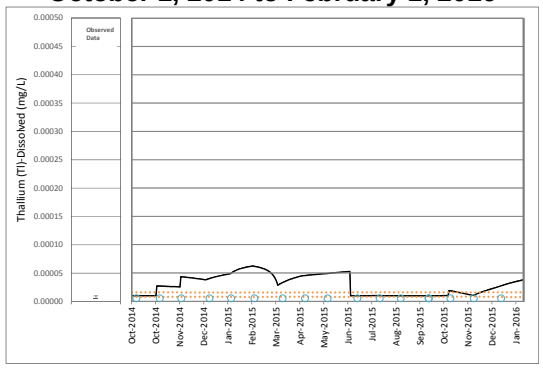
Scenario 2

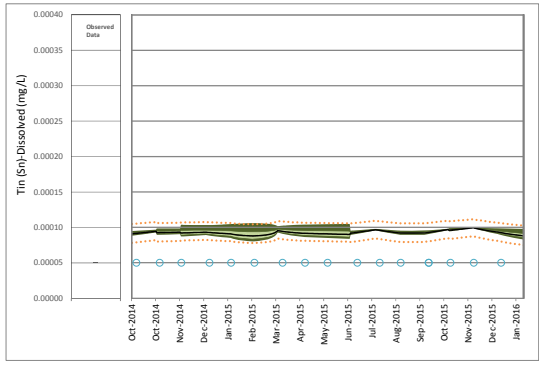
95th Percentile High, 5th Percentile Low

Golder Associates

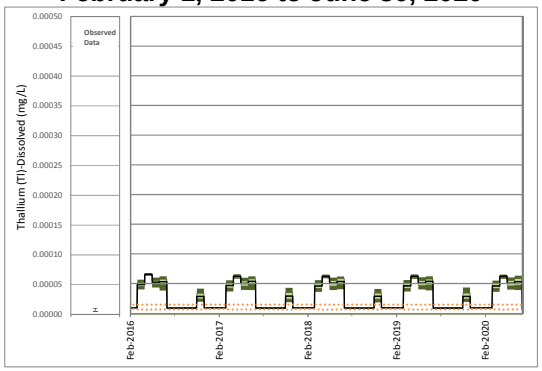
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

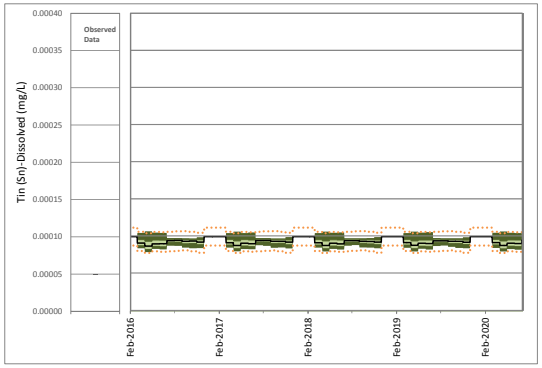
Calibration
October 1, 2014 to February 1, 2016



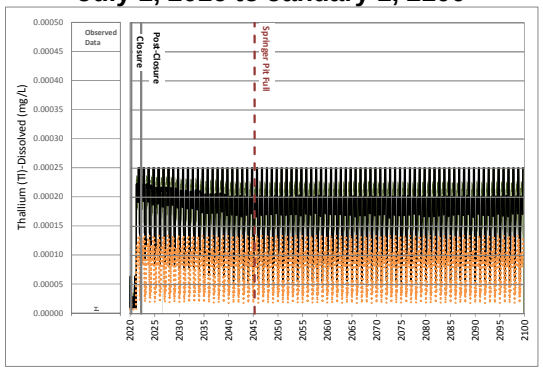


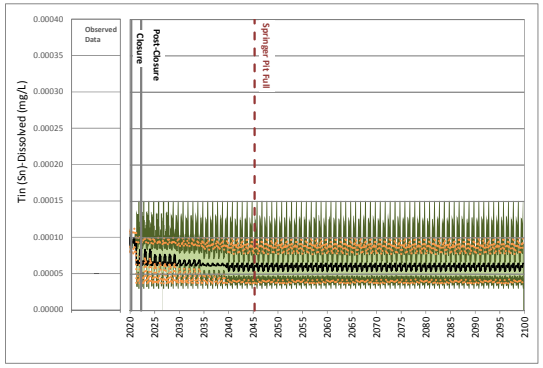
Operations
February 1, 2016 to June 30, 2020



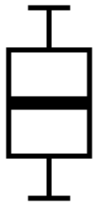


Closure and Post-closure
July 1, 2016 to January 1, 2100



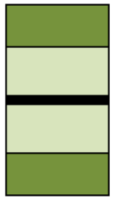


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

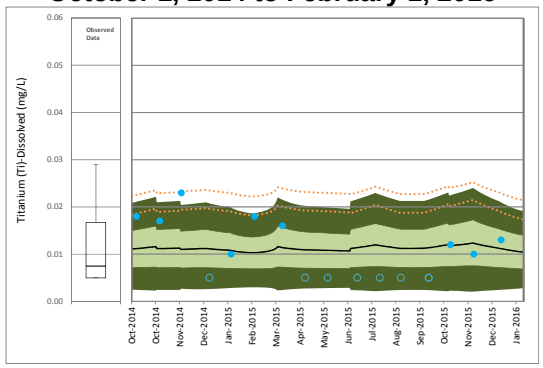
95th Percentile High, 5th Percentile Low

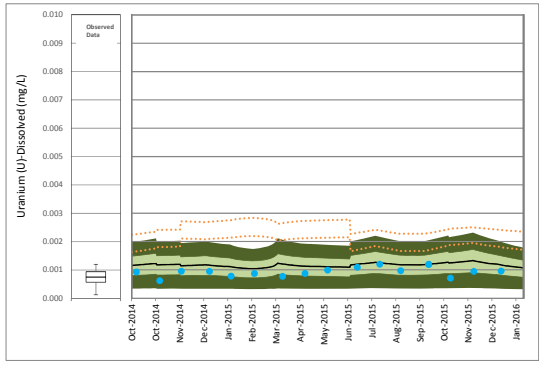
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

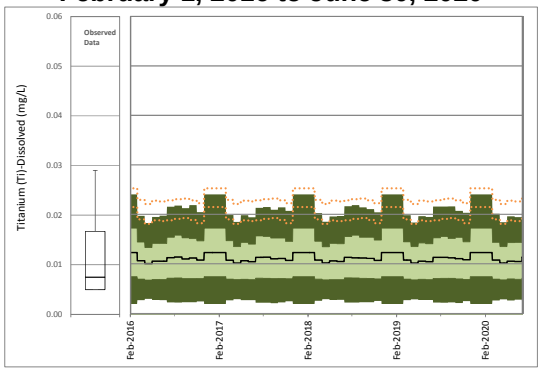
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

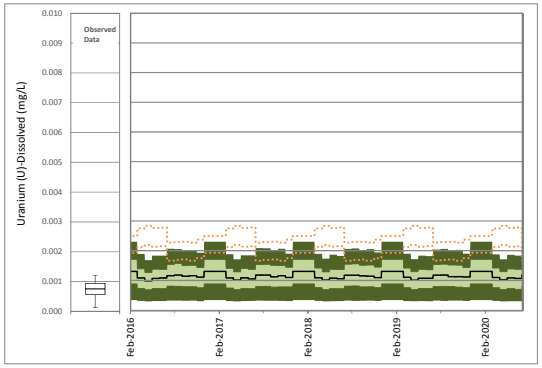
Calibration
October 1, 2014 to February 1, 2016



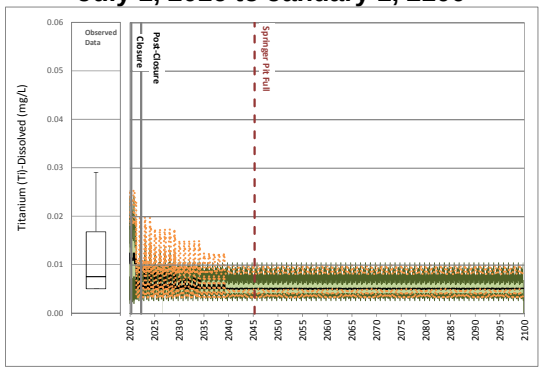


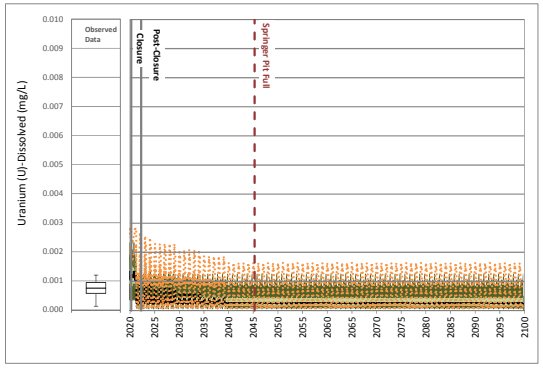
Operations
February 1, 2016 to June 30, 2020



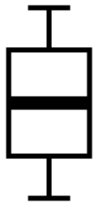


Closure and Post-closure
July 1, 2016 to January 1, 2100



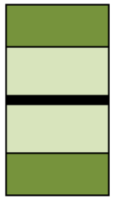


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

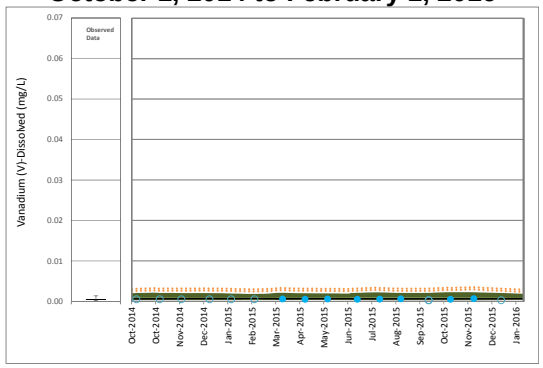
Detected Values
Non- Detected Values

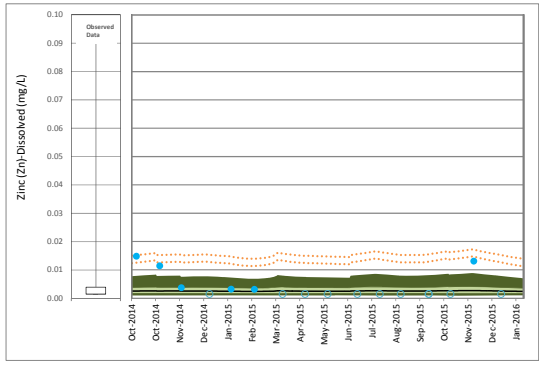
Scenario 2

95th Percentile High, 5th Percentile Low

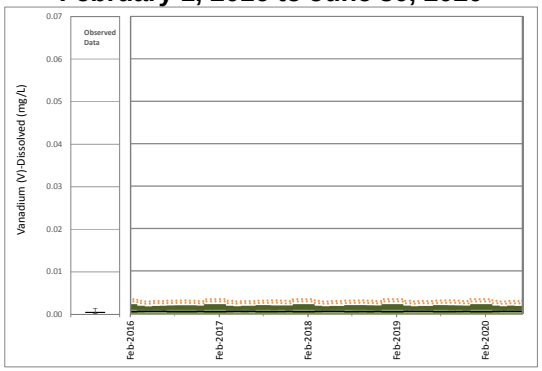
ATTACHMENT B
Figure B6: Time Series Plots of Predicted Northwest Sump Water Quality

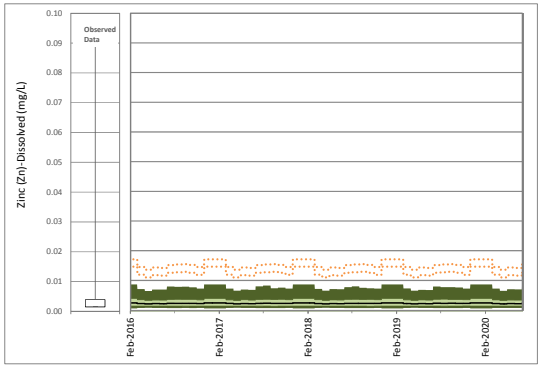
Calibration
October 1, 2014 to February 1, 2016



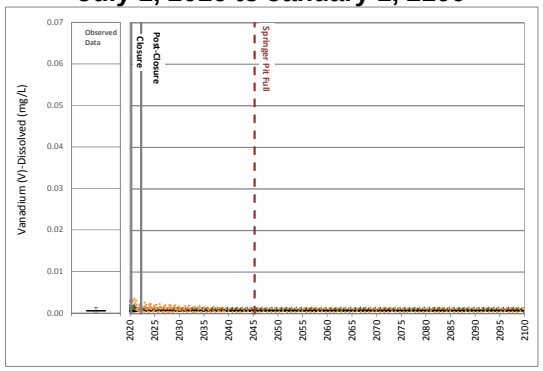


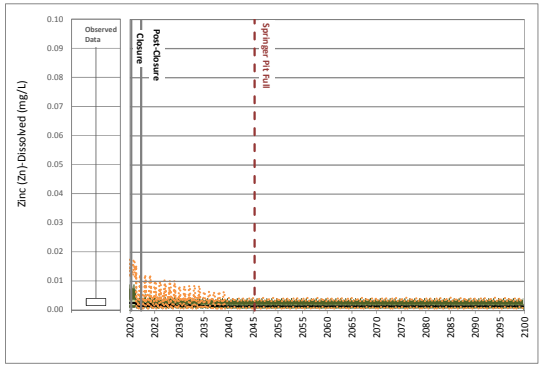
Operations
February 1, 2016 to June 30, 2020





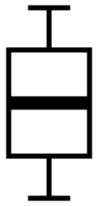
Closure and Post-closure
July 1, 2016 to January 1, 2100





o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig6-nws.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.7 Mine Drainage Creek Sump

Table B7 presents the maximum predicted median and 95th percentile results for the Mine Drainage Creek Sump, calculated based on 500 realizations for Scenario 1 (Table B7a) and Scenario 2 (Table B7b). Time series plots for each modelled parameter are provided in Figure B7.

Table B7a:
Predicted Mine Drainage Creek Sump Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	491	733	657	1034	798	1264	447	673	273	417
Total Dissolved Solids	mg/L	692	1056	944	1516	1178	1848	640	950	392	635
Major Ions											
Calcium	mg/L	151	219	202	321	245	392	136	208	82	126
Chloride	mg/L	2.3	7.0	3.9	9.1	4.1	11	2.6	6.5	2.2	6.1
Fluoride	mg/L	0.13	0.3	0.13	0.3	0.11	0.2	0.19	0.28	0.19	0.27
Magnesium	mg/L	27	45	37	56	45	69	26	37	16	25
Potassium	mg/L	1.7	3.4	3.4	5.2	4.1	6.4	2.1	3.1	1.2	2.0
Sodium	mg/L	11	17	17	27	20	34	11	16	11	14
Sulphate	mg/L	377	622	460	782	572	996	312	479	179	292
Nutrients											
Ammonia	mg/L (as N)	0.0051	0.054	0.044	0.54	0.057	0.72	0.15	0.72	0.15	0.5
Nitrate	mg/L (as N)	2.3	15	16	33	21	43	21	43	14	26
Nitrite	mg/L (as N)	0.0029	0.31	0.058	0.87	0.072	1.2	0.074	1.2	0.069	0.71
Total Phosphorus	mg/L	0.02	0.037	0.03	0.062	0.033	0.074	0.025	0.053	0.022	0.043
Total Metals											
Aluminum	mg/L	0.59	0.7	0.59	0.7	0.54	0.72	0.61	0.73	0.59	0.7
Antimony	mg/L	0.0002	0.00048	0.00024	0.00053	0.00028	0.00063	0.00059	0.0011	0.0006	0.0011
Arsenic	mg/L	0.00075	0.0013	0.00075	0.0013	0.00076	0.001	0.0011	0.0018	0.0012	0.0018
Barium	mg/L	0.043	0.084	0.078	0.12	0.098	0.15	0.053	0.081	0.031	0.054
Beryllium	mg/L	0.000077	0.00037	0.000077	0.00037	0.00013	0.00068	0.0002	0.00068	0.00021	0.00052
Boron	mg/L	0.051	0.11	0.051	0.11	0.049	0.13	0.093	0.17	0.093	0.17
Cadmium	mg/L	0.00004	0.0003	0.000045	0.0003	0.00005	0.00036	0.000042	0.00021	0.000036	0.00016
Chromium	mg/L	0.0013	0.0017	0.0013	0.0017	0.0011	0.0016	0.0014	0.0018	0.0013	0.0017
Cobalt	mg/L	0.00049	0.0023	0.0014	0.011	0.0015	0.013	0.00092	0.0042	0.00049	0.00088
Copper	mg/L	0.013	0.067	0.013	0.067	0.014	0.044	0.015	0.04	0.015	0.035
Iron	mg/L	0.67	0.82	0.67	0.96	0.62	1.0	0.69	0.84	0.67	0.8
Lead	mg/L	0.00018	0.00022	0.00018	0.00022	0.00018	0.00024	0.00018	0.00024	0.00018	0.00022
Lithium	mg/L	0.0021	0.0076	0.0021	0.0076	0.0021	0.011	0.0028	0.011	0.0028	0.0087
Manganese	mg/L	0.046	1.4	2.0	4.6	2.7	6.1	0.82	1.8	0.057	0.36
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.066	0.15	0.066	0.27	0.051	0.33	0.049	0.13	0.047	0.083
Nickel	mg/L	0.0016	0.0025	0.0016	0.0025	0.0013	0.0024	0.0015	0.0022	0.0014	0.002
Selenium	mg/L	0.018	0.094	0.073	0.16	0.1	0.2	0.036	0.075	0.015	0.036
Silver	mg/L	0.0000073	0.000023	0.0000077	0.000026	0.0000079	0.00003	0.0000076	0.000026	0.000007	0.000023
Strontium	mg/L	1.2	3.4	1.2	3.4	1.0	2.3	0.84	2.0	0.74	1.7
Thallium	mg/L	0.00012	0.00013	0.00012	0.00013	0.00025	0.00026	0.00025	0.00026	0.00015	0.0002
Tin	mg/L	0.000065	0.00021	0.000089	0.00021	0.0001	0.00025	0.000073	0.00025	0.00006	0.00021
Titanium	mg/L	0.031	0.036	0.033	0.042	0.035	0.046	0.031	0.035	0.028	0.031
Uranium	mg/L	0.0008	0.0021	0.0011	0.0025	0.0014	0.003	0.0019	0.0037	0.0018	0.0037
Vanadium	mg/L	0.002	0.0026	0.002	0.0031	0.002	0.0036	0.0022	0.0031	0.0022	0.0031
Zinc	mg/L	0.0047	0.015	0.0047	0.015	0.0046	0.01	0.0042	0.0082	0.0033	0.0056
Dissolved Metals											
Aluminum	mg/L	0.10	0.21	0.10	0.21	0.053	0.23	0.12	0.24	0.10	0.21
Antimony	mg/L	0.00018	0.0003	0.00022	0.00035	0.00026	0.00045	0.00057	0.00096	0.00058	0.00093
Arsenic	mg/L	0.00056	0.0011	0.00056	0.0011	0.00057	0.00086	0.00094	0.0016	0.00097	0.0016
Barium	mg/L	0.037	0.078	0.072	0.12	0.093	0.15	0.048	0.076	0.026	0.049
Beryllium	mg/L	0.000077	0.00029	0.000077	0.00029	0.00013	0.0006	0.0002	0.0006	0.00021	0.00044
Boron	mg/L	0.048	0.076	0.048	0.076	0.046	0.098	0.09	0.14	0.09	0.14
Cadmium	mg/L	0.000036	0.0002	0.000041	0.00021	0.000046	0.00027	0.000038	0.00012	0.000032	0.000068
Chromium	mg/L	0.00069	0.0010	0.00069	0.0010	0.0005	0.00094	0.0008	0.0012	0.00069	0.001
Cobalt	mg/L	0.00016	0.002	0.0010	0.01	0.0012	0.013	0.0006	0.0039	0.00016	0.00055
Copper	mg/L	0.0087	0.052	0.0087	0.052	0.009	0.028	0.010	0.024	0.010	0.02
Iron	mg/L	0.13	0.27	0.13	0.42	0.078	0.48	0.14	0.3	0.13	0.26
Lead	mg/L	0.000037	0.000072	0.000037	0.000076	0.000038	0.000091	0.000039	0.000091	0.000037	0.000077
Lithium	mg/L	0.0018	0.0047	0.0018	0.0047	0.0018	0.008	0.0025	0.008	0.0025	0.0058
Manganese	mg/L	0.031	1.4	2.0	4.6	2.7	6.1	0.81	1.8	0.042	0.35
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.066	0.14	0.066	0.25	0.051	0.32	0.049	0.12	0.047	0.069
Nickel	mg/L	0.001	0.0019	0.001	0.0019	0.00075	0.0018	0.001	0.0017	0.00087	0.0015
Selenium	mg/L	0.018	0.09	0.073	0.15	0.1	0.2	0.036	0.071	0.015	0.032
Silver	mg/L	0.0000073	0.000013	0.0000077	0.000016	0.0000079	0.00002	0.0000076	0.000016	0.000007	0.000013
Strontium	mg/L	1.2	3.0	1.2	3.0	1.0	1.8	0.82	1.6	0.72	1.3
Thallium	mg/L	0.00012	0.00012	0.00012	0.00012	0.00025	0.00025	0.00025	0.00025	0.00015	0.00019
Tin	mg/L	0.000065	0.00011	0.000089	0.00011	0.0001	0.00015	0.000073	0.00015	0.00006	0.00011
Titanium	mg/L	0.0088	0.014	0.011	0.02	0.012	0.024	0.0084	0.013	0.0057	0.0091
Uranium	mg/L	0.00076	0.0014	0.0011	0.0019	0.0013	0.0023	0.0018	0.0031	0.0018	0.0031
Vanadium	mg/L	0.00066	0.0013	0.00066	0.0018	0.00069	0.0023	0.00095	0.0018	0.00094	0.0018
Zinc	mg/L	0.0031	0.013	0.0031	0.013	0.003	0.0089	0.0027	0.0067	0.0018	0.0041

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

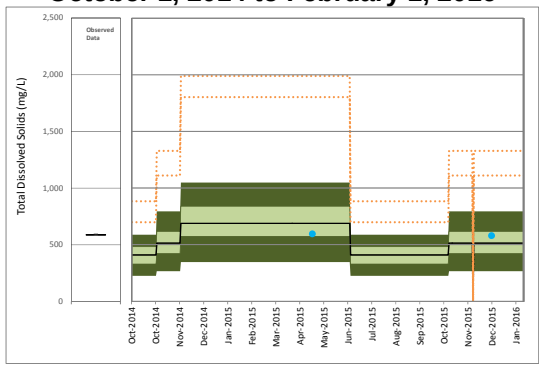
Table B7b:
Predicted Mine Drainage Creek Sump Water Quality - Scenario 2

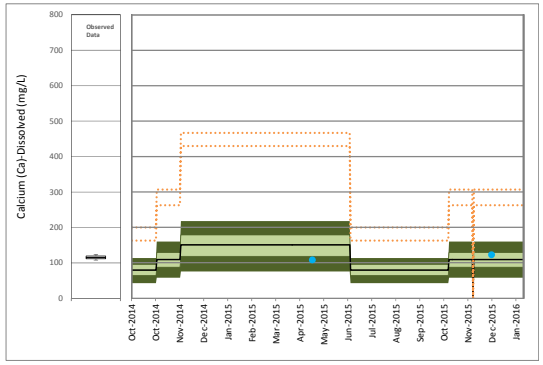
Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	1516	1547	1516	1547	1194	1242	905	967	327	392
Total Dissolved Solids	mg/L	1976	2005	1976	2005	1547	1588	1185	1239	445	510
Major Ions											
Calcium	mg/L	462	470	462	470	365	377	276	291	99	112
Chloride	mg/L	20.0	21.0	20	21	16	18	12	16	13	16
Fluoride	mg/L	0.63	0.65	0.63	0.65	0.47	0.5	0.37	0.4	0.36	0.39
Magnesium	mg/L	88	91	88	91	68	73	52	59	19	27
Potassium	mg/L	7.7	7.9	7.7	7.9	7.5	7.9	5.3	5.7	2.0	2.5
Sodium	mg/L	37	38	37	38	33	35	25	28	11	14
Sulphate	mg/L	1221	1236	1221	1236	950	957	706	717	203	225
Nutrients											
Ammonia	mg/L (as N)	0.190	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.11	0.12
Nitrate	mg/L (as N)	31.0	31	31	31	5.2	5.2	5.2	5.2	3.6	4.5
Nitrite	mg/L (as N)	0.420	0.42	1.5	1.5	1.9	1.9	1.9	1.9	1.2	1.2
Total Phosphorus	mg/L	0.11	0.12	0.11	0.12	0.084	0.094	0.068	0.082	0.28	0.29
Total Metals											
Aluminum	mg/L	0.6	0.71	0.72	0.81	0.77	0.85	0.64	0.74	0.69	0.76
Antimony	mg/L	0.0032	0.0034	0.0032	0.0034	0.0018	0.002	0.0014	0.0016	0.00062	0.0008
Arsenic	mg/L	0.0033	0.0035	0.0033	0.0035	0.0027	0.0031	0.0022	0.0027	0.0031	0.0037
Barium	mg/L	0.13	0.14	0.13	0.14	0.15	0.15	0.097	0.099	0.066	0.07
Beryllium	mg/L	0.00011	0.00025	0.00011	0.00025	0.0001	0.0004	0.000088	0.0004	0.00029	0.00041
Boron	mg/L	0.22	0.26	0.22	0.26	0.26	0.3	0.16	0.22	0.17	0.23
Cadmium	mg/L	0.00025	0.00035	0.00027	0.00037	0.00034	0.00044	0.00019	0.00029	0.00015	0.00025
Chromium	mg/L	0.0014	0.0017	0.0014	0.0017	0.0014	0.0017	0.0015	0.0018	0.0014	0.0018
Cobalt	mg/L	0.0095	0.0095	0.014	0.014	0.019	0.019	0.0089	0.0089	0.015	0.015
Copper	mg/L	0.055	0.066	0.055	0.066	0.038	0.05	0.03	0.043	0.26	0.27
Iron	mg/L	0.67	0.81	0.67	0.81	0.67	0.79	0.69	0.85	0.68	0.82
Lead	mg/L	0.0002	0.00022	0.00026	0.00029	0.00029	0.00032	0.00024	0.00026	0.00032	0.00034
Lithium	mg/L	0.013	0.016	0.013	0.016	0.008	0.011	0.0063	0.0096	0.0065	0.0097
Manganese	mg/L	4.60	4.6	5.2	5.2	6.7	6.7	3.6	3.6	0.75	0.77
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.51	0.52	0.51	0.52	0.4	0.41	0.29	0.31	0.092	0.11
Nickel	mg/L	0.0038	0.004	0.0038	0.004	0.0033	0.0037	0.0029	0.0034	0.0044	0.0049
Selenium	mg/L	0.37	0.38	0.37	0.38	0.26	0.27	0.2	0.2	0.063	0.07
Silver	mg/L	0.000014	0.000026	0.000027	0.000042	0.000035	0.000049	0.000021	0.000034	0.000042	0.000055
Strontium	mg/L	12.0	13.0	12	13	6.8	7.3	5.2	5.8	2.1	2.7
Thallium	mg/L	0.00005	0.00006	0.00005	0.000063	0.00013	0.00014	0.00013	0.00014	0.000082	0.000096
Tin	mg/L	0.00011	0.00021	0.00011	0.00021	0.0001	0.00021	0.000085	0.0002	0.00029	0.00042
Titanium	mg/L	0.048	0.049	0.048	0.049	0.046	0.048	0.04	0.042	0.031	0.033
Uranium	mg/L	0.0080	0.0088	0.008	0.0088	0.005	0.0059	0.0038	0.0048	0.0015	0.0026
Vanadium	mg/L	0.0041	0.0042	0.0041	0.0042	0.0045	0.0048	0.0035	0.0044	0.0035	0.0043
Zinc	mg/L	0.010	0.011	0.014	0.015	0.018	0.019	0.0096	0.011	0.056	0.057
Dissolved Metals											
Aluminum	mg/L	0.11	0.22	0.23	0.32	0.28	0.36	0.15	0.25	0.21	0.27
Antimony	mg/L	0.0032	0.0032	0.0032	0.0032	0.0018	0.0018	0.0014	0.0014	0.0006	0.00062
Arsenic	mg/L	0.0031	0.0033	0.0031	0.0033	0.0025	0.0029	0.002	0.0025	0.0029	0.0035
Barium	mg/L	0.13	0.13	0.13	0.13	0.14	0.14	0.091	0.093	0.06	0.064
Beryllium	mg/L	0.00011	0.00017	0.00011	0.00017	0.0001	0.00032	0.000088	0.00032	0.00029	0.00033
Boron	mg/L	0.22	0.22	0.22	0.22	0.26	0.26	0.16	0.18	0.16	0.2
Cadmium	mg/L	0.00025	0.00025	0.00026	0.00027	0.00034	0.00034	0.00019	0.0002	0.00015	0.00016
Chromium	mg/L	0.00075	0.0011	0.00079	0.0011	0.0008	0.0011	0.00082	0.0012	0.00079	0.0011
Cobalt	mg/L	0.0092	0.0092	0.014	0.014	0.018	0.018	0.0085	0.0086	0.015	0.015
Copper	mg/L	0.050	0.051	0.05	0.051	0.033	0.034	0.026	0.027	0.26	0.26
Iron	mg/L	0.12	0.26	0.12	0.26	0.12	0.24	0.14	0.3	0.14	0.27
Lead	mg/L	0.000056	0.000079	0.00012	0.00015	0.00015	0.00017	0.00009	0.00011	0.00017	0.0002
Lithium	mg/L	0.013	0.013	0.013	0.013	0.0077	0.0083	0.006	0.0067	0.0062	0.0067
Manganese	mg/L	4.60	4.6	5.1	5.1	6.7	6.7	3.6	3.6	0.74	0.75
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.51	0.51	0.51	0.51	0.4	0.4	0.29	0.3	0.092	0.095
Nickel	mg/L	0.0032	0.0034	0.0032	0.0034	0.0028	0.0031	0.0023	0.0028	0.0038	0.0043
Selenium	mg/L	0.37	0.37	0.37	0.37	0.26	0.26	0.2	0.2	0.063	0.066
Silver	mg/L	0.000014	0.000016	0.000027	0.000032	0.000035	0.000039	0.000021	0.000024	0.000042	0.000045
Strontium	mg/L	12.0	12.0	12	12	6.8	6.9	5.2	5.3	2.1	2.3
Thallium	mg/L	0.00005	0.00005	0.00005	0.000054	0.00013	0.00013	0.00013	0.00013	0.000082	0.000086
Tin	mg/L	0.00011	0.00011	0.00011	0.00011	0.0001	0.00011	0.000085	0.00010	0.00029	0.00032
Titanium	mg/L	0.026	0.027	0.026	0.027	0.024	0.025	0.018	0.02	0.0082	0.011
Uranium	mg/L	0.0080	0.0082	0.008	0.0082	0.0049	0.0052	0.0038	0.0042	0.0015	0.002
Vanadium	mg/L	0.0028	0.0029	0.0028	0.0029	0.0032	0.0035	0.0023	0.0031	0.0022	0.003
Zinc	mg/L	0.0086	0.009	0.012	0.014	0.016	0.017	0.0081	0.0096	0.054	0.055

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

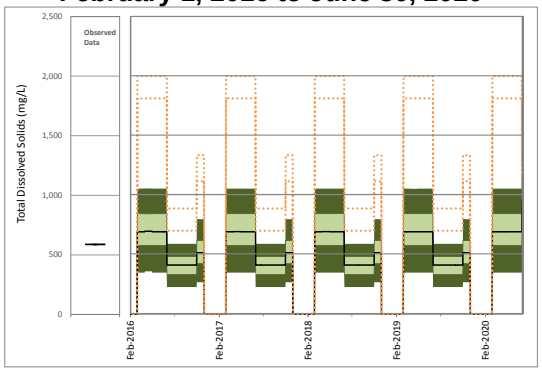
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

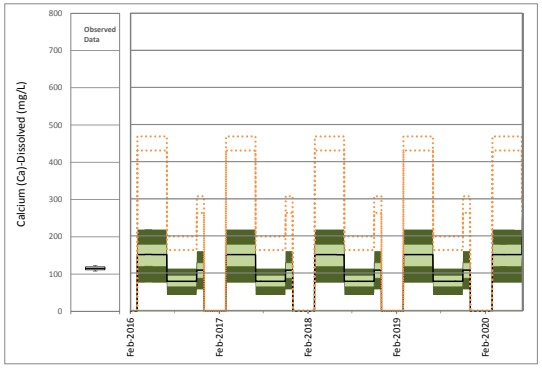
Calibration
October 1, 2014 to February 1, 2016



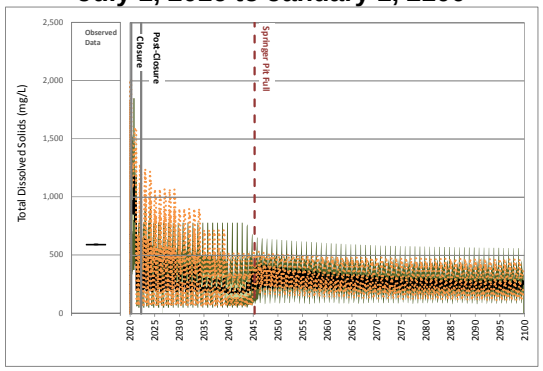


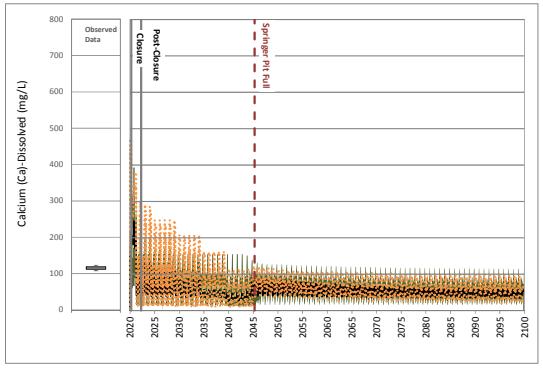
Operations
February 1, 2016 to June 30, 2020



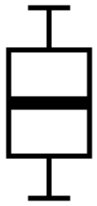


Closure and Post-closure
July 1, 2016 to January 1, 2100



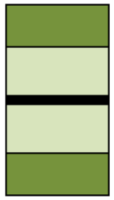


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

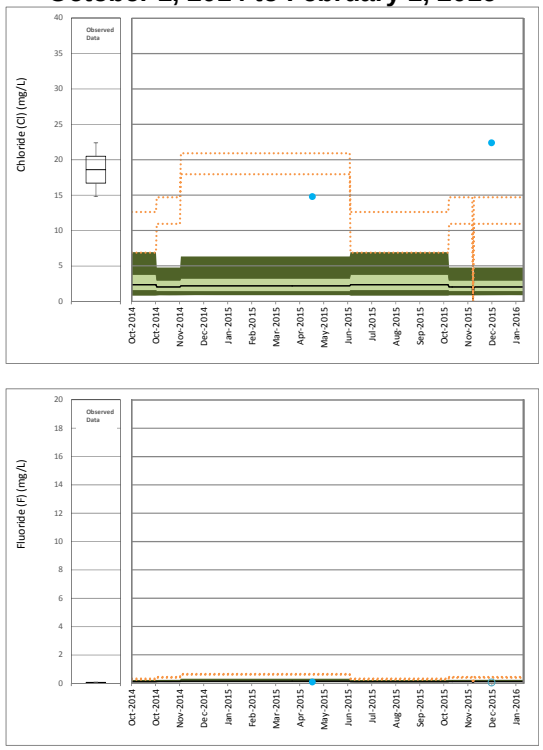
95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

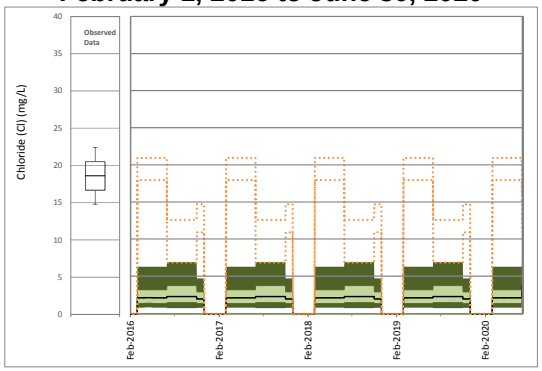
Golder Associates

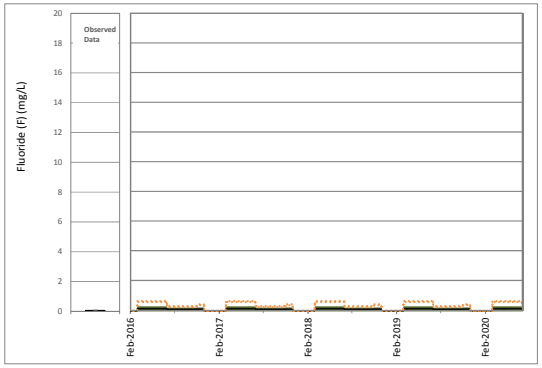
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

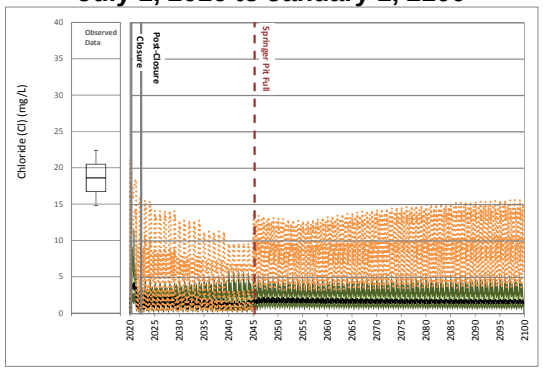


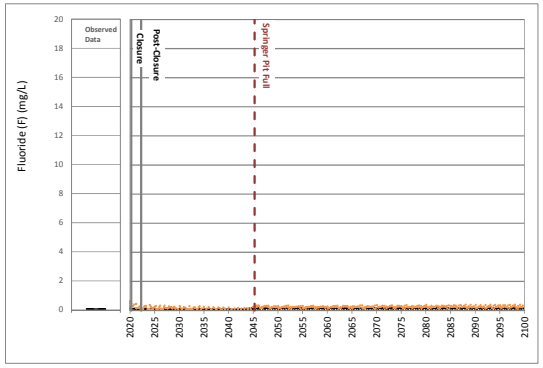
Operations
February 1, 2016 to June 30, 2020



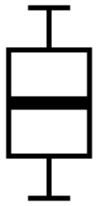


Closure and Post-closure
July 1, 2016 to January 1, 2100



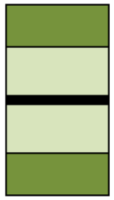


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

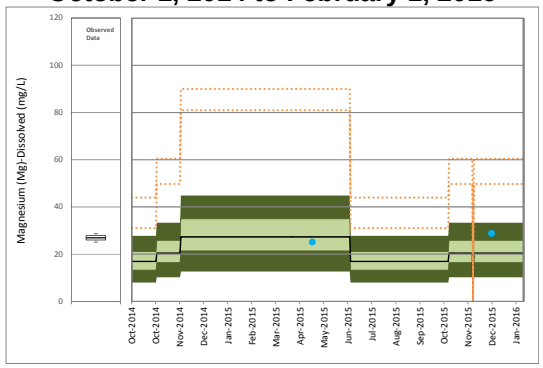
95th Percentile High, 5th Percentile Low

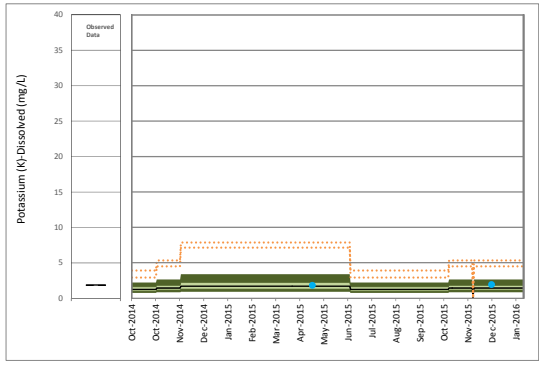
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

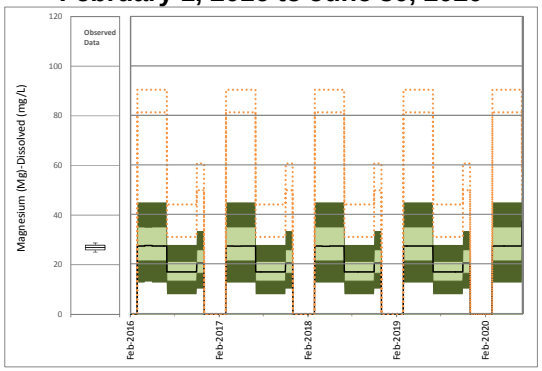
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

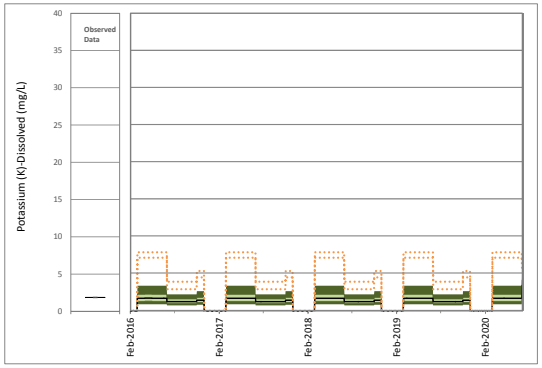
Calibration
October 1, 2014 to February 1, 2016



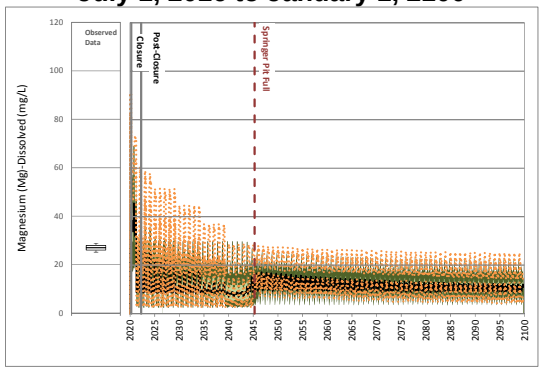


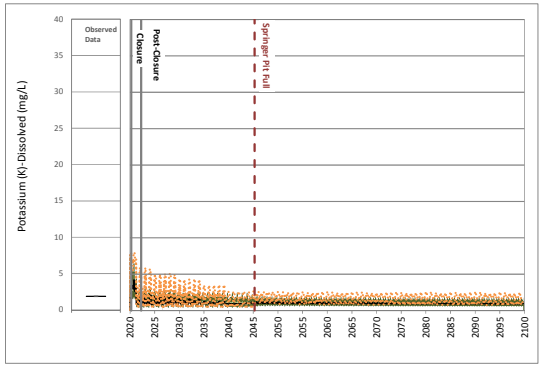
Operations
February 1, 2016 to June 30, 2020



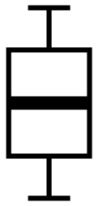


Closure and Post-closure
July 1, 2016 to January 1, 2100



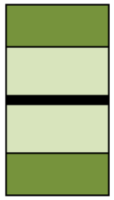


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

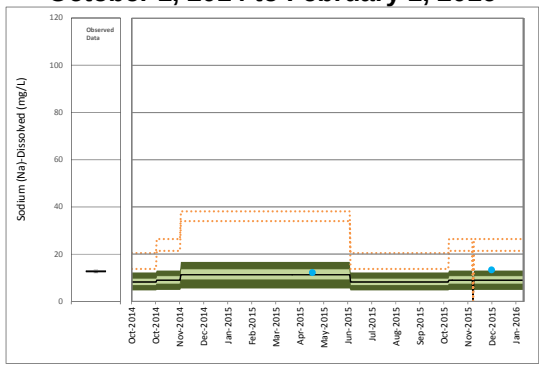
95th Percentile High, 5th Percentile Low

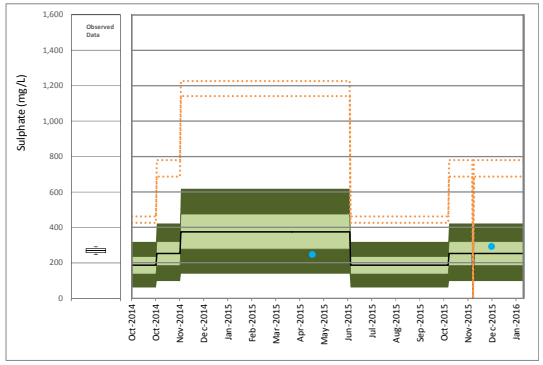
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

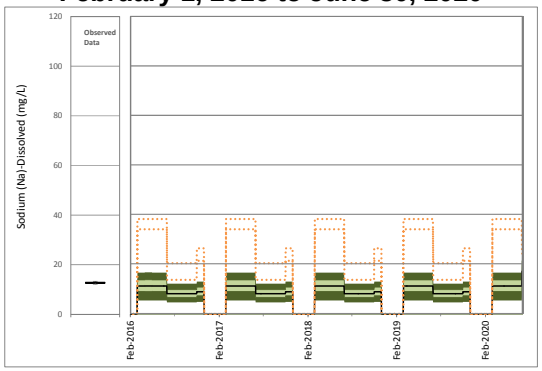
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

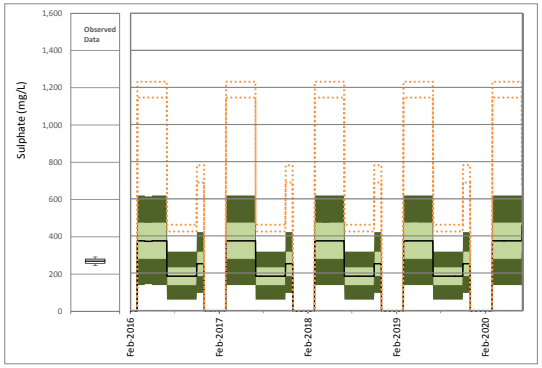
Calibration
October 1, 2014 to February 1, 2016



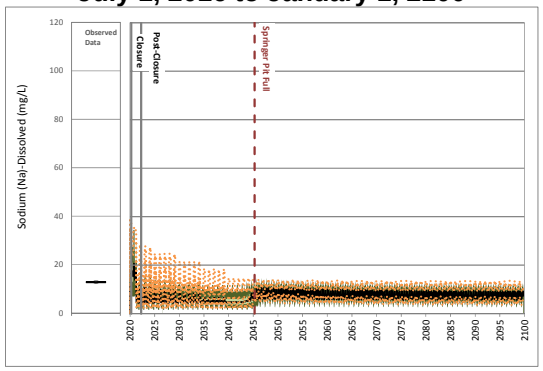


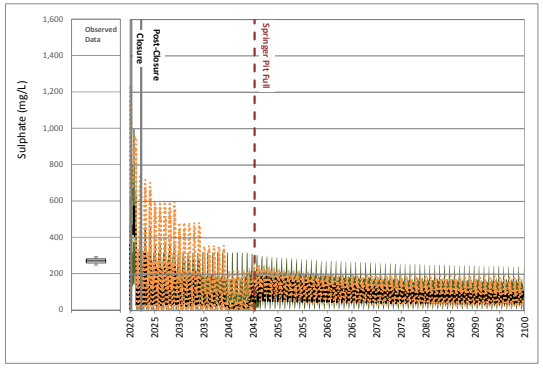
Operations
February 1, 2016 to June 30, 2020



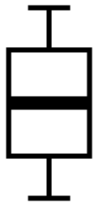


Closure and Post-closure
July 1, 2016 to January 1, 2100



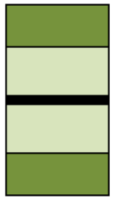


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

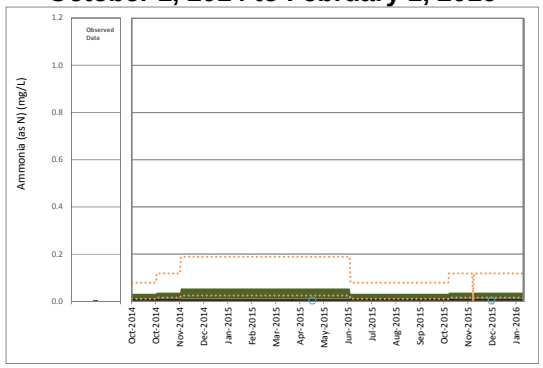
Scenario 2

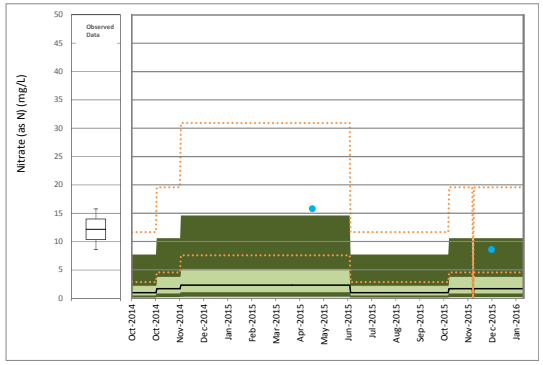
95th Percentile High, 5th Percentile Low

Golder Associates

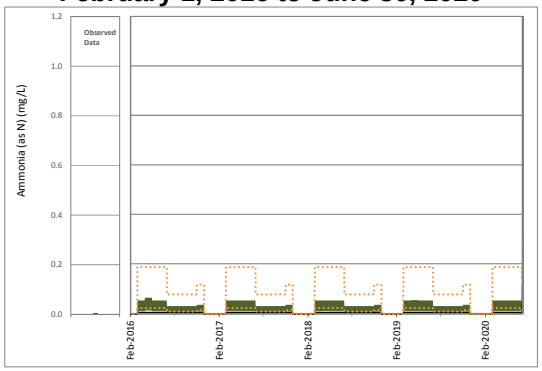
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

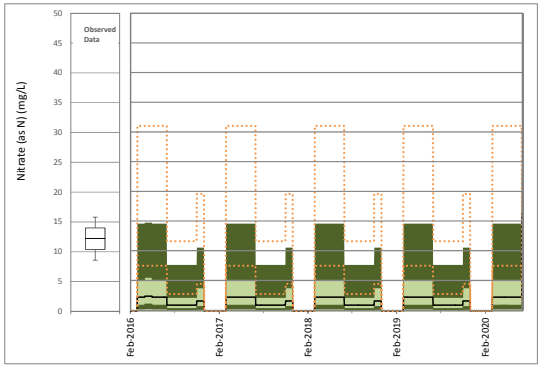
Calibration
October 1, 2014 to February 1, 2016



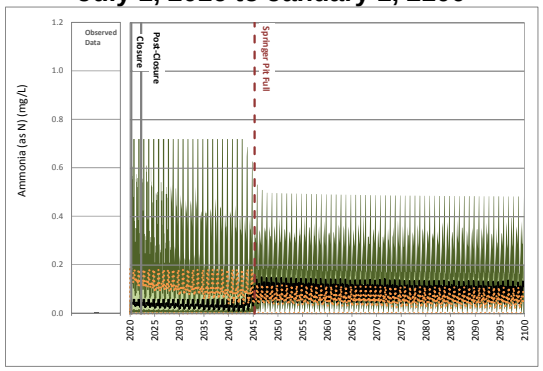


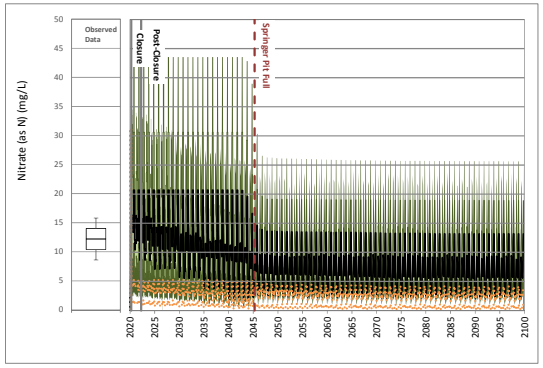
Operations
February 1, 2016 to June 30, 2020



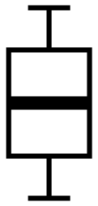


Closure and Post-closure
July 1, 2016 to January 1, 2100



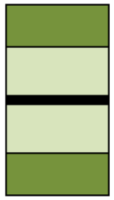


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

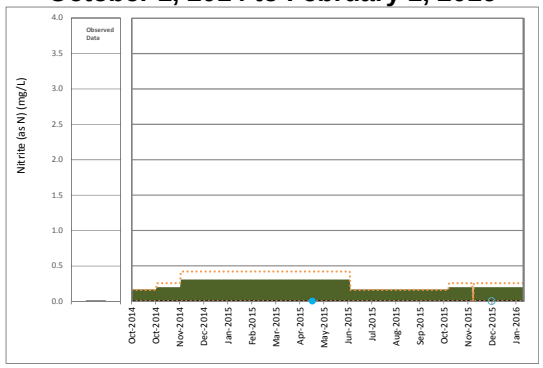
95th Percentile High, 5th Percentile Low

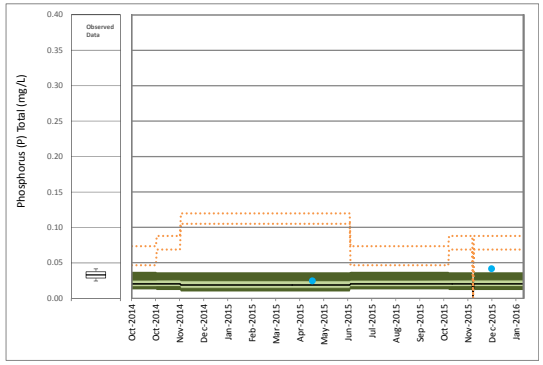
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

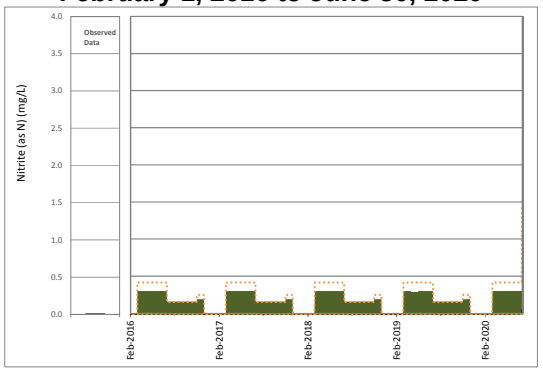
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

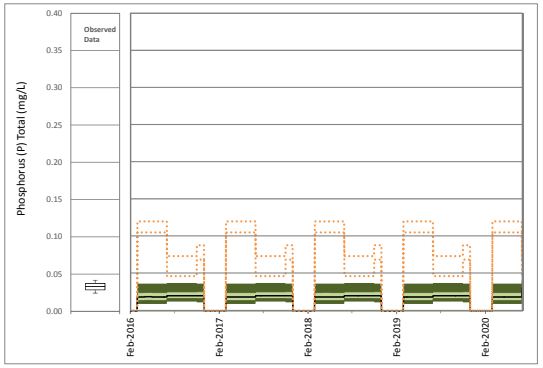
Calibration
October 1, 2014 to February 1, 2016



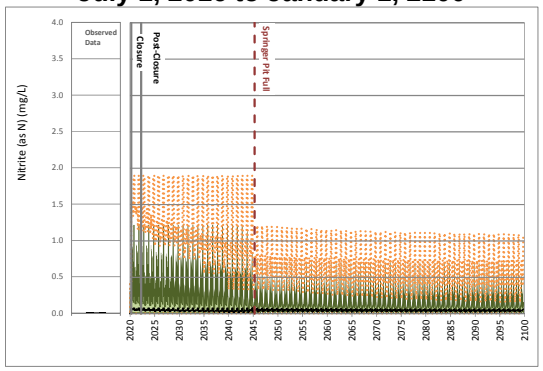


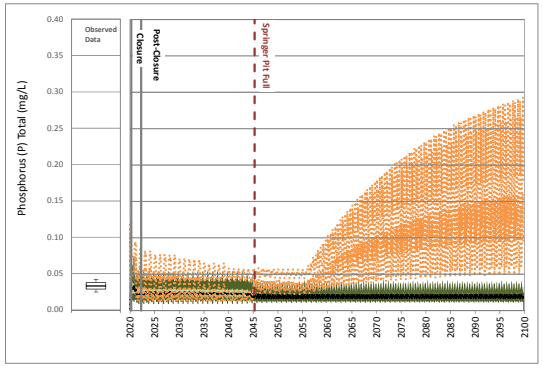
Operations
February 1, 2016 to June 30, 2020



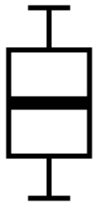


Closure and Post-closure
July 1, 2016 to January 1, 2100



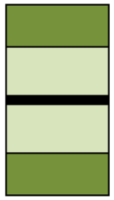


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

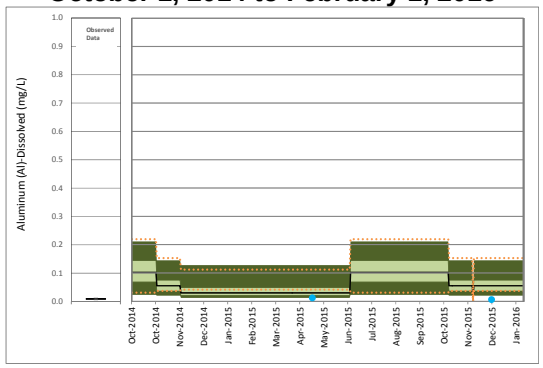
Detected Values
Non- Detected Values

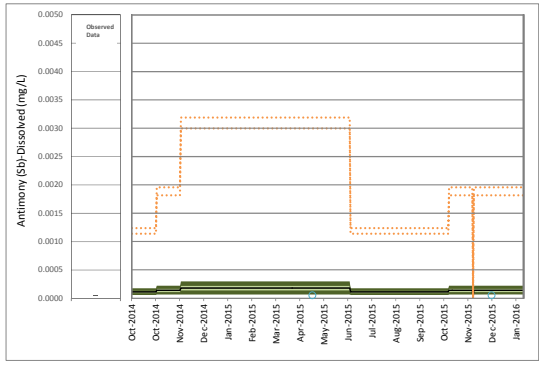
Scenario 2

95th Percentile High, 5th Percentile Low

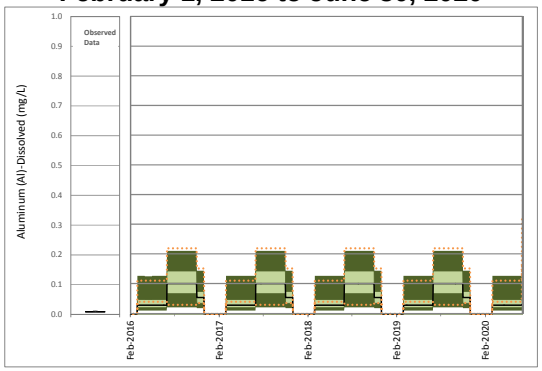
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

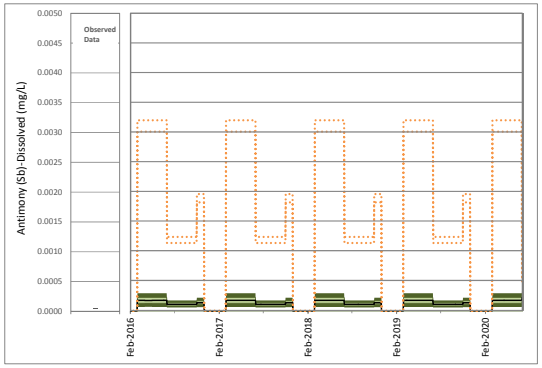
Calibration
October 1, 2014 to February 1, 2016



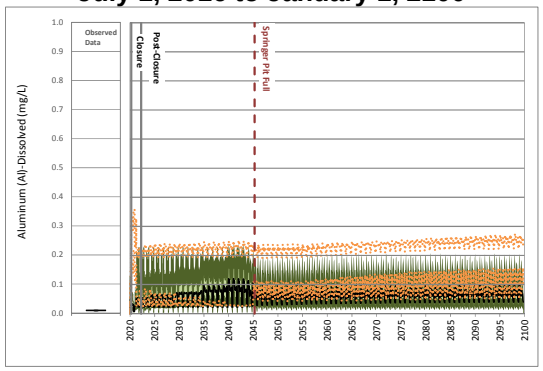


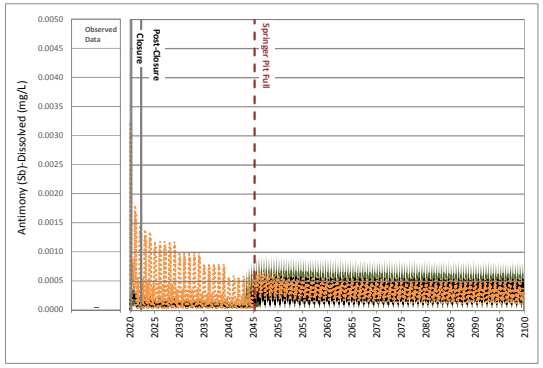
Operations
February 1, 2016 to June 30, 2020



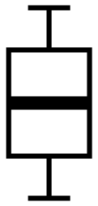


Closure and Post-closure
July 1, 2016 to January 1, 2100



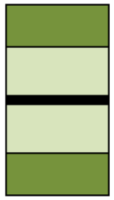


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

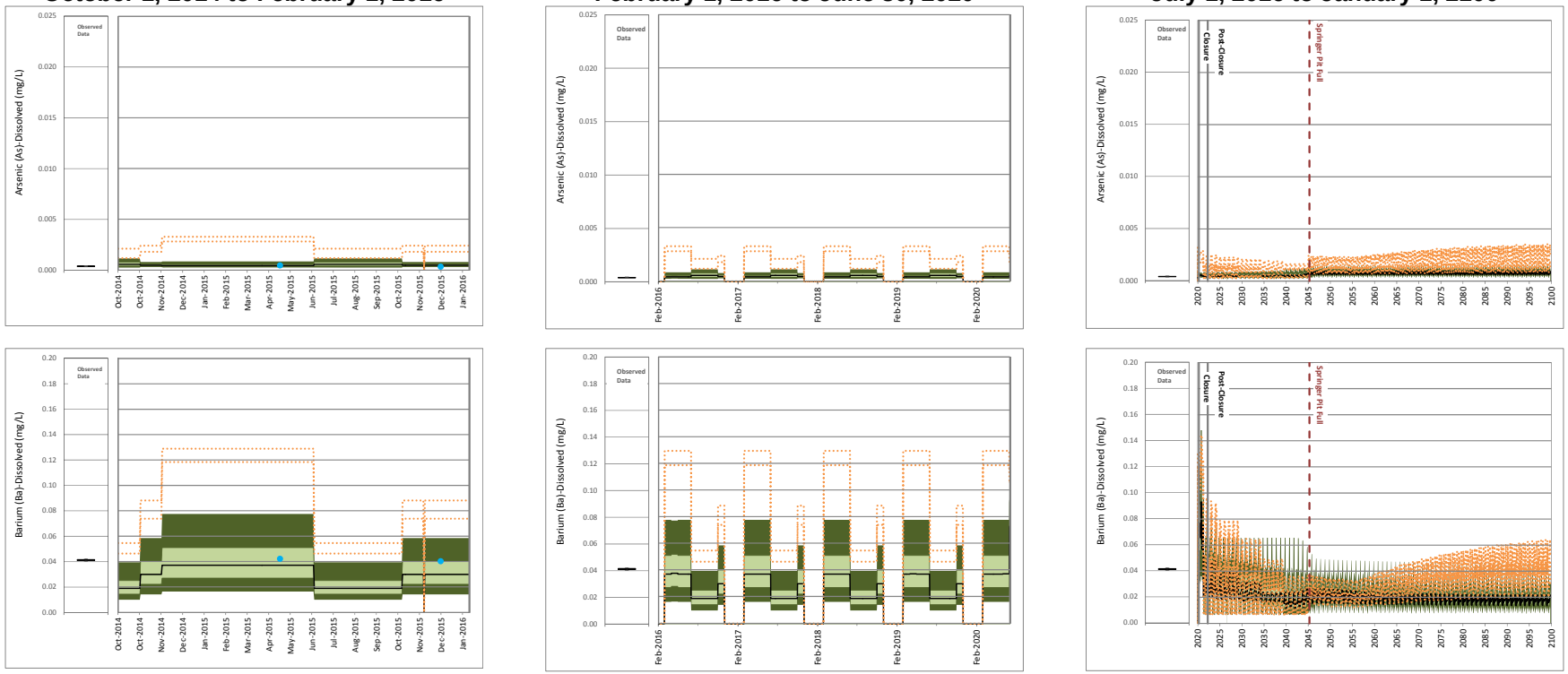
Golder Associates

ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

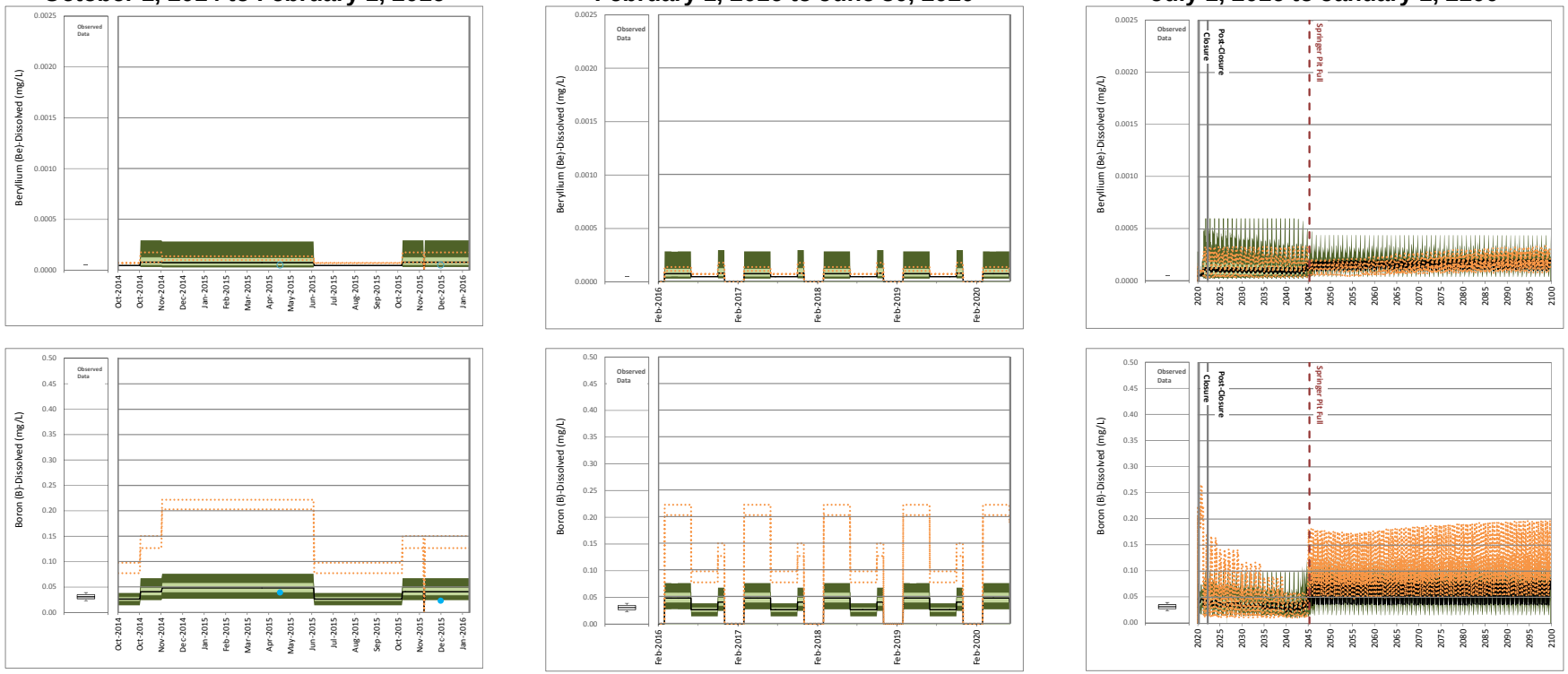
Golder Associates

ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

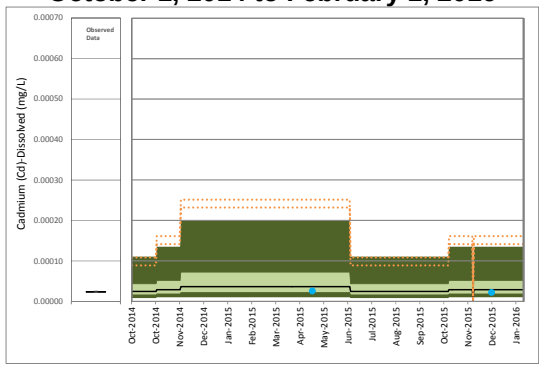
- Detected Values
- Non- Detected Values

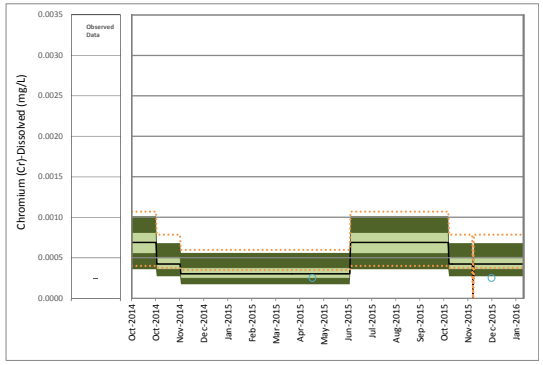
Scenario 2

- 95th Percentile High, 5th Percentile Low

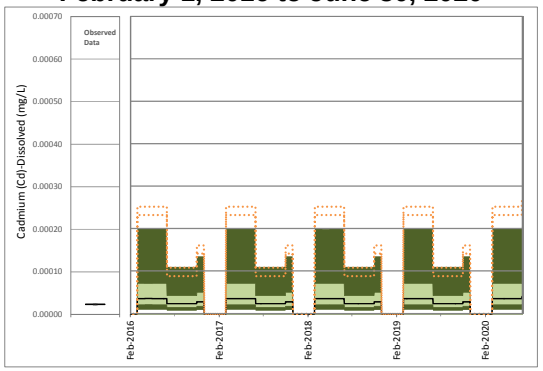
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

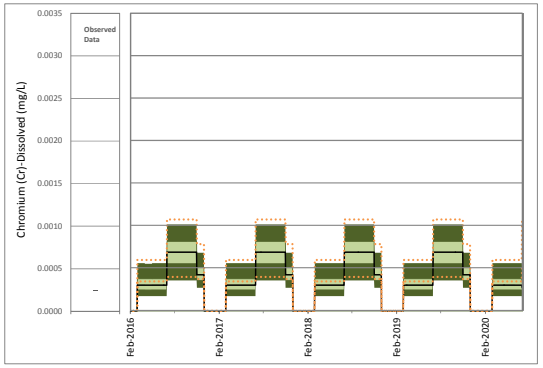
Calibration
October 1, 2014 to February 1, 2016



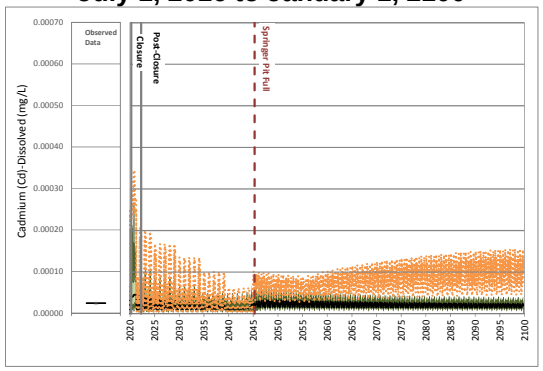


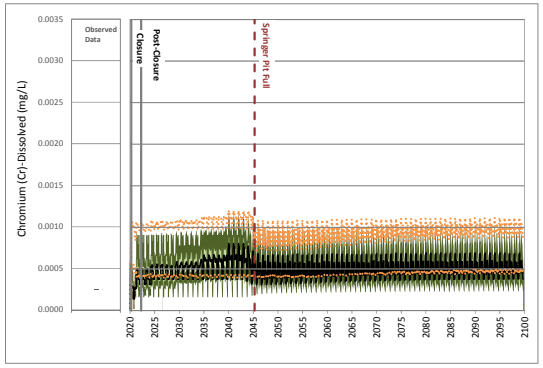
Operations
February 1, 2016 to June 30, 2020



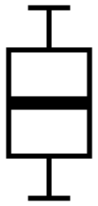


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

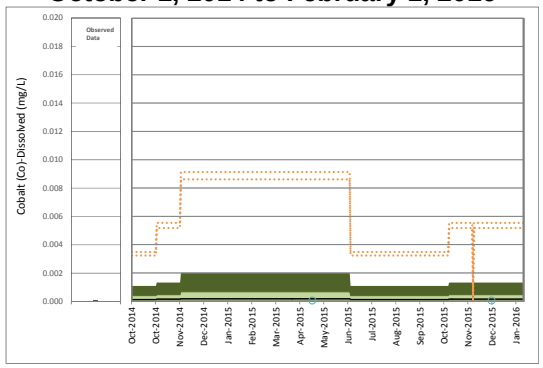
Scenario 2

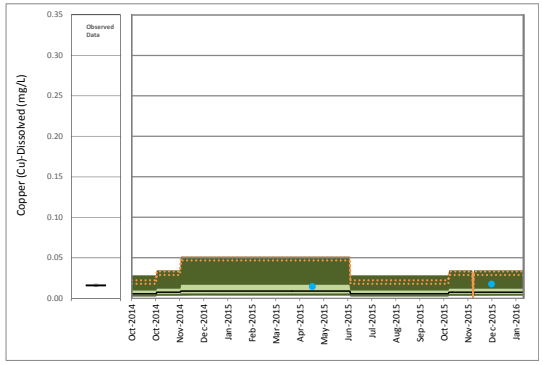
95th Percentile High, 5th Percentile Low

Golder Associates

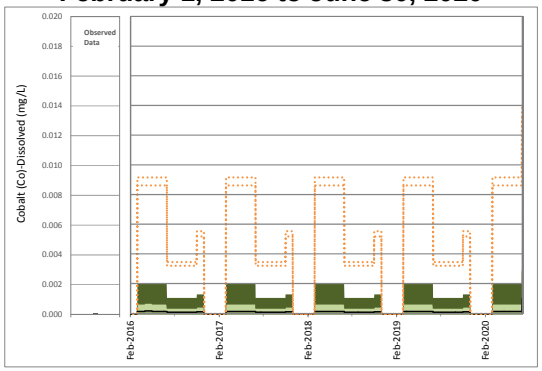
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

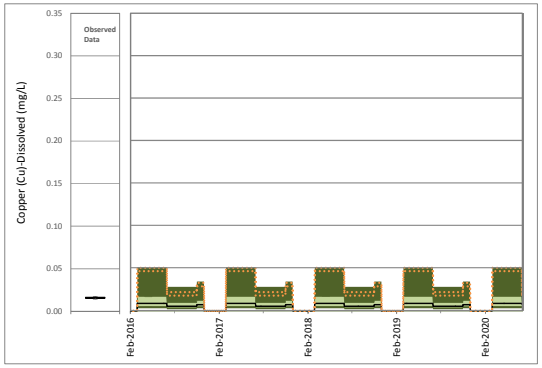
Calibration
October 1, 2014 to February 1, 2016



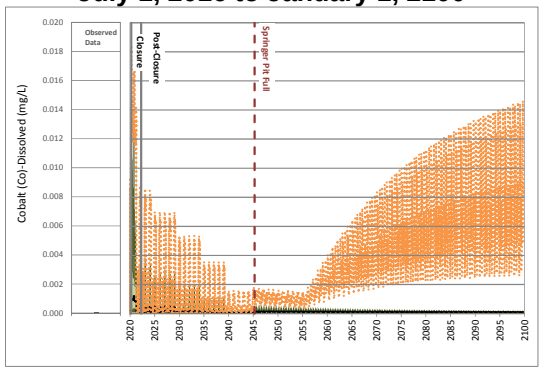


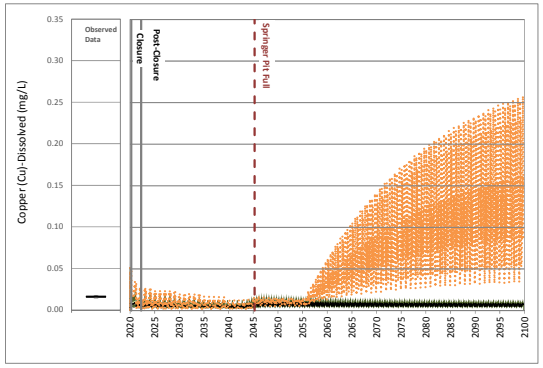
Operations
February 1, 2016 to June 30, 2020



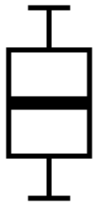


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

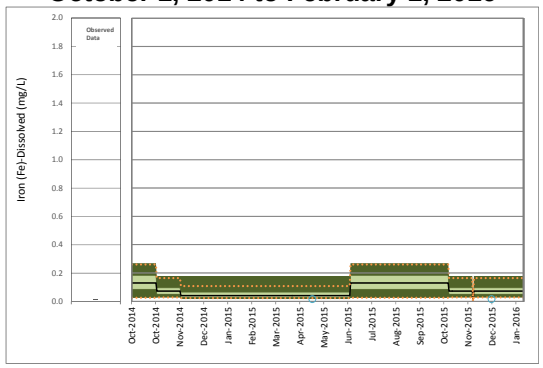
95th Percentile High, 5th Percentile Low

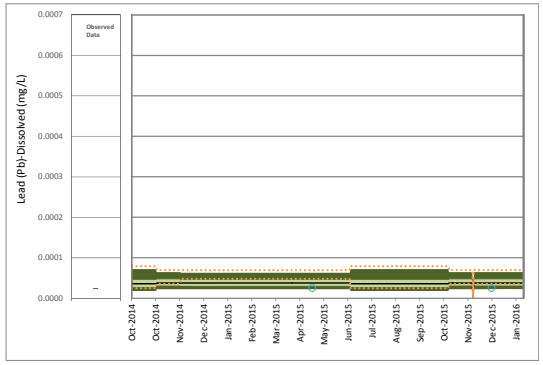
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

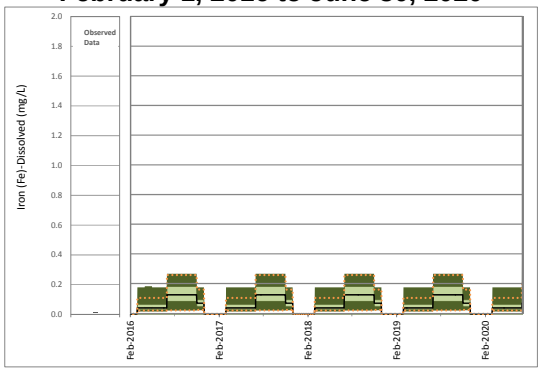
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

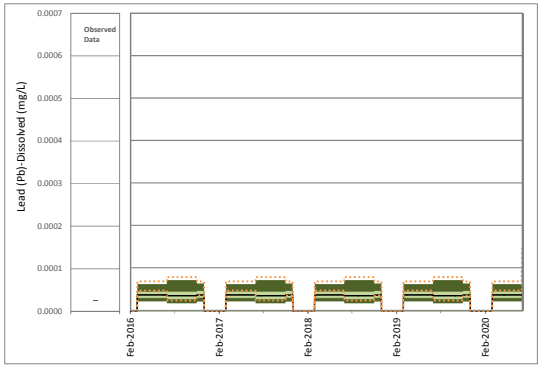
Calibration
October 1, 2014 to February 1, 2016



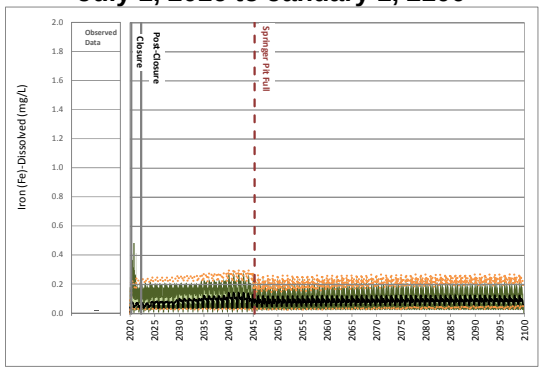


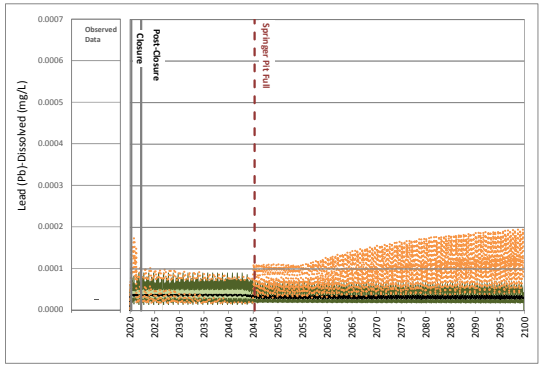
Operations
February 1, 2016 to June 30, 2020



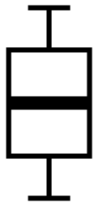


Closure and Post-closure
July 1, 2016 to January 1, 2100



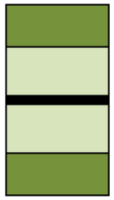


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

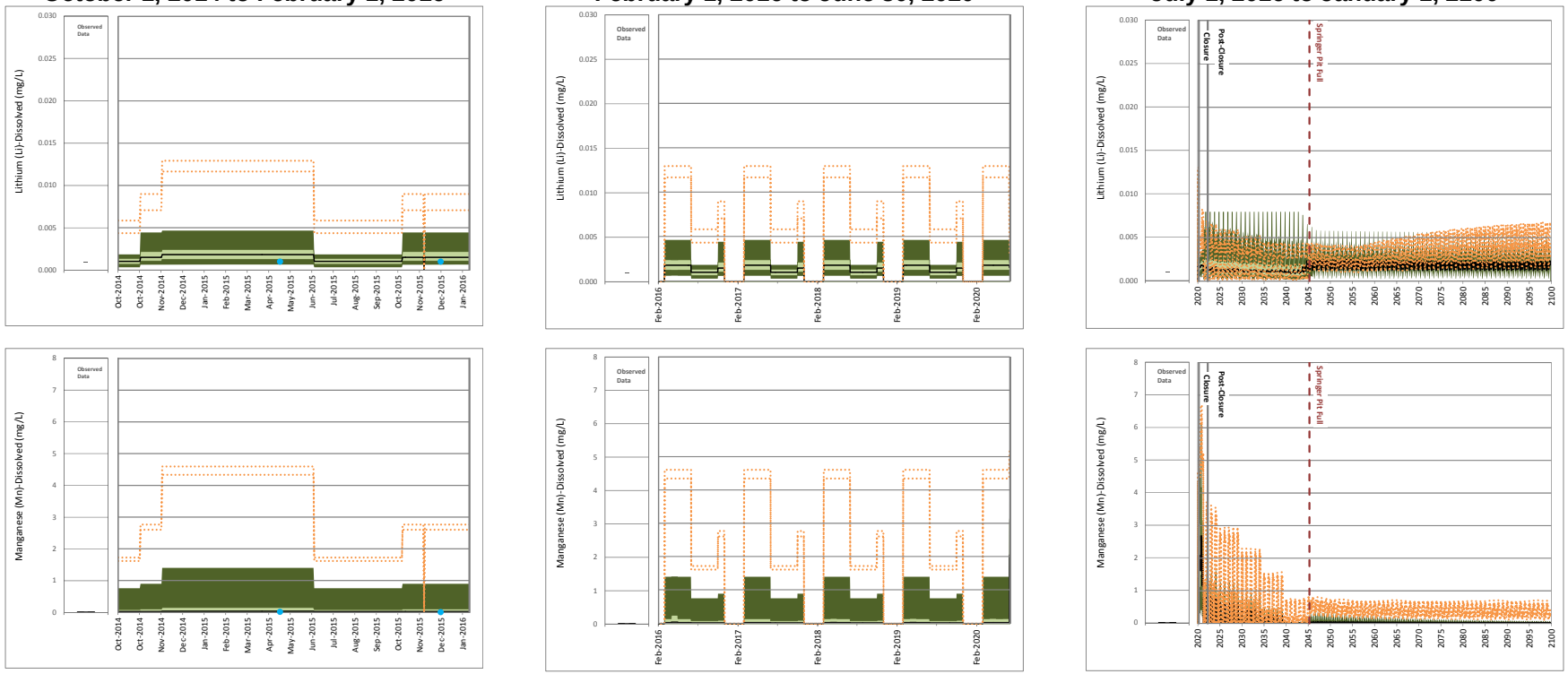
Golder Associates

ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

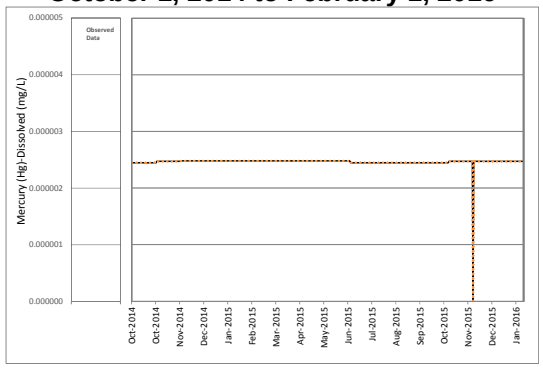
95th Percentile High, 5th Percentile Low

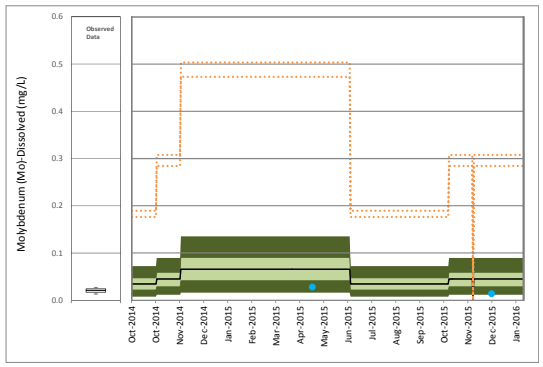
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

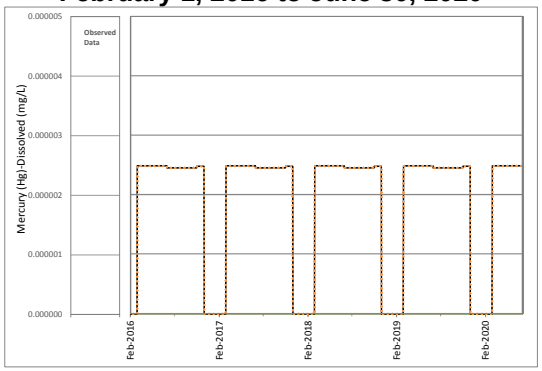
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

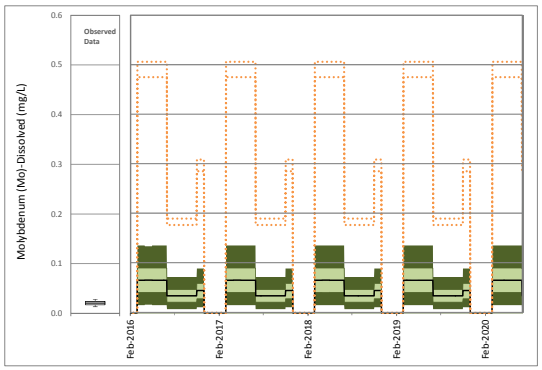
Calibration
October 1, 2014 to February 1, 2016



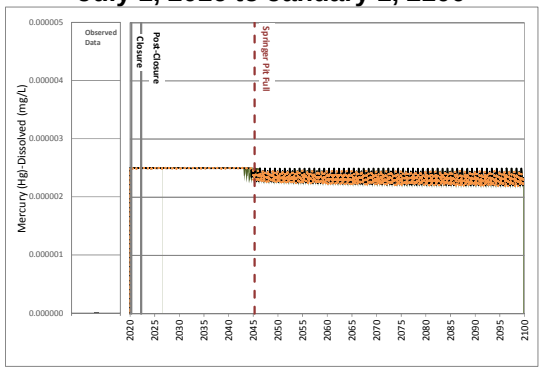


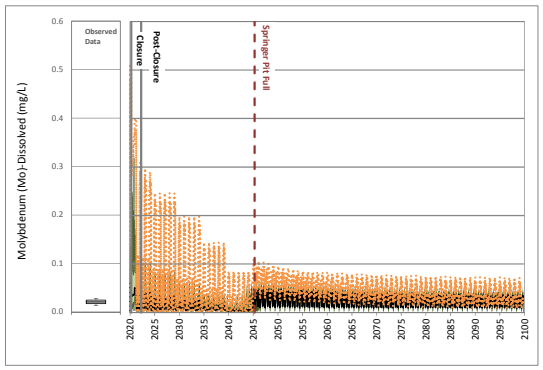
Operations
February 1, 2016 to June 30, 2020



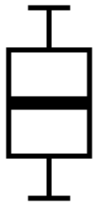


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

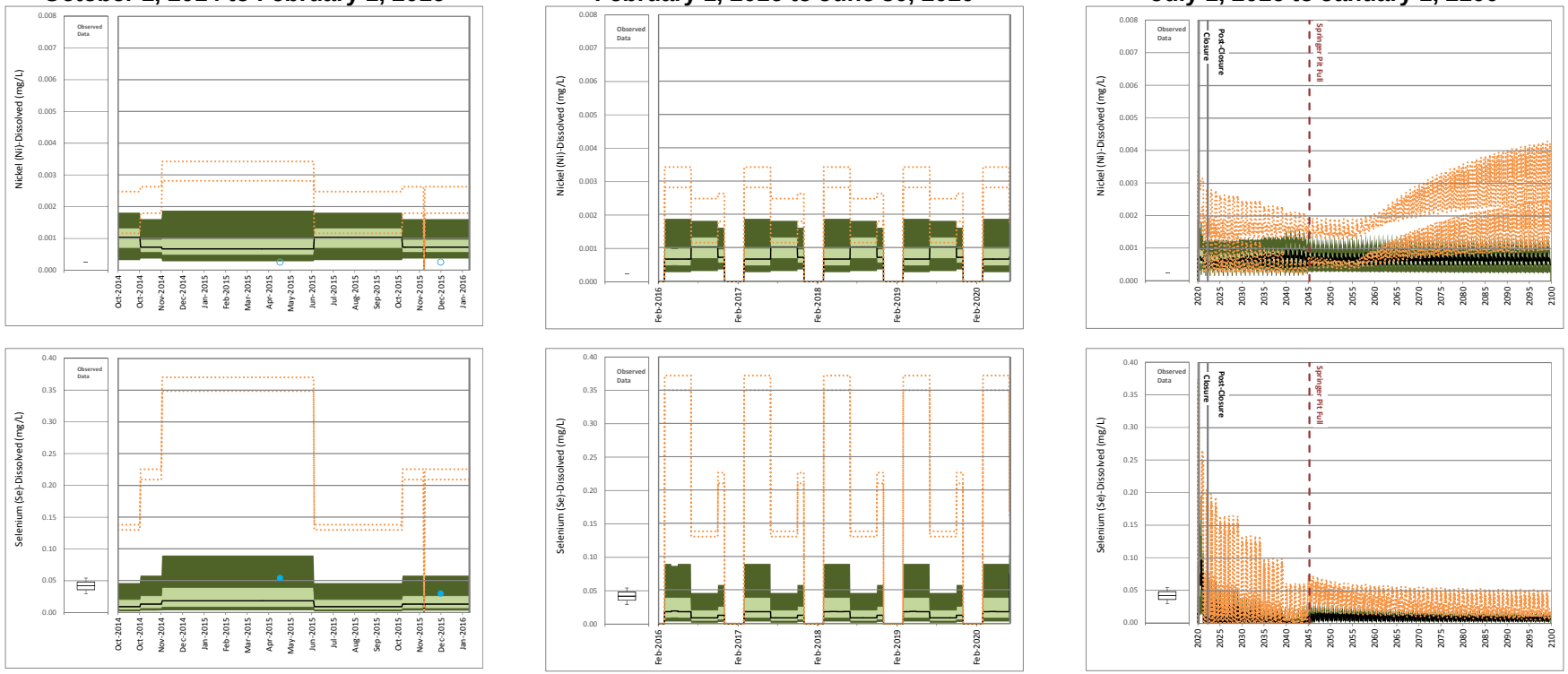
Golder Associates

ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

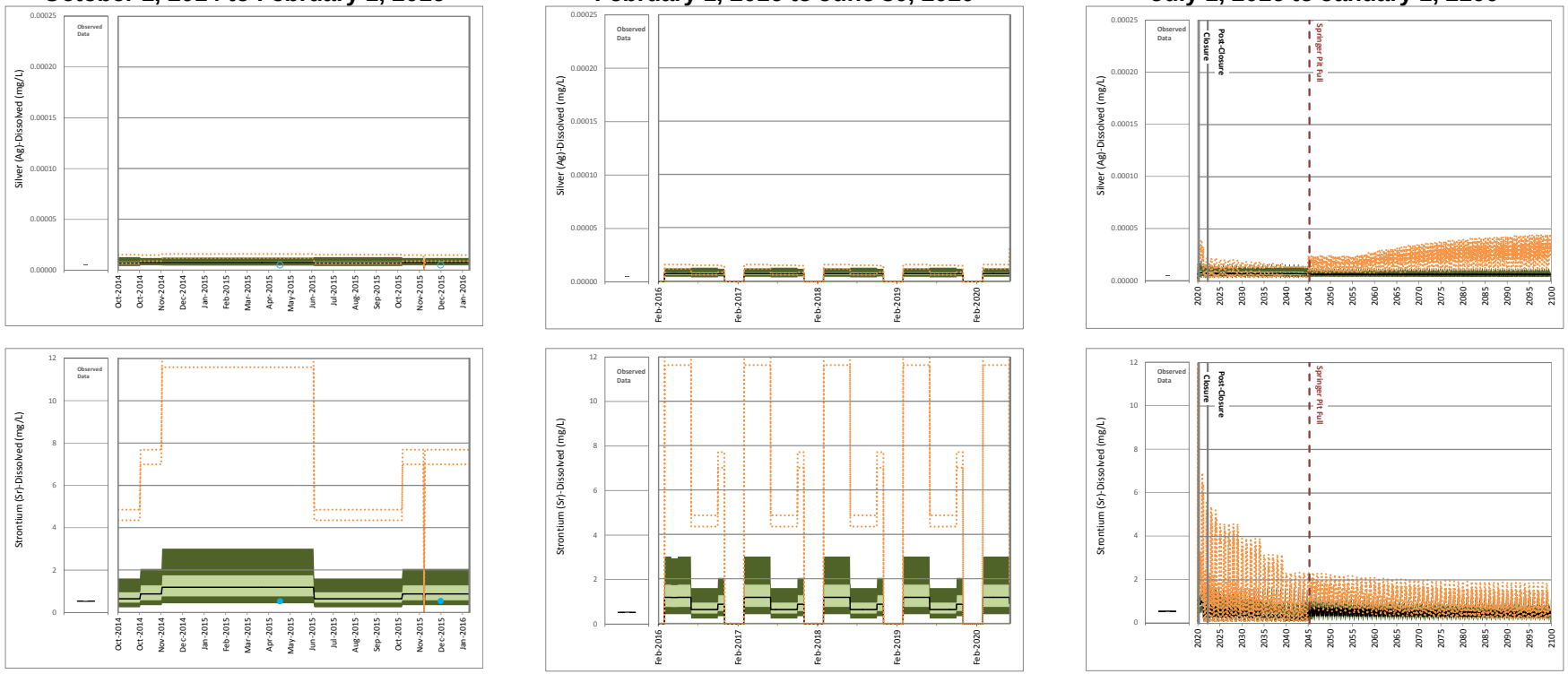
Golder Associates

ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

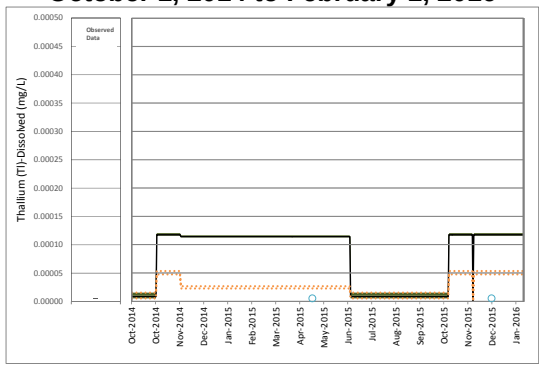
95th Percentile High, 5th Percentile Low

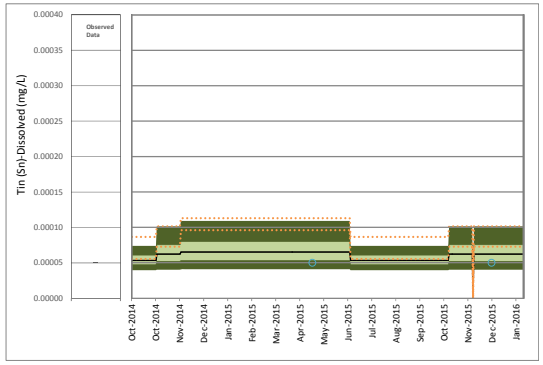
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

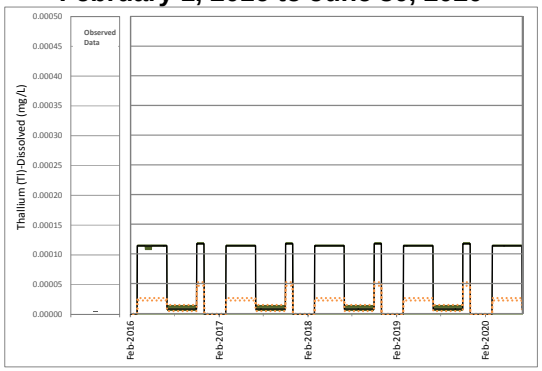
ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

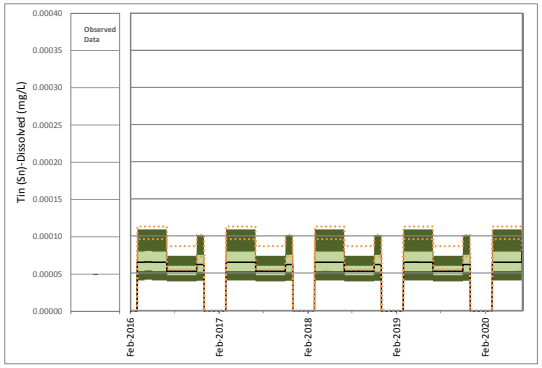
Calibration
October 1, 2014 to February 1, 2016



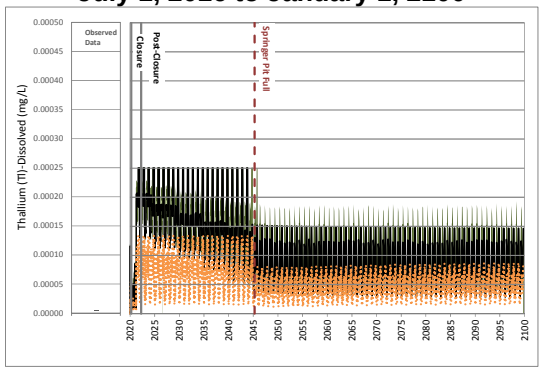


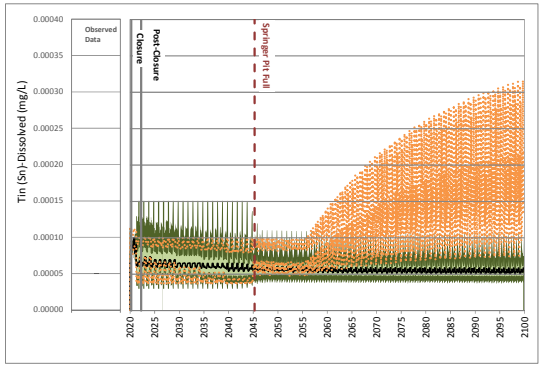
Operations
February 1, 2016 to June 30, 2020



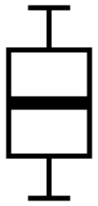


Closure and Post-closure
July 1, 2016 to January 1, 2100



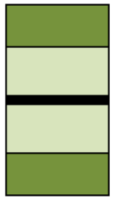


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

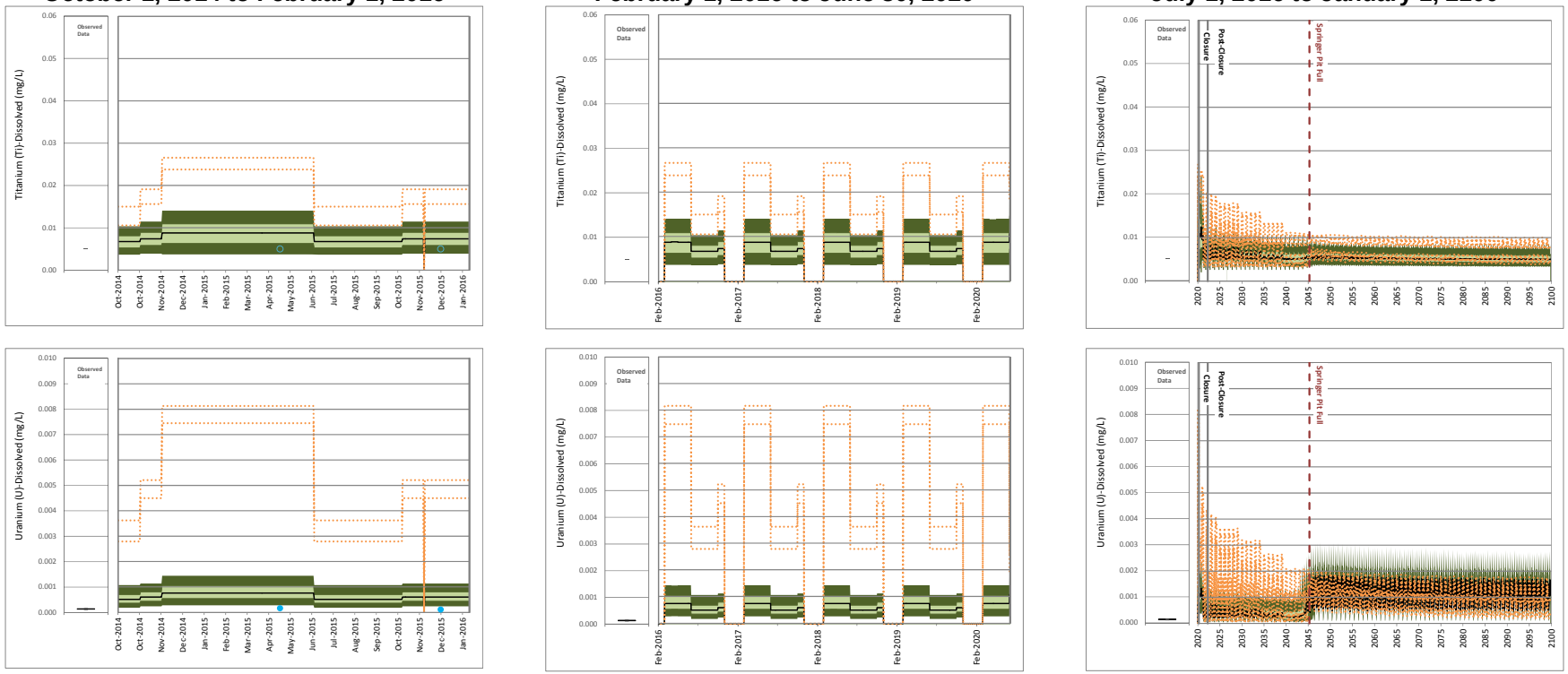
Golder Associates

ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

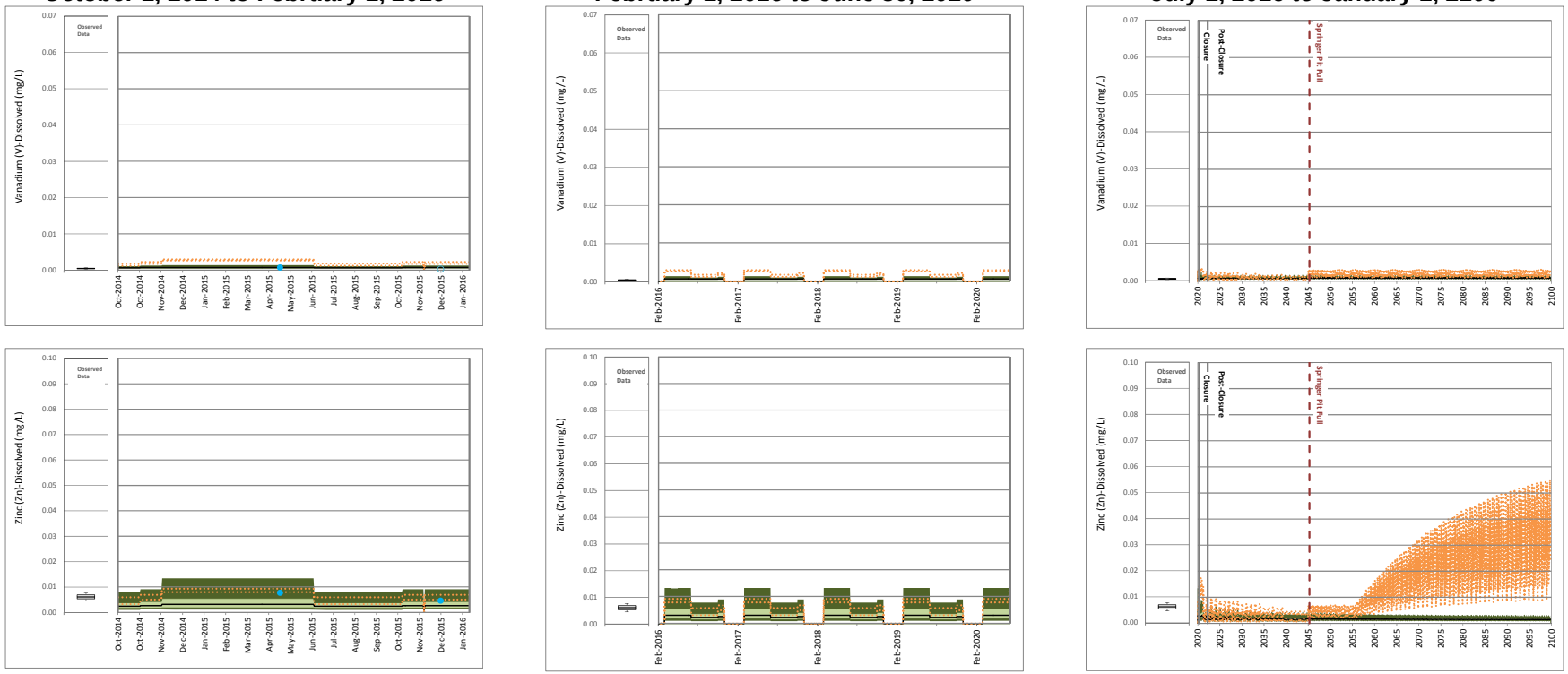
Golder Associates

ATTACHMENT B
Figure B7: Time Series Plots of Predicted Mine Drainage Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

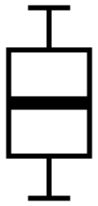
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



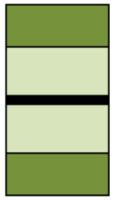
o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig7-mdcs.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.8 Bootjack Creek Sump

Table B8 presents the maximum predicted median and 95th percentile results for the Bootjack Creek Sump, calculated based on 500 realizations for Scenario 1 (Table B8a) and Scenario 2 (Table B8b). Time series plots for each modelled parameter are provided in Figure B8.

Table B8a:
Predicted Bootjack Creek Sump Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	767	1188	787	1221	787	1221	154	505	131	381
Total Dissolved Solids	mg/L	1079	1687	1109	1734	1109	1734	214	776	191	573
Major Ions											
Calcium	mg/L	237	355	243	364	243	364	47	154	39	115
Chloride	mg/L	2.8	11	2.9	11	2.9	11	1.5	5.5	1.5	5.5
Fluoride	mg/L	0.17	0.52	0.18	0.54	0.18	0.54	0.073	0.11	0.072	0.1
Magnesium	mg/L	43	73	44	75	44	75	8.9	30	8.6	23
Potassium	mg/L	2.1	5.3	2.2	5.4	2.2	5.4	0.92	2.4	0.91	2.0
Sodium	mg/L	17	26	17	27	17	27	4.7	12	4.7	10
Sulphate	mg/L	646	1124	664	1156	664	1156	37	316	27	220
Nutrients											
Ammonia	mg/L (as N)	0.0052	0.097	0.0052	0.099	0.0051	0.099	0.0055	0.099	0.0055	0.036
Nitrate	mg/L (as N)	3.1	27	3.2	28	3.2	28	3.2	28	1.1	9.1
Nitrite	mg/L (as N)	0.0035	0.58	0.0036	0.6	0.0036	0.6	0.0036	0.6	0.0024	0.2
Total Phosphorus	mg/L	0.021	0.052	0.021	0.052	0.021	0.053	0.023	0.053	0.023	0.045
Total Metals											
Aluminum	mg/L	0.51	0.7	0.51	0.7	0.51	0.72	0.6	0.72	0.6	0.7
Antimony	mg/L	0.00028	0.00064	0.00028	0.00066	0.00028	0.00066	0.000097	0.0004	0.000089	0.00035
Arsenic	mg/L	0.0006	0.0012	0.0006	0.0013	0.0006	0.0013	0.00074	0.0013	0.00074	0.0013
Barium	mg/L	0.05	0.13	0.051	0.13	0.051	0.13	0.029	0.071	0.024	0.053
Beryllium	mg/L	0.00012	0.00064	0.00012	0.00064	0.00013	0.00068	0.00013	0.00068	0.0001	0.00051
Boron	mg/L	0.06	0.13	0.061	0.13	0.061	0.13	0.042	0.13	0.034	0.11
Cadmium	mg/L	0.000056	0.00047	0.000057	0.00048	0.000057	0.00048	0.000015	0.00014	0.000015	0.00013
Chromium	mg/L	0.0010	0.0015	0.0010	0.0015	0.001	0.0015	0.0014	0.0017	0.0014	0.0017
Cobalt	mg/L	0.00054	0.004	0.00055	0.0041	0.00055	0.0041	0.0004	0.00054	0.0004	0.0005
Copper	mg/L	0.015	0.11	0.016	0.11	0.016	0.11	0.01	0.028	0.0093	0.025
Iron	mg/L	0.58	0.76	0.58	0.76	0.58	0.76	0.67	0.8	0.67	0.8
Lead	mg/L	0.00018	0.00023	0.00018	0.00023	0.00018	0.00024	0.00018	0.00024	0.00018	0.00022
Lithium	mg/L	0.0023	0.01	0.0023	0.01	0.0023	0.011	0.0016	0.011	0.0014	0.0086
Manganese	mg/L	0.059	2.7	0.06	2.8	0.06	2.8	0.021	0.058	0.021	0.045
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.12	0.26	0.12	0.27	0.12	0.27	0.0056	0.051	0.0044	0.039
Nickel	mg/L	0.0012	0.0034	0.0012	0.0035	0.0012	0.0035	0.0014	0.002	0.0014	0.002
Selenium	mg/L	0.029	0.17	0.03	0.17	0.03	0.17	0.002	0.028	0.0015	0.021
Silver	mg/L	0.000007	0.000025	0.000007	0.000025	0.000007	0.000026	0.0000072	0.000026	0.0000072	0.000024
Strontium	mg/L	1.8	5.6	1.8	5.8	1.8	5.8	0.33	2.0	0.29	1.6
Thallium	mg/L	0.00023	0.00024	0.00023	0.00024	0.00025	0.00026	0.00025	0.00026	0.00017	0.00019
Tin	mg/L	0.000064	0.00024	0.000064	0.00024	0.000064	0.00025	0.000064	0.00025	0.000059	0.00022
Titanium	mg/L	0.034	0.043	0.034	0.043	0.034	0.043	0.027	0.033	0.027	0.031
Uranium	mg/L	0.0012	0.0028	0.0012	0.0028	0.0012	0.0028	0.0003	0.0019	0.0003	0.0016
Vanadium	mg/L	0.002	0.0029	0.002	0.003	0.002	0.003	0.002	0.0029	0.0019	0.0026
Zinc	mg/L	0.0056	0.025	0.0057	0.026	0.0057	0.026	0.003	0.0057	0.003	0.005
Dissolved Metals											
Aluminum	mg/L	0.021	0.21	0.021	0.21	0.022	0.23	0.11	0.23	0.11	0.22
Antimony	mg/L	0.00026	0.00046	0.00026	0.00048	0.00026	0.00048	0.000077	0.00022	0.000069	0.00017
Arsenic	mg/L	0.00041	0.001	0.00041	0.0011	0.00041	0.0011	0.00055	0.0011	0.00055	0.0011
Barium	mg/L	0.045	0.13	0.046	0.13	0.046	0.13	0.024	0.065	0.019	0.048
Beryllium	mg/L	0.00012	0.00056	0.00012	0.00056	0.00013	0.0006	0.00013	0.0006	0.0001	0.00043
Boron	mg/L	0.057	0.096	0.058	0.096	0.058	0.098	0.039	0.098	0.031	0.072
Cadmium	mg/L	0.000051	0.00037	0.000053	0.00038	0.000053	0.00038	0.000011	0.000049	0.000011	0.000037
Chromium	mg/L	0.00036	0.00085	0.00036	0.00085	0.00037	0.0009	0.00074	0.0011	0.00074	0.0011
Cobalt	mg/L	0.00021	0.0037	0.00022	0.0038	0.00022	0.0038	0.000077	0.00021	0.000072	0.00017
Copper	mg/L	0.011	0.091	0.011	0.094	0.011	0.094	0.0054	0.012	0.0047	0.0094
Iron	mg/L	0.038	0.21	0.038	0.22	0.038	0.22	0.13	0.26	0.13	0.26
Lead	mg/L	0.000035	0.000087	0.000035	0.000087	0.000036	0.00009	0.000037	0.00009	0.000037	0.000077
Lithium	mg/L	0.002	0.0076	0.002	0.0076	0.002	0.0079	0.0012	0.0079	0.0011	0.0057
Manganese	mg/L	0.044	2.7	0.045	2.8	0.045	2.8	0.0065	0.043	0.0065	0.031
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.12	0.25	0.12	0.26	0.12	0.26	0.0056	0.037	0.0044	0.026
Nickel	mg/L	0.00065	0.0028	0.00066	0.0029	0.00066	0.0029	0.00087	0.0015	0.00087	0.0015
Selenium	mg/L	0.029	0.16	0.03	0.17	0.03	0.17	0.002	0.024	0.0015	0.017
Silver	mg/L	0.000007	0.000015	0.000007	0.000015	0.000007	0.000016	0.0000072	0.000016	0.0000072	0.000014
Strontium	mg/L	1.7	5.2	1.8	5.4	1.8	5.4	0.31	1.6	0.27	1.1
Thallium	mg/L	0.00023	0.00023	0.00023	0.00023	0.00025	0.00025	0.00025	0.00025	0.00017	0.00018
Tin	mg/L	0.000064	0.00014	0.000064	0.00014	0.000064	0.00015	0.000064	0.00015	0.000059	0.00012
Titanium	mg/L	0.011	0.02	0.012	0.021	0.012	0.021	0.0052	0.01	0.0051	0.0089
Uranium	mg/L	0.0011	0.0021	0.0012	0.0022	0.0012	0.0022	0.00026	0.0013	0.00026	0.0010
Vanadium	mg/L	0.00066	0.0016	0.00066	0.0017	0.00066	0.0017	0.00066	0.0016	0.00065	0.0013
Zinc	mg/L	0.0041	0.024	0.0042	0.024	0.0042	0.024	0.0015	0.0042	0.0015	0.0034

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

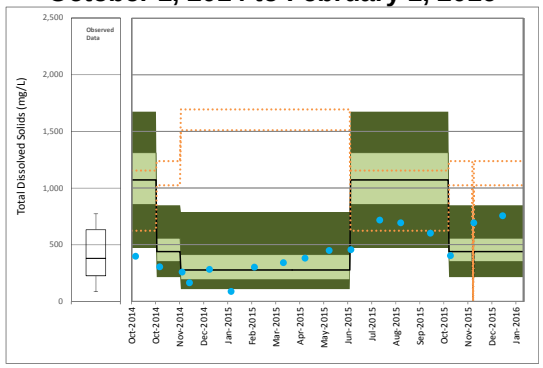
Table B8b:
Predicted Bootjack Creek Sump Water Quality - Scenario 2

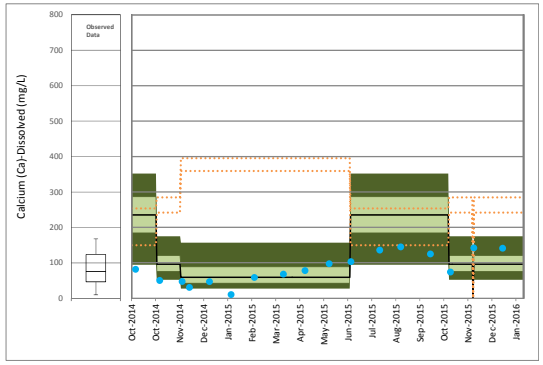
Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	1274	1317	1274	1317	1260	1303	1282	1330	1282	1330
Total Dissolved Solids	mg/L	1670	1707	1670	1707	1629	1668	1653	1710	1653	1710
Major Ions											
Calcium	mg/L	388	398	388	398	384	394	391	404	391	404
Chloride	mg/L	17	19	17	19	16	19	17	18	17	18
Fluoride	mg/L	0.54	0.56	0.54	0.56	0.53	0.55	0.54	0.56	0.54	0.56
Magnesium	mg/L	74	78	74	78	73	77	74	78	74	78
Potassium	mg/L	6.5	6.8	6.5	6.8	6.5	6.8	6.6	6.8	6.6	6.8
Sodium	mg/L	32	34	32	34	31	33	32	33	32	33
Sulphate	mg/L	1019	1031	1019	1031	1006	1023	1020	1052	1020	1052
Nutrients											
Ammonia	mg/L (as N)	0.25	0.26	0.25	0.26	0.17	0.18	0.17	0.18	0.12	0.13
Nitrate	mg/L (as N)	41	45	41	45	5.1	10	5.1	10	3.6	4.2
Nitrite	mg/L (as N)	0.55	0.56	1.8	1.8	1.8	1.8	1.8	1.8	1.3	1.3
Total Phosphorus	mg/L	0.099	0.11	0.099	0.11	0.098	0.11	0.099	0.11	0.099	0.11
Total Metals											
Aluminum	mg/L	0.58	0.66	0.58	0.66	0.57	0.7	0.6	0.7	0.6	0.7
Antimony	mg/L	0.0027	0.0029	0.0027	0.0029	0.0027	0.0028	0.0027	0.0029	0.0027	0.0029
Arsenic	mg/L	0.0029	0.0032	0.0029	0.0032	0.0028	0.0031	0.0028	0.0031	0.0028	0.0031
Barium	mg/L	0.11	0.12	0.11	0.12	0.11	0.11	0.11	0.12	0.11	0.12
Beryllium	mg/L	0.00012	0.00052	0.00012	0.00053	0.00012	0.00064	0.00012	0.00064	0.0001	0.00029
Boron	mg/L	0.19	0.23	0.19	0.23	0.19	0.22	0.19	0.23	0.19	0.23
Cadmium	mg/L	0.00021	0.00031	0.00021	0.00031	0.00021	0.00031	0.00021	0.00031	0.00021	0.00031
Chromium	mg/L	0.0012	0.0015	0.0012	0.0015	0.0012	0.0015	0.0014	0.0017	0.0014	0.0017
Cobalt	mg/L	0.008	0.008	0.008	0.008	0.0079	0.0079	0.008	0.008	0.008	0.008
Copper	mg/L	0.047	0.059	0.047	0.059	0.046	0.058	0.047	0.059	0.047	0.059
Iron	mg/L	0.64	0.72	0.64	0.72	0.64	0.72	0.67	0.8	0.67	0.8
Lead	mg/L	0.0002	0.00022	0.0002	0.00022	0.0002	0.00023	0.0002	0.00023	0.0002	0.00022
Lithium	mg/L	0.011	0.014	0.011	0.014	0.011	0.014	0.011	0.014	0.011	0.014
Manganese	mg/L	3.9	3.9	3.9	3.9	3.8	3.8	3.9	3.9	3.9	3.9
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.42	0.44	0.42	0.44	0.42	0.43	0.42	0.44	0.42	0.44
Nickel	mg/L	0.0034	0.0038	0.0034	0.0038	0.0034	0.0037	0.0034	0.0037	0.0034	0.0037
Selenium	mg/L	0.31	0.32	0.31	0.32	0.31	0.31	0.31	0.32	0.31	0.32
Silver	mg/L	0.000012	0.000026	0.000012	0.000026	0.000012	0.000025	0.000013	0.000025	0.000013	0.000025
Strontium	mg/L	10	11	10	11	10	11	10	11	10	11
Thallium	mg/L	0.00017	0.00018	0.00018	0.00019	0.00023	0.00024	0.00023	0.00024	0.00008	0.000096
Tin	mg/L	0.000097	0.00023	0.000097	0.00024	0.000097	0.00024	0.000098	0.00024	0.000098	0.00021
Titanium	mg/L	0.045	0.046	0.045	0.046	0.044	0.046	0.045	0.046	0.045	0.046
Uranium	mg/L	0.0067	0.0076	0.0067	0.0076	0.0067	0.0075	0.0067	0.0076	0.0067	0.0076
Vanadium	mg/L	0.0037	0.0039	0.0037	0.0039	0.0037	0.0039	0.0037	0.0039	0.0037	0.0039
Zinc	mg/L	0.0089	0.0099	0.0089	0.0099	0.0089	0.0098	0.009	0.0098	0.009	0.0098
Dissolved Metals											
Aluminum	mg/L	0.088	0.17	0.088	0.17	0.084	0.21	0.11	0.22	0.11	0.22
Antimony	mg/L	0.0027	0.0027	0.0027	0.0027	0.0026	0.0027	0.0027	0.0027	0.0027	0.0027
Arsenic	mg/L	0.0027	0.003	0.0027	0.003	0.0026	0.0029	0.0027	0.0029	0.0027	0.0029
Barium	mg/L	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Beryllium	mg/L	0.00012	0.00044	0.00012	0.00045	0.00012	0.00056	0.00012	0.00056	0.0001	0.00021
Boron	mg/L	0.19	0.19	0.19	0.19	0.18	0.19	0.19	0.19	0.19	0.19
Cadmium	mg/L	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021	0.00021
Chromium	mg/L	0.00059	0.00081	0.00059	0.00081	0.00058	0.00086	0.00074	0.0011	0.00074	0.0011
Cobalt	mg/L	0.0077	0.0077	0.0077	0.0077	0.0076	0.0076	0.0077	0.0077	0.0077	0.0077
Copper	mg/L	0.042	0.043	0.042	0.043	0.042	0.043	0.042	0.043	0.042	0.043
Iron	mg/L	0.09	0.17	0.09	0.17	0.089	0.17	0.13	0.26	0.13	0.26
Lead	mg/L	0.000053	0.000077	0.000053	0.000079	0.000053	0.000085	0.000053	0.000085	0.000053	0.000071
Lithium	mg/L	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Manganese	mg/L	3.9	3.9	3.9	3.9	3.8	3.8	3.9	3.9	3.9	3.9
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum	mg/L	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.43	0.42	0.43
Nickel	mg/L	0.0028	0.0032	0.0028	0.0032	0.0028	0.0031	0.0028	0.0031	0.0028	0.0031
Selenium	mg/L	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Silver	mg/L	0.000012	0.000016	0.000012	0.000016	0.000012	0.000015	0.000013	0.000015	0.000013	0.000015
Strontium	mg/L	10	10	10	10	10	10	10	11	10	11
Thallium	mg/L	0.00017	0.00017	0.00018	0.00018	0.00023	0.00023	0.00023	0.00023	0.00008	0.000086
Tin	mg/L	0.000097	0.00013	0.000097	0.00014	0.000097	0.00014	0.000098	0.00014	0.000098	0.00011
Titanium	mg/L	0.022	0.024	0.022	0.024	0.022	0.023	0.022	0.024	0.022	0.024
Uranium	mg/L	0.0067	0.007	0.0067	0.007	0.0066	0.0069	0.0067	0.0069	0.0067	0.0069
Vanadium	mg/L	0.0024	0.0026	0.0024	0.0026	0.0024	0.0026	0.0024	0.0026	0.0024	0.0026
Zinc	mg/L	0.0074	0.0084	0.0074	0.0084	0.0073	0.0083	0.0074	0.0083	0.0074	0.0083

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

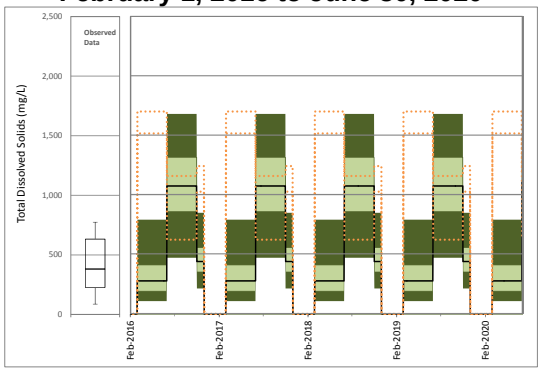
ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

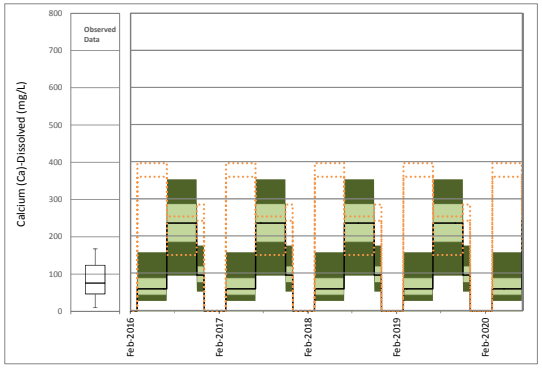
Calibration
October 1, 2014 to February 1, 2016



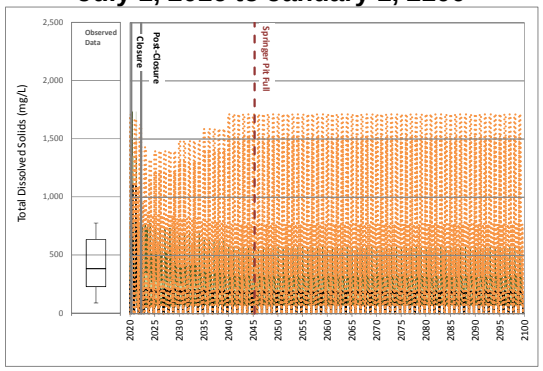


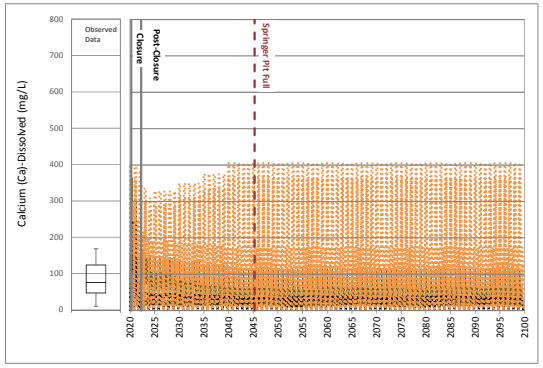
Operations
February 1, 2016 to June 30, 2020



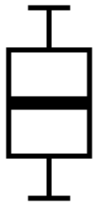


Closure and Post-closure
July 1, 2016 to January 1, 2100



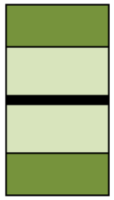


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

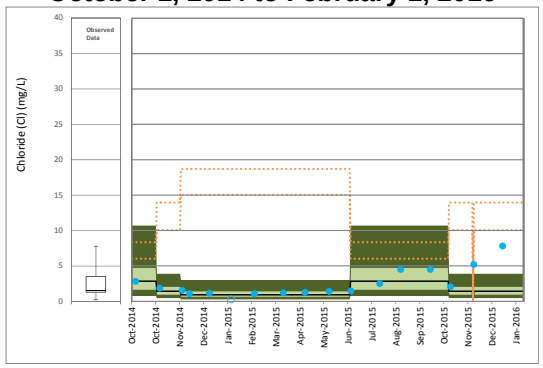
95th Percentile High, 5th Percentile Low

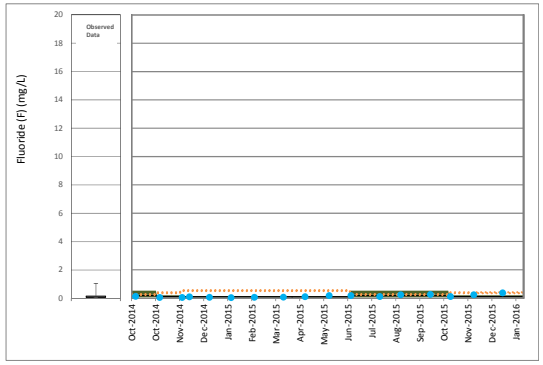
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

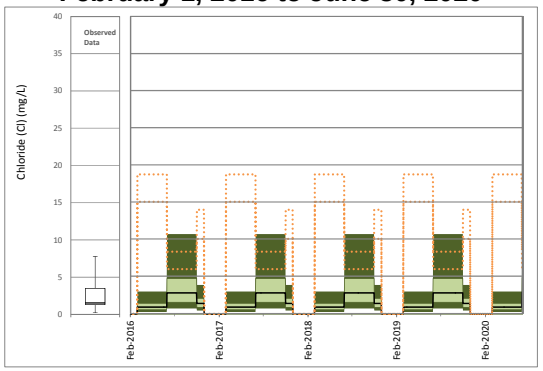
ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

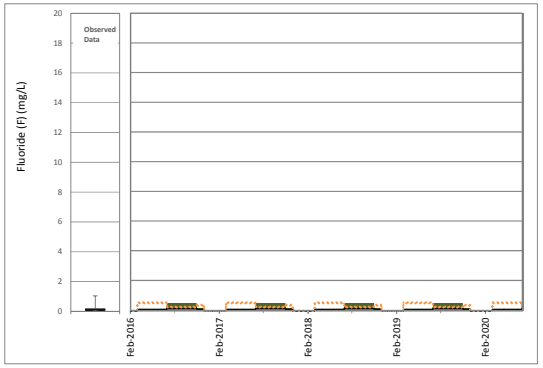
Calibration
October 1, 2014 to February 1, 2016



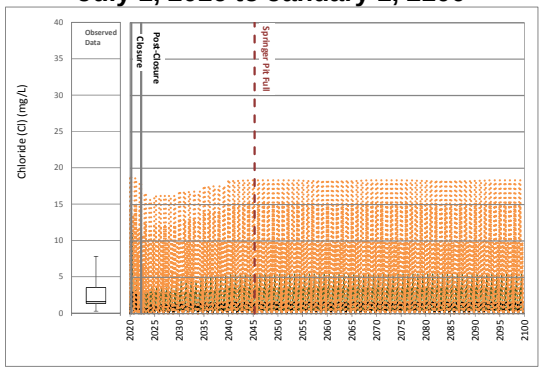


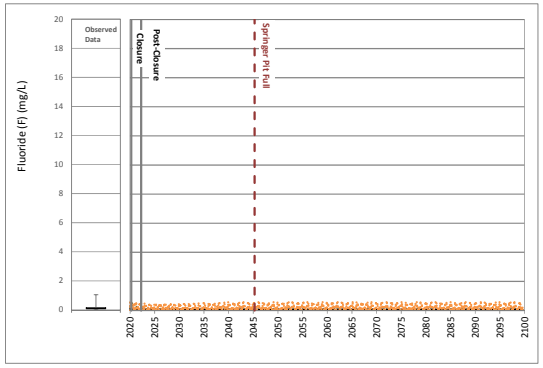
Operations
February 1, 2016 to June 30, 2020



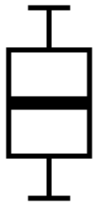


Closure and Post-closure
July 1, 2016 to January 1, 2100



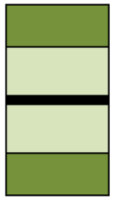


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

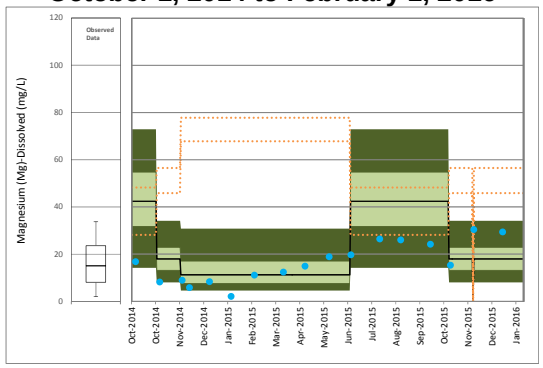
95th Percentile High, 5th Percentile Low

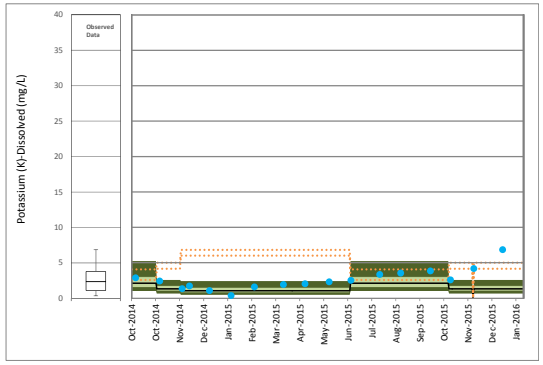
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

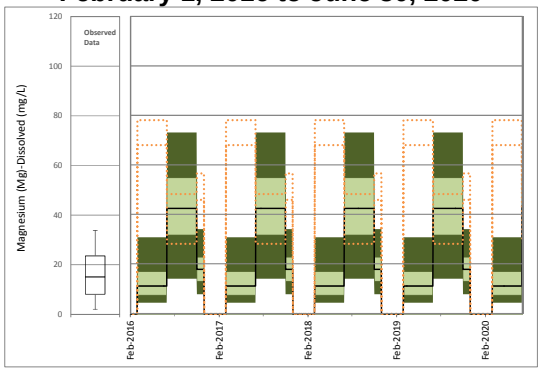
ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

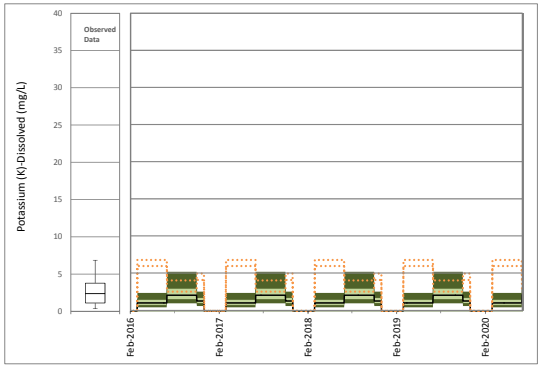
Calibration
October 1, 2014 to February 1, 2016



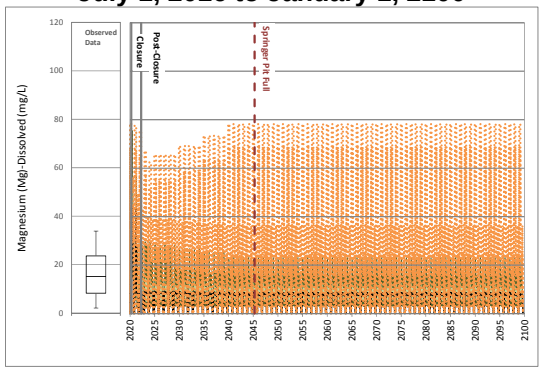


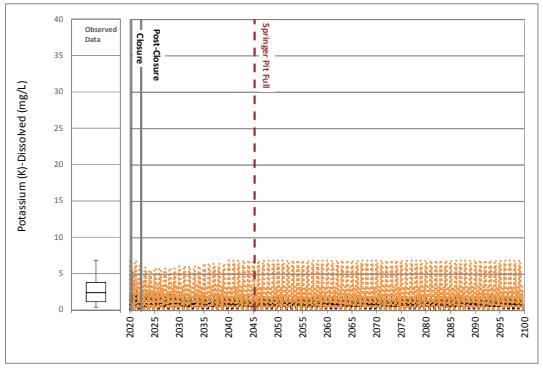
Operations
February 1, 2016 to June 30, 2020



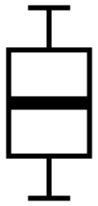


Closure and Post-closure
July 1, 2016 to January 1, 2100



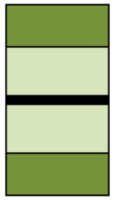


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

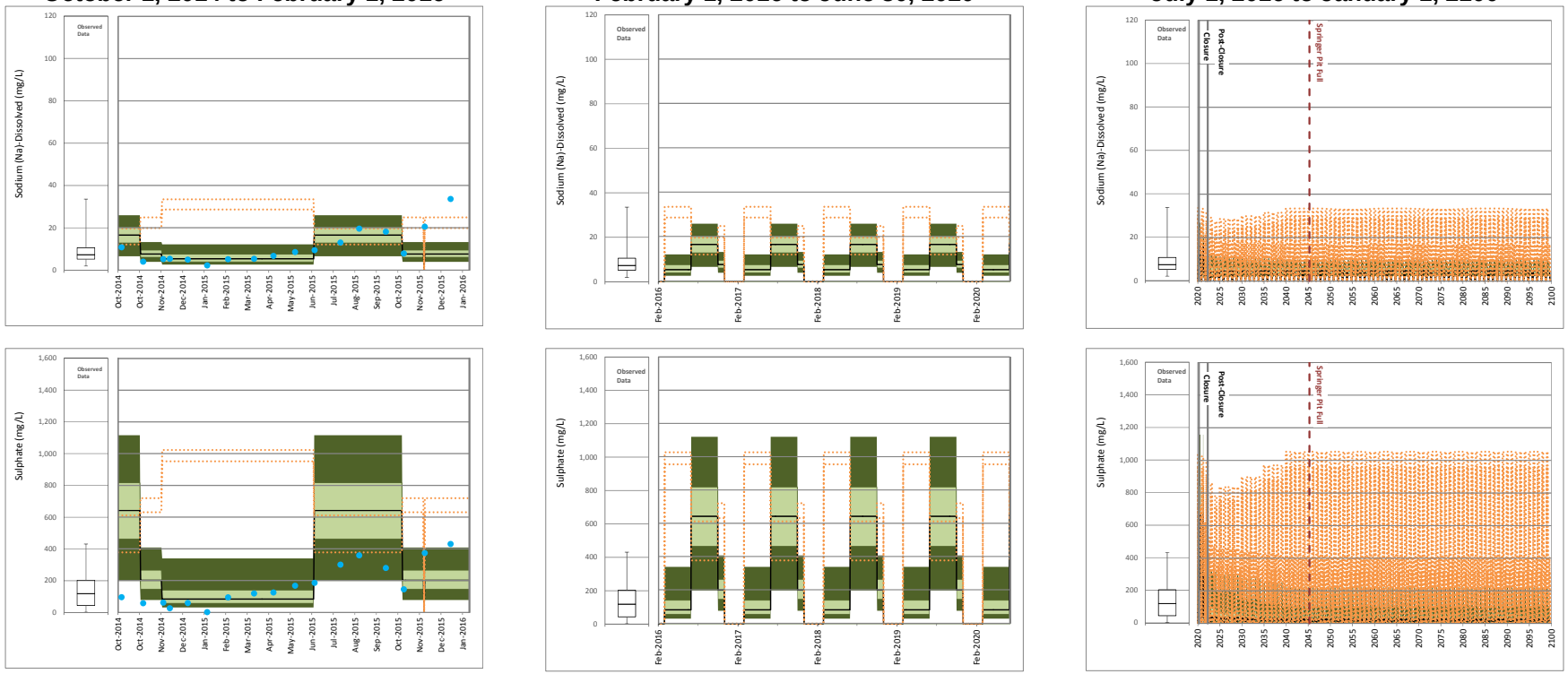
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

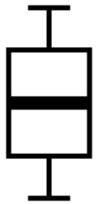
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

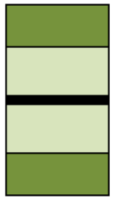


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

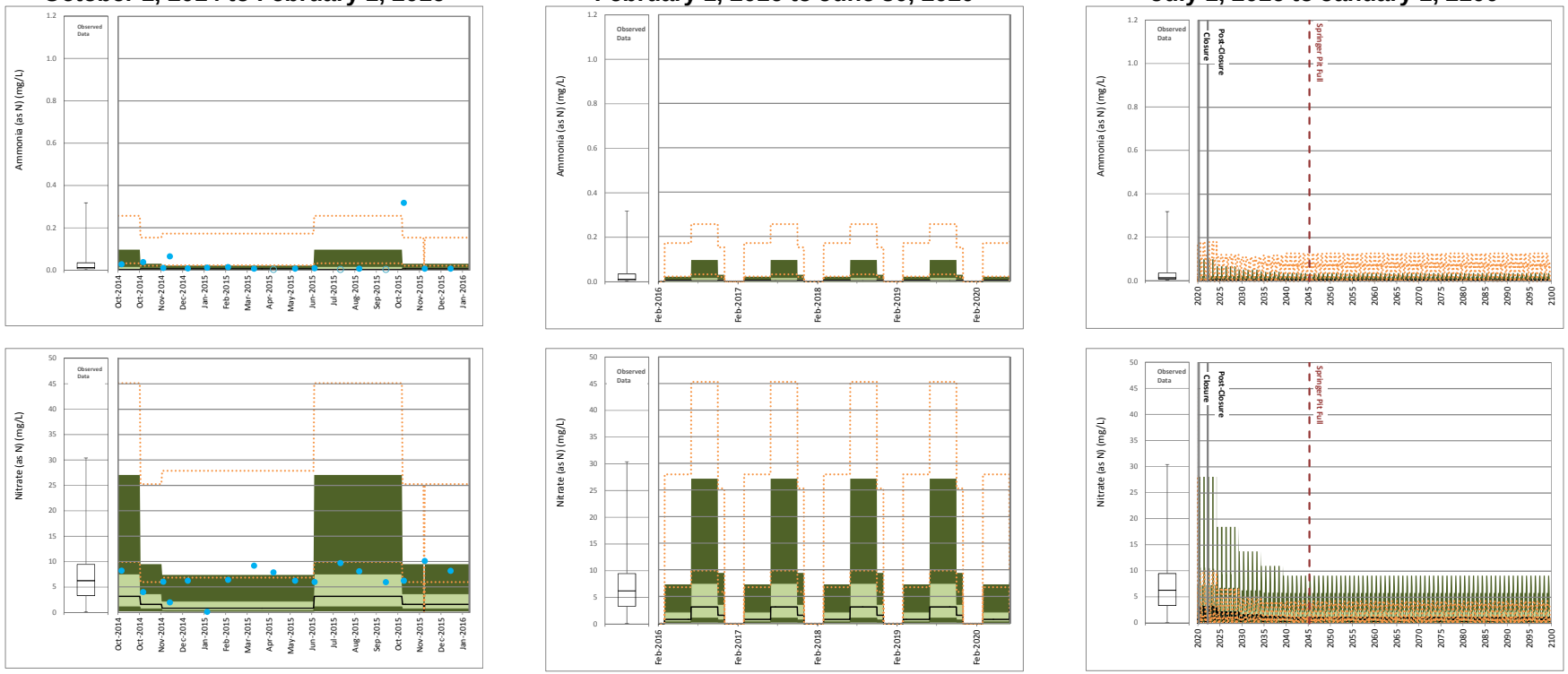
95th Percentile High, 5th Percentile Low

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

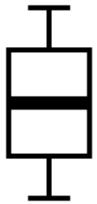
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

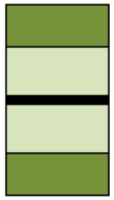


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

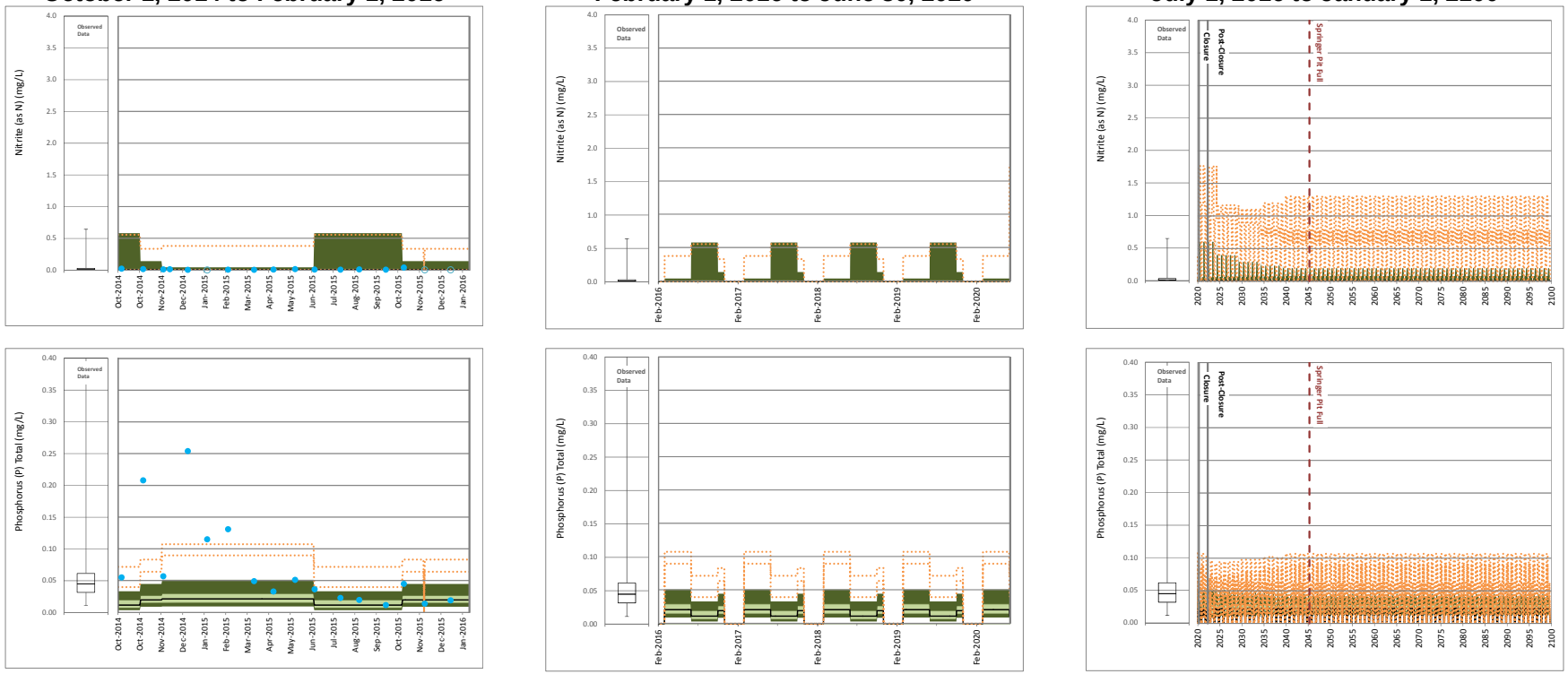
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

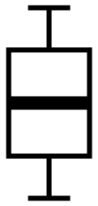
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

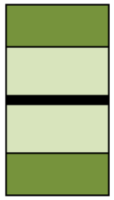


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

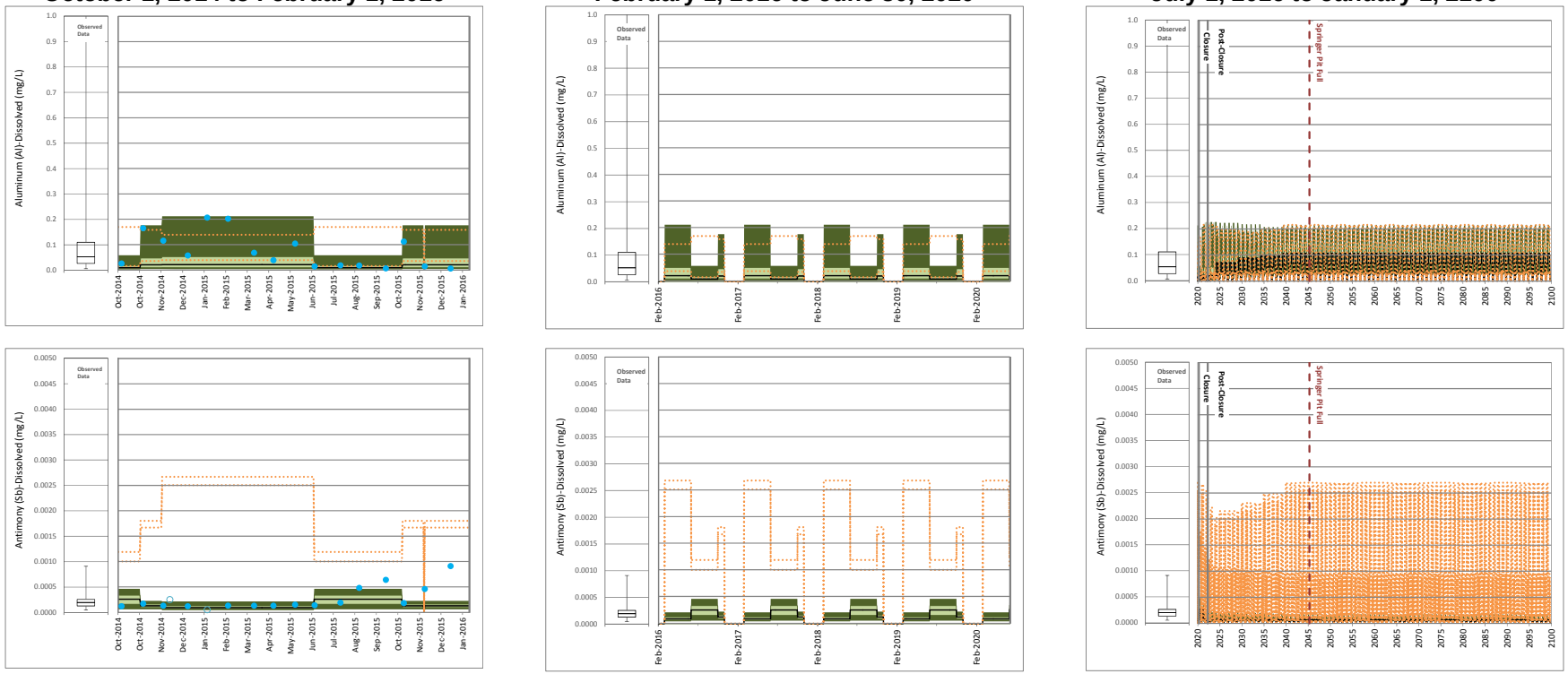
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

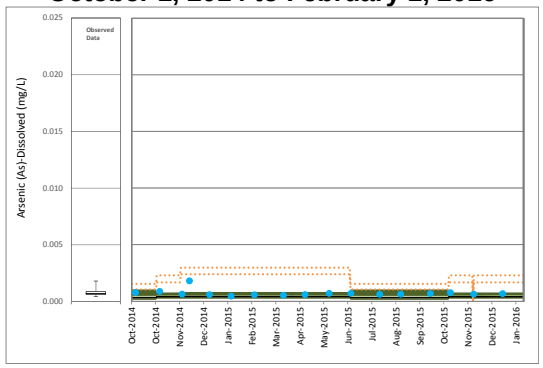
95th Percentile High, 5th Percentile Low

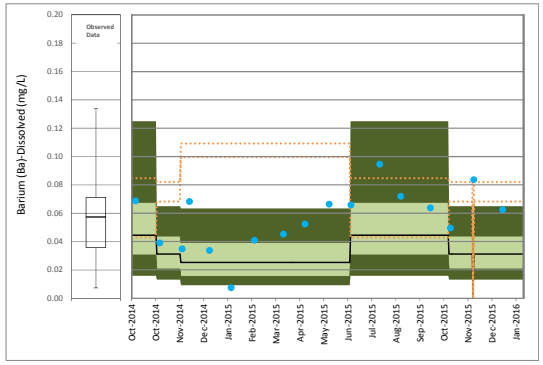
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

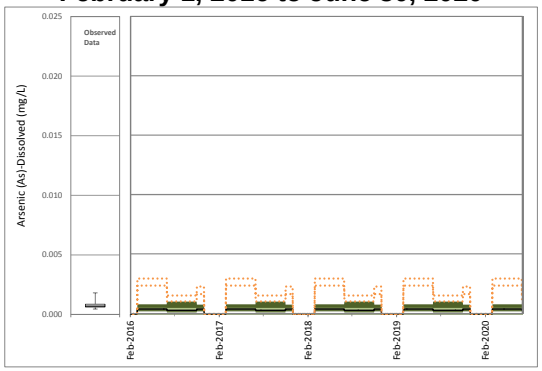
ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

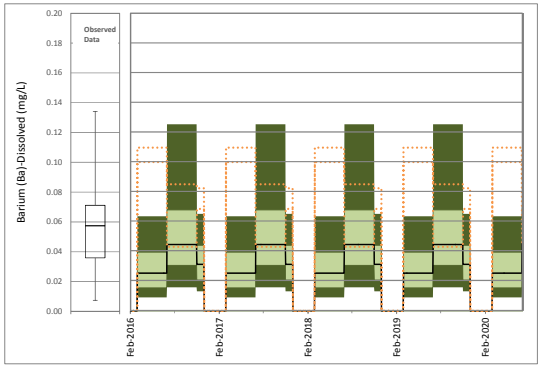
Calibration
October 1, 2014 to February 1, 2016



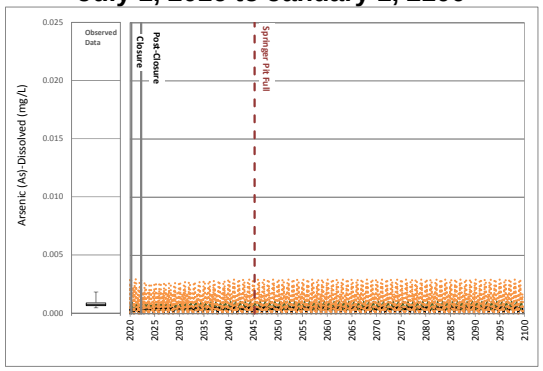


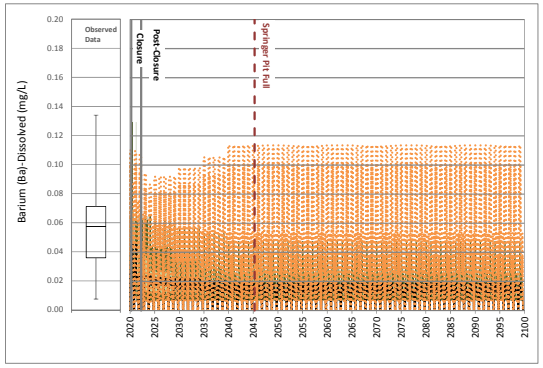
Operations
February 1, 2016 to June 30, 2020



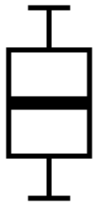


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

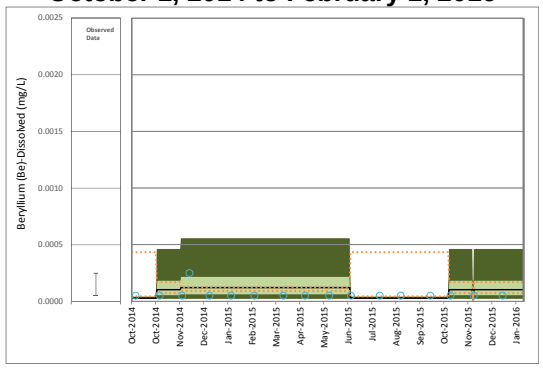
Scenario 2

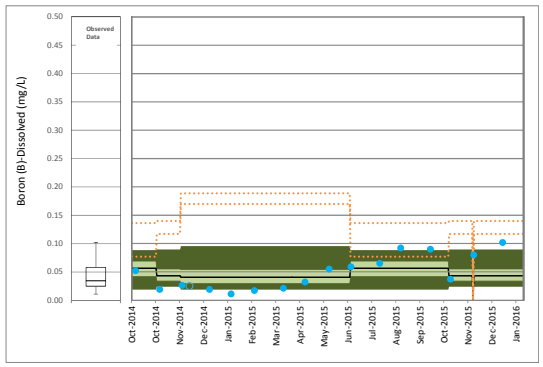
95th Percentile High, 5th Percentile Low

Golder Associates

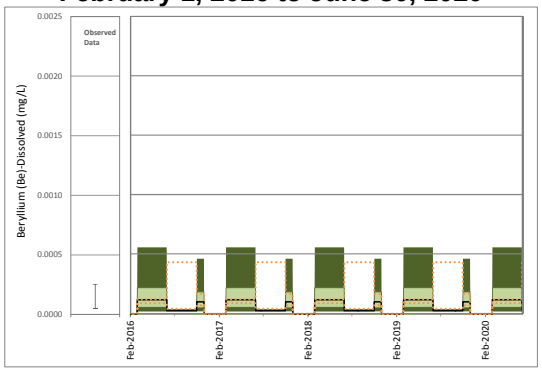
ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

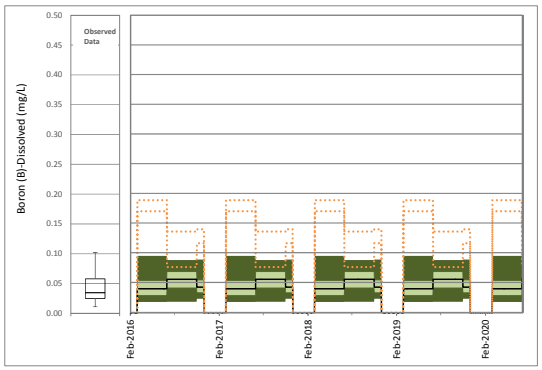
Calibration
October 1, 2014 to February 1, 2016



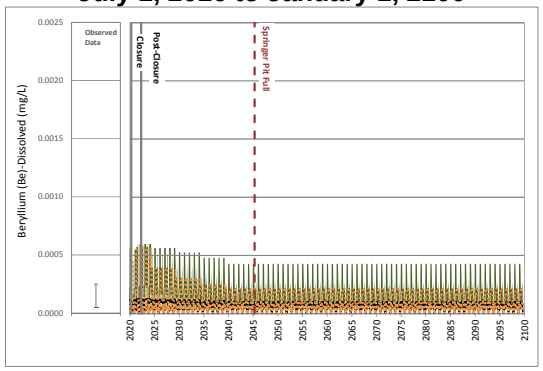


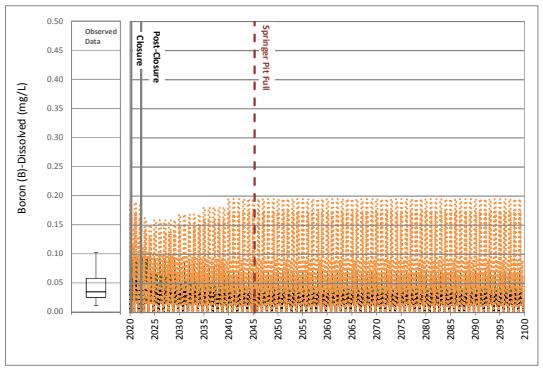
Operations
February 1, 2016 to June 30, 2020



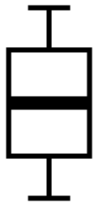


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

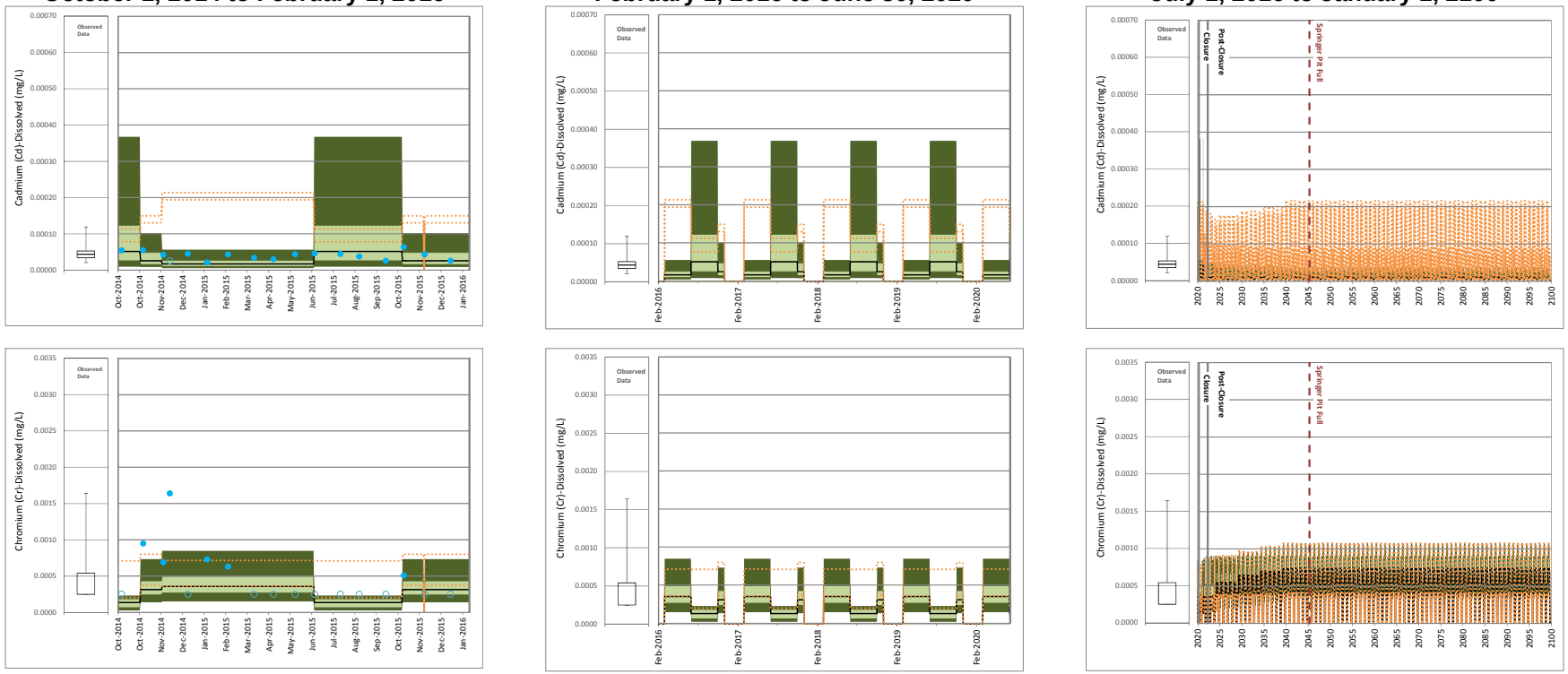
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

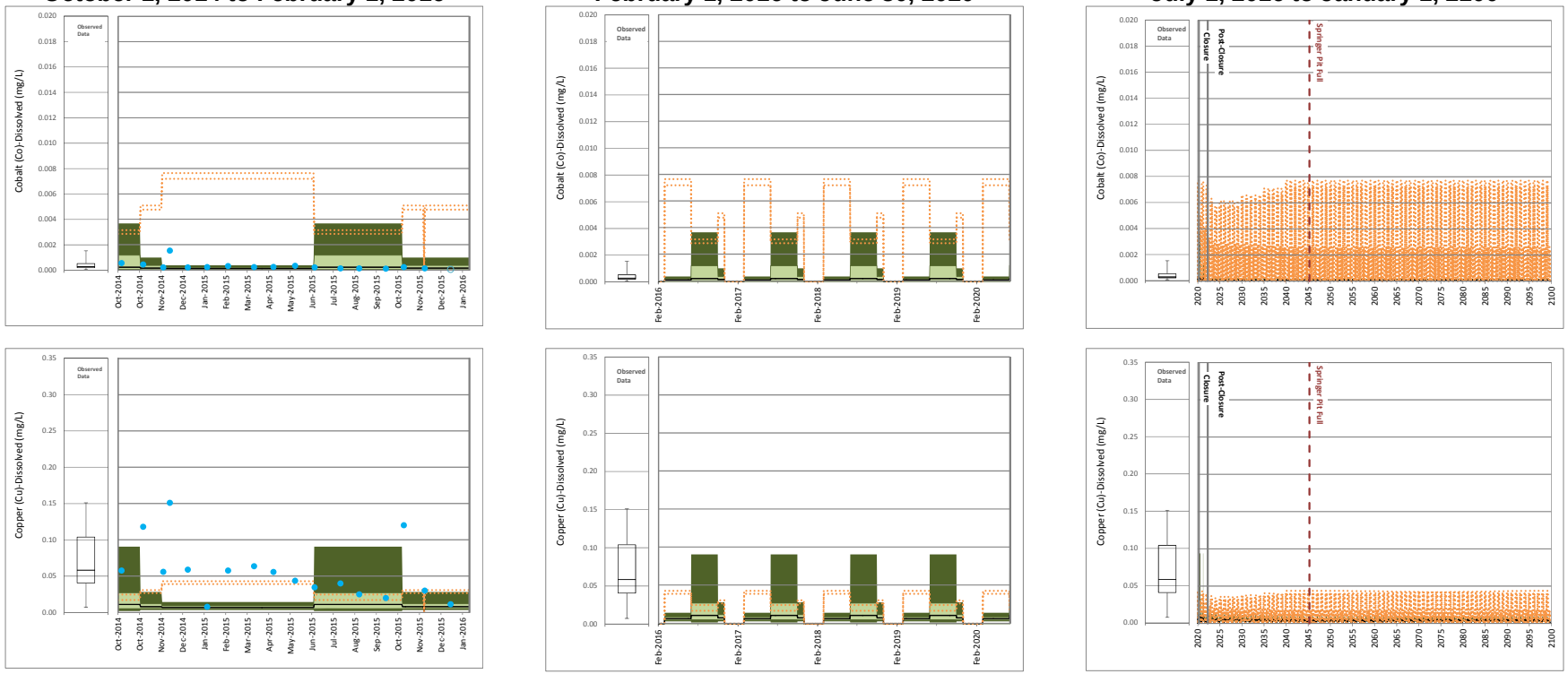
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

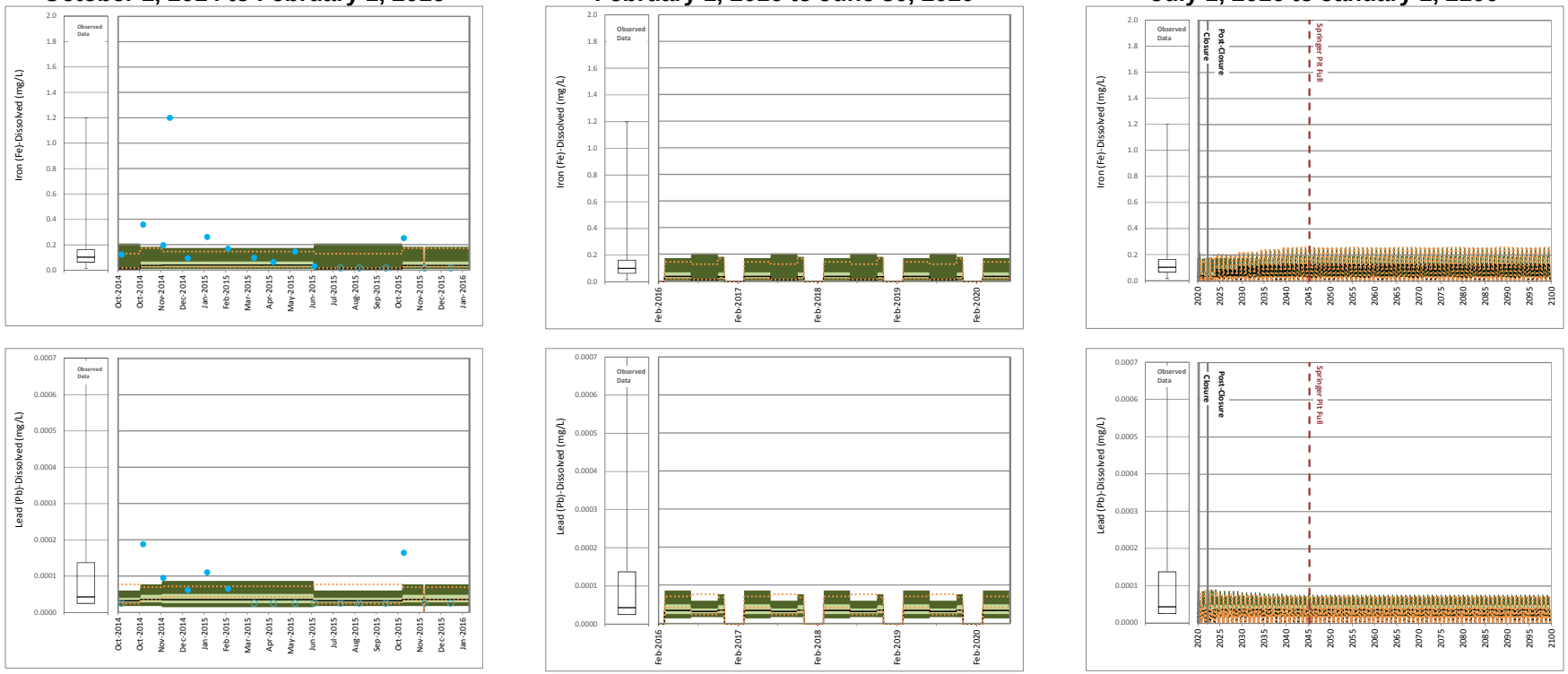
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

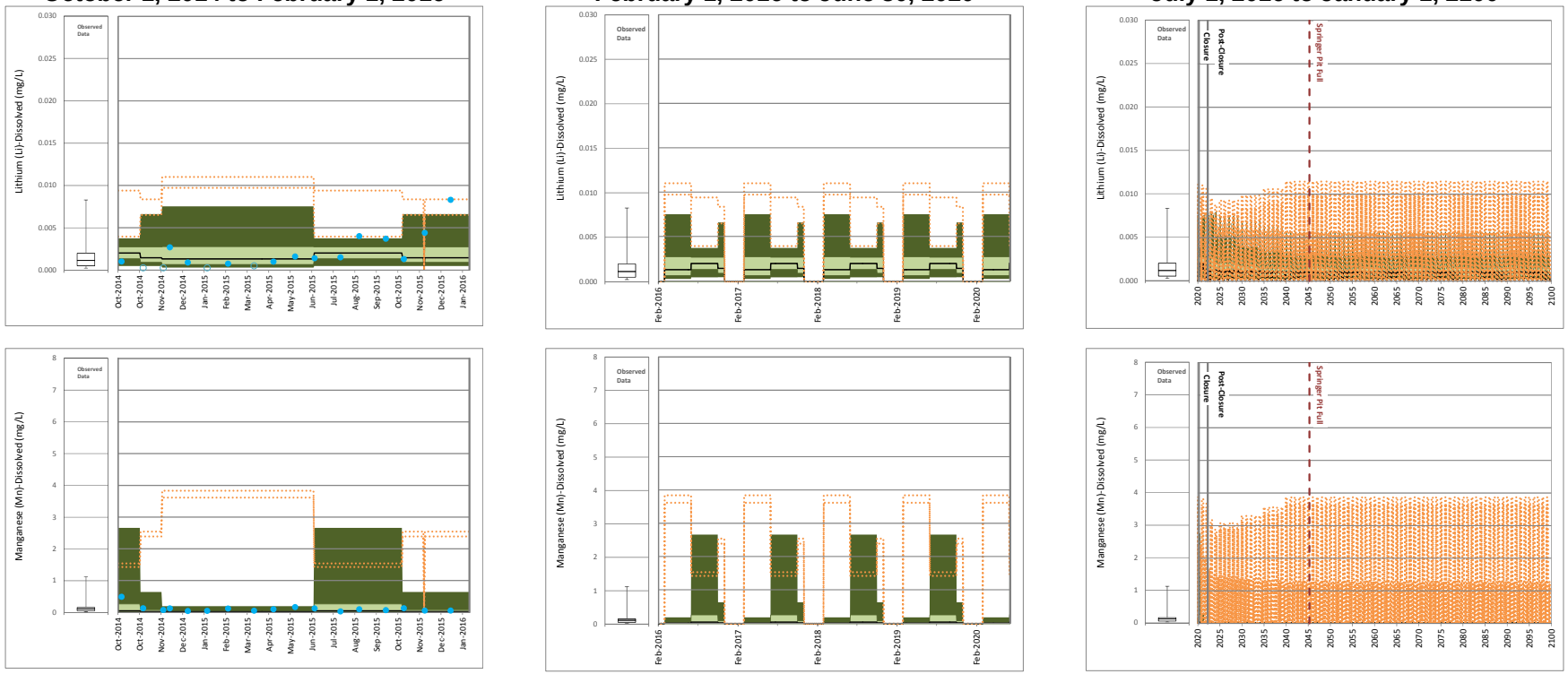
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

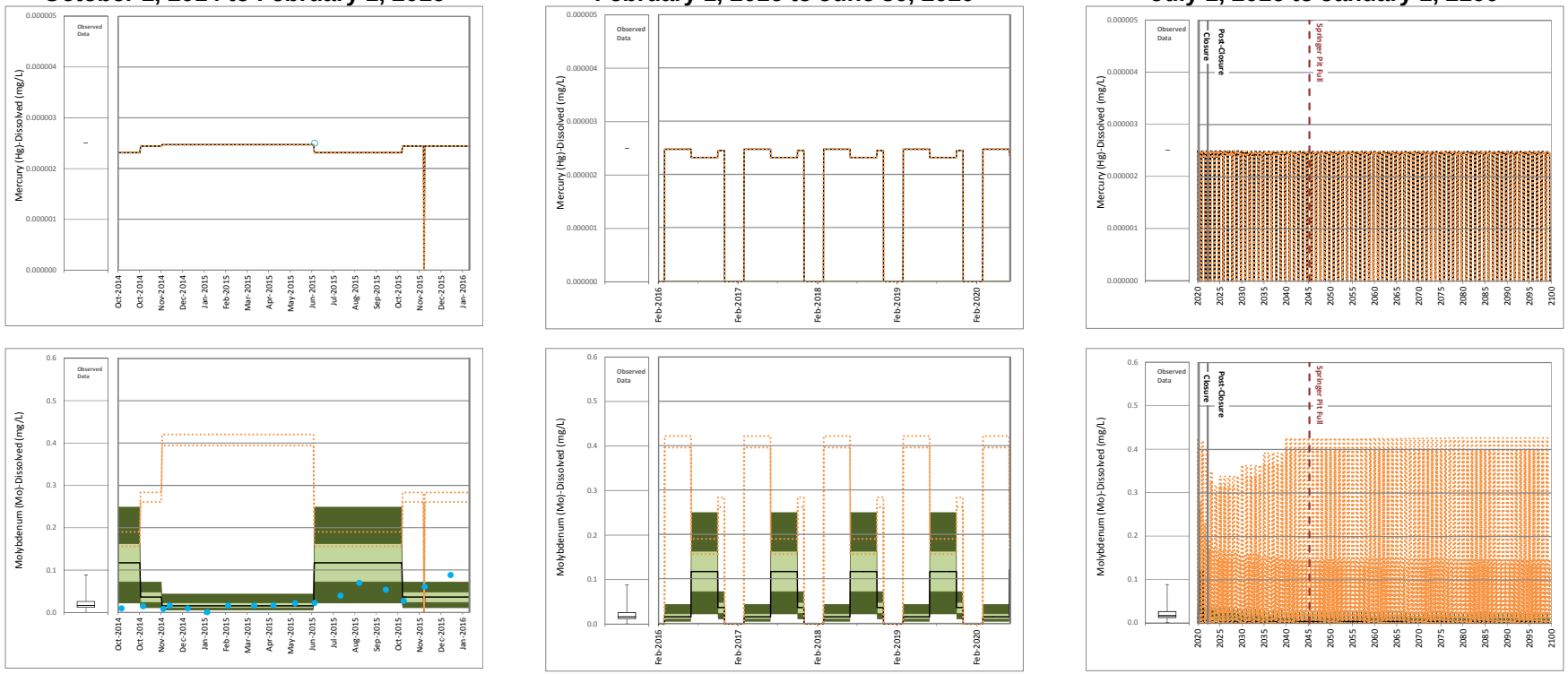
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

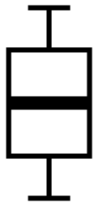
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

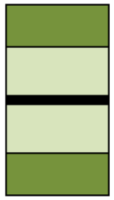


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

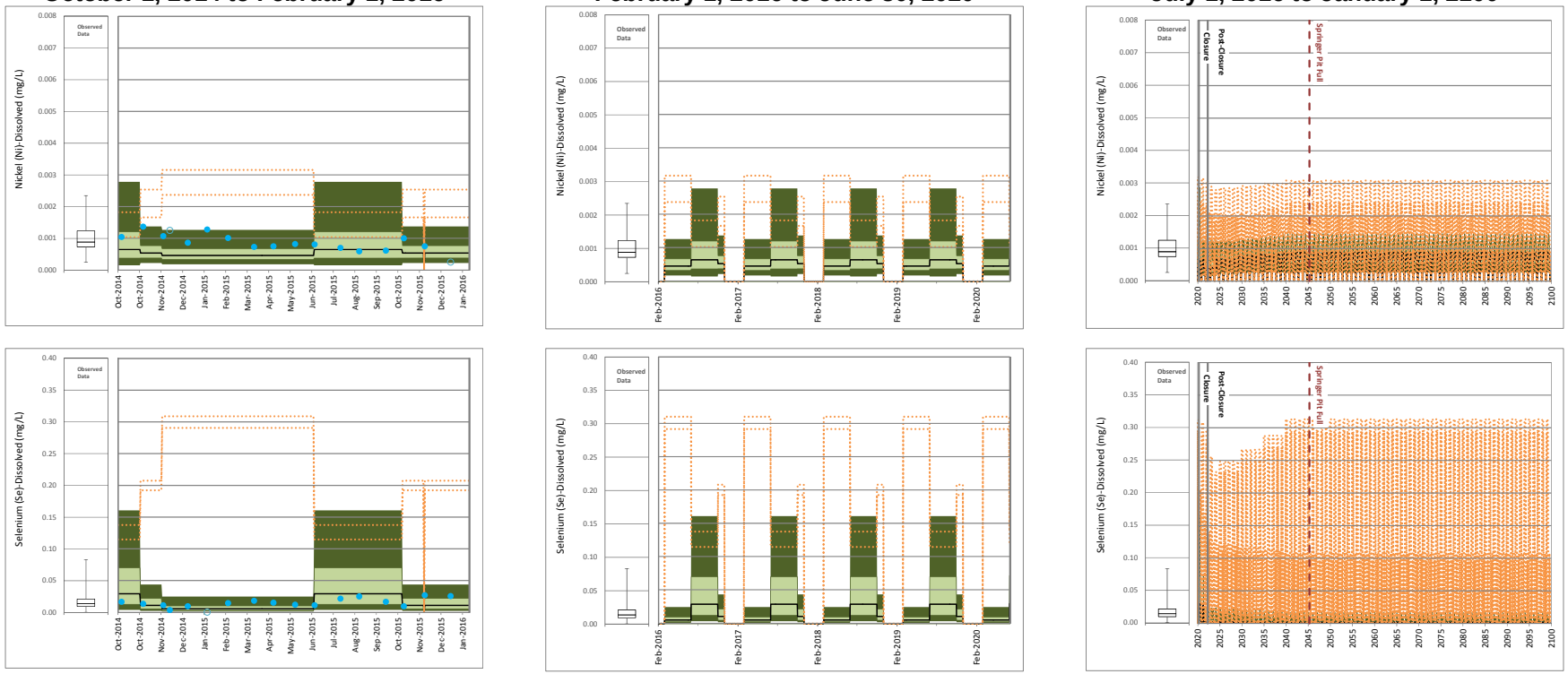
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

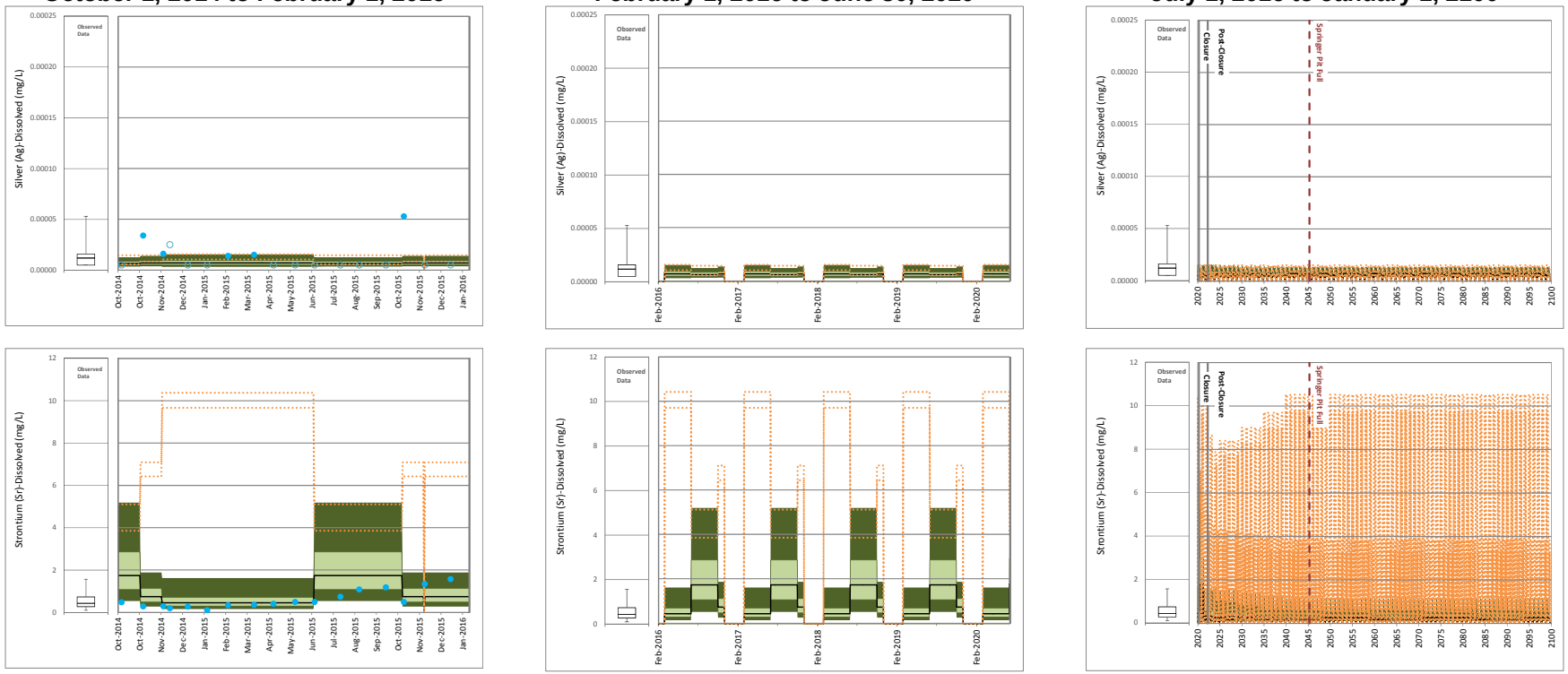
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

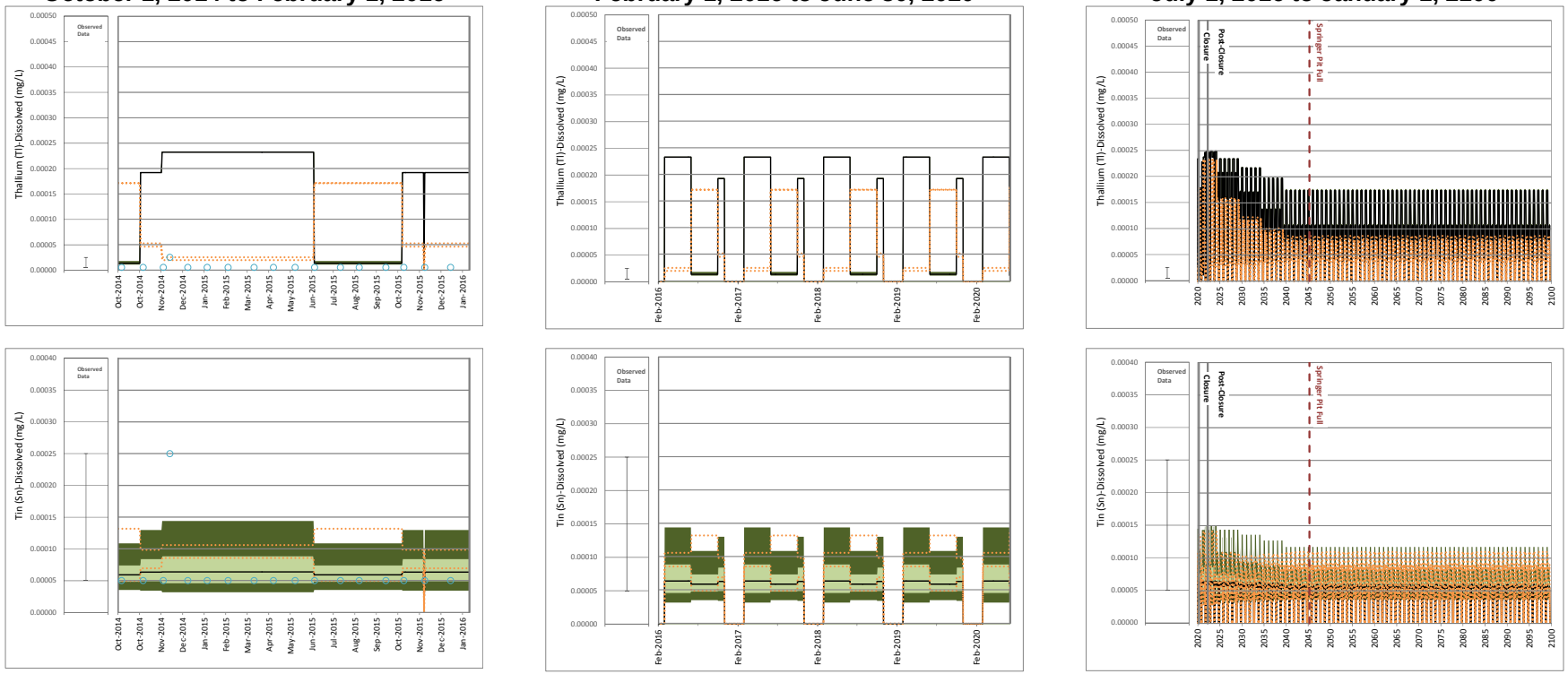
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

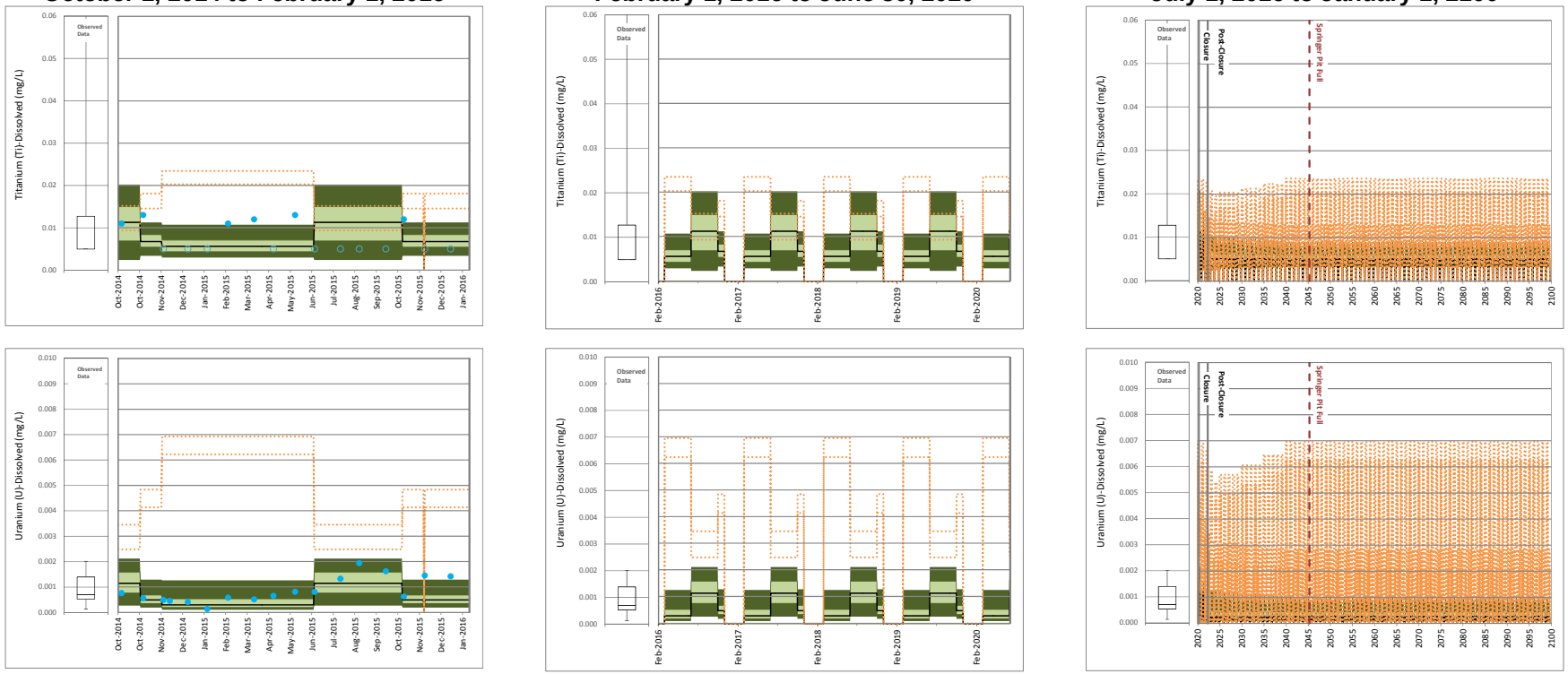
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

- Detected Values
- Non- Detected Values

Scenario 2

- 95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

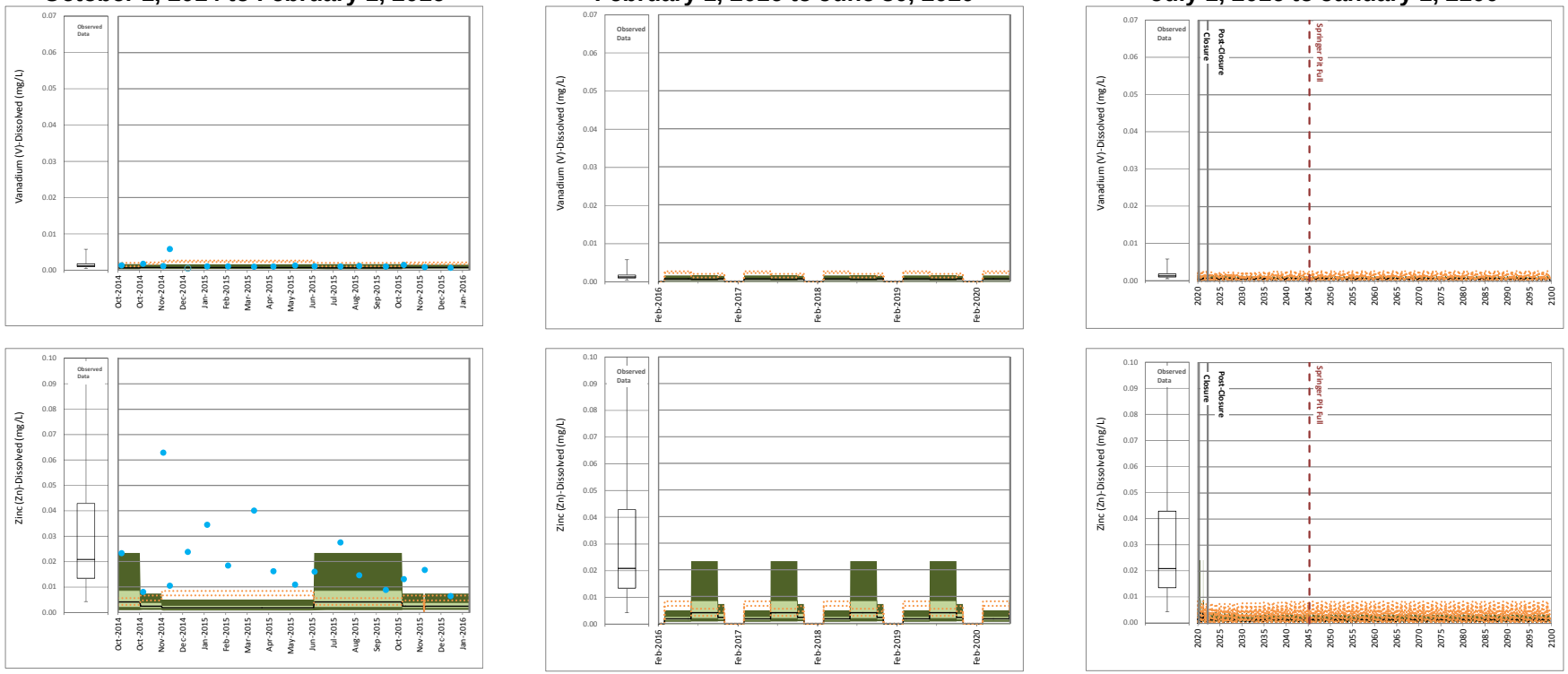
Golder Associates

ATTACHMENT B
Figure B8: Time Series Plots of Predicted Bootjack Creek Sump Water Quality

Calibration
October 1, 2014 to February 1, 2016

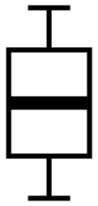
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



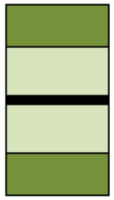
o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig8-bjcs.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.9 South Embankment Seepage Collection Pond (SESCP)

Table B9 presents the maximum predicted median and 95th percentile results for the SESCP, calculated based on 500 realizations for Scenario 1 (Table B9a) and Scenario 2 (Table B9b). Time series plots for each modelled parameter are provided in Figure B9.

Table B9a:
Predicted SESCP Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	392	463	624	694	178	339	178	254	188	252
Total Dissolved Solids	mg/L	802	873	929	1020	292	512	349	420	368	439
Major Ions											
Calcium	mg/L	131	147	193	213	53	103	55	75	58	74
Chloride	mg/L	19	24	17	22	4.0	8.1	8.7	12	9.3	12
Fluoride	mg/L	0.59	0.72	8.3	10	0.16	0.21	0.33	0.39	0.35	0.41
Magnesium	mg/L	16	23	34	39	11	20	10.0	16	10.0	16
Potassium	mg/L	18	24	16	22	2.2	2.9	4.5	5.5	4.8	5.8
Sodium	mg/L	67	84	59	75	13	17	28	32	30	34
Sulphate	mg/L	466	509	503	560	105	248	152	184	163	197
Nutrients											
Ammonia	mg/L (as N)	0.2	0.52	0.55	0.67	0.012	0.04	0.023	0.034	0.025	0.036
Nitrate	mg/L (as N)	5.5	7.6	11	14	1.0	4.7	0.75	2.4	0.8	1.4
Nitrite	mg/L (as N)	0.091	0.16	0.08	0.14	0.0068	0.08	0.006	0.046	0.0064	0.049
Total Phosphorus	mg/L	0.015	0.042	0.032	0.037	0.022	0.039	0.024	0.038	0.024	0.036
Total Metals											
Aluminum	mg/L	0.53	0.56	0.82	0.91	0.6	0.72	0.59	0.69	0.56	0.64
Antimony	mg/L	0.0015	0.0023	0.0018	0.0024	0.00012	0.00034	0.00017	0.0004	0.00018	0.00042
Arsenic	mg/L	0.0018	0.0023	0.012	0.015	0.00085	0.0014	0.0011	0.0015	0.0011	0.0016
Barium	mg/L	0.069	0.08	0.11	0.13	0.025	0.042	0.034	0.039	0.035	0.041
Beryllium	mg/L	0.000054	0.00018	0.0011	0.0014	0.0001	0.00027	0.00019	0.0003	0.00021	0.00031
Boron	mg/L	0.1	0.16	0.15	0.2	0.036	0.09	0.055	0.099	0.059	0.1
Cadmium	mg/L	0.000027	0.00016	0.00015	0.00028	0.000026	0.00016	0.000031	0.00019	0.000033	0.00019
Chromium	mg/L	0.00099	0.0011	0.002	0.0022	0.0014	0.0018	0.0013	0.0017	0.0012	0.0015
Cobalt	mg/L	0.0004	0.00044	0.00085	0.0016	0.00043	0.0011	0.00046	0.00057	0.00047	0.00051
Copper	mg/L	0.0066	0.019	0.026	0.047	0.0079	0.029	0.0073	0.02	0.0068	0.019
Iron	mg/L	0.59	0.63	0.64	0.7	0.68	0.84	0.67	0.79	0.64	0.73
Lead	mg/L	0.00017	0.00018	0.00039	0.00043	0.00018	0.00022	0.00018	0.00021	0.00017	0.0002
Lithium	mg/L	0.0086	0.02	0.017	0.021	0.0015	0.0055	0.0021	0.0056	0.0023	0.0058
Manganese	mg/L	0.032	0.053	0.22	0.58	0.09	0.44	0.14	0.18	0.15	0.18
Mercury	mg/L	0.0000047	0.0000047	0.0000042	0.0000047	0.0000023	0.0000024	0.0000023	0.0000023	0.0000022	0.0000022
Molybdenum	mg/L	0.15	0.19	0.15	0.19	0.025	0.07	0.049	0.075	0.053	0.08
Nickel	mg/L	0.00099	0.0012	0.0022	0.0025	0.0015	0.0022	0.0014	0.002	0.0013	0.0017
Selenium	mg/L	0.022	0.035	0.055	0.075	0.0041	0.031	0.0024	0.015	0.0026	0.0086
Silver	mg/L	0.0000053	0.000016	0.00011	0.00014	0.000017	0.000032	0.000037	0.000051	0.000039	0.000053
Strontium	mg/L	1.3	1.9	2.2	3.0	0.44	1.4	0.56	1.2	0.59	1.3
Thallium	mg/L	0.000028	0.000047	0.00026	0.00031	0.000064	0.000093	0.000034	0.000081	0.000031	0.000056
Tin	mg/L	0.00005	0.00016	0.000062	0.00018	0.000052	0.00017	0.000061	0.00017	0.000062	0.00017
Titanium	mg/L	0.03	0.035	0.03	0.034	0.027	0.03	0.027	0.029	0.027	0.029
Uranium	mg/L	0.00066	0.0018	0.002	0.0029	0.00048	0.0015	0.00057	0.0016	0.0006	0.0016
Vanadium	mg/L	0.0056	0.0088	0.031	0.038	0.0018	0.0022	0.0018	0.0021	0.0018	0.002
Zinc	mg/L	0.0032	0.0042	0.026	0.031	0.003	0.0055	0.0027	0.0045	0.0026	0.004
Dissolved Metals											
Aluminum	mg/L	0.04	0.071	0.33	0.42	0.11	0.23	0.098	0.2	0.073	0.15
Antimony	mg/L	0.0015	0.0021	0.0018	0.0022	0.0001	0.00016	0.00015	0.00022	0.00016	0.00024
Arsenic	mg/L	0.0016	0.0021	0.012	0.015	0.00066	0.0012	0.00091	0.0014	0.00095	0.0014
Barium	mg/L	0.064	0.074	0.1	0.12	0.02	0.037	0.028	0.033	0.03	0.035
Beryllium	mg/L	0.000054	0.00010	0.0011	0.0014	0.0001	0.00019	0.00019	0.00022	0.00021	0.00023
Boron	mg/L	0.1	0.13	0.14	0.17	0.033	0.051	0.052	0.063	0.056	0.067
Cadmium	mg/L	0.000023	0.000066	0.00014	0.00019	0.000022	0.000062	0.000027	0.000092	0.000028	0.000098
Chromium	mg/L	0.00035	0.00041	0.0013	0.0016	0.00075	0.0011	0.0007	0.0010	0.0006	0.00086
Cobalt	mg/L	0.000072	0.00012	0.00053	0.0013	0.0001	0.0008	0.00014	0.00024	0.00014	0.00019
Copper	mg/L	0.002	0.0039	0.021	0.032	0.0033	0.013	0.0027	0.0047	0.0022	0.0035
Iron	mg/L	0.041	0.088	0.096	0.15	0.14	0.29	0.12	0.25	0.09	0.19
Lead	mg/L	0.000027	0.000034	0.00024	0.00028	0.000032	0.00007	0.000032	0.000066	0.00003	0.000056
Lithium	mg/L	0.0083	0.017	0.016	0.018	0.0012	0.0025	0.0018	0.0027	0.002	0.0028
Manganese	mg/L	0.017	0.038	0.2	0.56	0.071	0.43	0.13	0.16	0.13	0.17
Mercury	mg/L	0.0000047	0.0000047	0.0000042	0.0000047	0.0000023	0.0000024	0.0000023	0.0000023	0.0000022	0.0000022
Molybdenum	mg/L	0.15	0.17	0.15	0.17	0.025	0.055	0.049	0.062	0.053	0.066
Nickel	mg/L	0.00042	0.00065	0.0016	0.0019	0.0009	0.0016	0.00081	0.0014	0.00068	0.0012
Selenium	mg/L	0.022	0.031	0.055	0.071	0.0041	0.026	0.0024	0.01	0.0026	0.0044
Silver	mg/L	0.0000053	0.0000065	0.00011	0.00013	0.000017	0.000022	0.000037	0.000041	0.000039	0.000043
Strontium	mg/L	1.3	1.5	2.2	2.6	0.42	1.0	0.54	0.8	0.57	0.84
Thallium	mg/L	0.000028	0.000037	0.00026	0.0003	0.000064	0.000083	0.000034	0.000071	0.000031	0.000046
Tin	mg/L	0.00005	0.000056	0.000062	0.00008	0.000052	0.000074	0.000061	0.000074	0.000062	0.000075
Titanium	mg/L	0.0073	0.012	0.0074	0.011	0.0049	0.0077	0.0046	0.007	0.0046	0.0068
Uranium	mg/L	0.00062	0.0012	0.0019	0.0022	0.00044	0.0009	0.00053	0.00094	0.00056	0.00095
Vanadium	mg/L	0.0043	0.0075	0.03	0.037	0.00052	0.0009	0.00051	0.00085	0.00048	0.00073
Zinc	mg/L	0.0017	0.0027	0.024	0.029	0.0014	0.004	0.0012	0.003	0.0011	0.0025

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

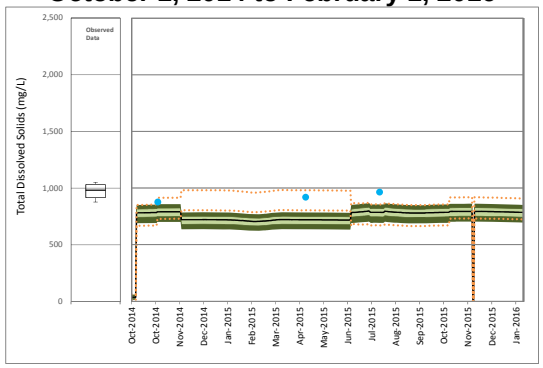
Table B9b:
Predicted SESCP Water Quality - Scenario 2

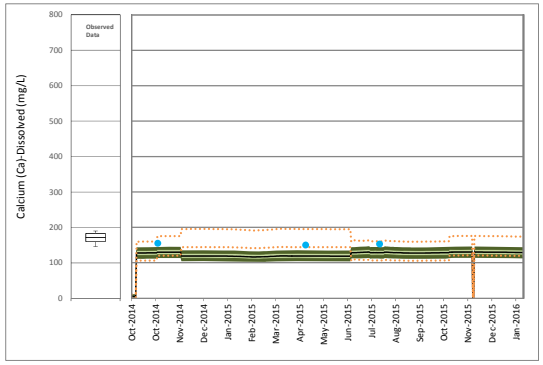
Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	549	628	850	884	663	741	532	704	559	742
Total Dissolved Solids	mg/L	908	989	1212	1250	934	1013	890	1086	936	1146
Major Ions											
Calcium	mg/L	172	197	263	273	204	226	172	228	181	241
Chloride	mg/L	23	25	24	25	8.8	12	6.9	11	7.1	11
Fluoride	mg/L	0.83	0.93	18	18	0.38	0.41	0.52	0.57	0.55	0.6
Magnesium	mg/L	29	33	47	49	37	43	25	33	26	34
Potassium	mg/L	15	15	16	16	5.4	6.3	8.1	10	8.7	11
Sodium	mg/L	69	82	68	79	28	33	46	60	49	64
Sulphate	mg/L	518	592	695	724	560	621	544	720	578	766
Nutrients											
Ammonia	mg/L (as N)	0.097	0.13	1.1	1.1	0.066	0.072	0.043	0.058	0.045	0.062
Nitrate	mg/L (as N)	7.2	9.3	20	21	1.7	1.9	0.41	0.67	0.41	0.61
Nitrite	mg/L (as N)	0.18	0.25	0.29	0.3	0.6	0.6	0.12	0.12	0.084	0.087
Total Phosphorus	mg/L	0.028	0.036	0.046	0.052	0.049	0.061	0.027	0.044	0.021	0.033
Total Metals											
Aluminum	mg/L	0.85	1.1	1.3	1.4	0.6	0.73	0.59	0.7	0.57	0.65
Antimony	mg/L	0.00098	0.0014	0.0035	0.0037	0.0017	0.0019	0.0022	0.0024	0.0023	0.0025
Arsenic	mg/L	0.0023	0.0027	0.025	0.025	0.0028	0.0032	0.0048	0.0052	0.0051	0.0055
Barium	mg/L	0.077	0.09	0.2	0.2	0.061	0.063	0.036	0.038	0.037	0.039
Beryllium	mg/L	0.00023	0.0005	0.0024	0.0026	0.000065	0.00015	0.000055	0.00014	0.000056	0.00014
Boron	mg/L	0.14	0.19	0.26	0.31	0.11	0.15	0.087	0.14	0.091	0.14
Cadmium	mg/L	0.00016	0.00033	0.00044	0.00055	0.00013	0.00025	0.00013	0.00028	0.00014	0.0003
Chromium	mg/L	0.0019	0.0026	0.0036	0.0038	0.0014	0.0018	0.0013	0.0017	0.0012	0.0014
Cobalt	mg/L	0.0019	0.0022	0.0052	0.0053	0.0043	0.0043	0.0012	0.0013	0.001	0.0011
Copper	mg/L	0.02	0.037	0.089	0.1	0.026	0.038	0.024	0.036	0.025	0.037
Iron	mg/L	1.0	1.4	1.0	1.3	0.68	0.84	0.67	0.8	0.64	0.73
Lead	mg/L	0.00042	0.00062	0.00073	0.00079	0.00019	0.00022	0.00018	0.00022	0.00018	0.00021
Lithium	mg/L	0.0075	0.012	0.03	0.033	0.0083	0.012	0.013	0.018	0.014	0.019
Manganese	mg/L	0.95	1.1	1.6	1.7	1.9	1.9	0.5	0.56	0.49	0.57
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000022	0.0000022
Molybdenum	mg/L	0.2	0.23	0.35	0.38	0.31	0.36	0.45	0.58	0.48	0.62
Nickel	mg/L	0.0018	0.0025	0.0054	0.0057	0.0022	0.0027	0.0017	0.0023	0.0016	0.002
Selenium	mg/L	0.055	0.066	0.17	0.18	0.15	0.17	0.098	0.15	0.1	0.16
Silver	mg/L	0.000012	0.000028	0.00024	0.00026	0.0000094	0.000024	0.0000068	0.000023	0.0000067	0.000021
Strontium	mg/L	2.5	3.3	4.1	4.7	4.2	4.8	1.4	2.0	1.3	1.9
Thallium	mg/L	0.000055	0.000094	0.0005	0.00051	0.000012	0.000027	0.000011	0.000026	0.000012	0.000026
Tin	mg/L	0.000073	0.00019	0.00009	0.0002	0.000064	0.00018	0.000056	0.00017	0.000057	0.00017
Titanium	mg/L	0.04	0.046	0.041	0.047	0.035	0.037	0.032	0.035	0.033	0.036
Uranium	mg/L	0.0026	0.0038	0.0034	0.0042	0.003	0.0039	0.0014	0.0023	0.0014	0.0024
Vanadium	mg/L	0.0034	0.0043	0.063	0.063	0.0033	0.0036	0.0042	0.0045	0.0044	0.0046
Zinc	mg/L	0.0078	0.012	0.066	0.067	0.006	0.0074	0.0045	0.0059	0.0047	0.0059
Dissolved Metals											
Aluminum	mg/L	0.36	0.63	0.84	0.93	0.11	0.24	0.1	0.21	0.082	0.16
Antimony	mg/L	0.00096	0.0012	0.0034	0.0035	0.0017	0.0017	0.0022	0.0022	0.0023	0.0024
Arsenic	mg/L	0.0021	0.0025	0.025	0.025	0.0026	0.003	0.0046	0.005	0.0049	0.0053
Barium	mg/L	0.072	0.084	0.19	0.2	0.056	0.058	0.03	0.032	0.031	0.033
Beryllium	mg/L	0.00023	0.00042	0.0024	0.0025	0.000065	0.00007	0.000055	0.000063	0.000056	0.000064
Boron	mg/L	0.14	0.16	0.26	0.27	0.1	0.11	0.084	0.1	0.088	0.11
Cadmium	mg/L	0.00016	0.00023	0.00044	0.00046	0.00013	0.00015	0.00012	0.00019	0.00013	0.0002
Chromium	mg/L	0.0012	0.002	0.003	0.0032	0.00077	0.0011	0.0007	0.001	0.00056	0.00079
Cobalt	mg/L	0.0016	0.0019	0.0049	0.005	0.004	0.004	0.00089	0.00094	0.00071	0.00077
Copper	mg/L	0.016	0.021	0.085	0.087	0.022	0.023	0.019	0.021	0.02	0.022
Iron	mg/L	0.5	0.87	0.46	0.79	0.14	0.29	0.12	0.25	0.09	0.19
Lead	mg/L	0.00027	0.00047	0.00058	0.00064	0.000042	0.000074	0.000034	0.00007	0.000034	0.00006
Lithium	mg/L	0.0072	0.0088	0.03	0.03	0.008	0.0091	0.012	0.015	0.013	0.016
Manganese	mg/L	0.94	1.1	1.6	1.7	1.9	1.9	0.48	0.54	0.47	0.55
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000023	0.0000023	0.0000023	0.0000022	0.0000022
Molybdenum	mg/L	0.2	0.22	0.35	0.36	0.31	0.35	0.45	0.56	0.48	0.6
Nickel	mg/L	0.0013	0.0019	0.0048	0.0051	0.0017	0.0021	0.0011	0.0017	0.001	0.0015
Selenium	mg/L	0.055	0.062	0.17	0.18	0.15	0.16	0.098	0.15	0.1	0.16
Silver	mg/L	0.000012	0.000018	0.00024	0.00025	0.0000094	0.000014	0.0000068	0.000013	0.0000067	0.000011
Strontium	mg/L	2.4	2.9	4.1	4.3	4.2	4.3	1.4	1.6	1.3	1.5
Thallium	mg/L	0.000055	0.000085	0.0005	0.0005	0.000012	0.000017	0.000011	0.000016	0.000012	0.000017
Tin	mg/L	0.000073	0.000091	0.00009	0.0001	0.000064	0.000076	0.000056	0.00007	0.000057	0.00007
Titanium	mg/L	0.018	0.024	0.019	0.025	0.013	0.015	0.01	0.013	0.01	0.013
Uranium	mg/L	0.0025	0.0032	0.0034	0.0036	0.0029	0.0033	0.0013	0.0017	0.0014	0.0017
Vanadium	mg/L	0.0022	0.003	0.062	0.062	0.002	0.0023	0.0029	0.0032	0.0031	0.0033
Zinc	mg/L	0.0062	0.01	0.065	0.066	0.0045	0.0059	0.003	0.0044	0.0031	0.0044

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

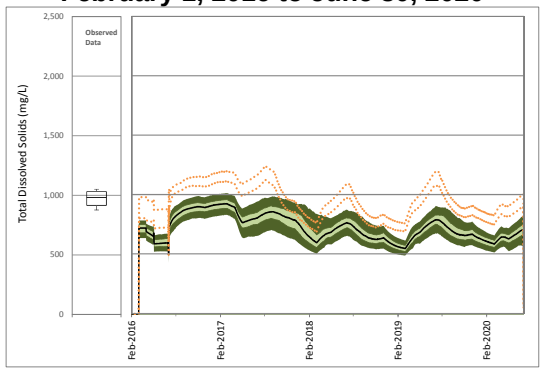
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

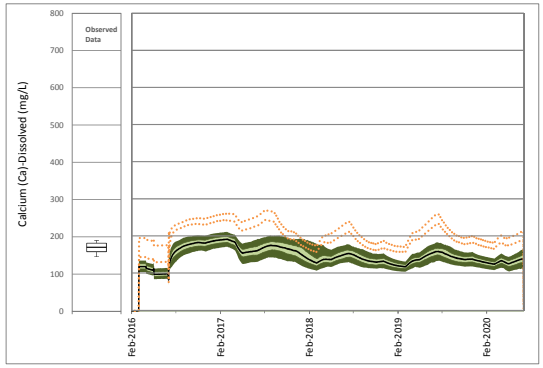
Calibration
October 1, 2014 to February 1, 2016



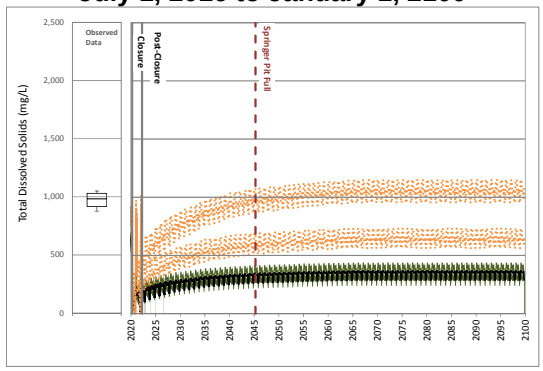


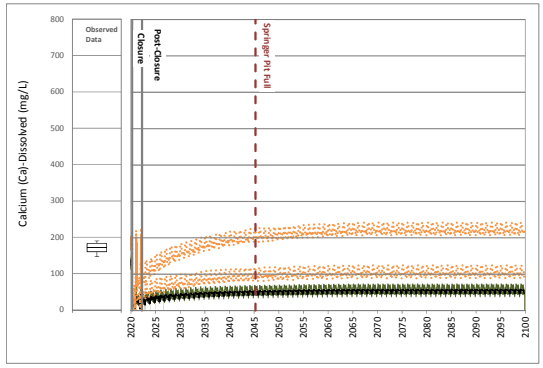
Operations
February 1, 2016 to June 30, 2020



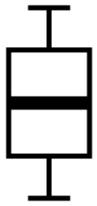


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

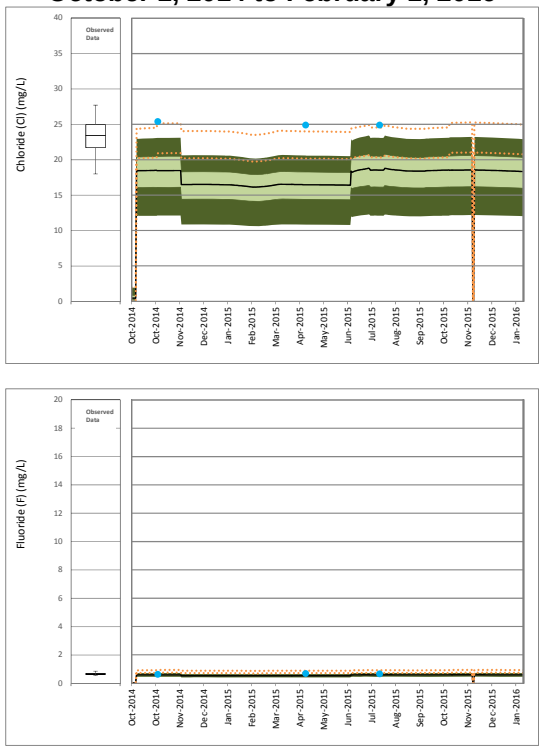
95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

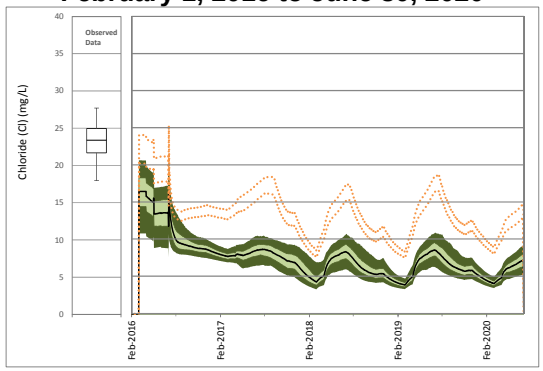
Golder Associates

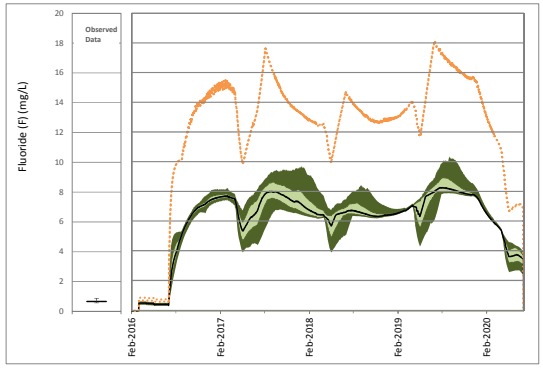
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

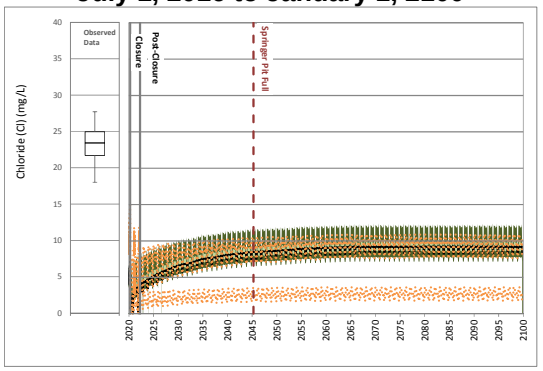


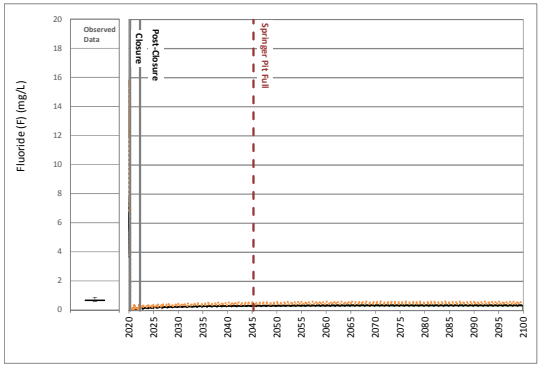
Operations
February 1, 2016 to June 30, 2020



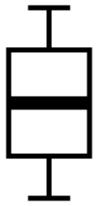


Closure and Post-closure
July 1, 2016 to January 1, 2100



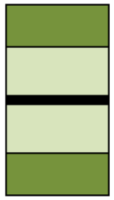


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

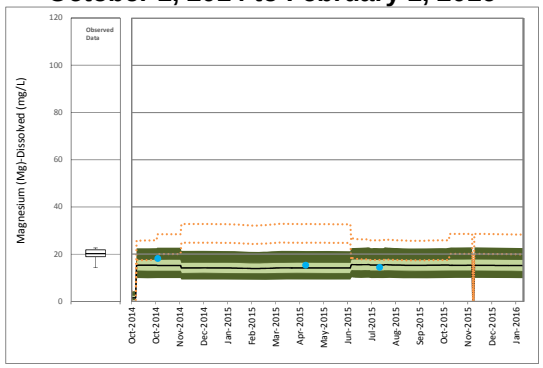
95th Percentile High, 5th Percentile Low

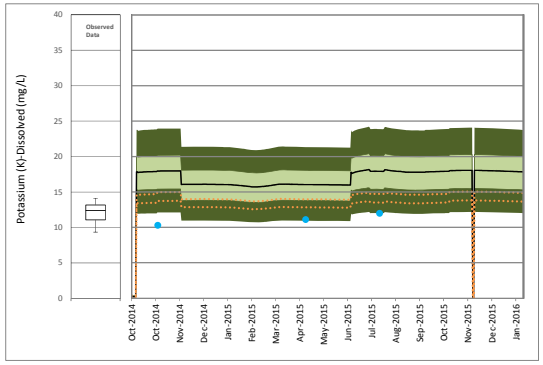
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

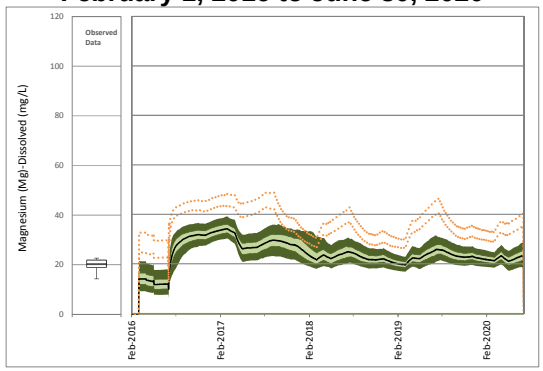
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

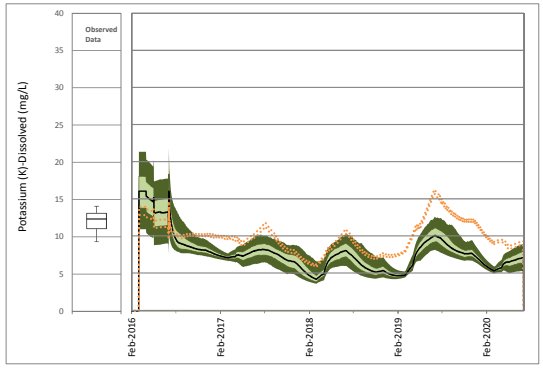
Calibration
October 1, 2014 to February 1, 2016



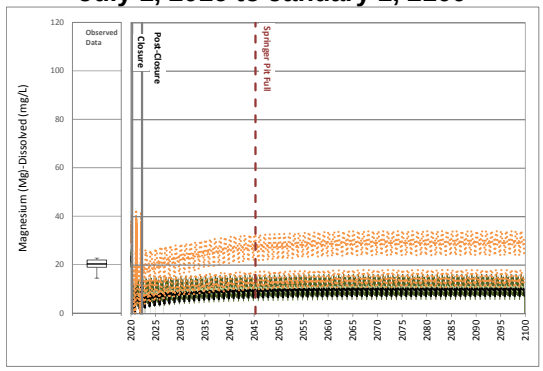


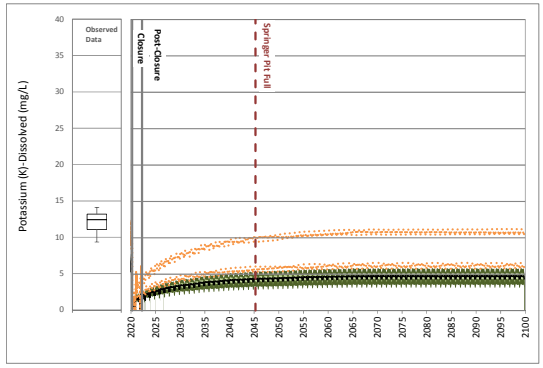
Operations
February 1, 2016 to June 30, 2020



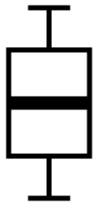


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

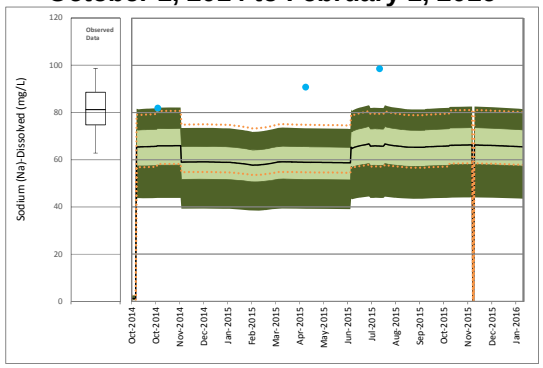
95th Percentile High, 5th Percentile Low

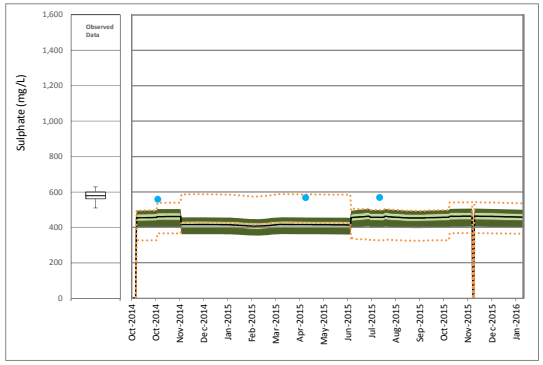
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

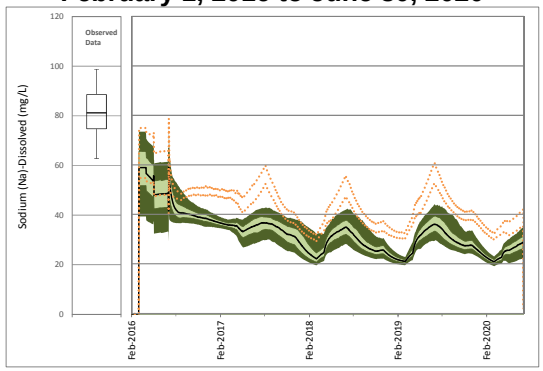
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

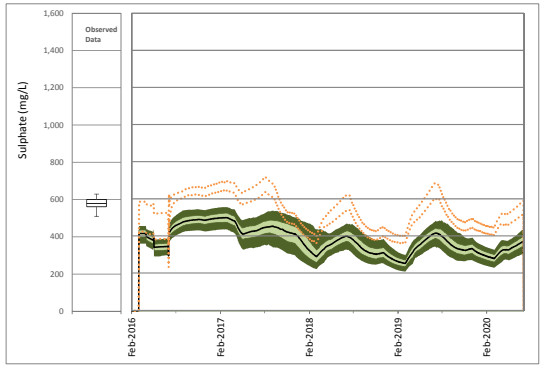
Calibration
October 1, 2014 to February 1, 2016



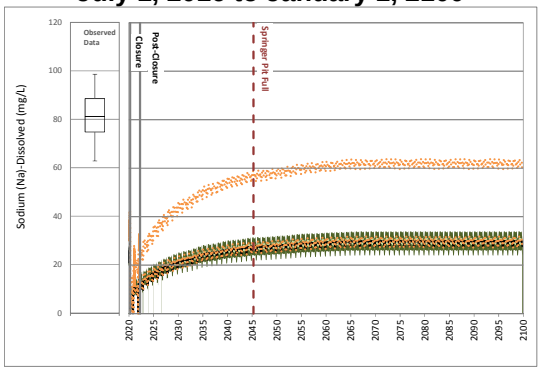


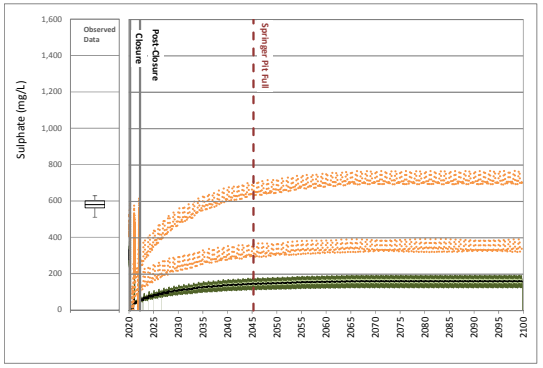
Operations
February 1, 2016 to June 30, 2020



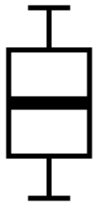


Closure and Post-closure
July 1, 2016 to January 1, 2100



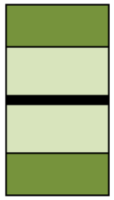


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

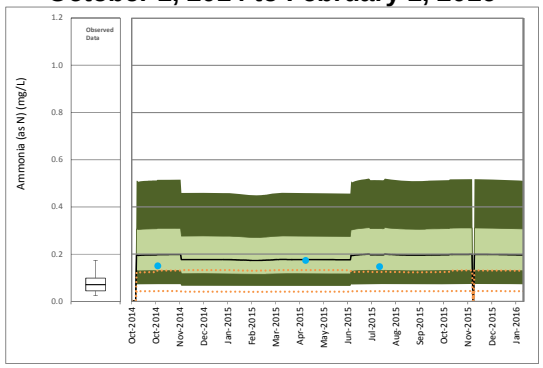
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

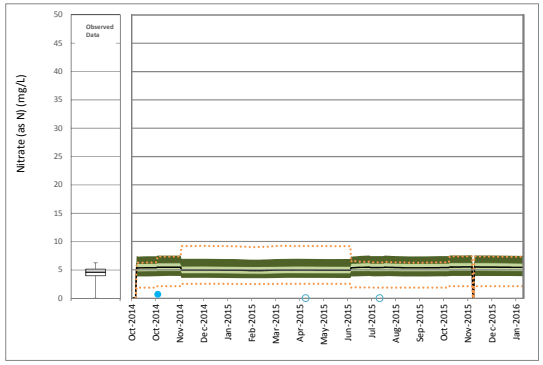
Golder Associates

ATTACHMENT B

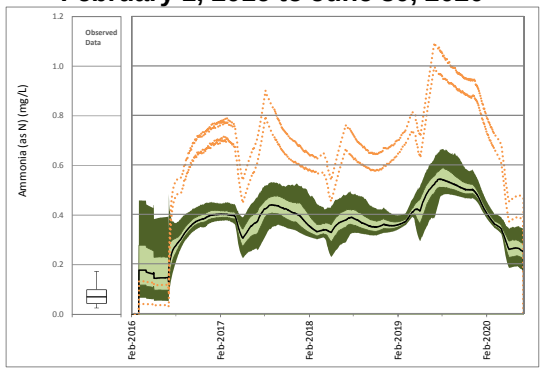
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

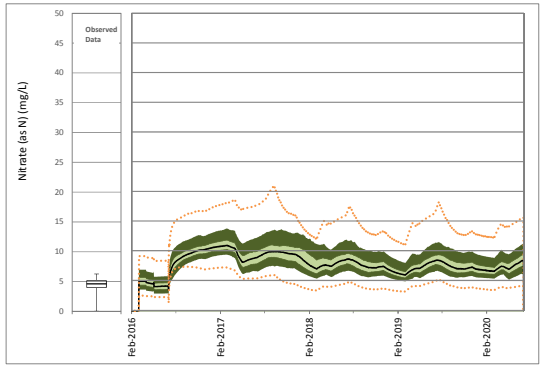
Calibration
October 1, 2014 to February 1, 2016



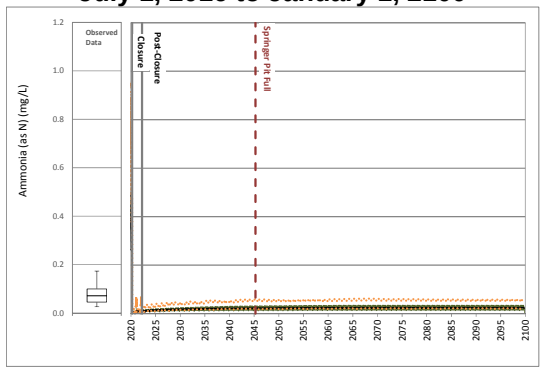


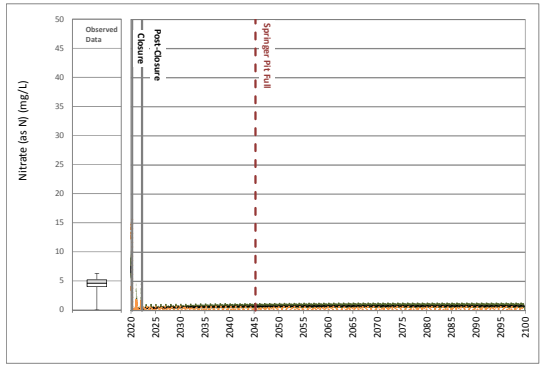
Operations
February 1, 2016 to June 30, 2020



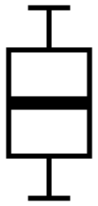


Closure and Post-closure
July 1, 2016 to January 1, 2100



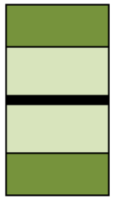


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

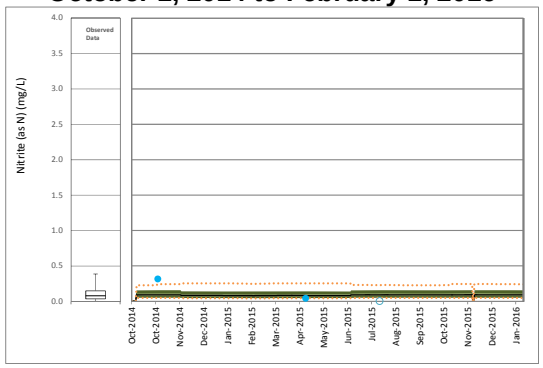
Scenario 2

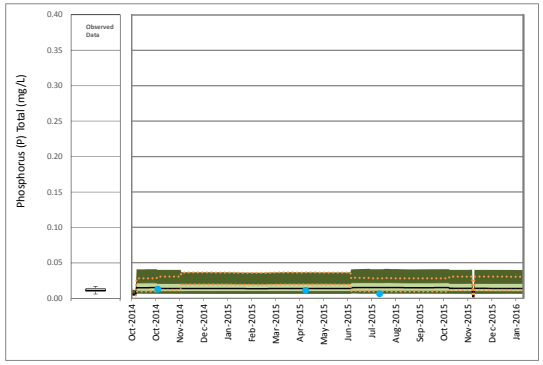
95th Percentile High, 5th Percentile Low

Golder Associates

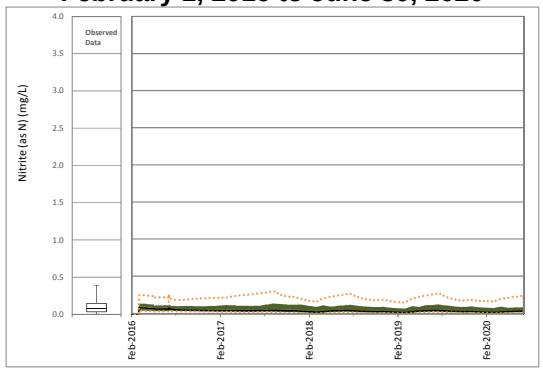
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

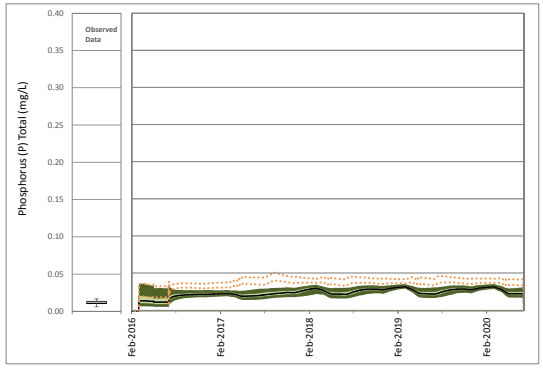
Calibration
October 1, 2014 to February 1, 2016



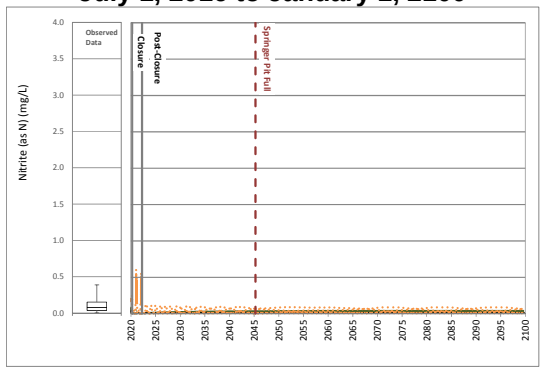


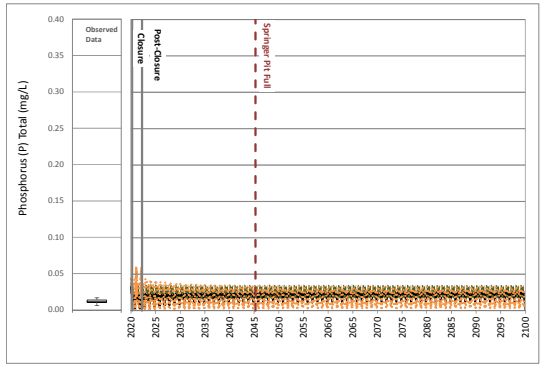
Operations
February 1, 2016 to June 30, 2020



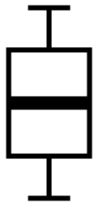


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

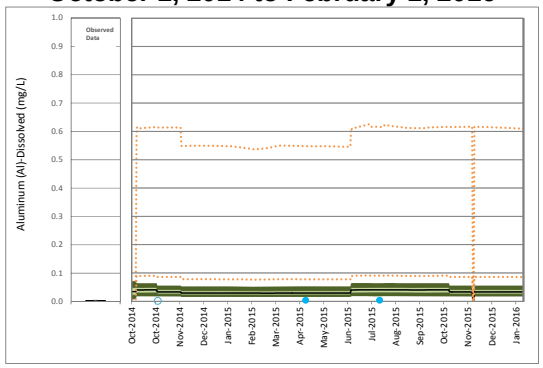
95th Percentile High, 5th Percentile Low

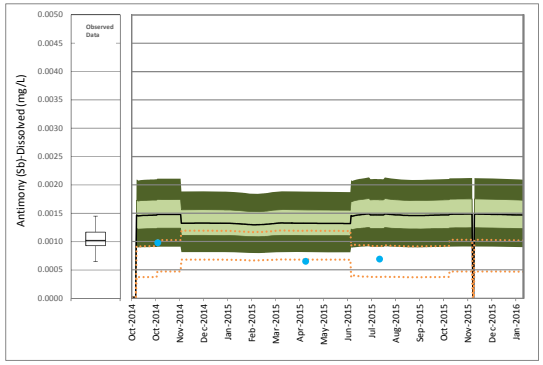
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

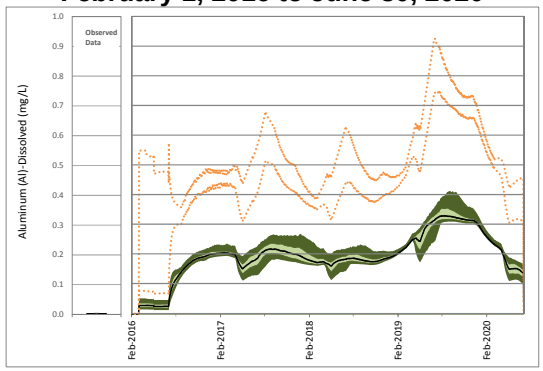
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

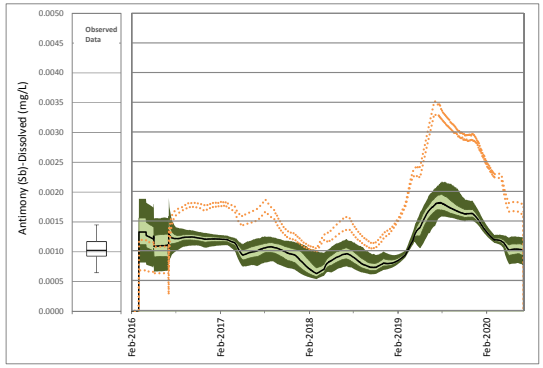
Calibration
October 1, 2014 to February 1, 2016



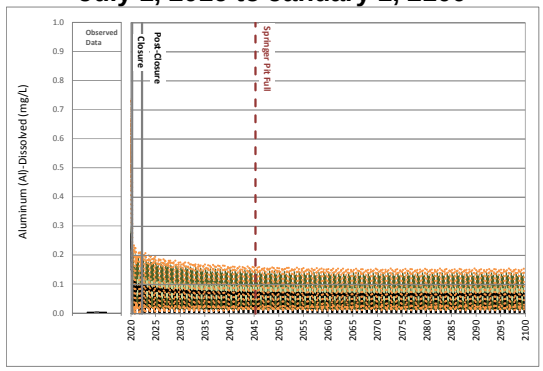


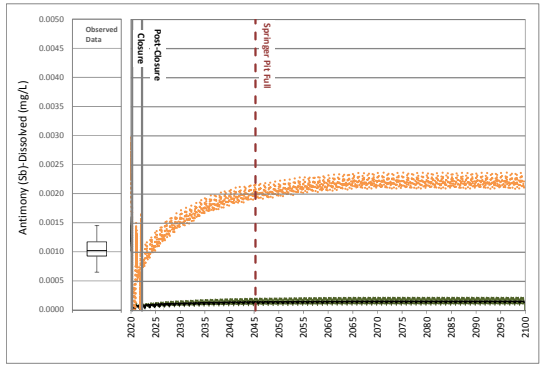
Operations
February 1, 2016 to June 30, 2020



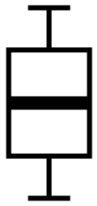


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

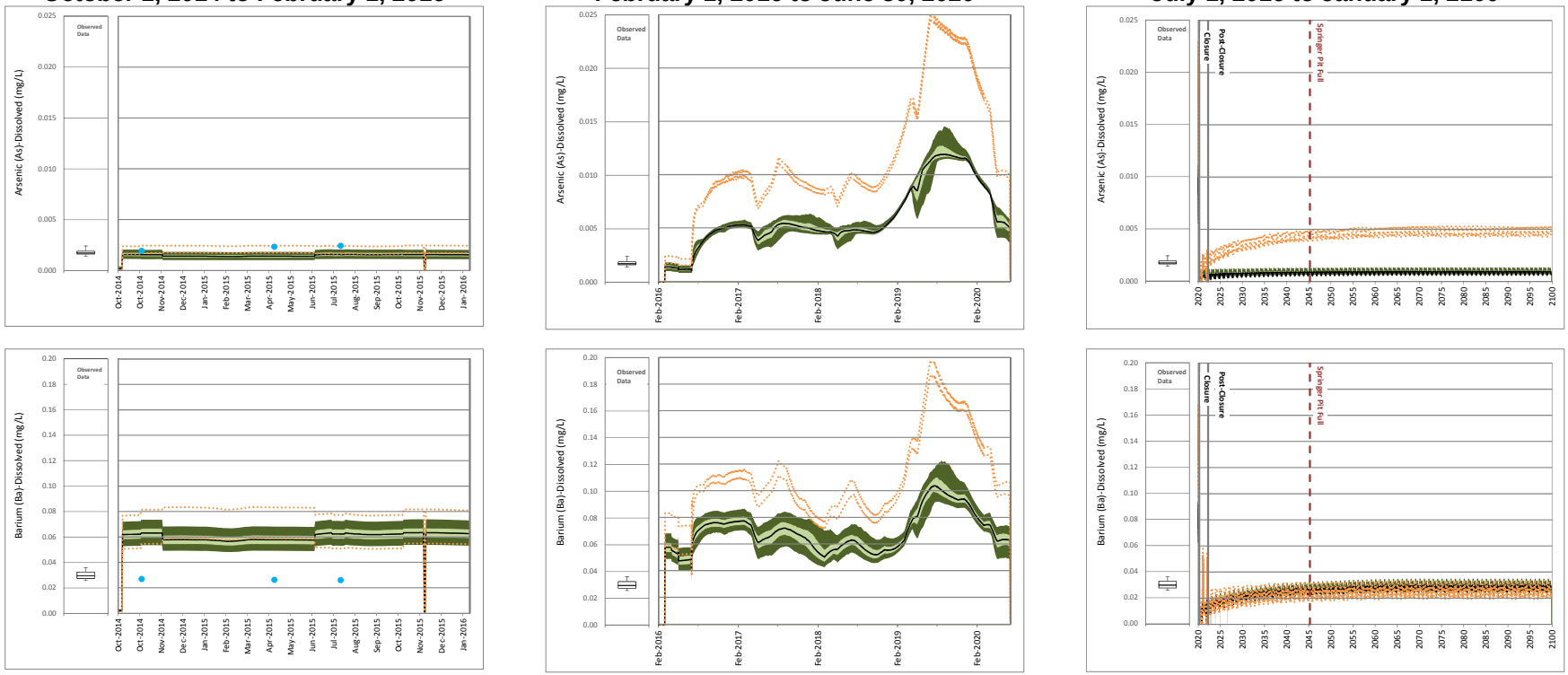
Golder Associates

ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

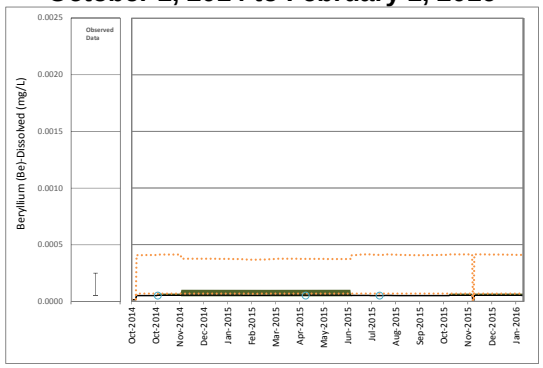
95th Percentile High, 5th Percentile Low

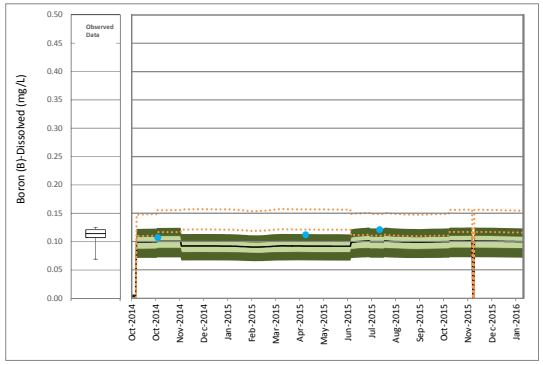
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

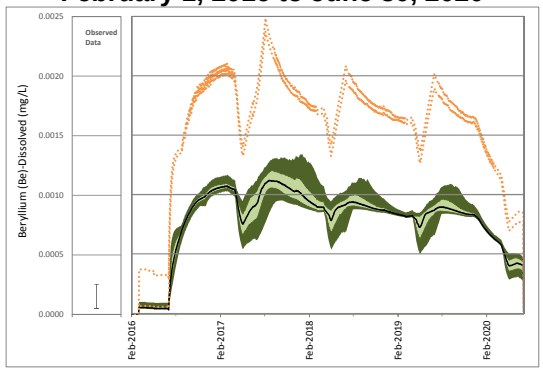
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

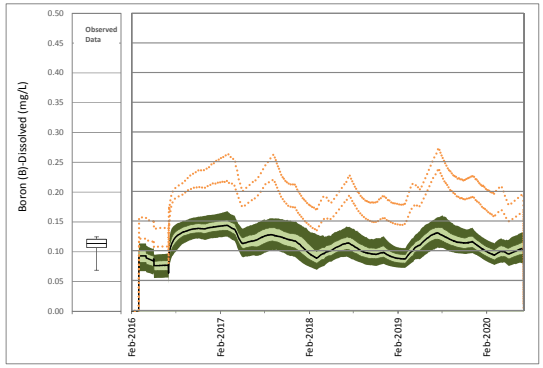
Calibration
October 1, 2014 to February 1, 2016



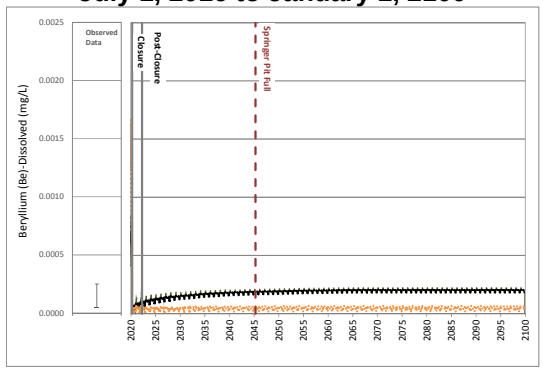


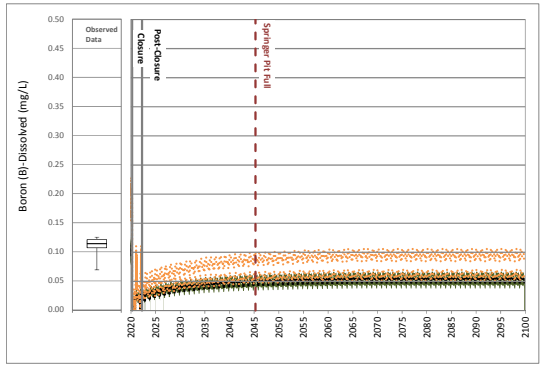
Operations
February 1, 2016 to June 30, 2020



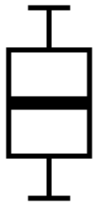


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

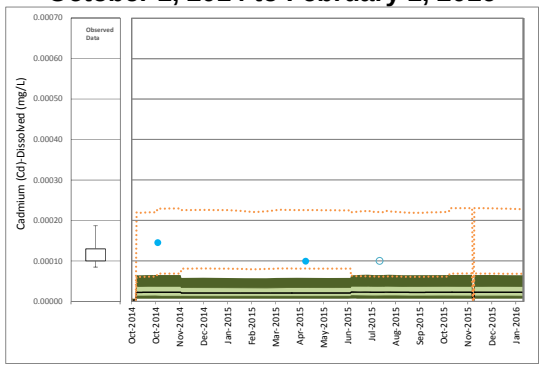
95th Percentile High, 5th Percentile Low

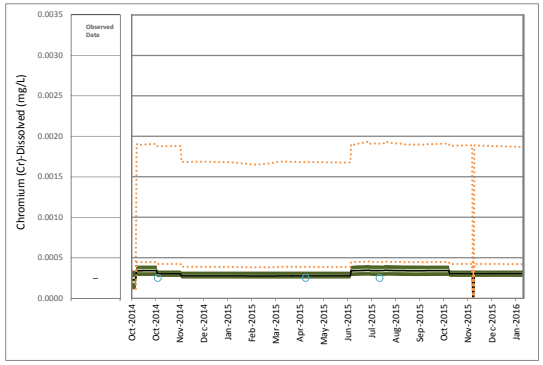
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

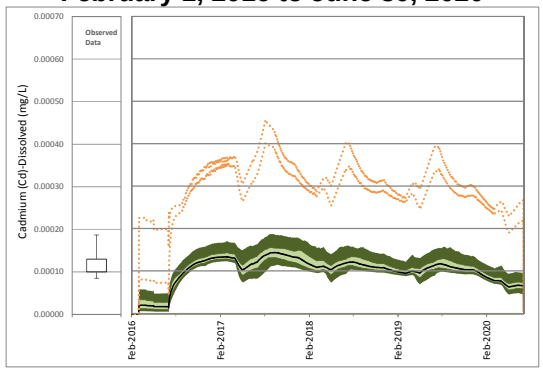
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

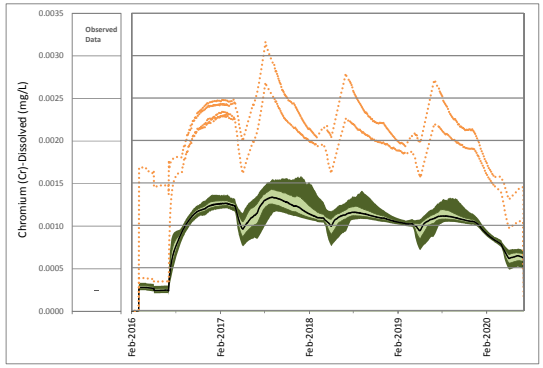
Calibration
October 1, 2014 to February 1, 2016



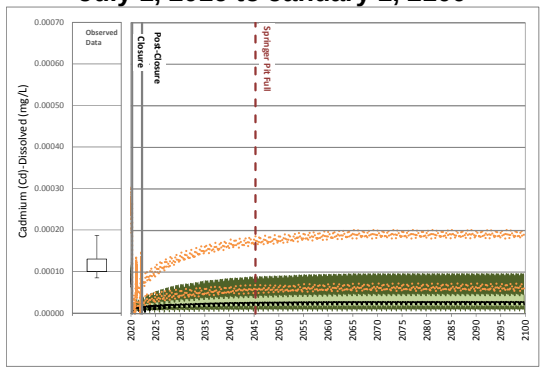


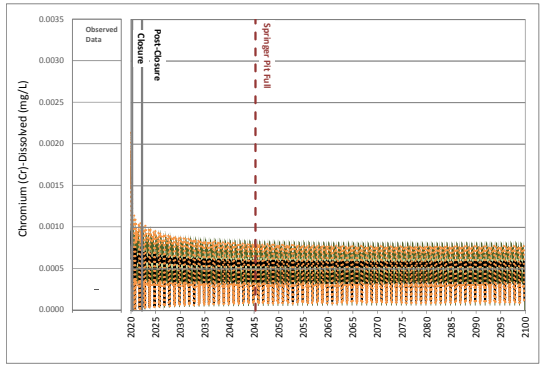
Operations
February 1, 2016 to June 30, 2020



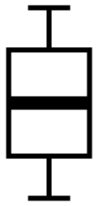


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

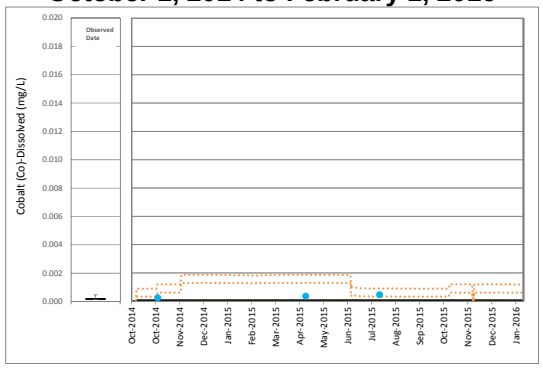
95th Percentile High, 5th Percentile Low

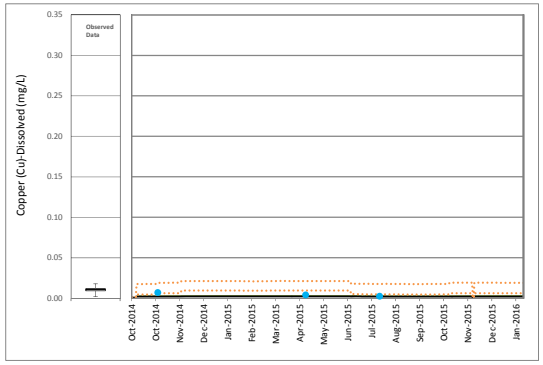
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

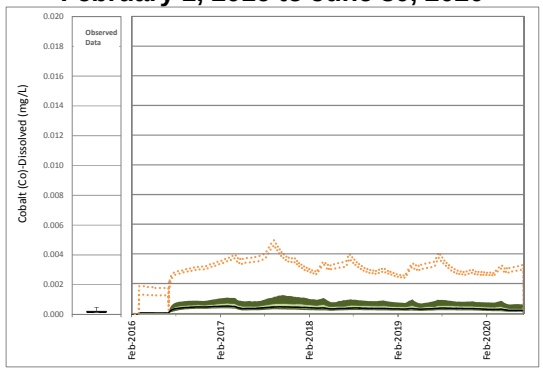
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

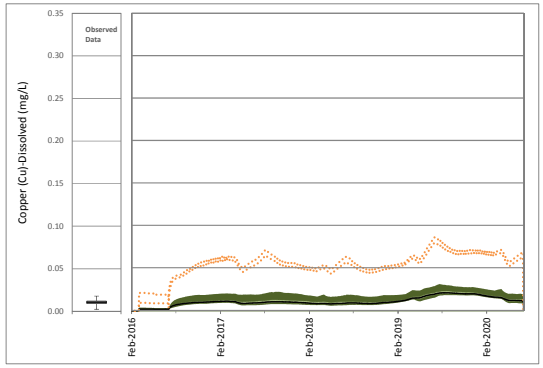
Calibration
October 1, 2014 to February 1, 2016



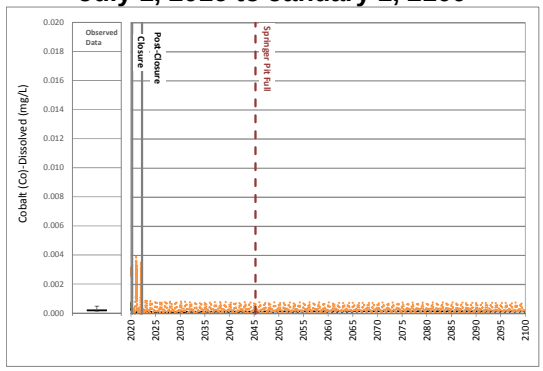


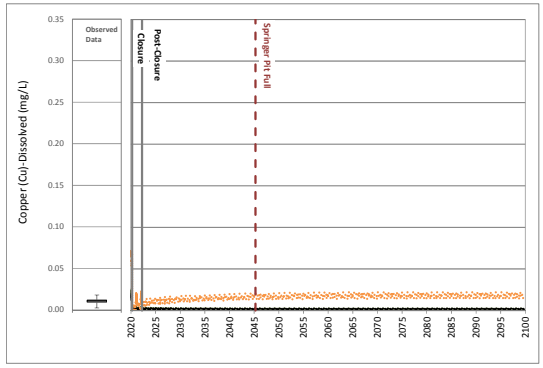
Operations
February 1, 2016 to June 30, 2020



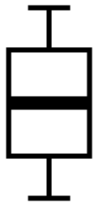


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

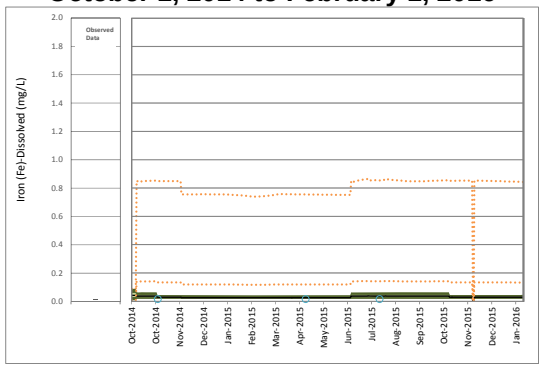
Detected Values
Non- Detected Values

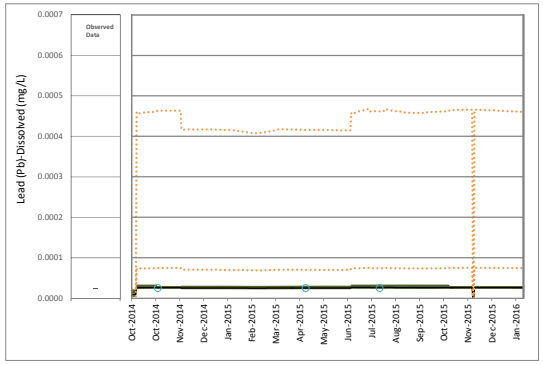
Scenario 2

95th Percentile High, 5th Percentile Low

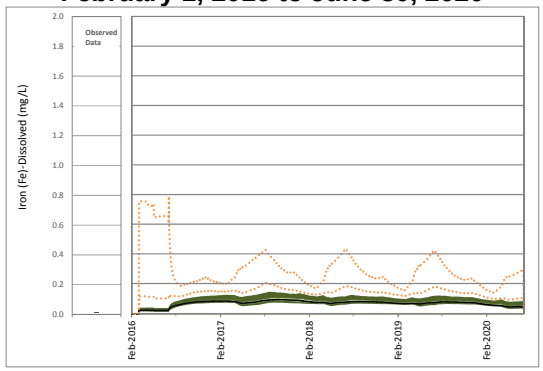
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

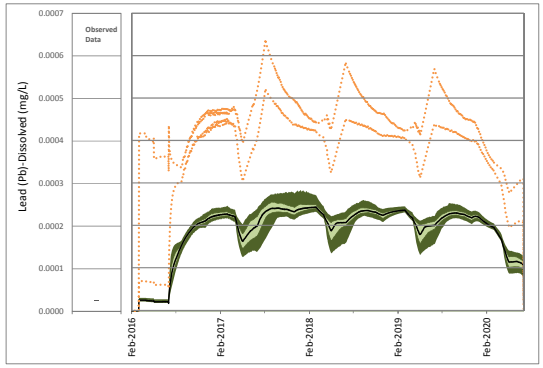
Calibration
October 1, 2014 to February 1, 2016



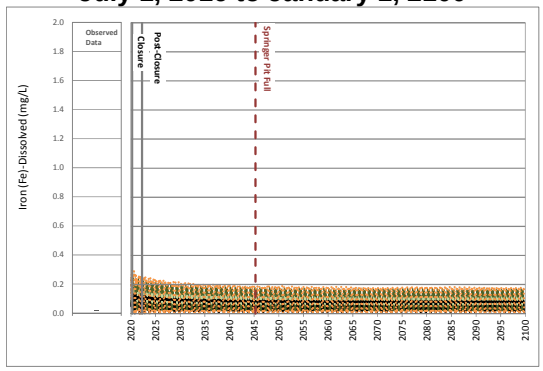


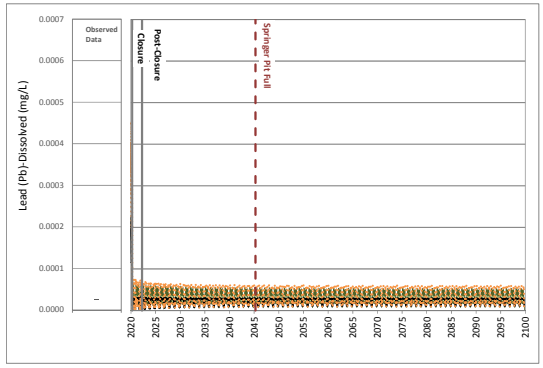
Operations
February 1, 2016 to June 30, 2020



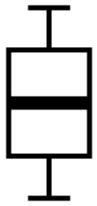


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

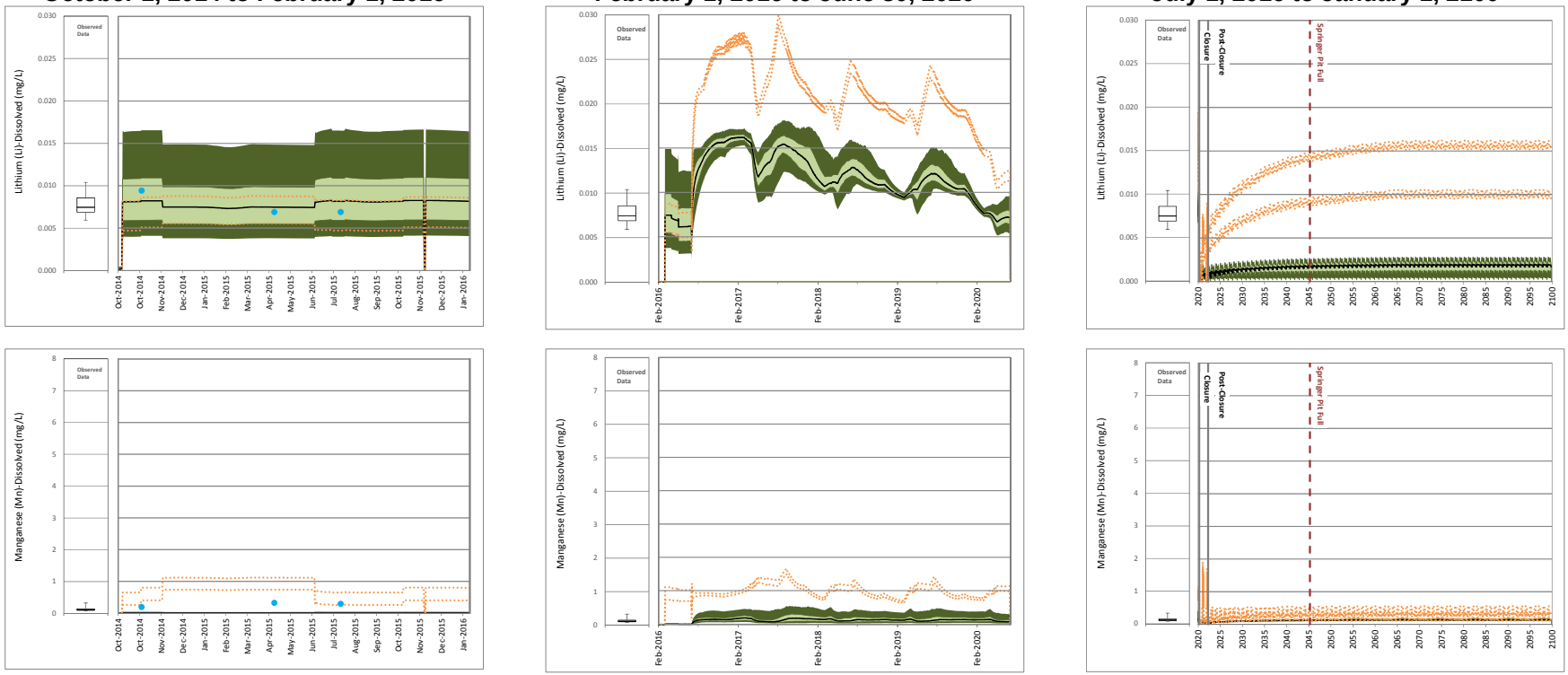
Golder Associates

ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

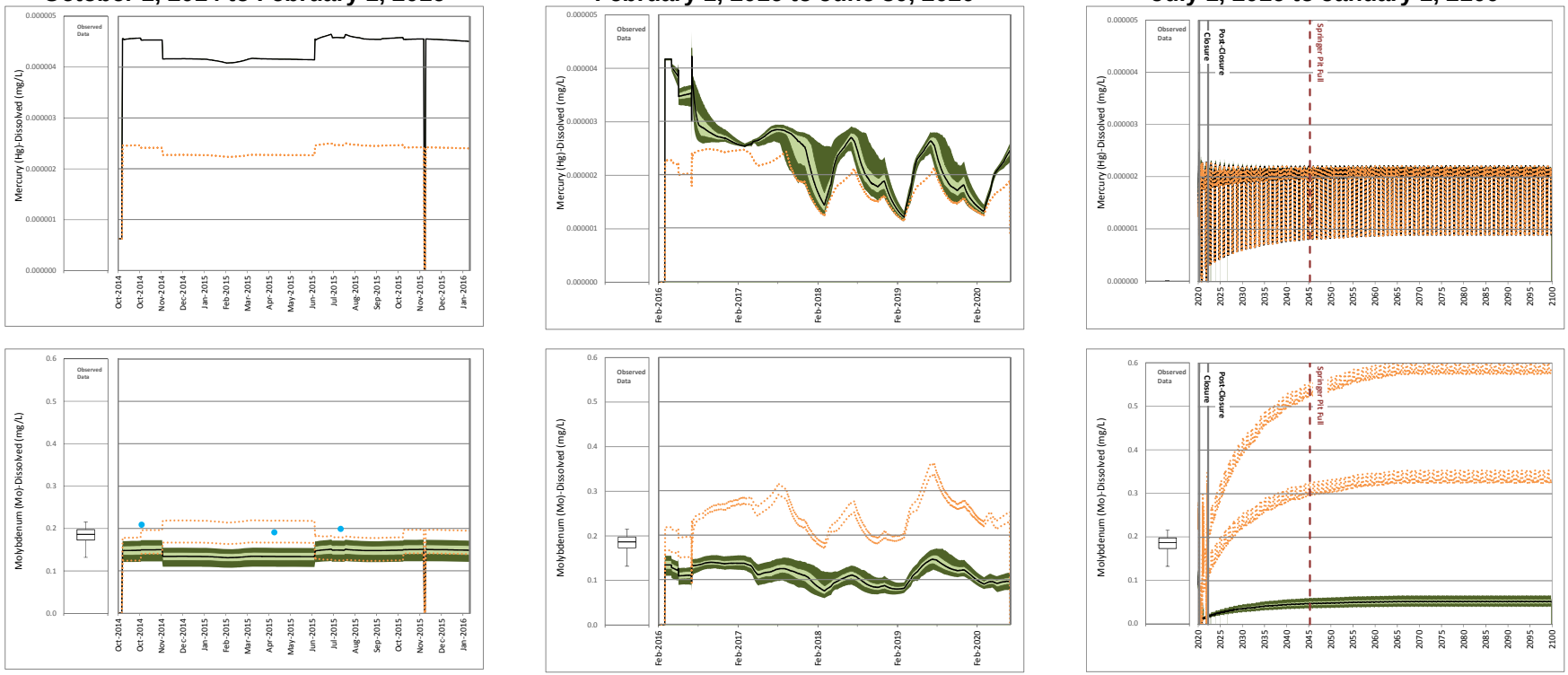
Golder Associates

ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

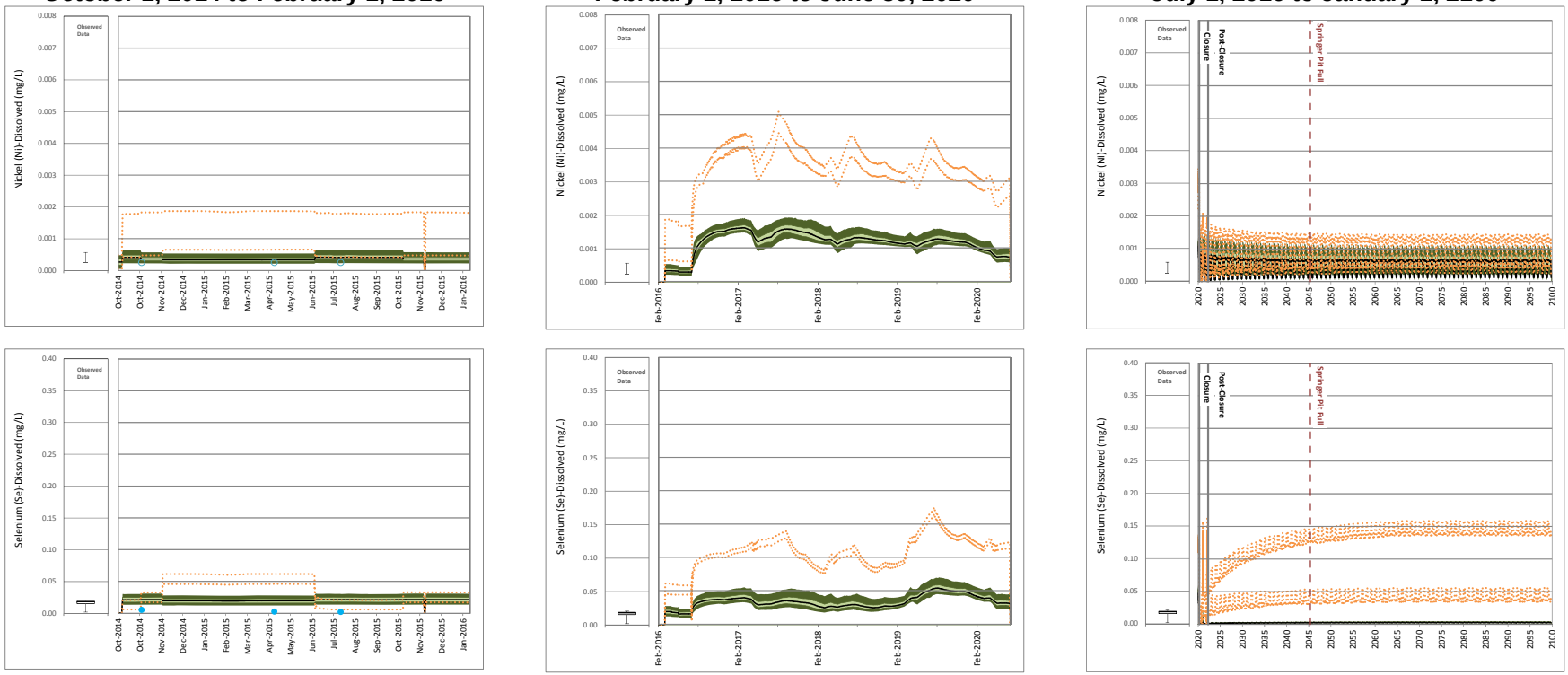
Golder Associates

ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

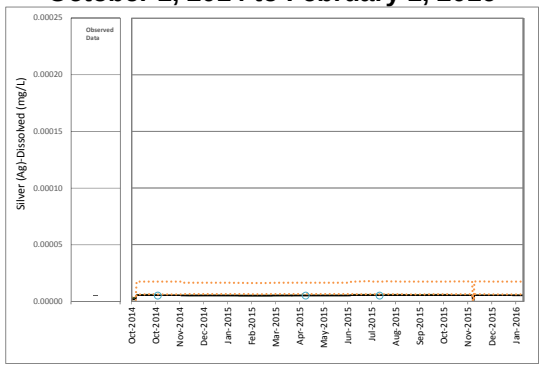
95th Percentile High, 5th Percentile Low

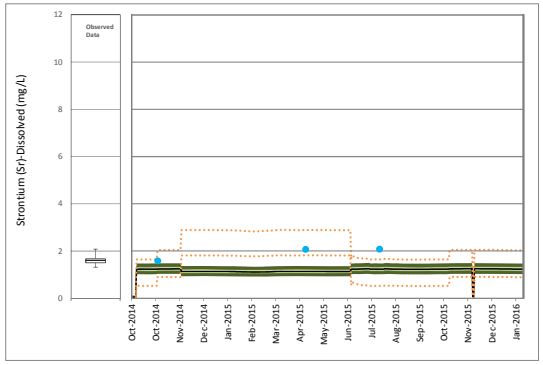
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

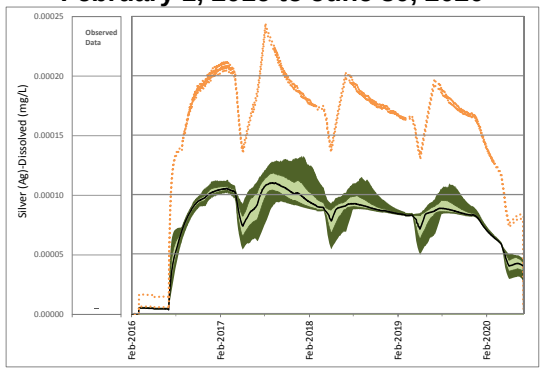
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

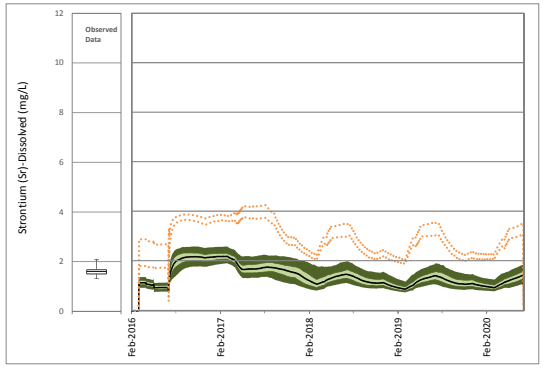
Calibration
October 1, 2014 to February 1, 2016



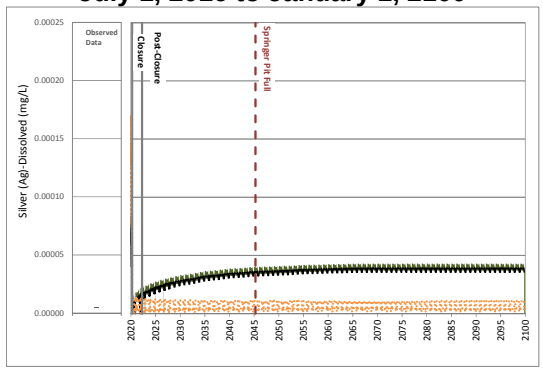


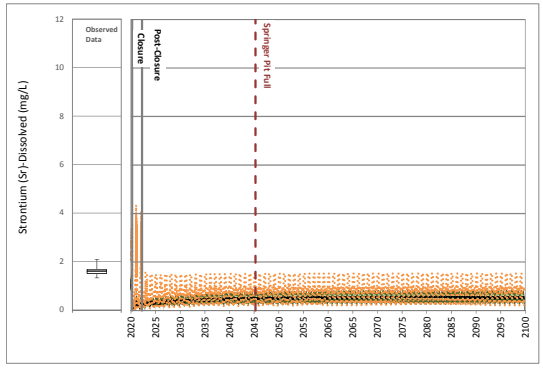
Operations
February 1, 2016 to June 30, 2020



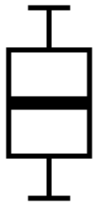


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

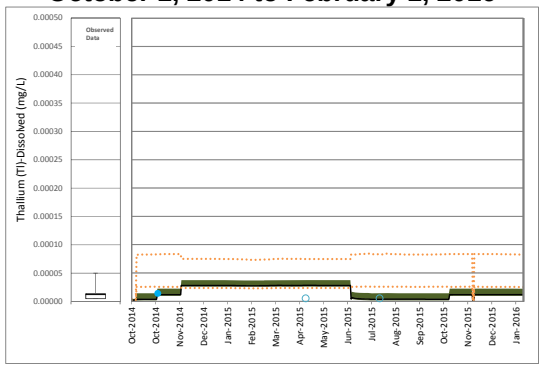
95th Percentile High, 5th Percentile Low

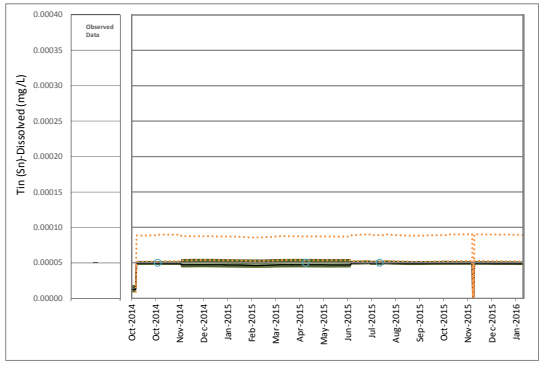
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

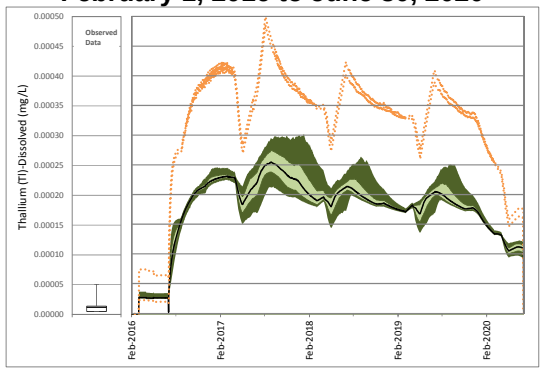
ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

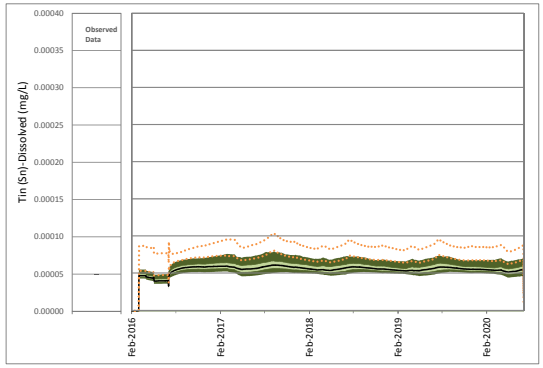
Calibration
October 1, 2014 to February 1, 2016



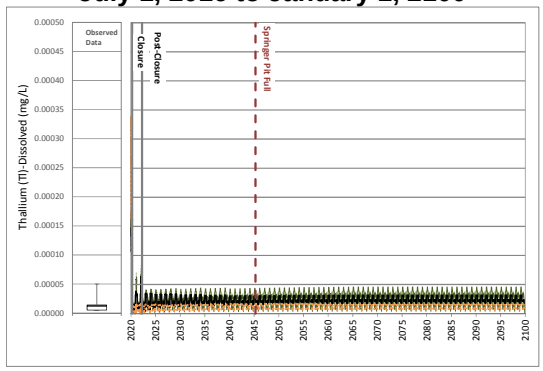


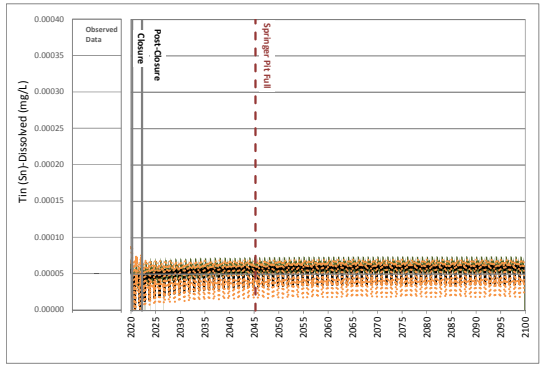
Operations
February 1, 2016 to June 30, 2020



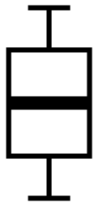


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

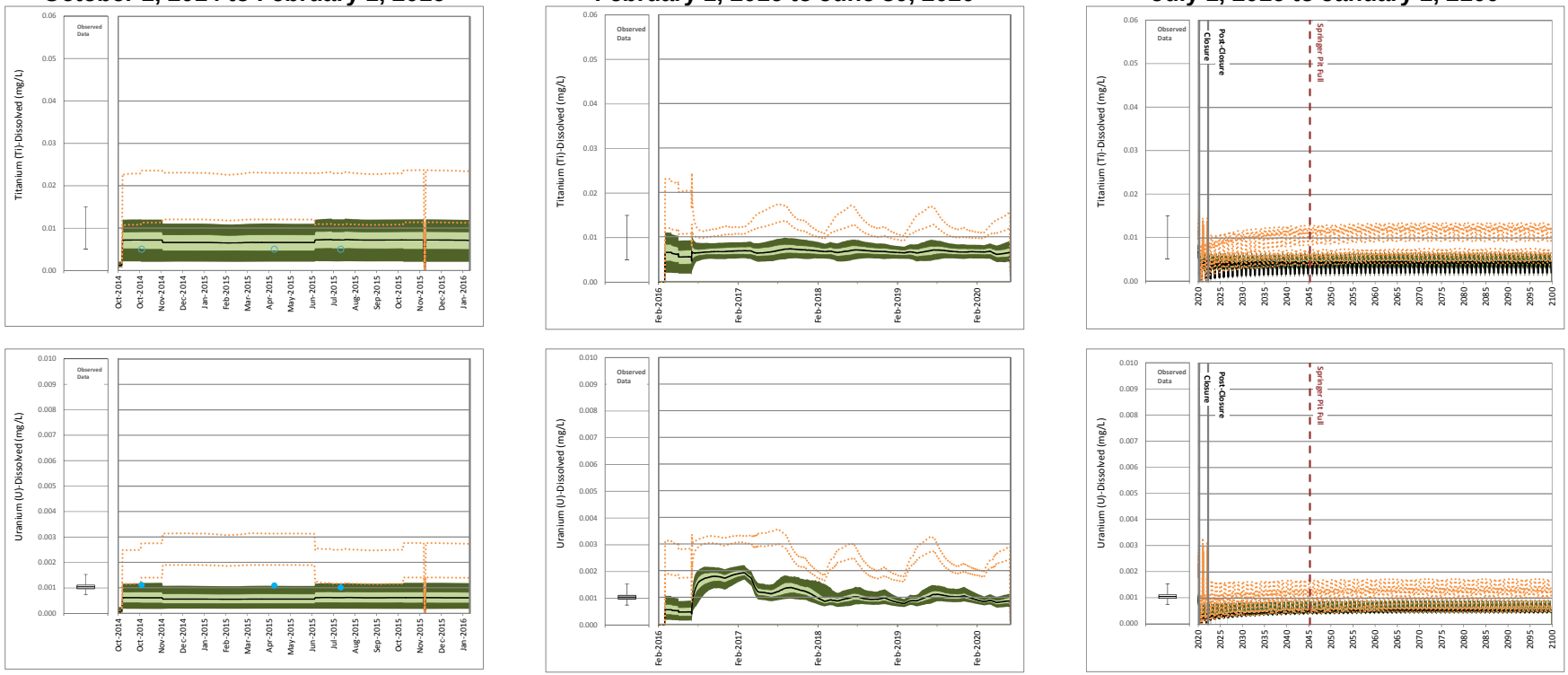
Golder Associates

ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Detected Values
Non- Detected Values

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

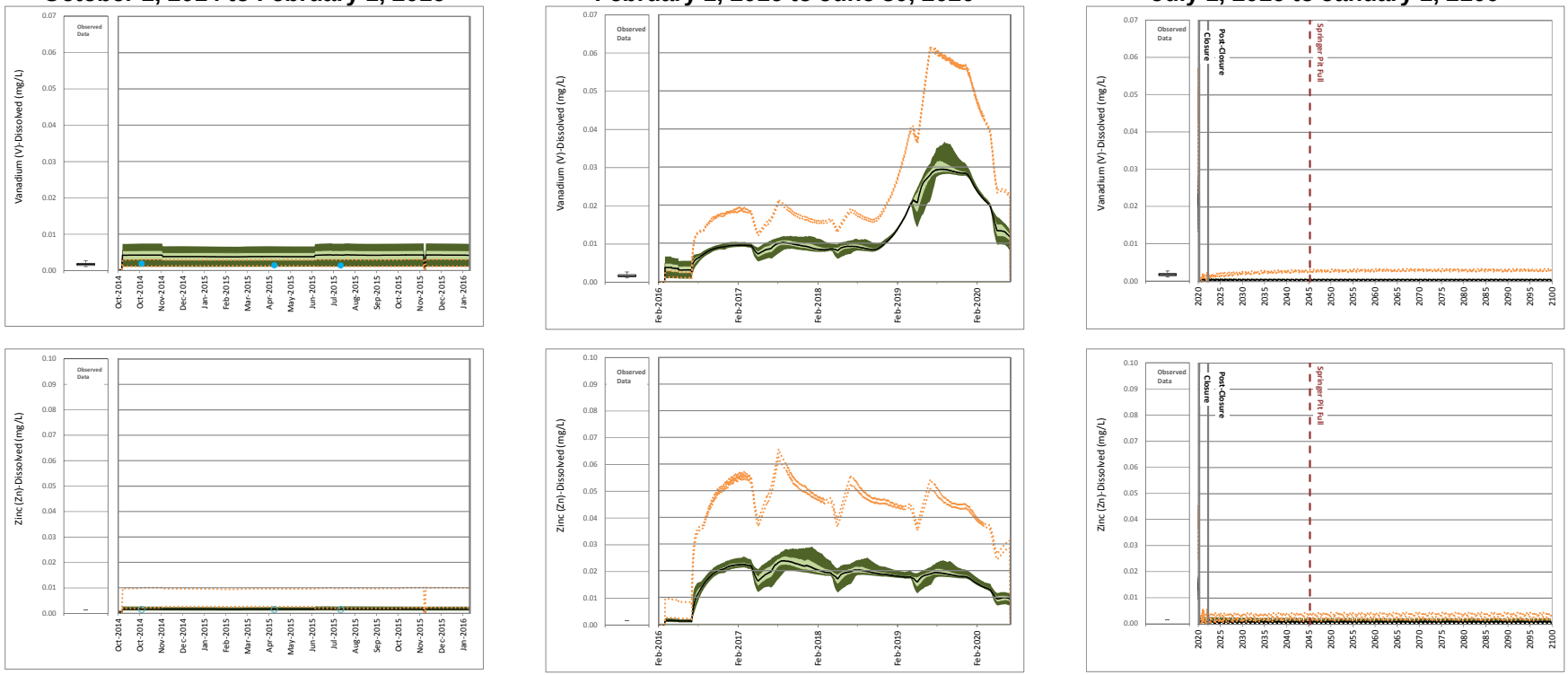
Golder Associates

ATTACHMENT B
Figure B9: Time Series Plots of Predicted South Embankment Seepage Collection Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

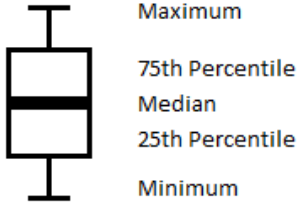
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

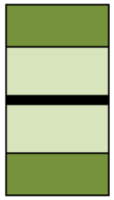


o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig9-sescp.docm

Site Monitoring Data



Scenario 1



Detected Values
Non- Detected Values

Scenario 2
95th Percentile High, 5th Percentile Low

Golder Associates

1.10 Main Embankment Seepage Collection Pond (MESCP)

Table B10 presents the maximum predicted median and 95th percentile results for MESCP, calculated based on 500 realizations for Scenario 1 (Table B10a) and Scenario 2 (Table B10b). Time series plots for each modelled parameter are provided in Figure B10.

Table B10a:
Predicted MESCP Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	502	586	623	696	359	547	370	549	84	147
Total Dissolved Solids	mg/L	995	1084	929	1026	529	790	532	804	167	224
Major Ions											
Calcium	mg/L	163	183	193	213	110	164	114	164	25	39
Chloride	mg/L	23.0	29	21	21	3.5	7.7	6.8	11	3.9	6.8
Fluoride	mg/L	0.73	0.89	8.5	10	0.2	0.3	0.26	0.32	0.15	0.18
Magnesium	mg/L	23	31	34	40	21	34	21	34	5.3	12
Potassium	mg/L	23.0	30.0	13	17	2.0	3.0	3.5	4.5	2.0	2.5
Sodium	mg/L	83	104	84	84	13	16	22	26	12	15
Sulphate	mg/L	580	631	503	572	275	463	277	458	64	78
Nutrients											
Ammonia	mg/L (as N)	0.250	0.65	0.56	0.68	0.01	0.04	0.019	0.041	0.01	0.015
Nitrate	mg/L (as N)	6.8	10	11	14	1.8	10	1.7	10	0.31	0.53
Nitrite	mg/L (as N)	0.110	0.2	0.062	0.24	0.007	0.2	0.0069	0.2	0.0028	0.02
Total Phosphorus	mg/L	0.019	0.052	0.035	0.036	0.02	0.037	0.024	0.039	0.016	0.031
Total Metals											
Aluminum	mg/L	0.54	0.57	0.83	0.91	0.59	0.7	0.58	0.68	0.57	0.66
Antimony	mg/L	0.0019	0.0028	0.0019	0.0024	0.00016	0.0004	0.00017	0.00041	0.000091	0.00028
Arsenic	mg/L	0.0022	0.0028	0.012	0.015	0.0008	0.0013	0.001	0.0015	0.00072	0.0012
Barium	mg/L	0.085	0.1	0.11	0.13	0.035	0.063	0.036	0.065	0.018	0.021
Beryllium	mg/L	0.00007	0.00027	0.0012	0.0014	0.00009	0.00031	0.00016	0.00031	0.000088	0.00017
Boron	mg/L	0.13	0.19	0.15	0.2	0.04	0.1	0.049	0.099	0.026	0.066
Cadmium	mg/L	0.000038	0.00022	0.00015	0.00029	0.000034	0.00024	0.000037	0.00024	0.000018	0.00014
Chromium	mg/L	0.0011	0.0012	0.002	0.0022	0.0013	0.0017	0.0013	0.0016	0.0012	0.0015
Cobalt	mg/L	0.00044	0.0015	0.00085	0.0018	0.00051	0.0017	0.00047	0.0017	0.00039	0.00043
Copper	mg/L	0.01	0.045	0.026	0.051	0.011	0.053	0.011	0.051	0.0065	0.019
Iron	mg/L	0.59	0.65	0.64	0.7	0.67	0.82	0.66	0.78	0.64	0.76
Lead	mg/L	0.00018	0.00019	0.00039	0.00043	0.00018	0.00021	0.00018	0.00021	0.00017	0.0002
Lithium	mg/L	0.011	0.024	0.017	0.022	0.0018	0.007	0.0019	0.0066	0.0011	0.0044
Manganese	mg/L	0.079	0.8	1.0	1.0	0.093	1.0	0.11	0.98	0.068	0.082
Mercury	mg/L	0.0000058	0.0000058	0.0000036	0.0000038	0.0000023	0.0000023	0.0000024	0.0000026	0.0000017	0.0000018
Molybdenum	mg/L	0.19	0.23	0.15	0.19	0.051	0.12	0.053	0.12	0.021	0.04
Nickel	mg/L	0.0011	0.0017	0.0022	0.0026	0.0014	0.0021	0.0014	0.0021	0.0012	0.0018
Selenium	mg/L	0.027	0.06	0.056	0.078	0.013	0.066	0.013	0.066	0.001	0.006
Silver	mg/L	0.0000066	0.000019	0.00011	0.00014	0.000014	0.000029	0.000029	0.000045	0.000016	0.000029
Strontium	mg/L	2.1	2.6	2.3	3.1	0.9	2.6	0.93	2.6	0.27	0.8
Thallium	mg/L	0.00007	0.00009	0.00026	0.00031	0.00009	0.00011	0.000086	0.0001	0.000011	0.000027
Tin	mg/L	0.000063	0.00018	0.000073	0.00019	0.000058	0.00019	0.000063	0.00019	0.000039	0.00015
Titanium	mg/L	0.031	0.038	0.03	0.034	0.029	0.033	0.029	0.033	0.026	0.028
Uranium	mg/L	0.0012	0.0021	0.002	0.0029	0.00065	0.0017	0.00066	0.0018	0.00029	0.0013
Vanadium	mg/L	0.0066	0.011	0.032	0.038	0.002	0.002	0.0019	0.0023	0.0017	0.002
Zinc	mg/L	0.0039	0.01	0.026	0.031	0.004	0.011	0.004	0.011	0.0024	0.004
Dissolved Metals											
Aluminum	mg/L	0.05	0.08	0.34	0.42	0.1	0.22	0.091	0.19	0.081	0.17
Antimony	mg/L	0.0019	0.0027	0.0019	0.0022	0.00014	0.0002	0.00015	0.00023	0.000071	0.0001
Arsenic	mg/L	0.0020	0.0026	0.012	0.015	0.0006	0.0012	0.00084	0.0014	0.00053	0.00099
Barium	mg/L	0.079	0.09	0.11	0.13	0.03	0.058	0.031	0.059	0.013	0.015
Beryllium	mg/L	0.00007	0.00019	0.0012	0.0014	0.00009	0.00023	0.00016	0.00023	0.000088	0.000092
Boron	mg/L	0.13	0.16	0.14	0.17	0.041	0.06	0.046	0.062	0.023	0.03
Cadmium	mg/L	0.000034	0.00012	0.00015	0.00019	0.00003	0.00015	0.000033	0.00014	0.000014	0.000041
Chromium	mg/L	0.00043	0.00051	0.0014	0.0016	0.0007	0.0011	0.00068	0.0010	0.00056	0.00085
Cobalt	mg/L	0.00012	0.0011	0.00052	0.0014	0.00018	0.0013	0.00014	0.0014	0.000067	0.0001
Copper	mg/L	0.006	0.029	0.022	0.036	0.007	0.037	0.0066	0.036	0.0019	0.0033
Iron	mg/L	0.046	0.11	0.097	0.16	0.13	0.27	0.11	0.23	0.1	0.22
Lead	mg/L	0.000033	0.000045	0.00025	0.00028	0.000034	0.00007	0.000035	0.000064	0.000024	0.000056
Lithium	mg/L	0.010	0.021	0.016	0.019	0.0015	0.0037	0.0016	0.0036	0.0008	0.0015
Manganese	mg/L	0.064	0.8	1.0	1.0	0.078	1.0	0.098	0.97	0.054	0.067
Mercury	mg/L	0.0000058	0.0000058	0.0000036	0.0000038	0.0000023	0.0000023	0.0000024	0.0000026	0.0000017	0.0000018
Molybdenum	mg/L	0.19	0.22	0.15	0.18	0.051	0.1	0.053	0.1	0.021	0.026
Nickel	mg/L	0.00052	0.0012	0.0016	0.002	0.00085	0.0015	0.00083	0.0015	0.00066	0.0012
Selenium	mg/L	0.027	0.06	0.056	0.074	0.013	0.061	0.013	0.062	0.001	0.0017
Silver	mg/L	0.0000066	0.000009	0.00011	0.00013	0.000014	0.000019	0.000029	0.000035	0.000016	0.000019
Strontium	mg/L	2.1	2.2	2.3	2.7	0.9	2.2	0.91	2.2	0.25	0.38
Thallium	mg/L	0.00007	0.00008	0.00026	0.00031	0.00009	0.0001	0.000086	0.000093	0.000011	0.000018
Tin	mg/L	0.000063	0.00008	0.000073	0.000088	0.000058	0.000088	0.000063	0.000087	0.000039	0.000053
Titanium	mg/L	0.009	0.015	0.0076	0.012	0.0069	0.011	0.0069	0.011	0.0034	0.0055
Uranium	mg/L	0.0012	0.0015	0.0019	0.0022	0.00061	0.0011	0.00062	0.0011	0.00025	0.00068
Vanadium	mg/L	0.0053	0.0093	0.03	0.037	0.001	0.001	0.00059	0.001	0.00038	0.00068
Zinc	mg/L	0.0024	0.008	0.025	0.029	0.0024	0.009	0.0024	0.0098	0.00086	0.0025

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

Table B10b:
Predicted MESCP Water Quality - Scenario 2

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	830	885	938	971	860	913	849	904	202	287
Total Dissolved Solids	mg/L	1217	1282	1271	1303	1141	1189	1132	1183	355	440
Major Ions											
Calcium	mg/L	255	272	287	295	263	275	260	273	65	90
Chloride	mg/L	29	31	22	24	11	14	11	14	2.8	6.1
Fluoride	mg/L	1.0	1.1	18	18	0.4	0.43	0.42	0.46	0.22	0.24
Magnesium	mg/L	47	50	54	57	49	55	49	54	9.6	15
Potassium	mg/L	18	19	16	16	5.1	5.6	6.4	8.0	3.4	4.4
Sodium	mg/L	85	101	84	84	26	29	35	46	19	25
Sulphate	mg/L	713	770	754	765	694	713	689	712	202	277
Nutrients											
Ammonia	mg/L (as N)	0.12	0.16	1.1	1.1	0.072	0.076	0.069	0.073	0.016	0.023
Nitrate	mg/L (as N)	15	16	20	21	2.0	2.2	1.9	2.1	0.11	0.33
Nitrite	mg/L (as N)	0.24	0.3	0.29	0.31	0.7	0.71	0.67	0.67	0.017	0.02
Total Phosphorus	mg/L	0.059	0.065	0.064	0.071	0.067	0.078	0.066	0.077	0.015	0.029
Total Metals											
Aluminum	mg/L	0.94	1.3	1.3	1.4	0.6	0.72	0.59	0.68	0.57	0.66
Antimony	mg/L	0.0017	0.0019	0.0035	0.0037	0.0019	0.0021	0.0019	0.0021	0.00088	0.0011
Arsenic	mg/L	0.0027	0.0032	0.025	0.026	0.0025	0.003	0.0037	0.0042	0.0021	0.0024
Barium	mg/L	0.094	0.1	0.2	0.21	0.077	0.079	0.076	0.078	0.017	0.019
Beryllium	mg/L	0.00029	0.0006	0.0025	0.0026	0.000074	0.00016	0.000074	0.00016	0.000037	0.00012
Boron	mg/L	0.17	0.23	0.26	0.32	0.13	0.17	0.13	0.17	0.036	0.076
Cadmium	mg/L	0.00019	0.00037	0.00045	0.00056	0.00015	0.00025	0.00015	0.00025	0.000053	0.00017
Chromium	mg/L	0.0022	0.0031	0.0036	0.0039	0.0014	0.0017	0.0013	0.0016	0.0012	0.0015
Cobalt	mg/L	0.0045	0.0047	0.0055	0.0056	0.0053	0.0053	0.0051	0.0051	0.0005	0.00054
Copper	mg/L	0.031	0.045	0.089	0.1	0.033	0.045	0.033	0.045	0.012	0.024
Iron	mg/L	1.2	1.6	0.96	1.3	0.68	0.82	0.66	0.78	0.64	0.75
Lead	mg/L	0.00048	0.00073	0.00073	0.00079	0.00019	0.00022	0.00019	0.00022	0.00017	0.0002
Lithium	mg/L	0.0091	0.013	0.03	0.033	0.0083	0.012	0.0099	0.014	0.0053	0.0091
Manganese	mg/L	2.2	2.3	2.4	2.4	2.5	2.5	2.4	2.4	0.13	0.15
Mercury	mg/L	0.0000031	0.0000031	0.0000026	0.0000026	0.0000023	0.0000023	0.0000024	0.0000024	0.0000017	0.0000017
Molybdenum	mg/L	0.28	0.31	0.36	0.38	0.31	0.34	0.34	0.44	0.18	0.24
Nickel	mg/L	0.0025	0.003	0.0055	0.0058	0.0026	0.003	0.0026	0.003	0.0013	0.0018
Selenium	mg/L	0.17	0.17	0.2	0.2	0.2	0.21	0.2	0.21	0.033	0.059
Silver	mg/L	0.000015	0.000032	0.00025	0.00026	0.0000096	0.000024	0.0000094	0.000024	0.0000047	0.000019
Strontium	mg/L	5.8	6.4	6.6	7.1	6.6	7.1	6.5	7.0	0.39	0.92
Thallium	mg/L	0.00007	0.00012	0.0005	0.00052	0.000011	0.000026	0.000013	0.000029	0.0000061	0.000021
Tin	mg/L	0.000091	0.00021	0.000092	0.0002	0.000074	0.00018	0.000073	0.00018	0.000037	0.00015
Titanium	mg/L	0.044	0.051	0.041	0.045	0.038	0.04	0.038	0.039	0.027	0.029
Uranium	mg/L	0.0043	0.0052	0.0045	0.0054	0.0044	0.0053	0.0043	0.0052	0.00046	0.0015
Vanadium	mg/L	0.0039	0.005	0.063	0.064	0.0032	0.0035	0.0036	0.004	0.0025	0.0027
Zinc	mg/L	0.009	0.014	0.067	0.068	0.0067	0.0079	0.0066	0.0078	0.0029	0.0044
Dissolved Metals											
Aluminum	mg/L	0.45	0.78	0.85	0.93	0.11	0.23	0.1	0.19	0.083	0.17
Antimony	mg/L	0.0016	0.0018	0.0035	0.0036	0.0019	0.0019	0.0019	0.0019	0.00086	0.00087
Arsenic	mg/L	0.0025	0.003	0.025	0.025	0.0024	0.0028	0.0035	0.004	0.0019	0.0022
Barium	mg/L	0.088	0.098	0.2	0.2	0.072	0.074	0.07	0.072	0.012	0.014
Beryllium	mg/L	0.00029	0.00052	0.0025	0.0025	0.000074	0.00008	0.000074	0.000079	0.000037	0.000039
Boron	mg/L	0.17	0.19	0.26	0.28	0.13	0.13	0.12	0.13	0.033	0.04
Cadmium	mg/L	0.00019	0.00028	0.00044	0.00046	0.00015	0.00015	0.00014	0.00015	0.000048	0.000075
Chromium	mg/L	0.0015	0.0024	0.003	0.0032	0.00074	0.0011	0.00067	0.00096	0.00055	0.00082
Cobalt	mg/L	0.0042	0.0043	0.0052	0.0052	0.0049	0.005	0.0048	0.0048	0.00018	0.00022
Copper	mg/L	0.026	0.03	0.085	0.087	0.029	0.03	0.028	0.03	0.0073	0.0083
Iron	mg/L	0.62	1.1	0.41	0.71	0.13	0.28	0.11	0.23	0.097	0.21
Lead	mg/L	0.00034	0.00058	0.00059	0.00065	0.000042	0.000072	0.000042	0.000072	0.000025	0.000054
Lithium	mg/L	0.0088	0.01	0.03	0.031	0.008	0.0086	0.0096	0.012	0.005	0.0062
Manganese	mg/L	2.2	2.3	2.4	2.4	2.5	2.5	2.4	2.4	0.11	0.13
Mercury	mg/L	0.0000031	0.0000031	0.0000026	0.0000026	0.0000023	0.0000023	0.0000024	0.0000024	0.0000017	0.0000017
Molybdenum	mg/L	0.28	0.3	0.36	0.37	0.31	0.32	0.34	0.42	0.18	0.23
Nickel	mg/L	0.0019	0.0024	0.0049	0.0052	0.0021	0.0025	0.002	0.0024	0.00073	0.0012
Selenium	mg/L	0.17	0.17	0.2	0.2	0.2	0.21	0.2	0.21	0.033	0.055
Silver	mg/L	0.000015	0.000022	0.00025	0.00025	0.0000096	0.000014	0.0000094	0.000014	0.0000047	0.0000095
Strontium	mg/L	5.8	6.0	6.6	6.6	6.6	6.7	6.5	6.6	0.37	0.51
Thallium	mg/L	0.00007	0.00011	0.0005	0.00051	0.000011	0.000016	0.000013	0.00002	0.0000061	0.000012
Tin	mg/L	0.000091	0.00011	0.000092	0.0001	0.000074	0.000084	0.000073	0.000084	0.000037	0.00005
Titanium	mg/L	0.021	0.029	0.018	0.023	0.016	0.017	0.016	0.017	0.0048	0.0068
Uranium	mg/L	0.0042	0.0045	0.0045	0.0047	0.0043	0.0047	0.0043	0.0046	0.00042	0.00083
Vanadium	mg/L	0.0026	0.0037	0.062	0.062	0.0019	0.0022	0.0024	0.0027	0.0013	0.0014
Zinc	mg/L	0.0075	0.012	0.065	0.067	0.0052	0.0064	0.0051	0.0063	0.0014	0.0029

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

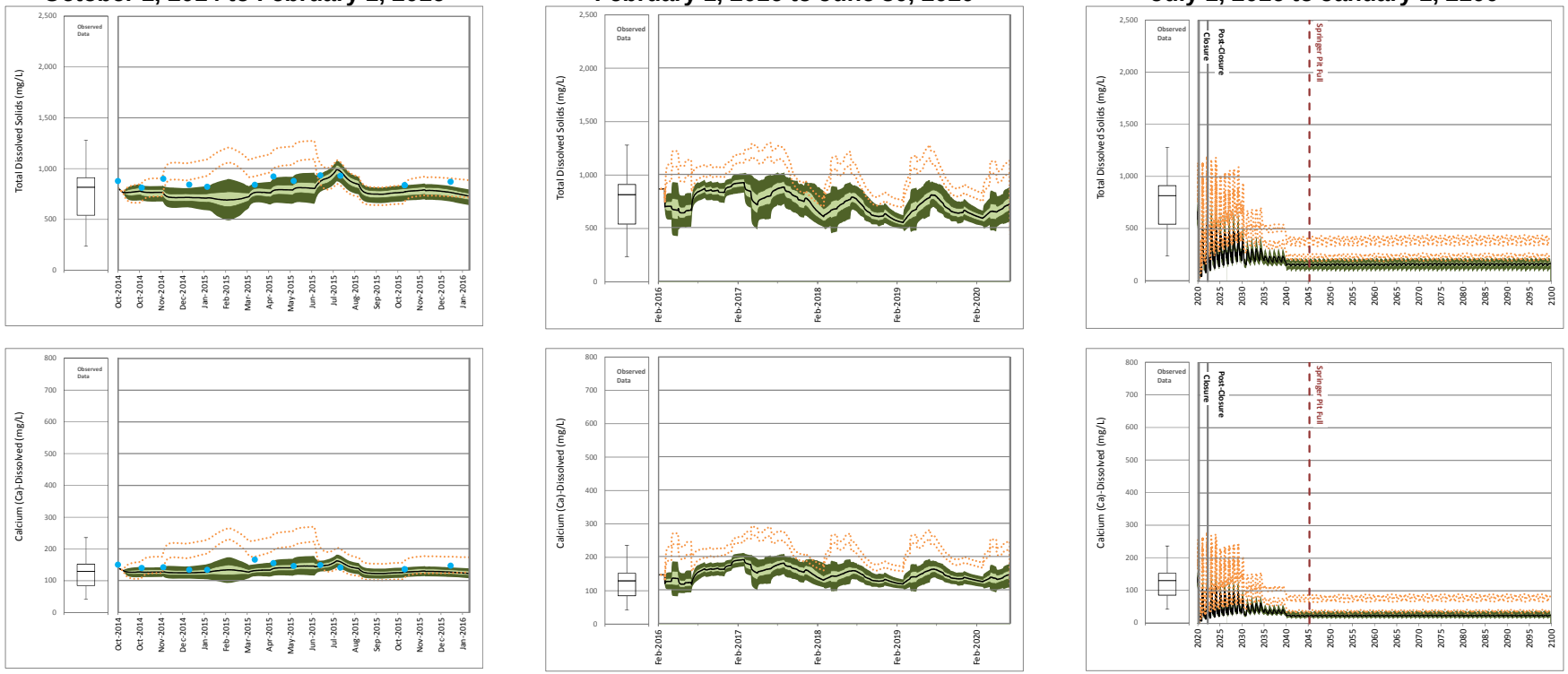
ATTACHMENT B

Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

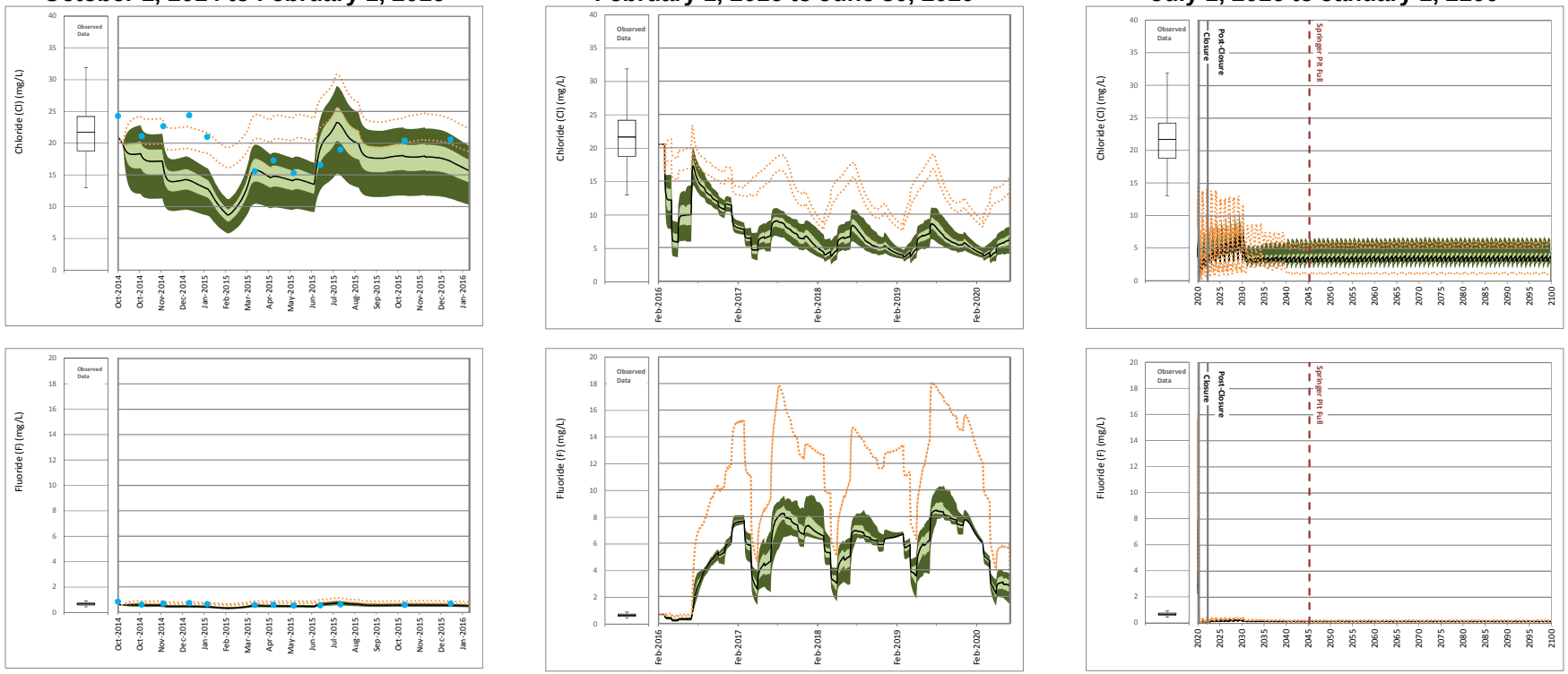
ATTACHMENT B

Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

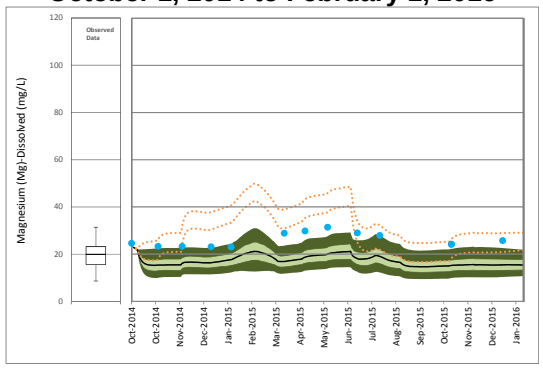
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

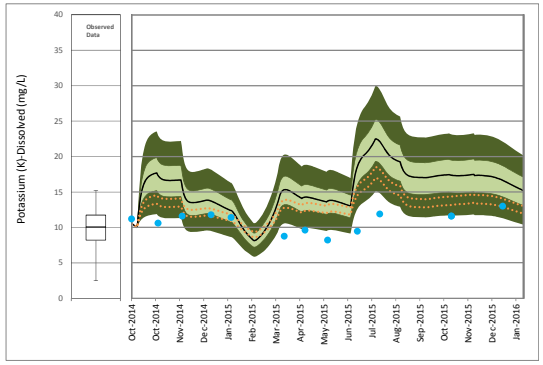
Golder Associates

ATTACHMENT B

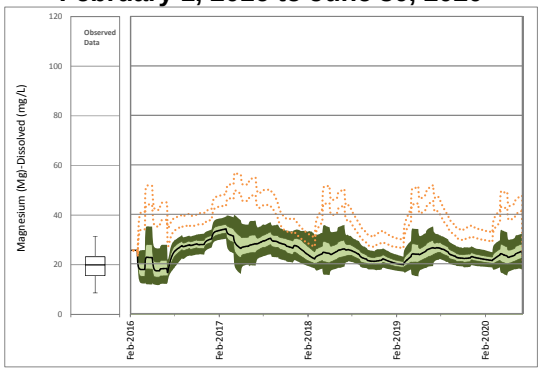
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

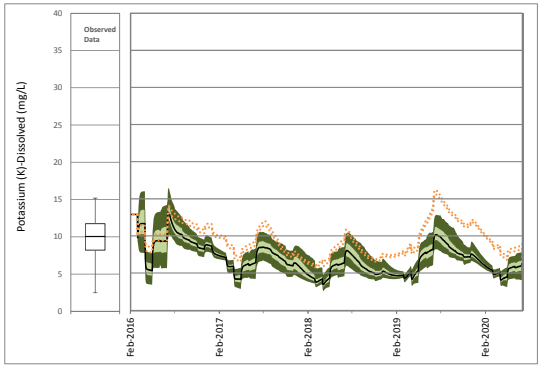
Calibration
October 1, 2014 to February 1, 2016



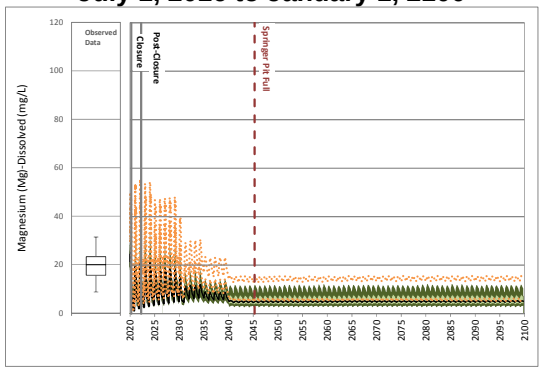


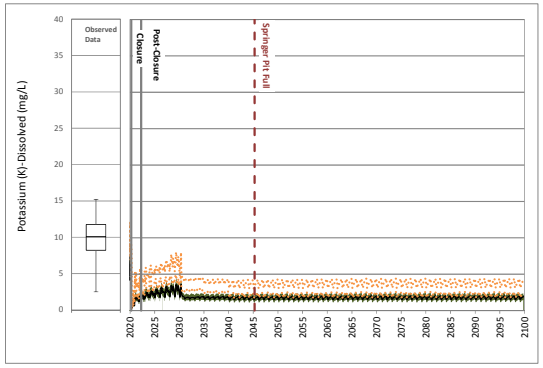
Operations
February 1, 2016 to June 30, 2020



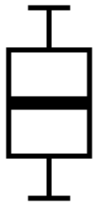


Closure and Post-closure
July 1, 2016 to January 1, 2100



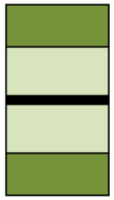


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

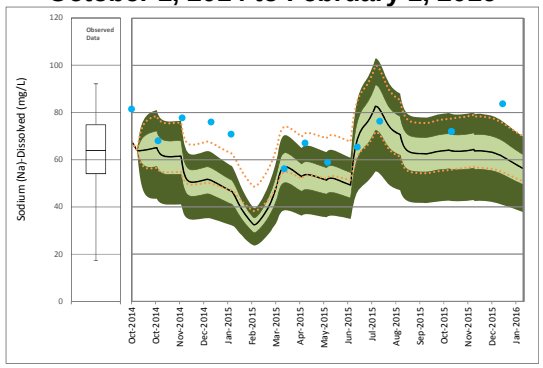
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

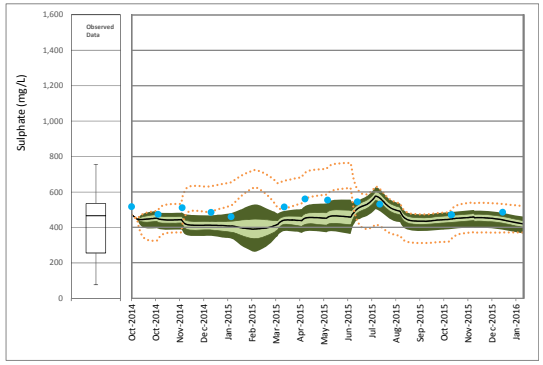
Golder Associates

ATTACHMENT B

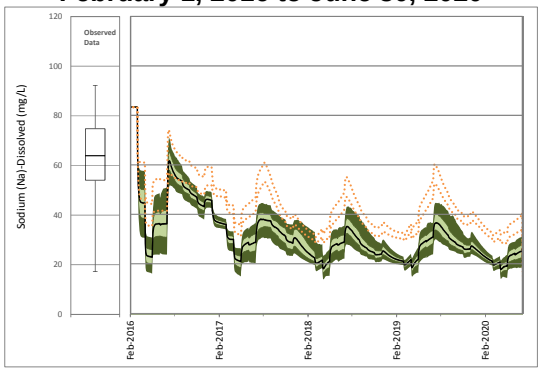
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

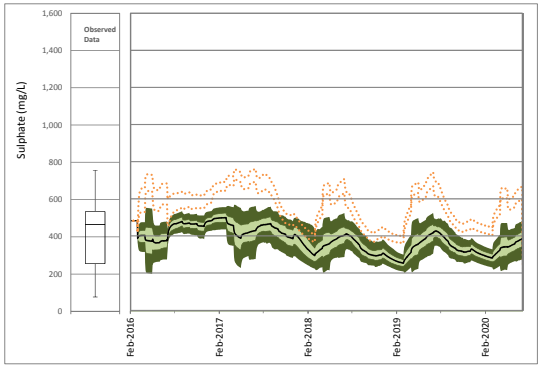
Calibration
October 1, 2014 to February 1, 2016



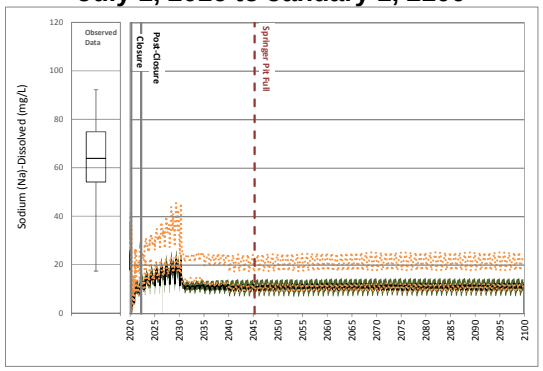


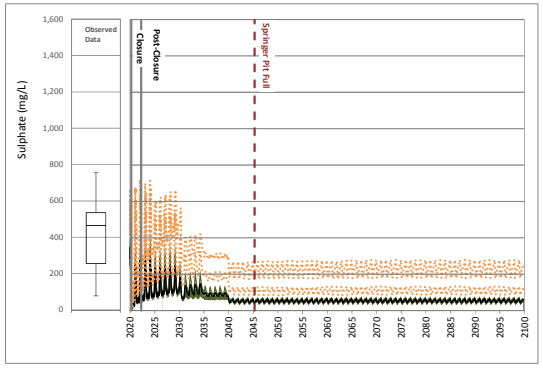
Operations
February 1, 2016 to June 30, 2020



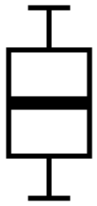


Closure and Post-closure
July 1, 2016 to January 1, 2100



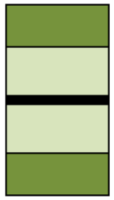


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

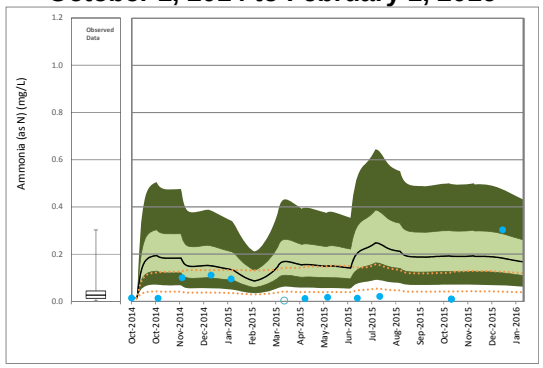
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

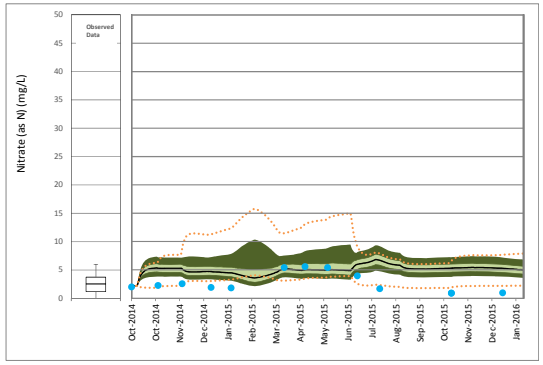
Golder Associates

ATTACHMENT B

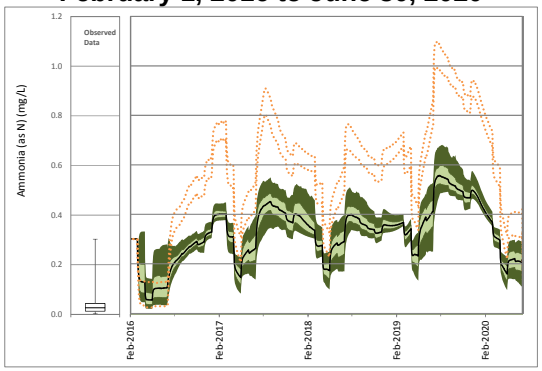
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

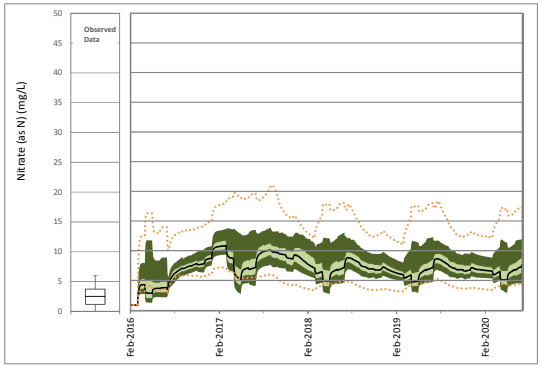
Calibration
October 1, 2014 to February 1, 2016



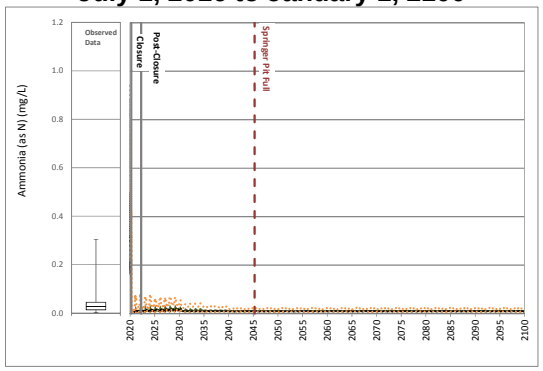


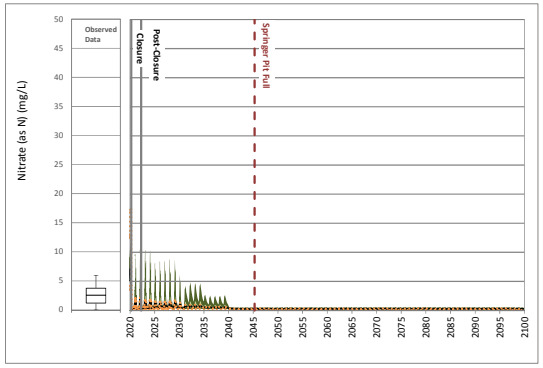
Operations
February 1, 2016 to June 30, 2020



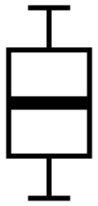


Closure and Post-closure
July 1, 2016 to January 1, 2100



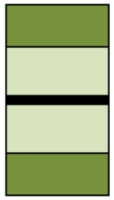


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

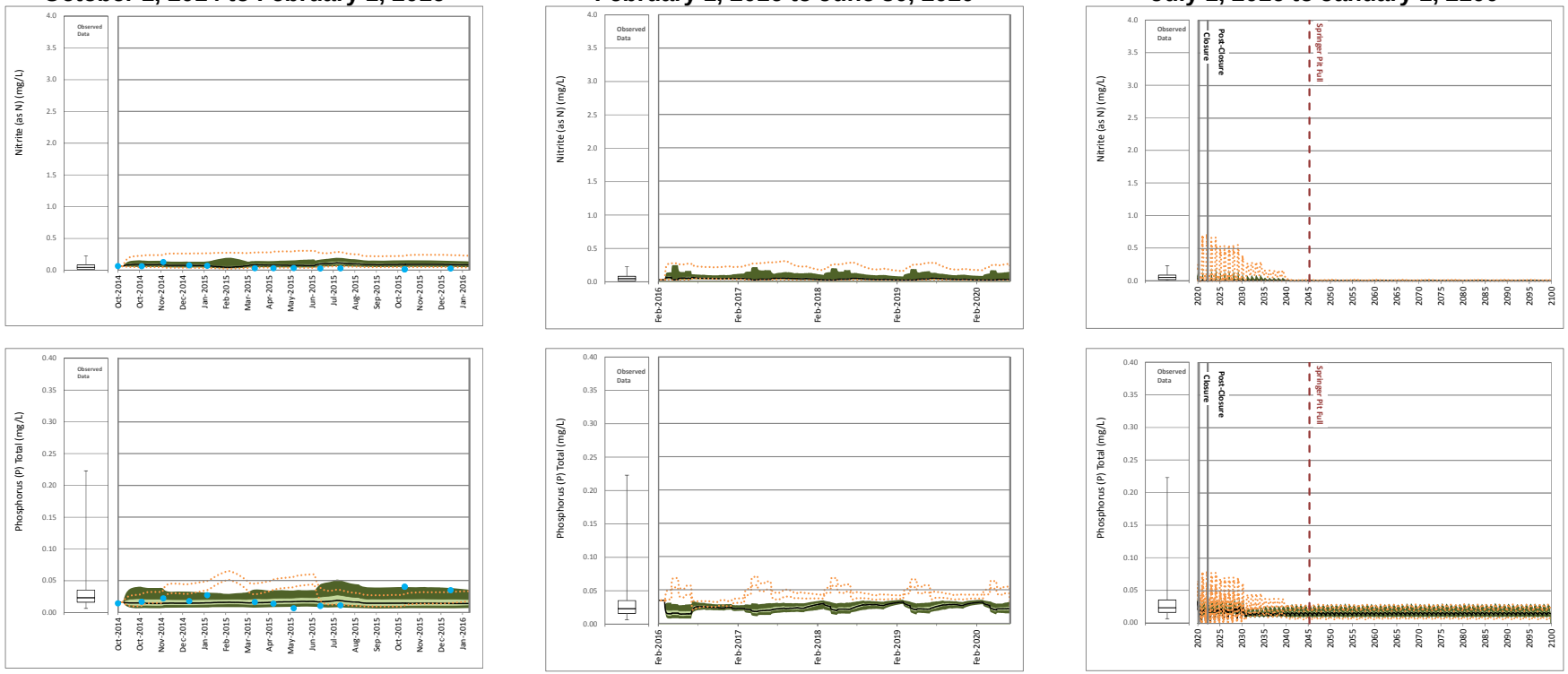
ATTACHMENT B

Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

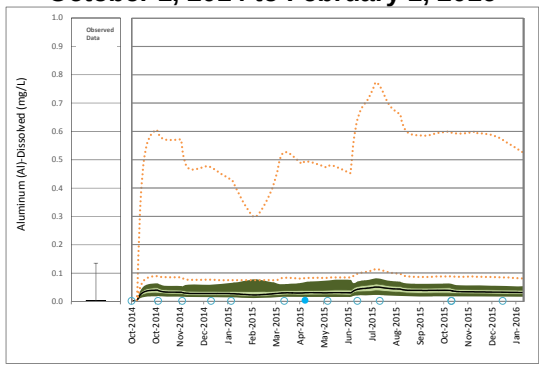
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

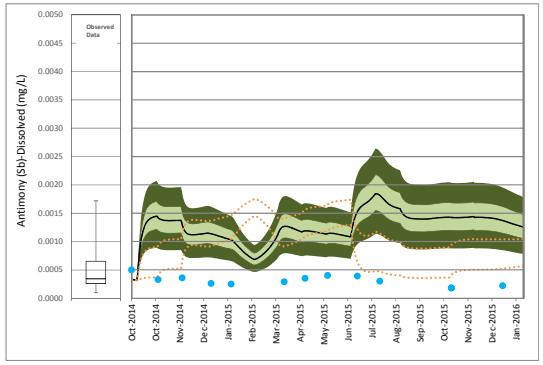
Golder Associates

ATTACHMENT B

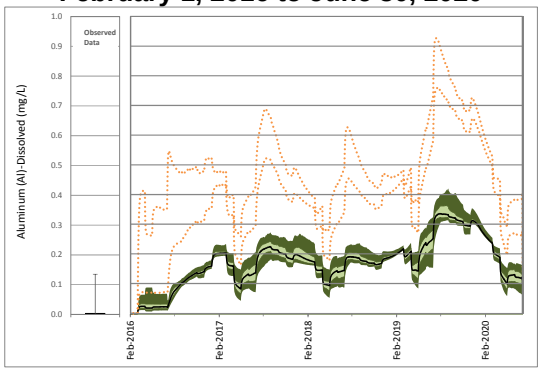
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

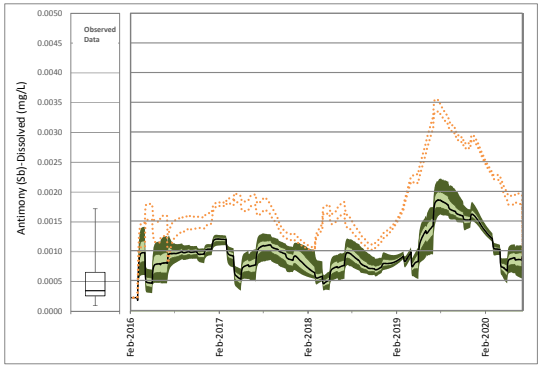
Calibration
October 1, 2014 to February 1, 2016



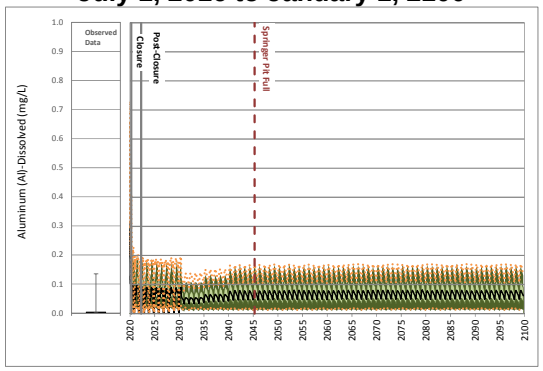


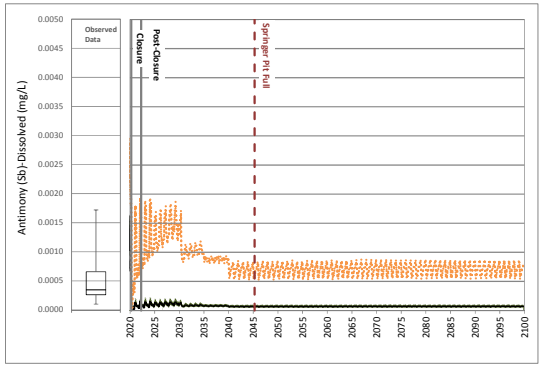
Operations
February 1, 2016 to June 30, 2020



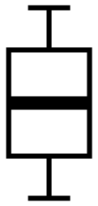


Closure and Post-closure
July 1, 2016 to January 1, 2100



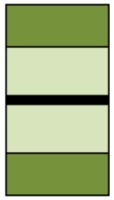


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

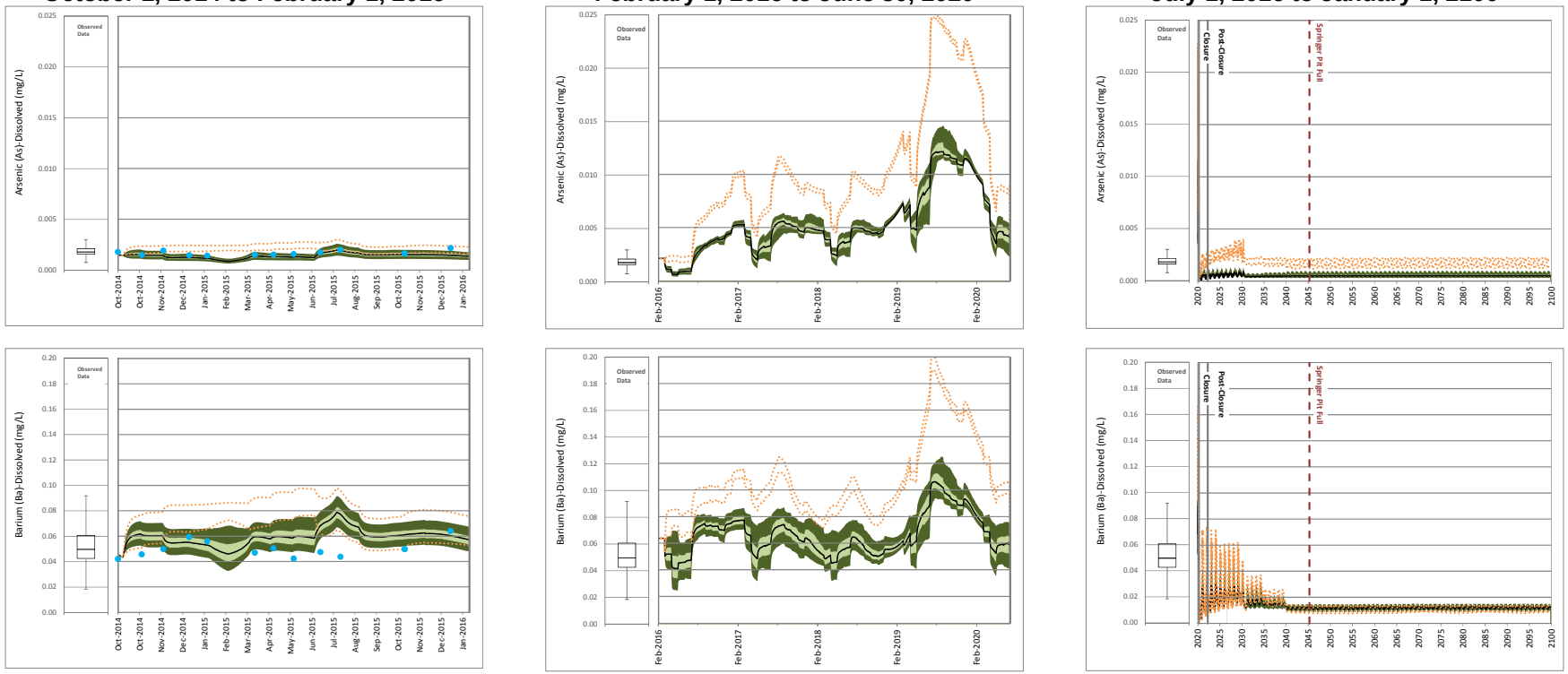
Golder Associates

ATTACHMENT B
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

- Maximum
- 75th Percentile
- Median
- 25th Percentile
- Minimum

Scenario 1

- 95th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 5th Percentile

- Detected Values
- Non- Detected Values

Scenario 2

- 95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

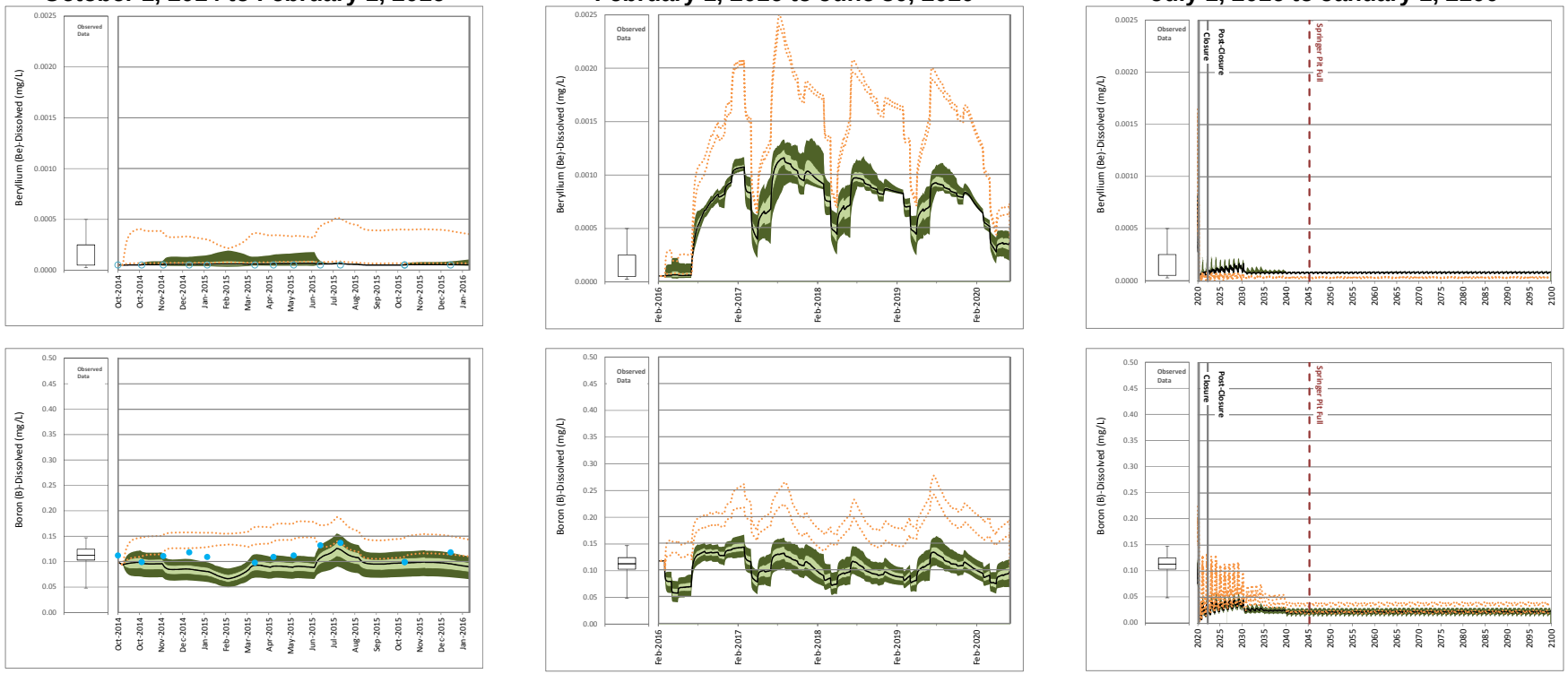
ATTACHMENT B

Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

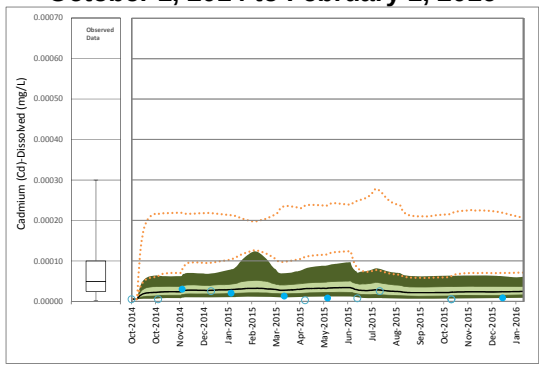
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

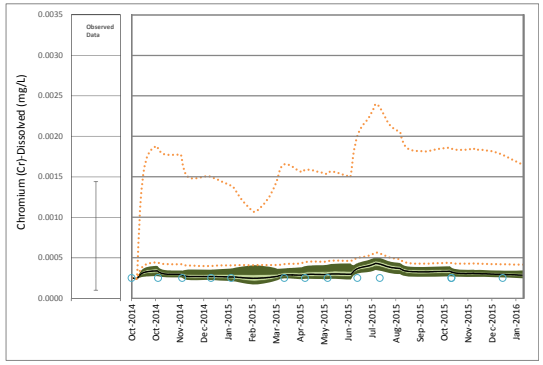
Golder Associates

ATTACHMENT B

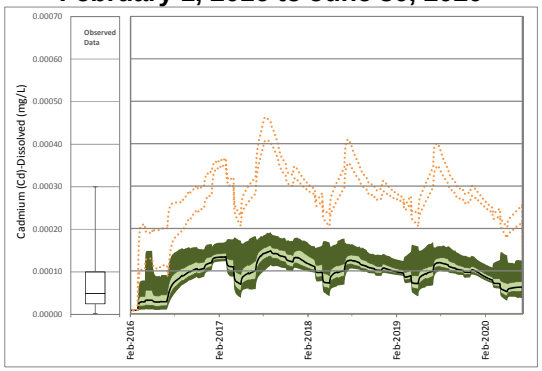
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

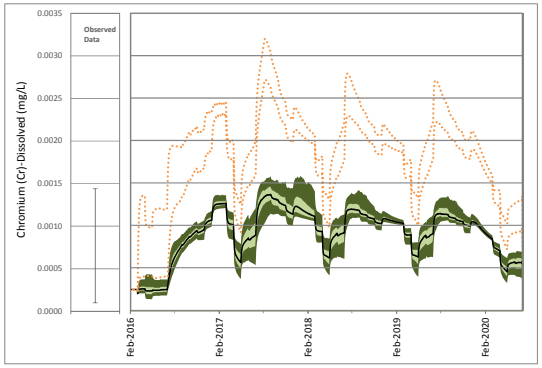
Calibration
October 1, 2014 to February 1, 2016



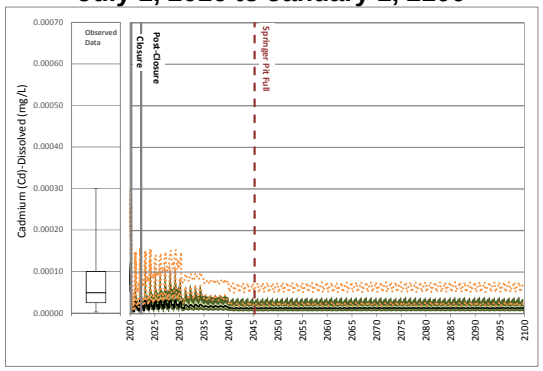


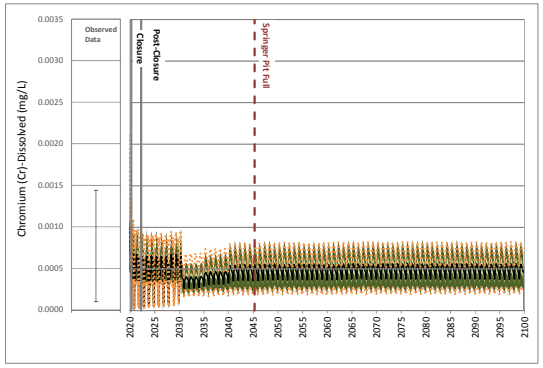
Operations
February 1, 2016 to June 30, 2020



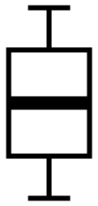


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

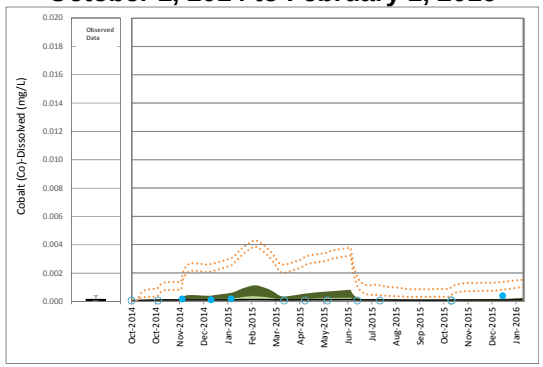
95th Percentile High, 5th Percentile Low

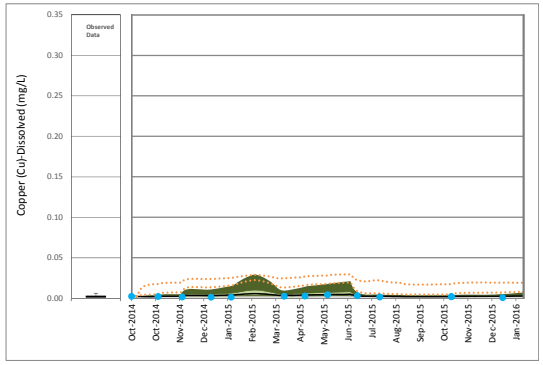
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

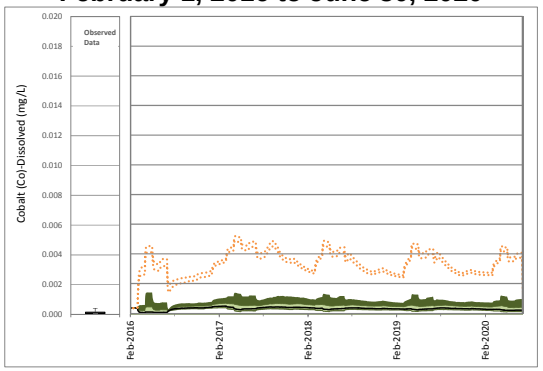
ATTACHMENT B
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

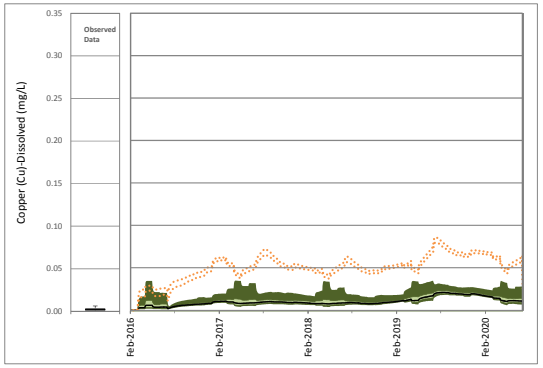
Calibration
October 1, 2014 to February 1, 2016



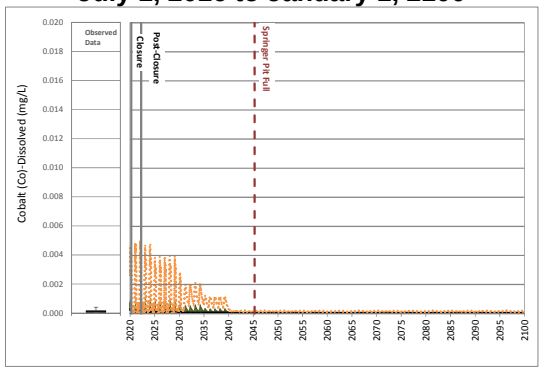


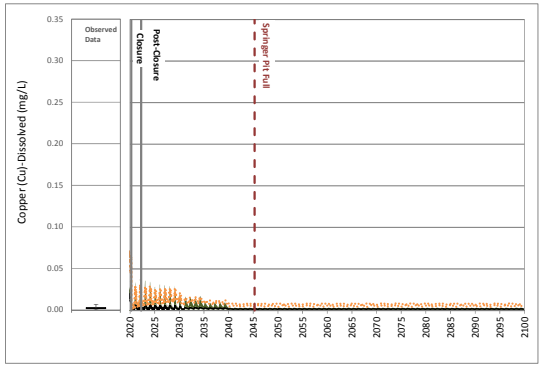
Operations
February 1, 2016 to June 30, 2020



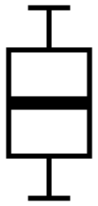


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

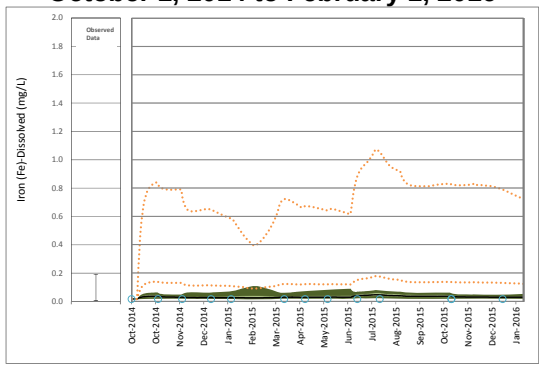
95th Percentile High, 5th Percentile Low

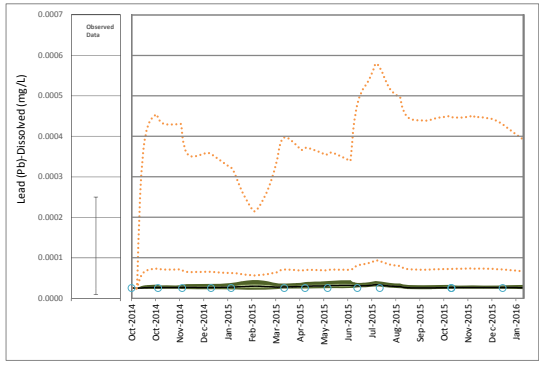
Golder Associates

ATTACHMENT B

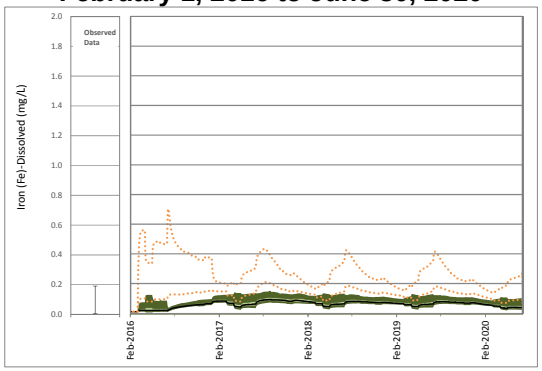
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

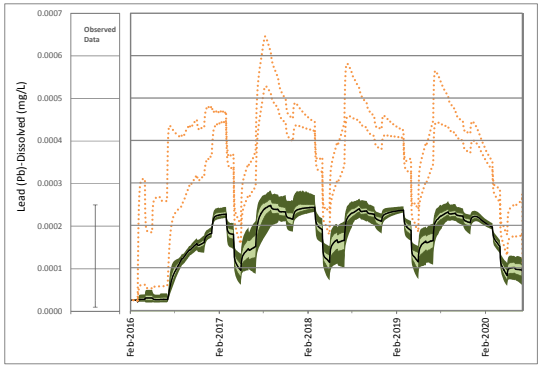
Calibration
October 1, 2014 to February 1, 2016



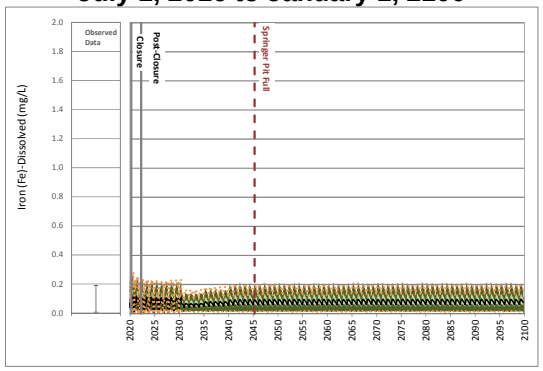


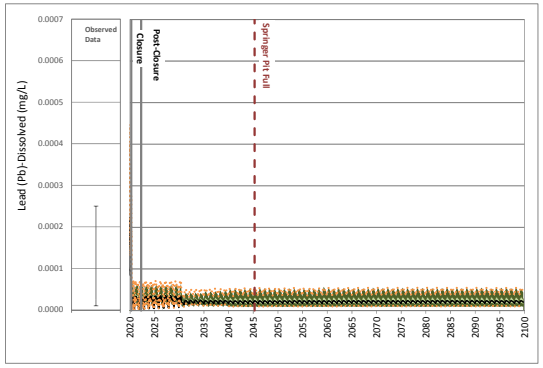
Operations
February 1, 2016 to June 30, 2020



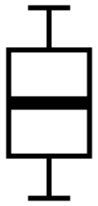


Closure and Post-closure
July 1, 2016 to January 1, 2100



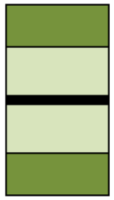


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

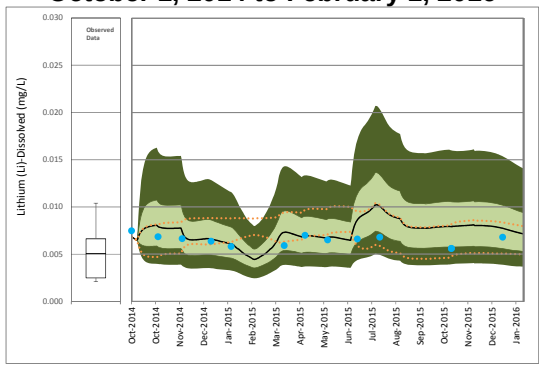
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

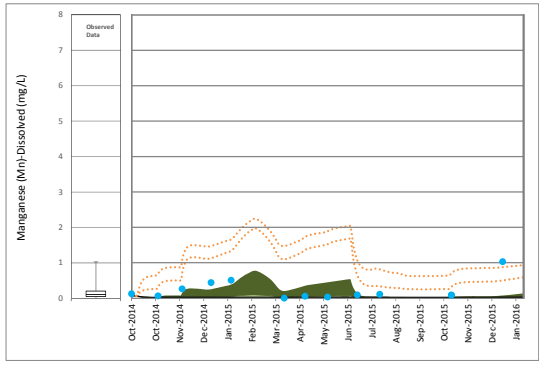
Golder Associates

ATTACHMENT B

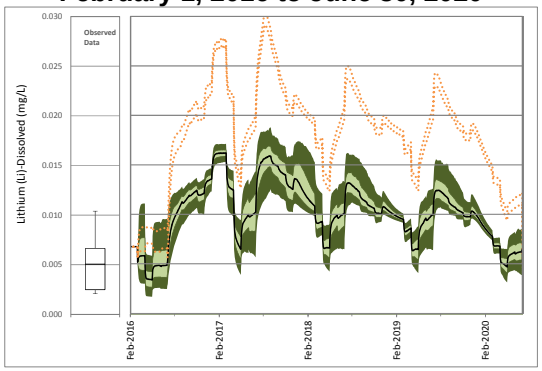
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

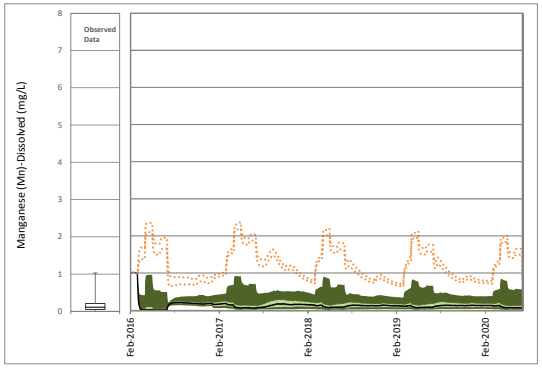
Calibration
October 1, 2014 to February 1, 2016



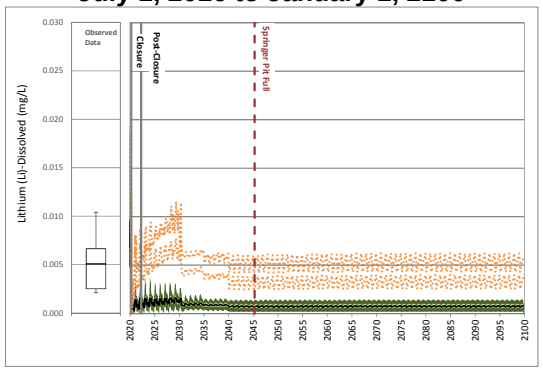


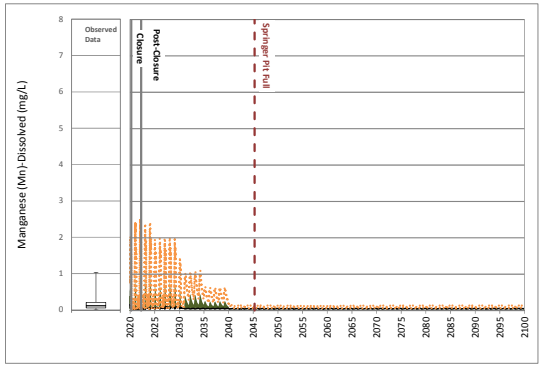
Operations
February 1, 2016 to June 30, 2020



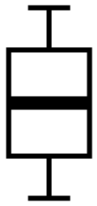


Closure and Post-closure
July 1, 2016 to January 1, 2100



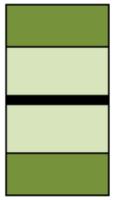


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

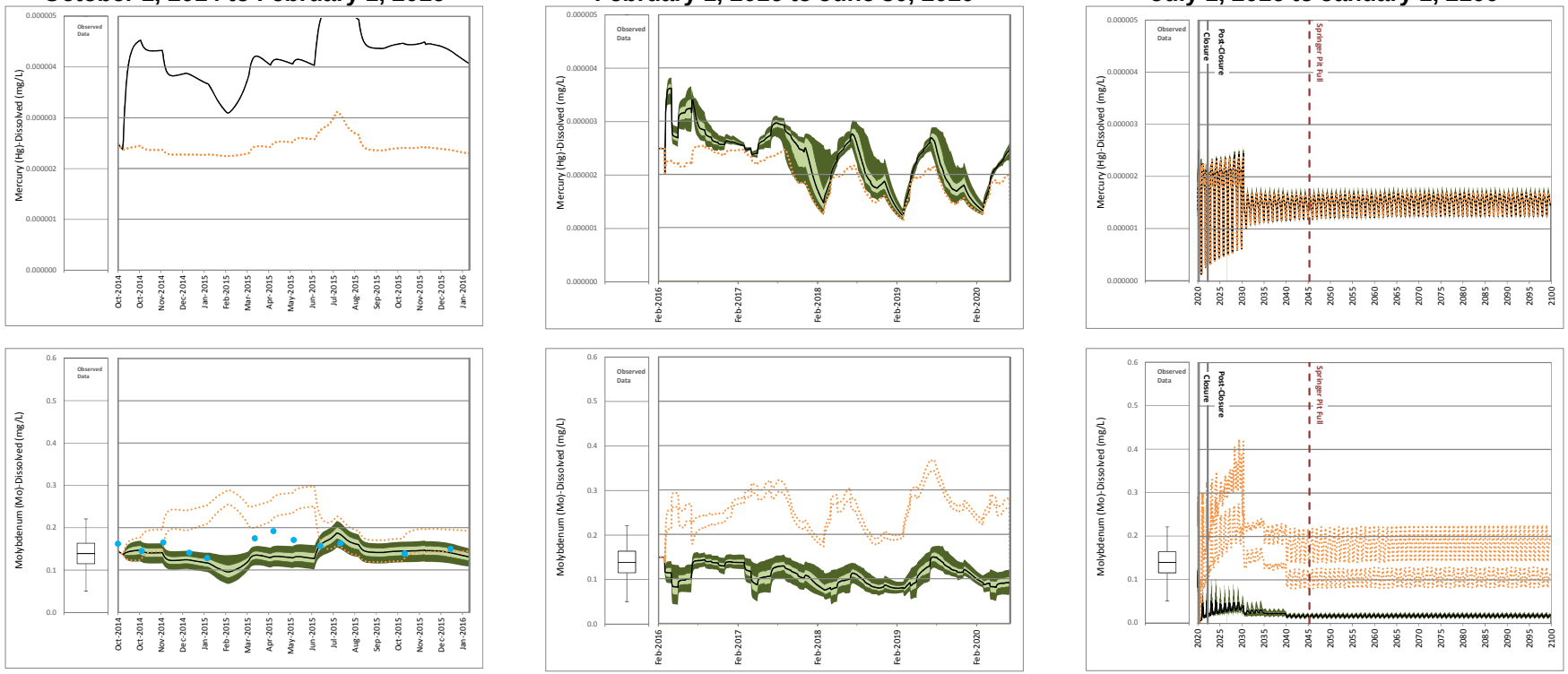
Golder Associates

ATTACHMENT B
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

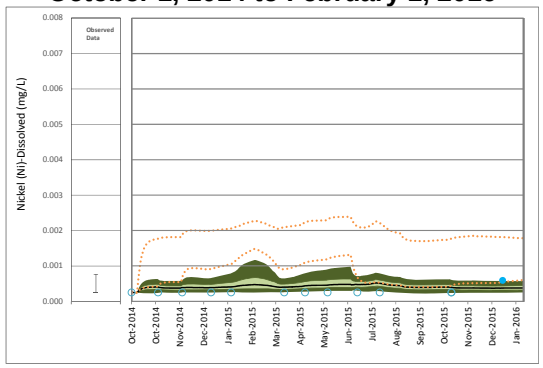
95th Percentile High, 5th Percentile Low

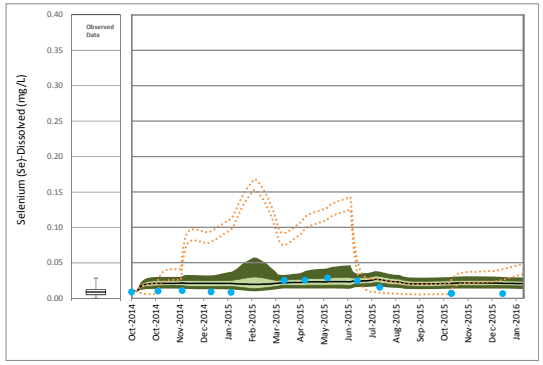
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

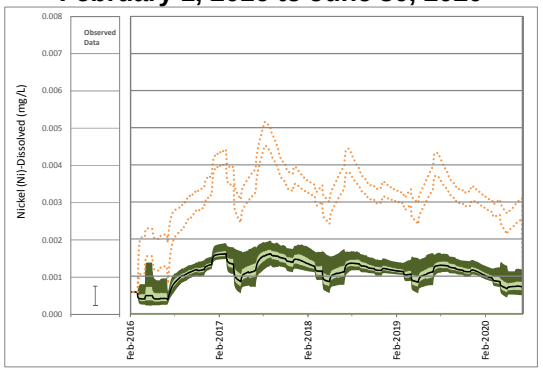
ATTACHMENT B
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

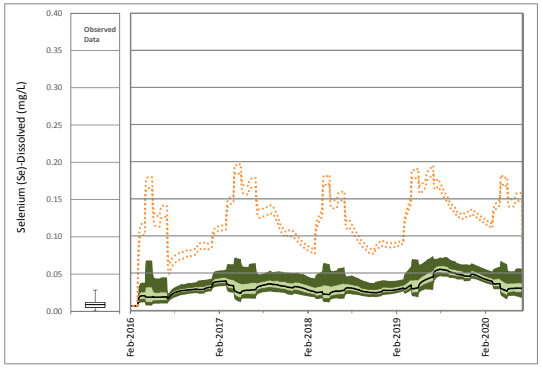
Calibration
October 1, 2014 to February 1, 2016



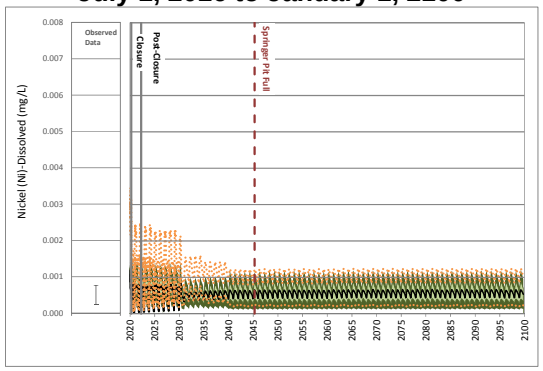


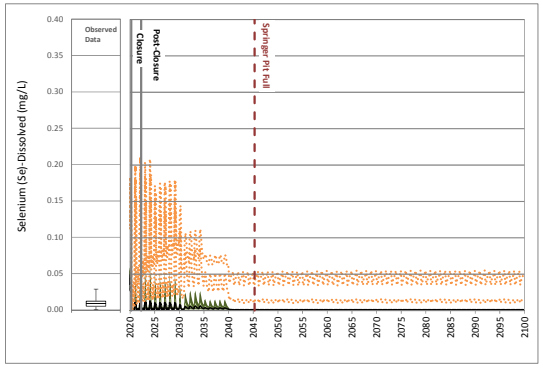
Operations
February 1, 2016 to June 30, 2020



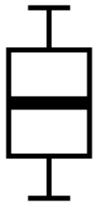


Closure and Post-closure
July 1, 2016 to January 1, 2100



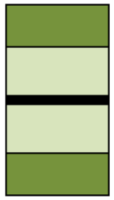


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

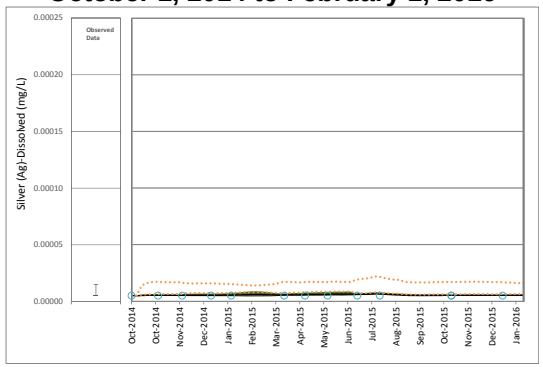
Scenario 2

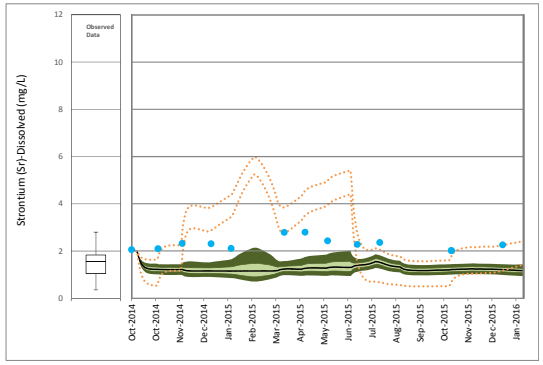
95th Percentile High, 5th Percentile Low

Golder Associates

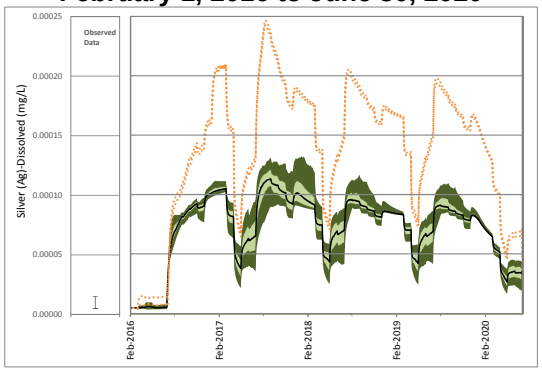
ATTACHMENT B
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

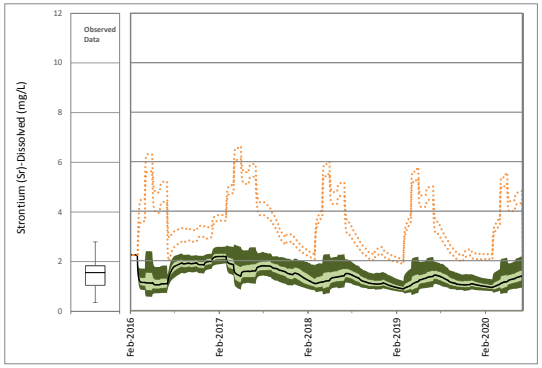
Calibration
October 1, 2014 to February 1, 2016



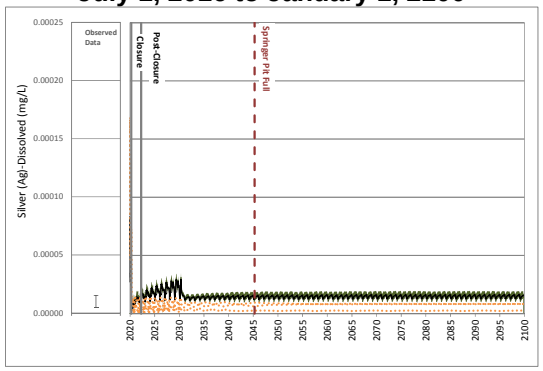


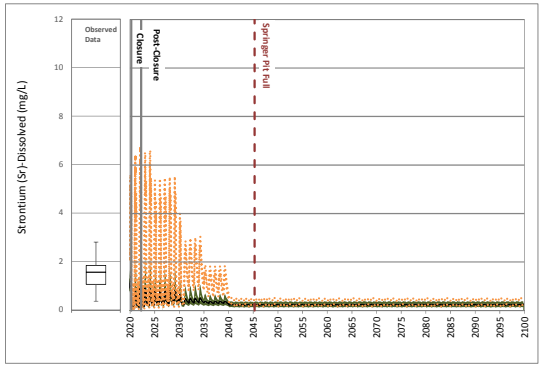
Operations
February 1, 2016 to June 30, 2020



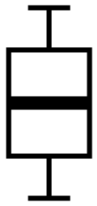


Closure and Post-closure
July 1, 2016 to January 1, 2100



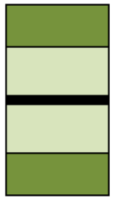


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

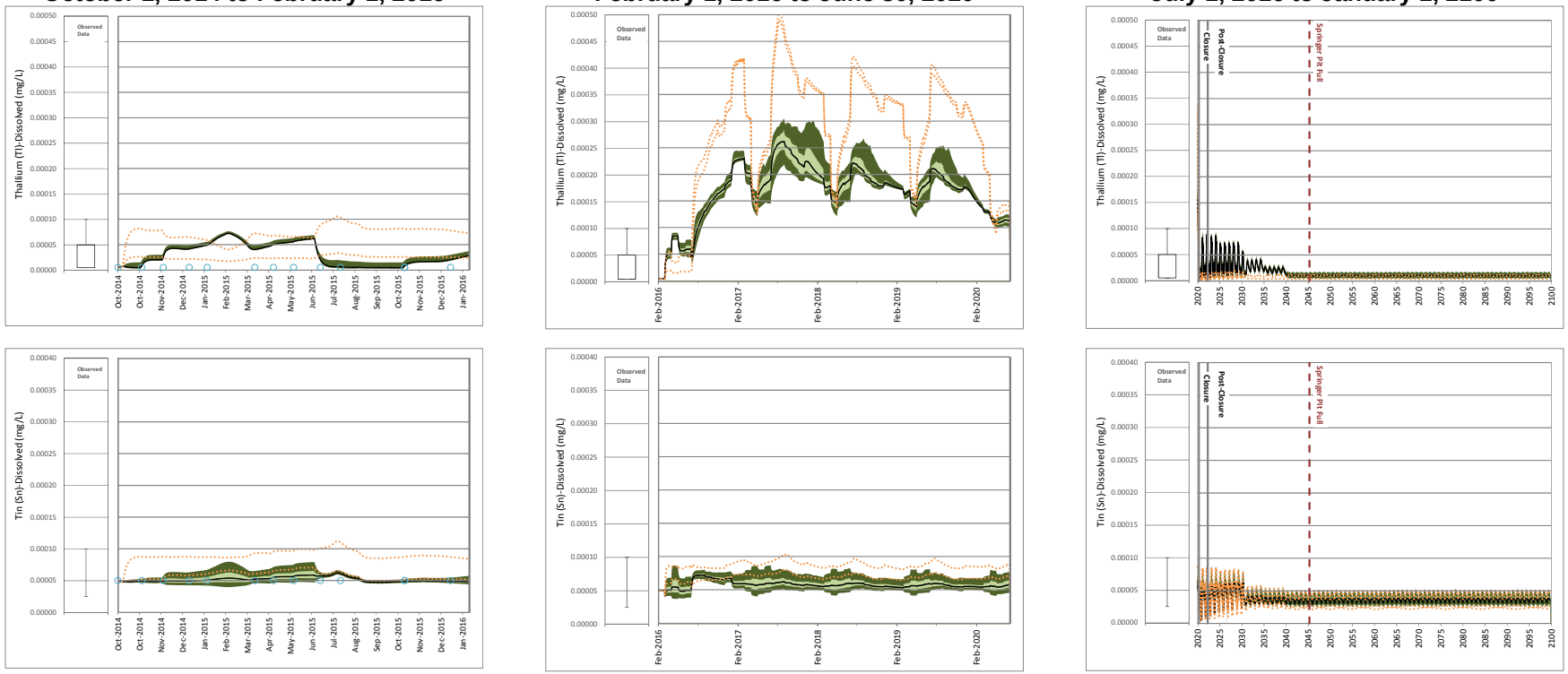
ATTACHMENT B

Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

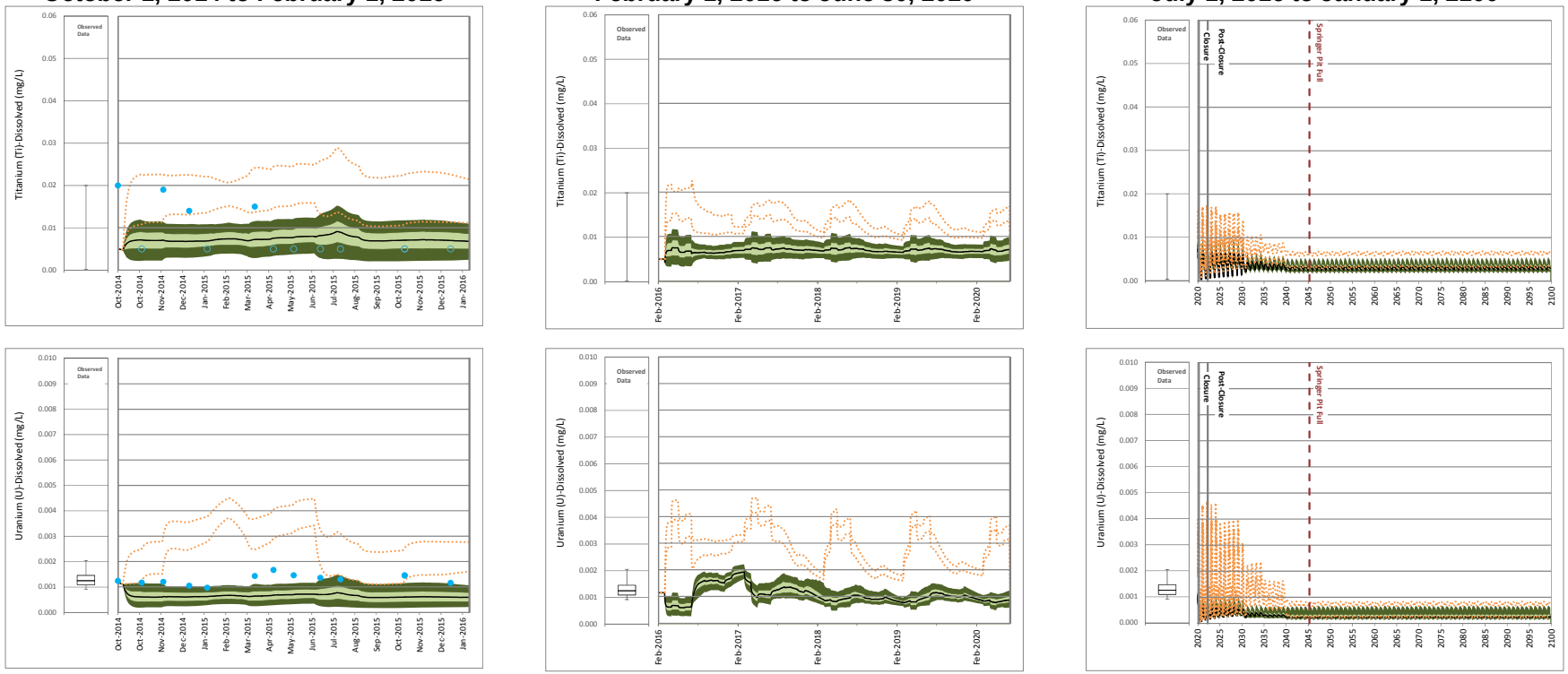
Golder Associates

ATTACHMENT B
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

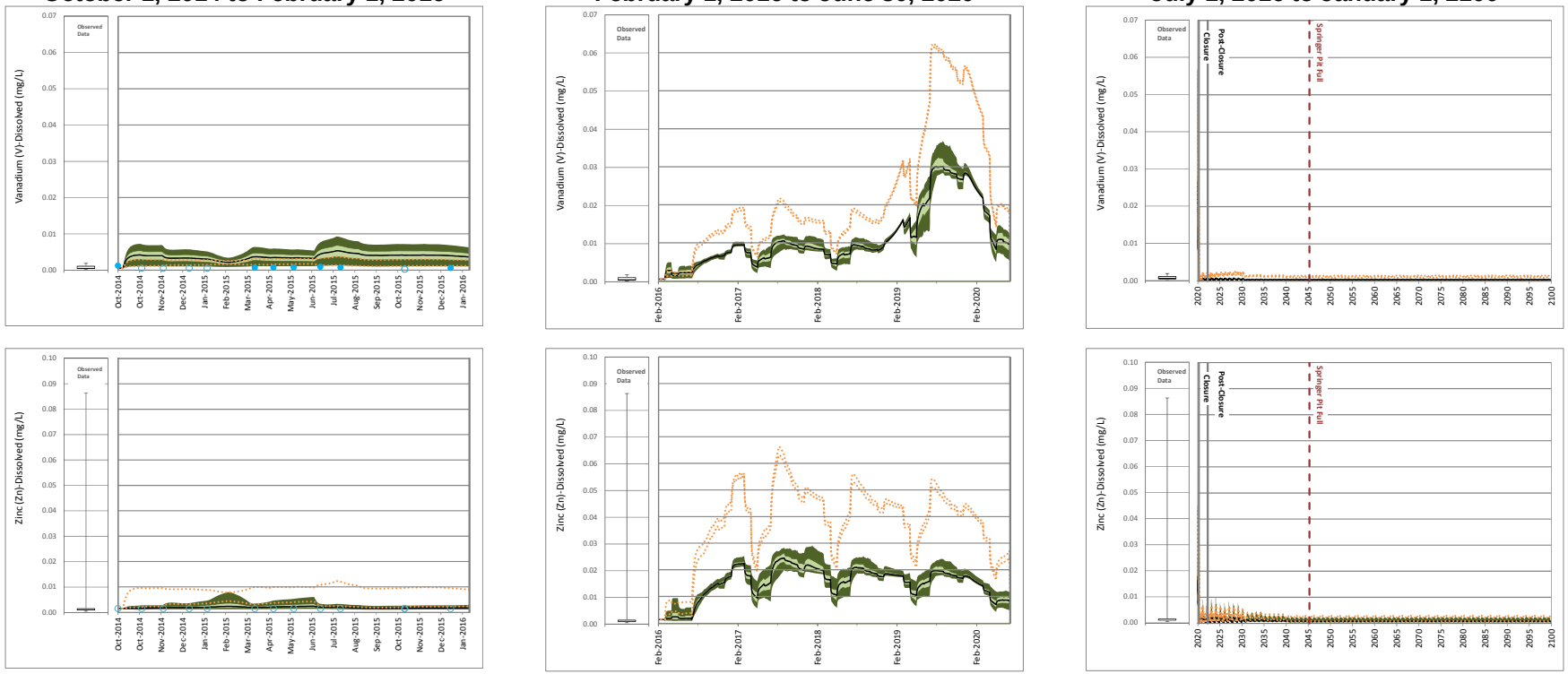
Golder Associates

ATTACHMENT B
Figure B10: Time Series Plots of Predicted Main Embankment Seepage Collection Pond (MESCP) Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig10-mescp.docm

Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.11 Tailings Storage Facility (TSF) Supernatant Pond

Table B11 presents the maximum predicted median and 95th percentile results for the Tailings Storage Facility (TSF) Supernatant Pond, calculated based on 500 realizations for Scenario 1 (Table B11a) and Scenario 2 (Table B11b). Time series plots for each modelled parameter are provided in Figure B11.

Table B11a:
Predicted TSF Supernatant Pond Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	394	465	625	694	151	334	72	231	64	153
Total Dissolved Solids	mg/L	806	877	930	1020	222	491	141	323	128	202
Major Ions											
Calcium	mg/L	132	148	193	213	44	101	20	68	17	38
Chloride	mg/L	19	24	17	22	1.6	6.5	1.5	6.2	1.4	6.2
Fluoride	mg/L	0.59	0.73	8.3	10	0.071	0.12	0.058	0.1	0.055	0.1
Magnesium	mg/L	16	23	35	39	10	20	5.6	15	5.1	14
Potassium	mg/L	18	25	16	22	0.93	1.7	0.74	1.4	0.69	1.3
Sodium	mg/L	68	84	60	76	5.7	9	4.2	8.6	3.9	8.2
Sulphate	mg/L	468	510	503	560	64	232	8.4	131	6.8	23
Nutrients											
Ammonia	mg/L (as N)	0.2	0.53	0.55	0.67	0.0055	0.03	0.004	0.012	0.0037	0.010
Nitrate	mg/L (as N)	5.5	7.6	11	14	0.9	5.1	0.099	2.4	0.078	0.66
Nitrite	mg/L (as N)	0.091	0.16	0.08	0.14	0.0026	0.08	0.0011	0.0095	0.00095	0.0041
Total Phosphorus	mg/L	0.015	0.042	0.032	0.037	0.021	0.04	0.02	0.039	0.019	0.038
Total Metals											
Aluminum	mg/L	0.53	0.55	0.82	0.91	0.61	0.73	0.6	0.72	0.6	0.72
Antimony	mg/L	0.0015	0.0023	0.0018	0.0024	0.000085	0.00031	0.00007	0.00027	0.000066	0.00025
Arsenic	mg/L	0.0018	0.0023	0.012	0.015	0.00072	0.0014	0.00072	0.0014	0.00069	0.0013
Barium	mg/L	0.07	0.08	0.11	0.13	0.019	0.038	0.015	0.027	0.014	0.017
Beryllium	mg/L	0.000054	0.00018	0.0011	0.0014	0.000053	0.00023	0.000052	0.00018	0.000047	0.00016
Boron	mg/L	0.11	0.16	0.15	0.2	0.024	0.08	0.019	0.063	0.017	0.059
Cadmium	mg/L	0.000027	0.00016	0.00015	0.00028	0.000017	0.00015	0.000013	0.00012	0.000013	0.00012
Chromium	mg/L	0.00099	0.0011	0.002	0.0022	0.0014	0.0018	0.0014	0.0018	0.0014	0.0017
Cobalt	mg/L	0.0004	0.00044	0.00085	0.0016	0.0004	0.0011	0.00038	0.0005	0.00038	0.00042
Copper	mg/L	0.0066	0.019	0.026	0.047	0.0081	0.03	0.0075	0.02	0.0073	0.02
Iron	mg/L	0.58	0.61	0.64	0.7	0.69	0.85	0.68	0.83	0.68	0.83
Lead	mg/L	0.00017	0.00018	0.00039	0.00043	0.00018	0.00022	0.00018	0.00022	0.00018	0.00022
Lithium	mg/L	0.0087	0.02	0.017	0.021	0.0011	0.0053	0.0009	0.0045	0.00084	0.0044
Manganese	mg/L	0.033	0.053	0.22	0.74	0.051	0.45	0.02	0.13	0.02	0.031
Mercury	mg/L	0.0000047	0.0000047	0.0000043	0.0000047	0.0000023	0.0000024	0.0000022	0.0000023	0.0000021	0.0000021
Molybdenum	mg/L	0.15	0.19	0.15	0.19	0.008	0.058	0.002	0.037	0.0017	0.018
Nickel	mg/L	0.00099	0.0012	0.0022	0.0025	0.0015	0.0022	0.0015	0.0021	0.0014	0.0021
Selenium	mg/L	0.022	0.035	0.055	0.075	0.0038	0.032	0.00056	0.015	0.00047	0.0062
Silver	mg/L	0.0000053	0.000016	0.00011	0.00014	0.0000063	0.000023	0.0000062	0.000023	0.0000059	0.000022
Strontium	mg/L	1.3	1.9	2.2	3.0	0.34	1.4	0.19	0.9	0.17	0.76
Thallium	mg/L	0.000028	0.000047	0.00026	0.00031	0.000067	0.000097	0.000031	0.000076	0.000021	0.000038
Tin	mg/L	0.000051	0.00016	0.000062	0.00018	0.000047	0.00017	0.000046	0.00017	0.000043	0.00016
Titanium	mg/L	0.03	0.035	0.03	0.034	0.027	0.03	0.027	0.029	0.026	0.029
Uranium	mg/L	0.00066	0.0018	0.002	0.0029	0.00038	0.0015	0.00024	0.0014	0.00022	0.0014
Vanadium	mg/L	0.0056	0.0088	0.031	0.038	0.0018	0.0022	0.0018	0.0022	0.0018	0.0022
Zinc	mg/L	0.0032	0.0042	0.026	0.031	0.003	0.0059	0.0027	0.0048	0.0026	0.0047
Dissolved Metals											
Aluminum	mg/L	0.04	0.065	0.33	0.42	0.12	0.24	0.11	0.23	0.11	0.23
Antimony	mg/L	0.0015	0.0022	0.0018	0.0022	0.000065	0.00013	0.00005	0.00009	0.000046	0.00007
Arsenic	mg/L	0.0016	0.0021	0.012	0.015	0.00053	0.0012	0.00053	0.0012	0.00051	0.0011
Barium	mg/L	0.064	0.074	0.1	0.12	0.013	0.033	0.0092	0.021	0.0081	0.012
Beryllium	mg/L	0.000054	0.00010	0.0011	0.0014	0.000053	0.00015	0.000052	0.00010	0.000047	0.000078
Boron	mg/L	0.1	0.13	0.14	0.17	0.021	0.039	0.016	0.027	0.014	0.023
Cadmium	mg/L	0.000023	0.000066	0.00015	0.00019	0.000013	0.000057	0.0000091	0.000022	0.0000085	0.000021
Chromium	mg/L	0.00035	0.00041	0.0013	0.0016	0.00077	0.0012	0.00075	0.0011	0.00073	0.0011
Cobalt	mg/L	0.000072	0.00012	0.00053	0.0013	0.000075	0.00079	0.000055	0.00018	0.000051	0.000095
Copper	mg/L	0.002	0.0039	0.021	0.032	0.0035	0.014	0.0029	0.0048	0.0027	0.0045
Iron	mg/L	0.037	0.063	0.096	0.15	0.14	0.31	0.14	0.29	0.13	0.28
Lead	mg/L	0.000027	0.000034	0.00024	0.00028	0.000032	0.000073	0.000032	0.000072	0.00003	0.00007
Lithium	mg/L	0.0084	0.017	0.016	0.018	0.00085	0.0024	0.00064	0.0016	0.00054	0.0015
Manganese	mg/L	0.018	0.038	0.2	0.73	0.036	0.43	0.0053	0.11	0.0048	0.016
Mercury	mg/L	0.0000047	0.0000047	0.0000043	0.0000047	0.0000023	0.0000024	0.0000022	0.0000023	0.0000021	0.0000021
Molybdenum	mg/L	0.15	0.18	0.15	0.17	0.008	0.045	0.002	0.024	0.0017	0.0042
Nickel	mg/L	0.00042	0.00065	0.0016	0.0019	0.00092	0.0016	0.00088	0.0016	0.00086	0.0015
Selenium	mg/L	0.022	0.031	0.055	0.071	0.0038	0.028	0.00056	0.011	0.00047	0.0019
Silver	mg/L	0.0000053	0.0000065	0.00011	0.00013	0.0000063	0.000013	0.0000062	0.000013	0.0000059	0.000012
Strontium	mg/L	1.3	1.5	2.2	2.6	0.32	1.0	0.17	0.49	0.15	0.35
Thallium	mg/L	0.000028	0.000038	0.00026	0.0003	0.000067	0.000087	0.000031	0.000067	0.000021	0.000029
Tin	mg/L	0.000051	0.000056	0.000062	0.00008	0.000047	0.000071	0.000046	0.000067	0.000043	0.000063
Titanium	mg/L	0.0074	0.012	0.0074	0.011	0.0048	0.0078	0.0043	0.007	0.0041	0.0068
Uranium	mg/L	0.00062	0.0012	0.0019	0.0022	0.00034	0.0008	0.0002	0.0008	0.00018	0.00077
Vanadium	mg/L	0.0043	0.0075	0.03	0.037	0.00052	0.0009	0.00051	0.0009	0.00049	0.00087
Zinc	mg/L	0.0017	0.0027	0.024	0.029	0.0015	0.0044	0.0012	0.0033	0.0011	0.0032

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

Table B11b:
Predicted TSF Supernatant Pond Water Quality - Scenario 2

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	551	630	852	885	618	678	204	297	191	278
Total Dissolved Solids	mg/L	912	993	1214	1252	820	872	307	387	287	362
Major Ions											
Calcium	mg/L	173	198	263	273	188	201	60	82	56	76
Chloride	mg/L	23	25	24	26	8.4	12.0	3.4	8.2	3.1	7.8
Fluoride	mg/L	0.83	0.93	18.0	18	0.27	0.3	0.11	0.16	0.11	0.15
Magnesium	mg/L	29	33	47	49	36	42	13.0	23	12.0	21
Potassium	mg/L	15	15	16	16	3.5	3.9	1.4	2.1	1.3	1.9
Sodium	mg/L	69	82	68	80	17.0	20	7.4	12.0	6.9	11.0
Sulphate	mg/L	520	594	696	725	478	485	126.0	136	117.0	126
Nutrients											
Ammonia	mg/L (as N)	0.1	0.13	1.1	1.1	0.063	0.07	0.016	0.023	0.015	0.022
Nitrate	mg/L (as N)	7.3	9.3	20	21	1.8	2.0	0.39	0.7	0.36	0.65
Nitrite	mg/L (as N)	0.18	0.25	0.29	0.3	0.640	0.65	0.130	0.140	0.1200	0.130
Total Phosphorus	mg/L	0.028	0.037	0.046	0.052	0.053	0.066	0.029	0.049	0.028	0.046
Total Metals											
Aluminum	mg/L	0.85	1.1	1.3	1.4	0.61	0.74	0.6	0.73	0.6	0.71
Antimony	mg/L	0.001	0.0014	0.0035	0.0037	0.00120	0.0014	0.00039	0.00057	0.00036	0.00054
Arsenic	mg/L	0.0023	0.0027	0.025	0.025	0.0017	0.0021	0.00099	0.0016	0.00094	0.0016
Barium	mg/L	0.078	0.09	0.2	0.2	0.062	0.064	0.025	0.028	0.024	0.027
Beryllium	mg/L	0.00024	0.0005	0.0024	0.0026	0.000064	0.00015	0.00005	0.00013	0.000047	0.00013
Boron	mg/L	0.14	0.19	0.26	0.31	0.10	0.14	0.036	0.079	0.034	0.076
Cadmium	mg/L	0.00016	0.00033	0.00044	0.00055	0.00011	0.00021	0.000037	0.00014	0.000035	0.00014
Chromium	mg/L	0.0019	0.0026	0.0036	0.0038	0.0014	0.0018	0.0014	0.0018	0.0014	0.0017
Cobalt	mg/L	0.0020	0.0022	0.0052	0.0053	0.0046	0.0046	0.0013	0.0014	0.0012	0.0013
Copper	mg/L	0.020	0.037	0.089	0.10	0.024	0.037	0.012	0.025	0.011	0.024
Iron	mg/L	1.0	1.4	1.0	1.3	0.69	0.85	0.68	0.84	0.67	0.82
Lead	mg/L	0.00042	0.00062	0.00073	0.00079	0.00019	0.00022	0.00018	0.00022	0.00018	0.00022
Lithium	mg/L	0.0075	0.012	0.03	0.033	0.0052	0.0085	0.002	0.0056	0.0019	0.0054
Manganese	mg/L	0.96	1.10	1.6	1.7	2.00	2.0	0.49	0.5	0.45	0.47
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000023	0.0000022	0.0000022	0.0000021	0.0000021
Molybdenum	mg/L	0.2	0.23	0.35	0.38	0.20	0.22	0.053	0.068	0.049	0.064
Nickel	mg/L	0.0018	0.0025	0.0054	0.0057	0.0023	0.0028	0.0017	0.0025	0.0017	0.0023
Selenium	mg/L	0.056	0.067	0.17	0.18	0.140	0.15	0.0380	0.043	0.0350	0.040
Silver	mg/L	0.000012	0.000028	0.00024	0.00026	0.0000096	0.000024	0.0000068	0.000023	0.0000064	0.000023
Strontium	mg/L	2.5	3.3	4.2	4.7	4.5	5.0	1.4	2.0	1.3	1.9
Thallium	mg/L	0.000055	0.000095	0.0005	0.00052	0.000011	0.000026	0.000006	0.000023	0.000006	0.000023
Tin	mg/L	0.000073	0.00019	0.00009	0.0002	0.000063	0.00018	0.00005	0.00017	0.000047	0.00017
Titanium	mg/L	0.04	0.046	0.041	0.047	0.035	0.037	0.029	0.032	0.028	0.031
Uranium	mg/L	0.0026	0.0038	0.0034	0.0042	0.0030	0.004	0.0010	0.0022	0.00094	0.0021
Vanadium	mg/L	0.0034	0.0043	0.063	0.063	0.0027	0.003	0.002	0.0024	0.002	0.0024
Zinc	mg/L	0.0078	0.012	0.066	0.068	0.006	0.0074	0.0034	0.0056	0.0033	0.0053
Dissolved Metals											
Aluminum	mg/L	0.36	0.63	0.84	0.93	0.12	0.25	0.11	0.24	0.11	0.22
Antimony	mg/L	0.001	0.0012	0.0034	0.0035	0.00120	0.0012	0.00037	0.00039	0.00034	0.00036
Arsenic	mg/L	0.0021	0.0025	0.025	0.025	0.0015	0.0019	0.0008	0.0015	0.00075	0.0014
Barium	mg/L	0.072	0.084	0.19	0.2	0.056	0.058	0.019	0.022	0.018	0.021
Beryllium	mg/L	0.00024	0.00042	0.0024	0.0025	0.000064	0.00007	0.00005	0.00005	0.000047	0.000047
Boron	mg/L	0.14	0.16	0.26	0.27	0.097	0.10	0.033	0.043	0.031	0.04
Cadmium	mg/L	0.00016	0.00023	0.00044	0.00046	0.00011	0.00012	0.000033	0.000045	0.000031	0.000042
Chromium	mg/L	0.0013	0.0020	0.003	0.0032	0.00079	0.0012	0.00077	0.0011	0.00072	0.0011
Cobalt	mg/L	0.00160	0.0019	0.0049	0.005	0.00430	0.0043	0.00098	0.0010	0.00091	0.00095
Copper	mg/L	0.016	0.021	0.085	0.087	0.020	0.021	0.0073	0.0093	0.0069	0.0087
Iron	mg/L	0.50	0.88	0.46	0.8	0.14	0.3	0.14	0.29	0.13	0.27
Lead	mg/L	0.00027	0.00047	0.00058	0.00064	0.000043	0.000076	0.000033	0.000075	0.000032	0.000071
Lithium	mg/L	0.0072	0.009	0.03	0.03	0.0049	0.0055	0.0017	0.0027	0.0016	0.0025
Manganese	mg/L	0.94	1.10	1.6	1.7	2.00	2.0	0.470	0.49	0.440	0.45
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000023	0.0000022	0.0000022	0.0000021	0.0000021
Molybdenum	mg/L	0.2	0.22	0.35	0.36	0.20	0.20	0.053	0.054	0.049	0.050
Nickel	mg/L	0.0013	0.0019	0.0049	0.0051	0.0017	0.0022	0.0012	0.0019	0.0011	0.0018
Selenium	mg/L	0.056	0.062	0.17	0.18	0.140	0.14	0.0380	0.038	0.0350	0.036
Silver	mg/L	0.000012	0.000018	0.00024	0.00025	0.0000096	0.000014	0.0000068	0.000013	0.0000064	0.000013
Strontium	mg/L	2.4	2.9	4.1	4.3	4.4	4.6	1.4	1.6	1.3	1.5
Thallium	mg/L	0.000055	0.000085	0.0005	0.00051	0.000011	0.000017	0.000006	0.000014	0.000006	0.000013
Tin	mg/L	0.000073	0.000091	0.00009	0.00010	0.000063	0.000076	0.00005	0.000069	0.000047	0.000065
Titanium	mg/L	0.018	0.024	0.019	0.025	0.012	0.014	0.0064	0.0093	0.006	0.0087
Uranium	mg/L	0.0025	0.0032	0.0034	0.0036	0.0030	0.0034	0.00097	0.0016	0.0009	0.0015
Vanadium	mg/L	0.0022	0.003	0.062	0.062	0.0014	0.0017	0.00073	0.0011	0.00069	0.0011
Zinc	mg/L	0.0062	0.010	0.065	0.066	0.0045	0.0059	0.0019	0.004	0.0018	0.0038

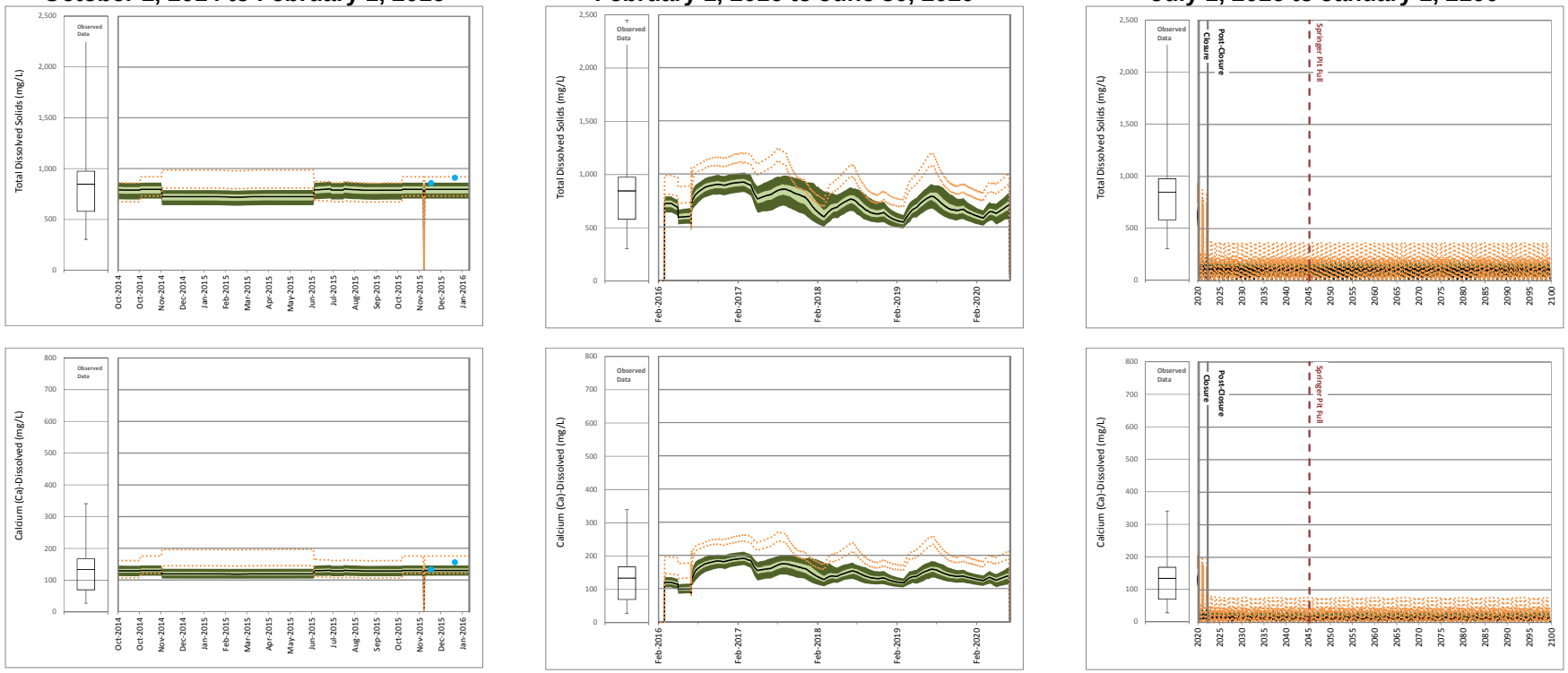
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

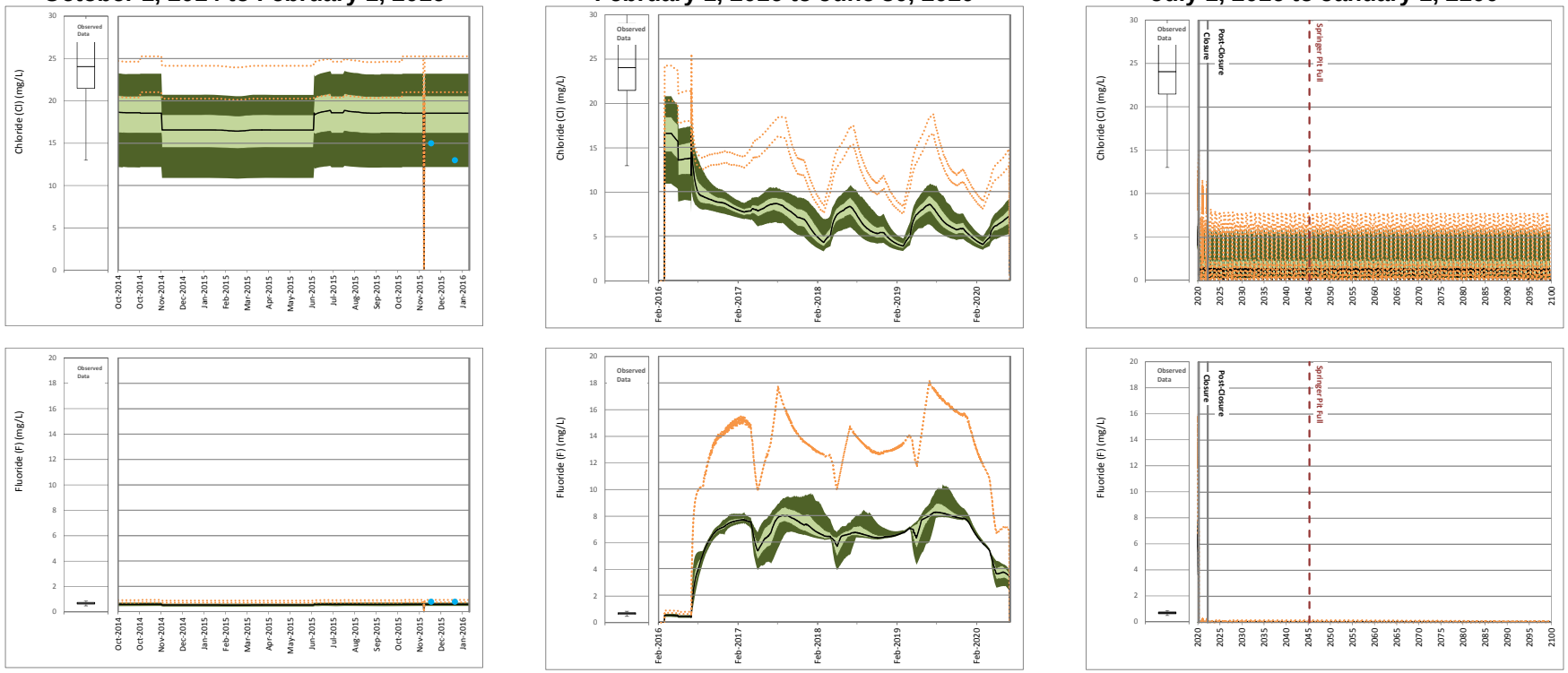
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

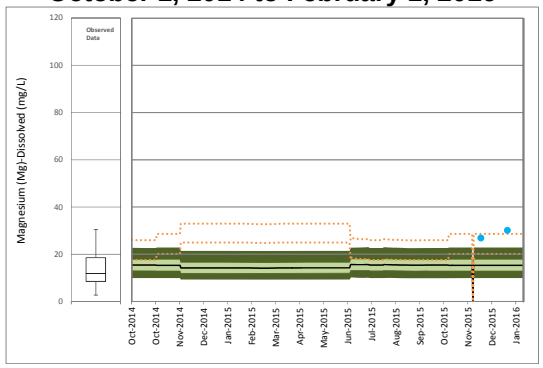
95th Percentile High, 5th Percentile Low

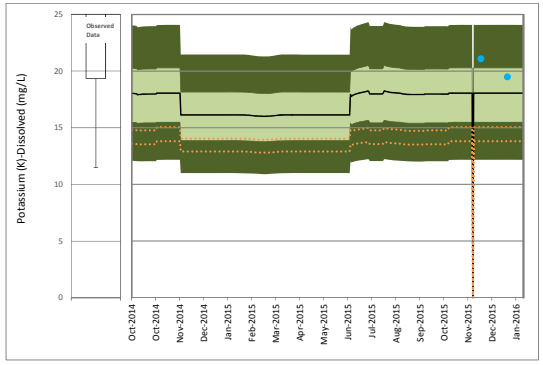
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

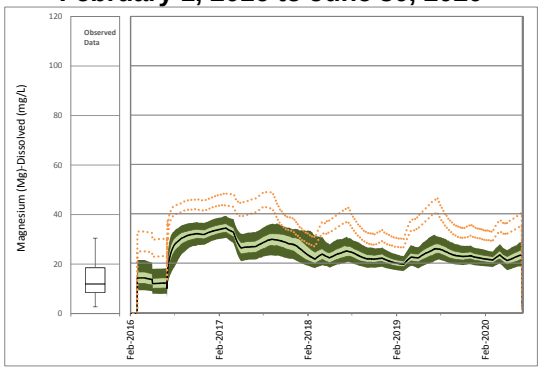
ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

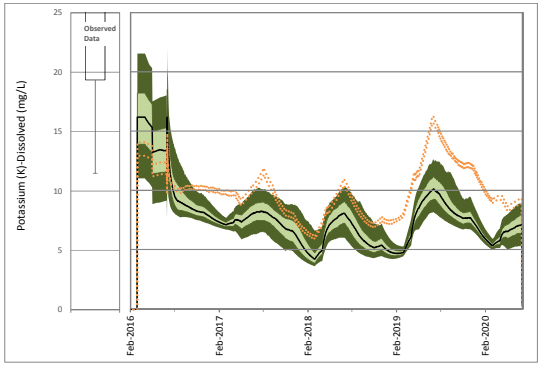
Calibration
October 1, 2014 to February 1, 2016



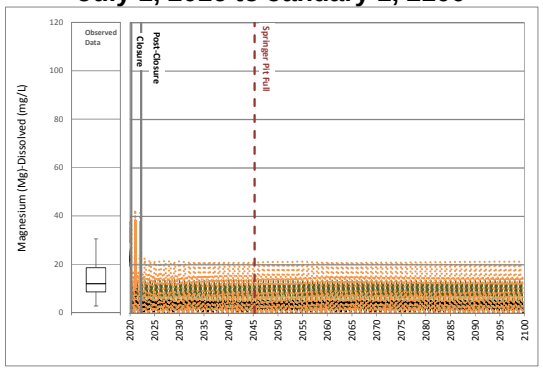


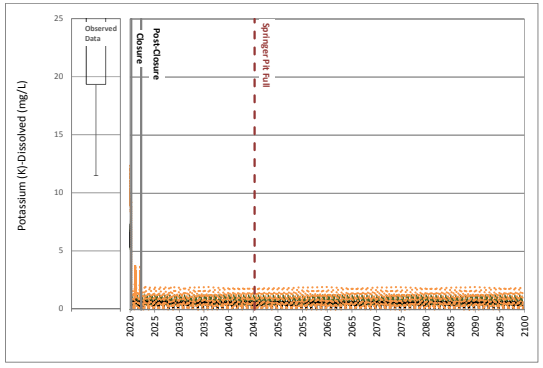
Operations
February 1, 2016 to June 30, 2020



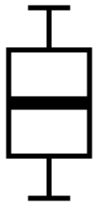


Closure and Post-closure
July 1, 2016 to January 1, 2100



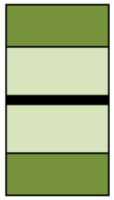


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

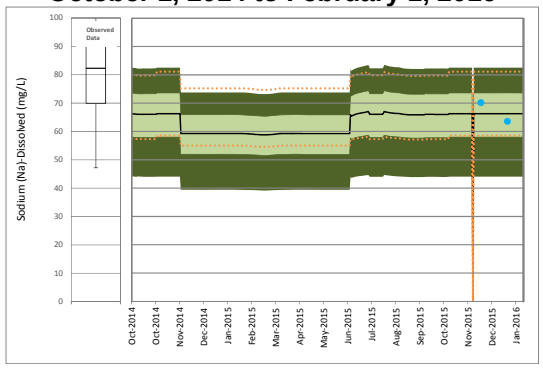
95th Percentile High, 5th Percentile Low

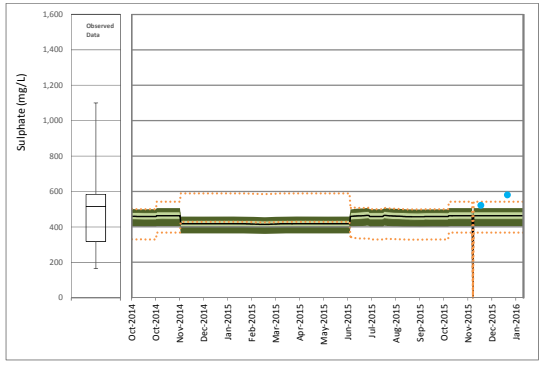
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

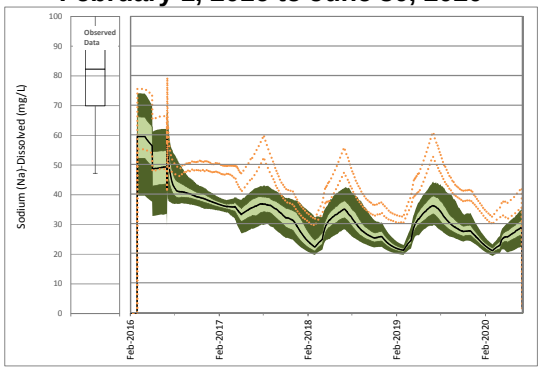
ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

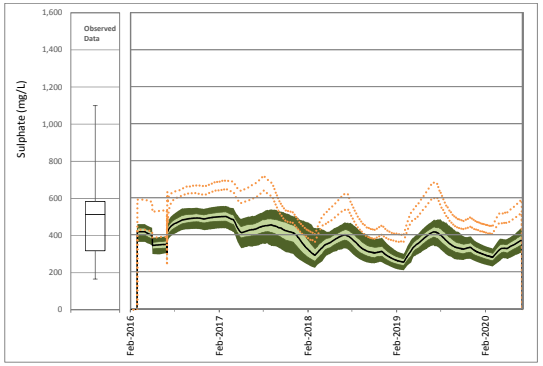
Calibration
October 1, 2014 to February 1, 2016



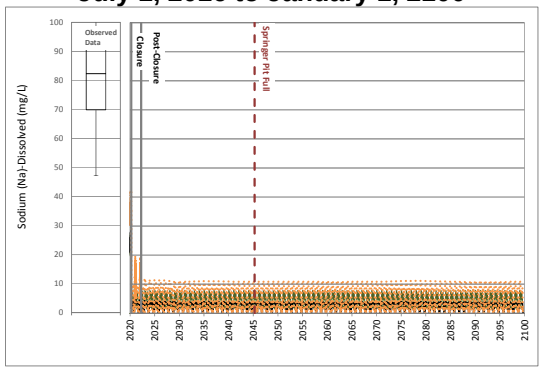


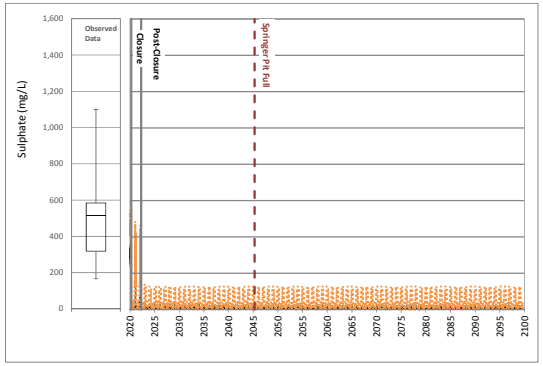
Operations
February 1, 2016 to June 30, 2020



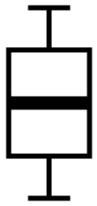


Closure and Post-closure
July 1, 2016 to January 1, 2100



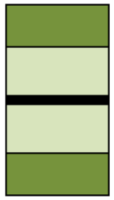


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

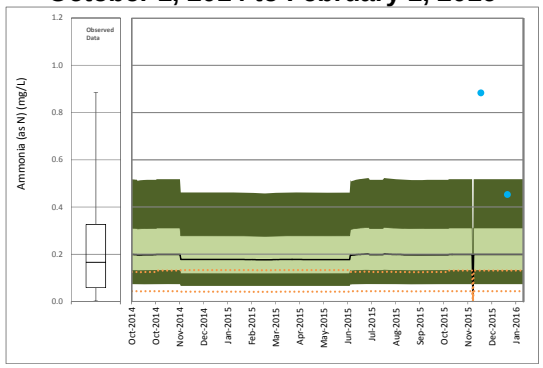
95th Percentile High, 5th Percentile Low

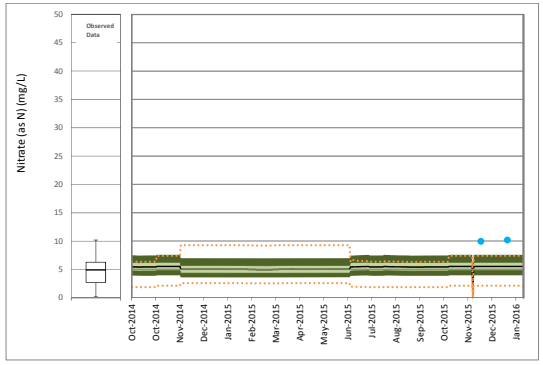
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

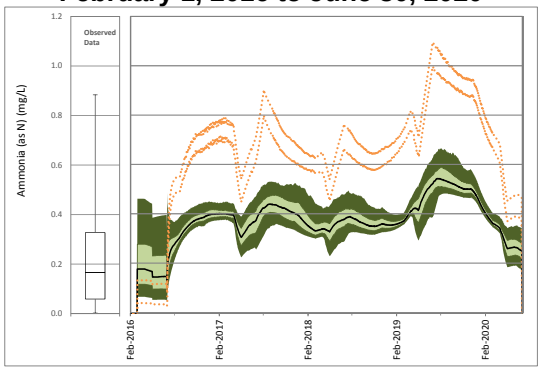
ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

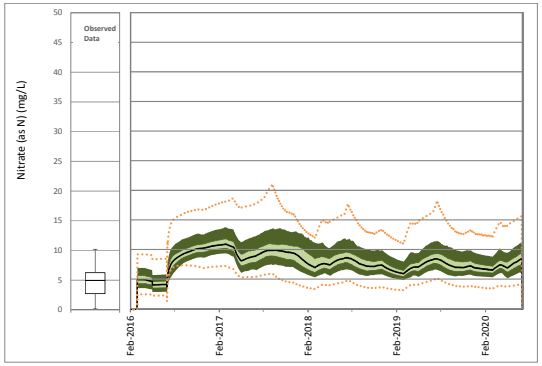
Calibration
October 1, 2014 to February 1, 2016



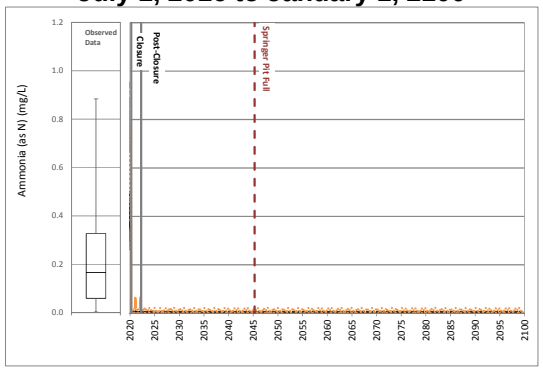


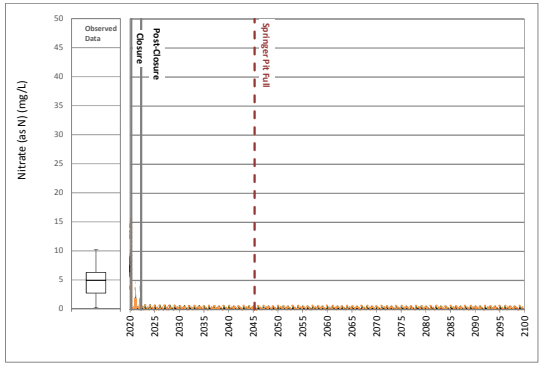
Operations
February 1, 2016 to June 30, 2020



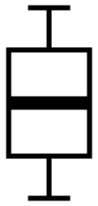


Closure and Post-closure
July 1, 2016 to January 1, 2100



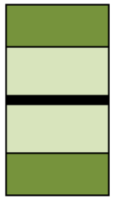


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

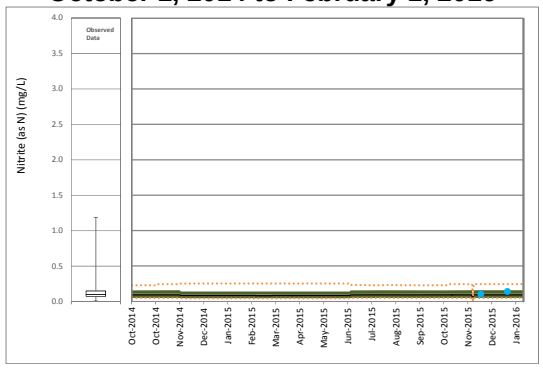
95th Percentile High, 5th Percentile Low

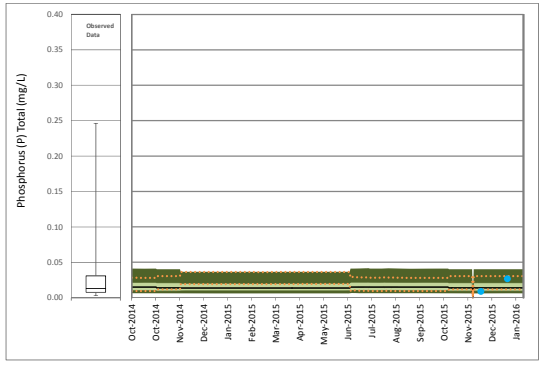
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

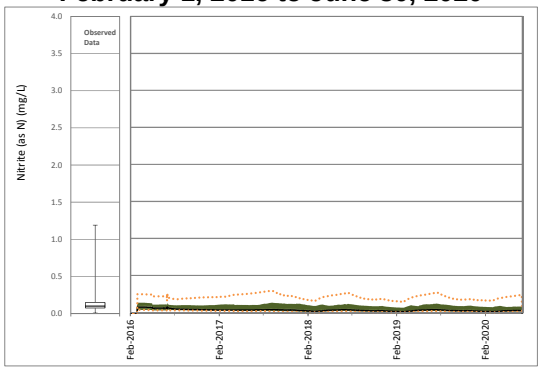
ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

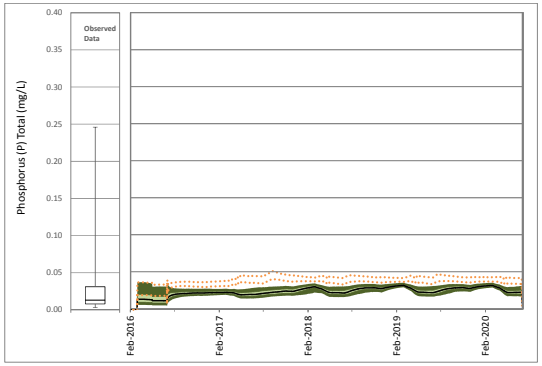
Calibration
October 1, 2014 to February 1, 2016



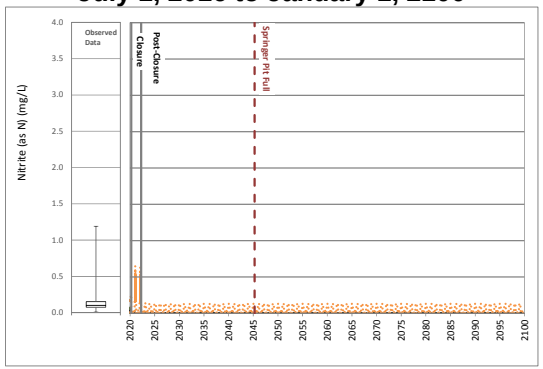


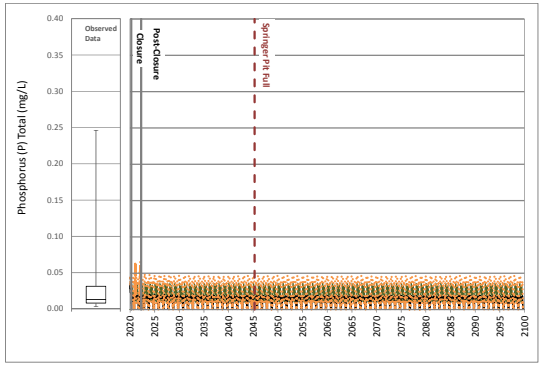
Operations
February 1, 2016 to June 30, 2020



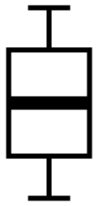


Closure and Post-closure
July 1, 2016 to January 1, 2100



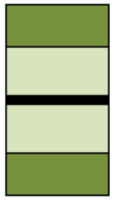


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

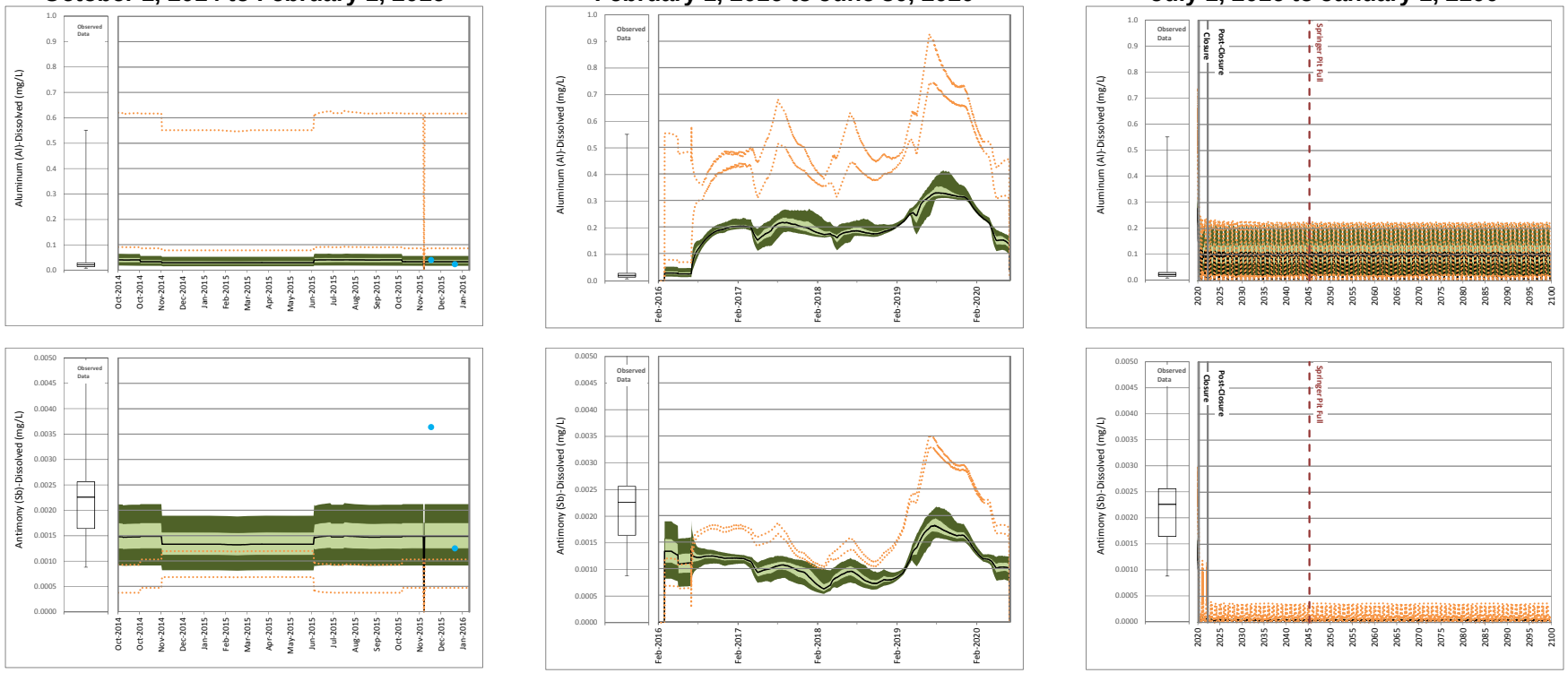
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

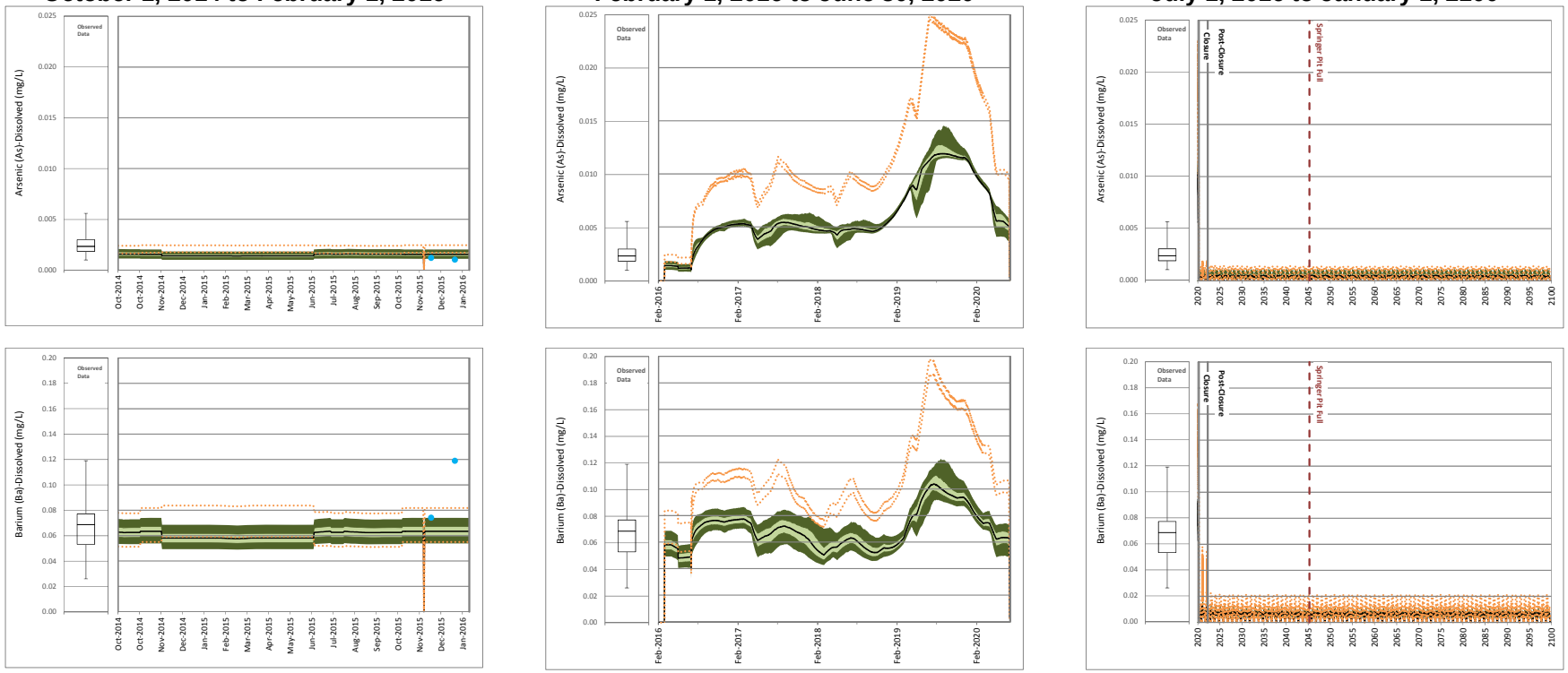
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

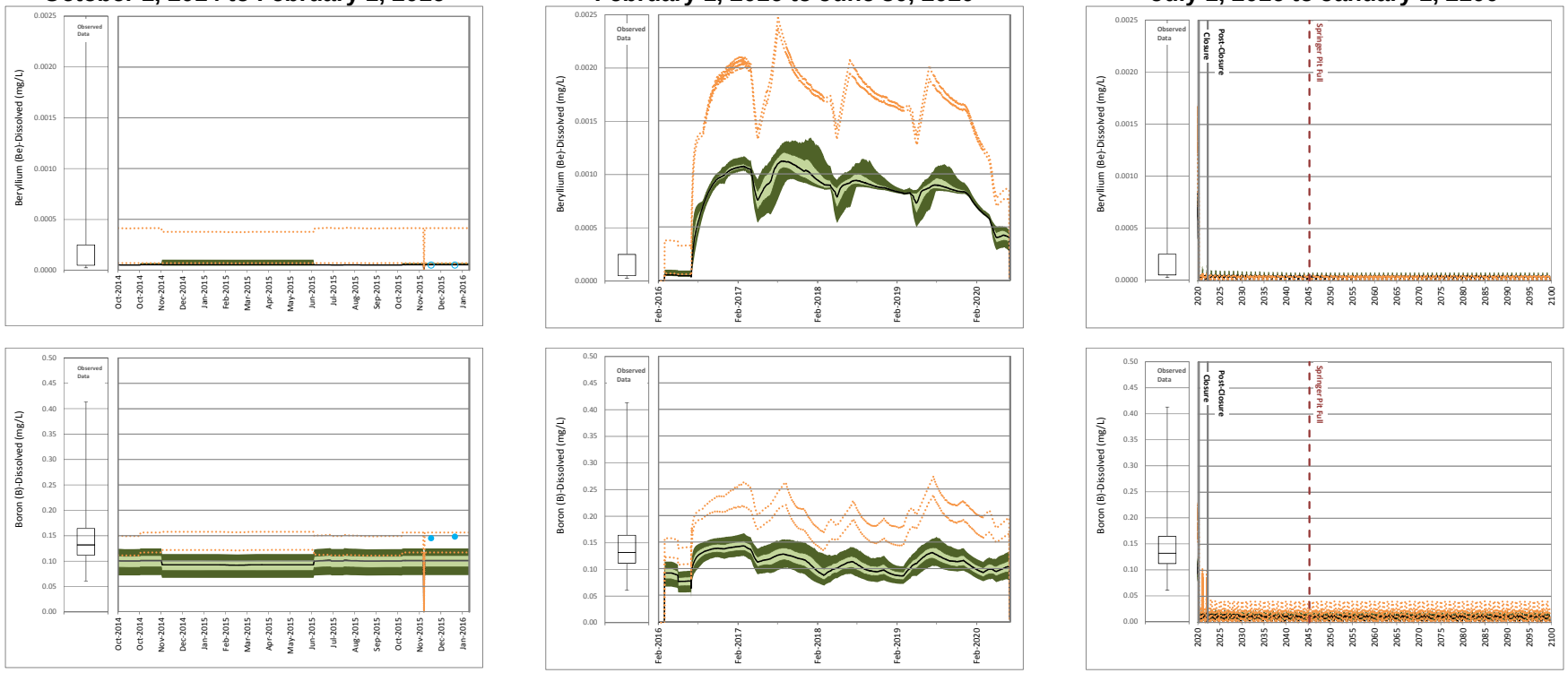
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

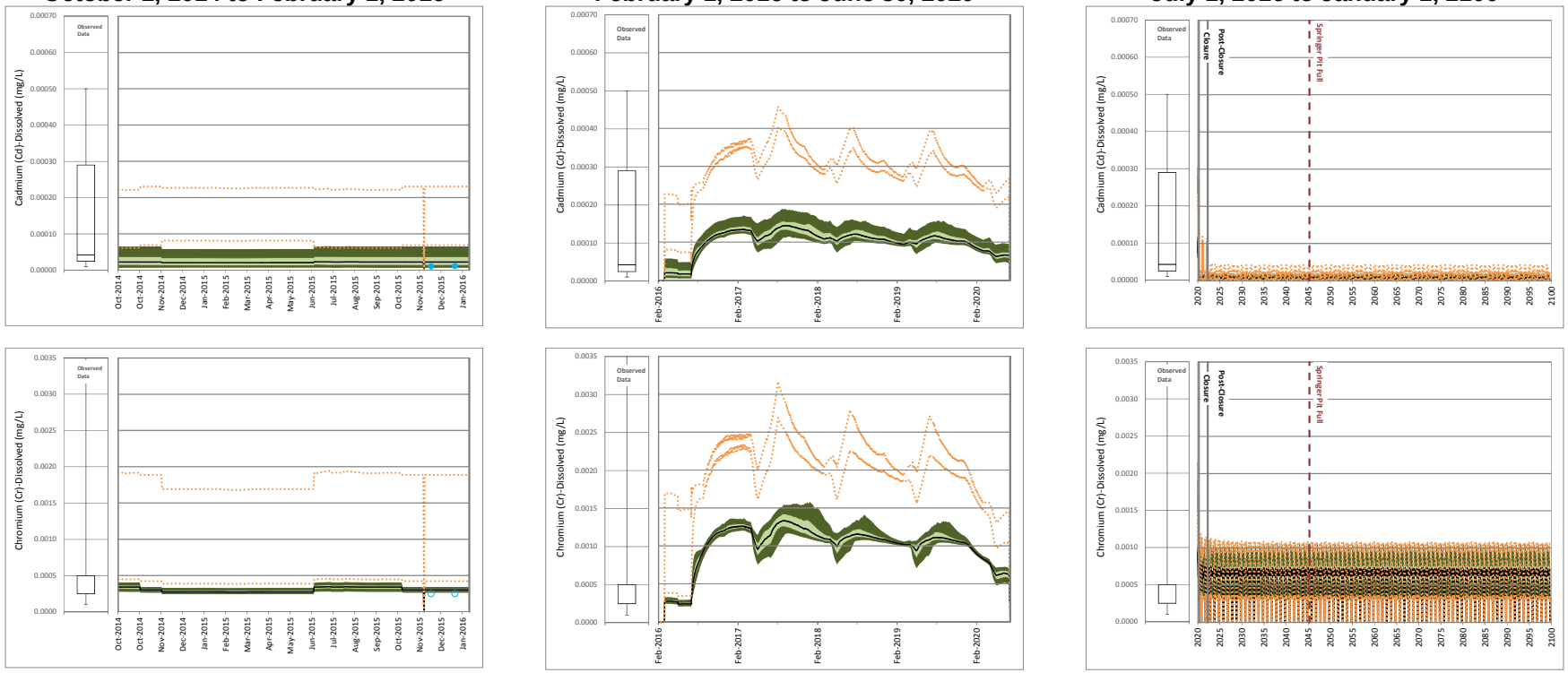
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

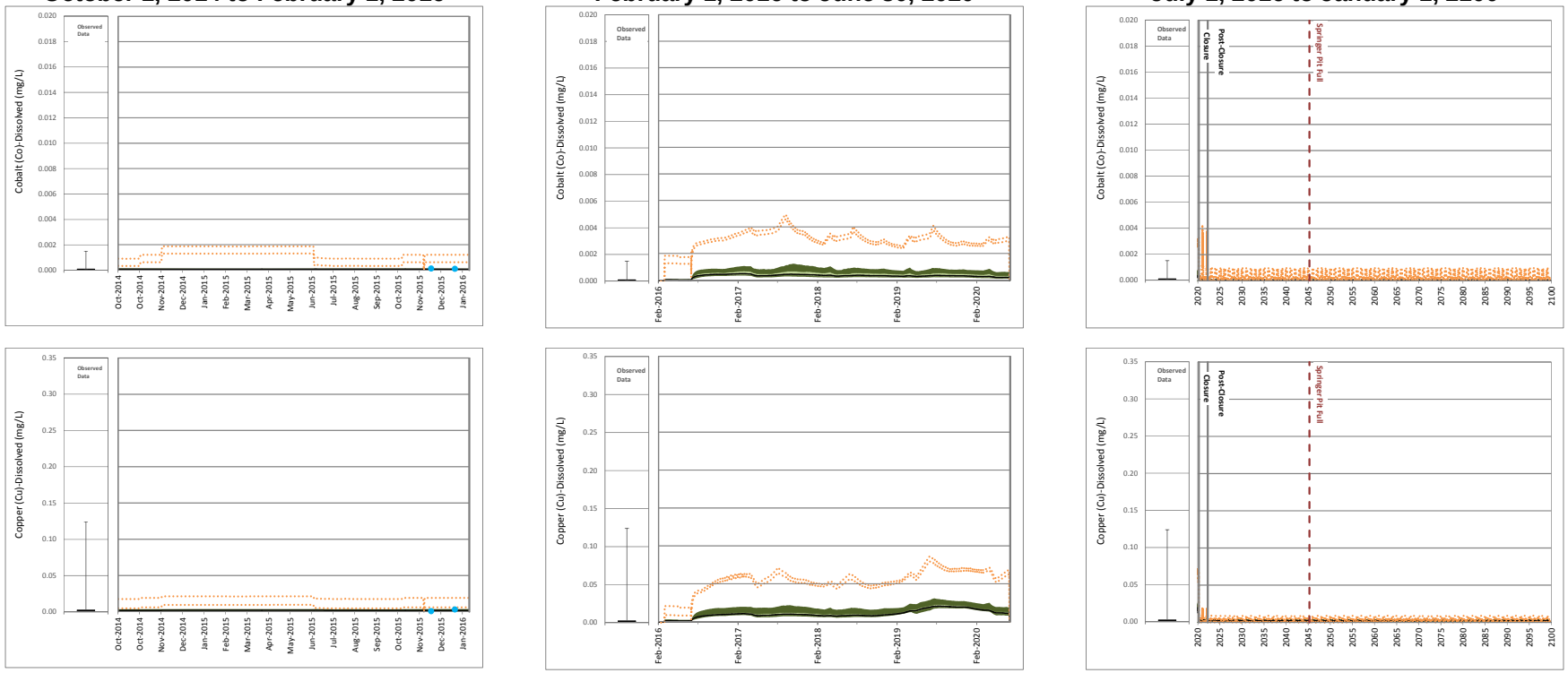
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



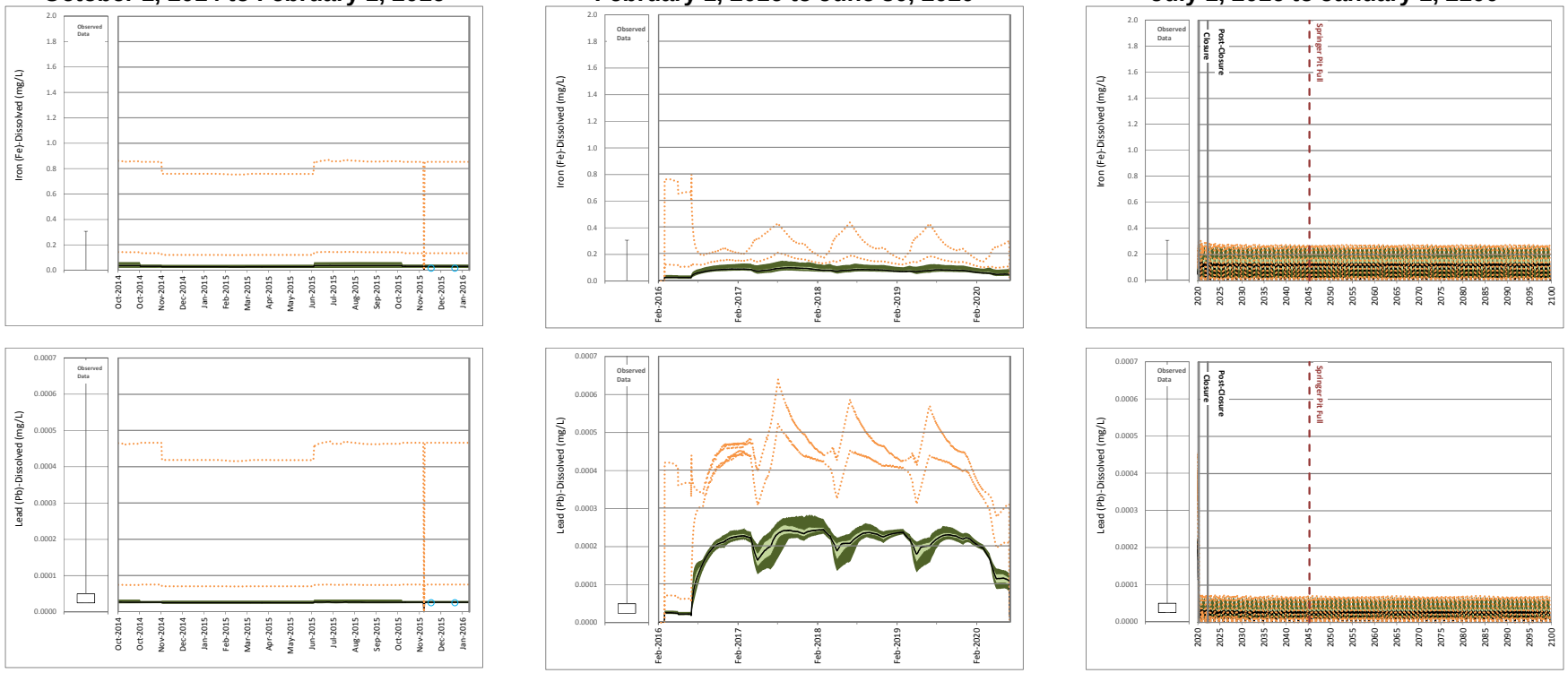
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

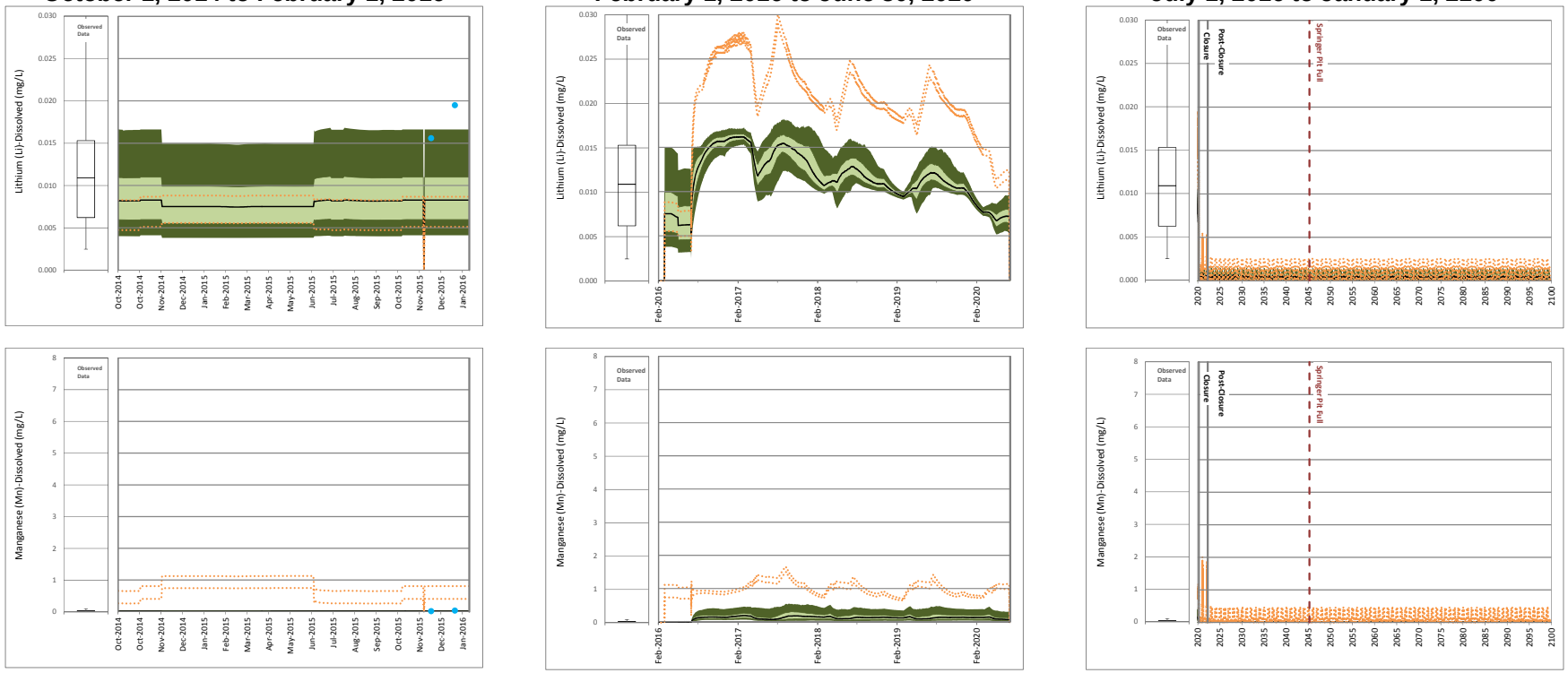
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

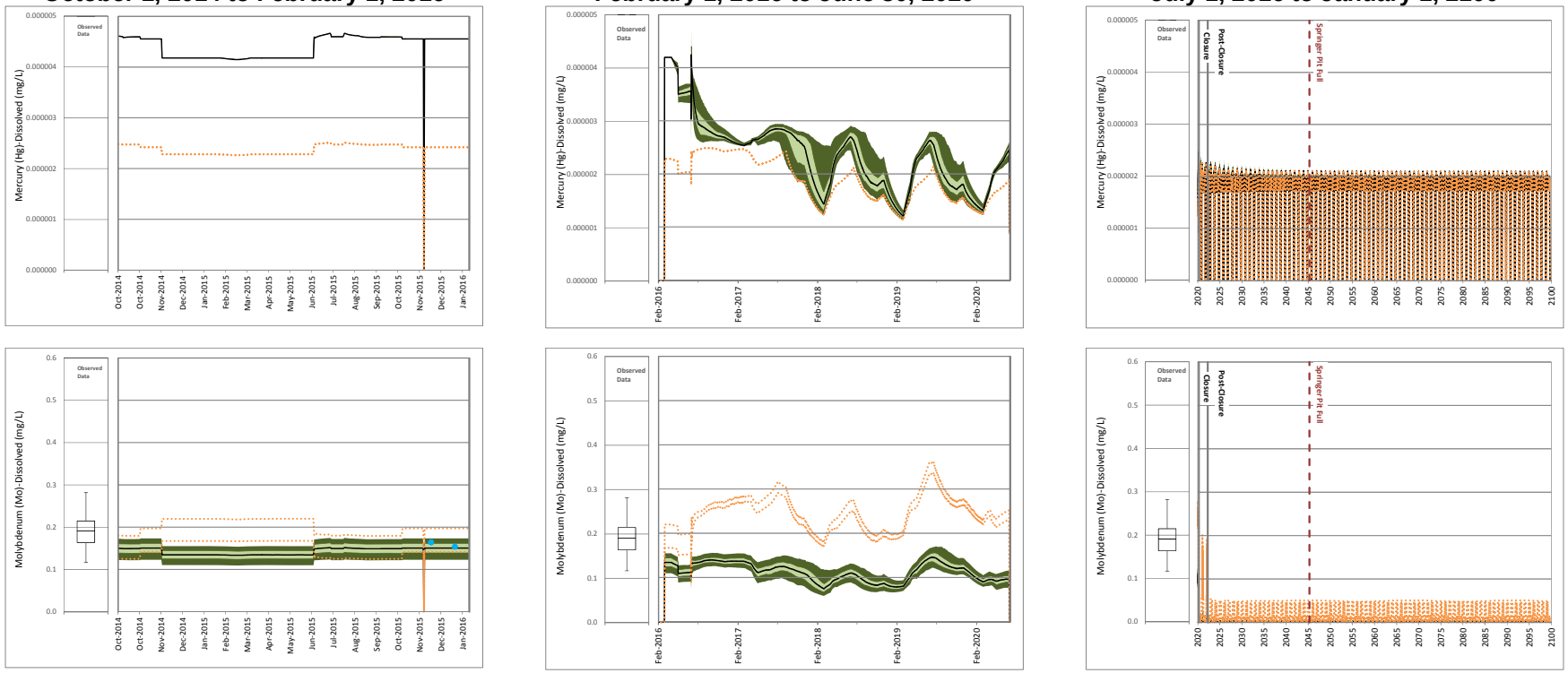
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

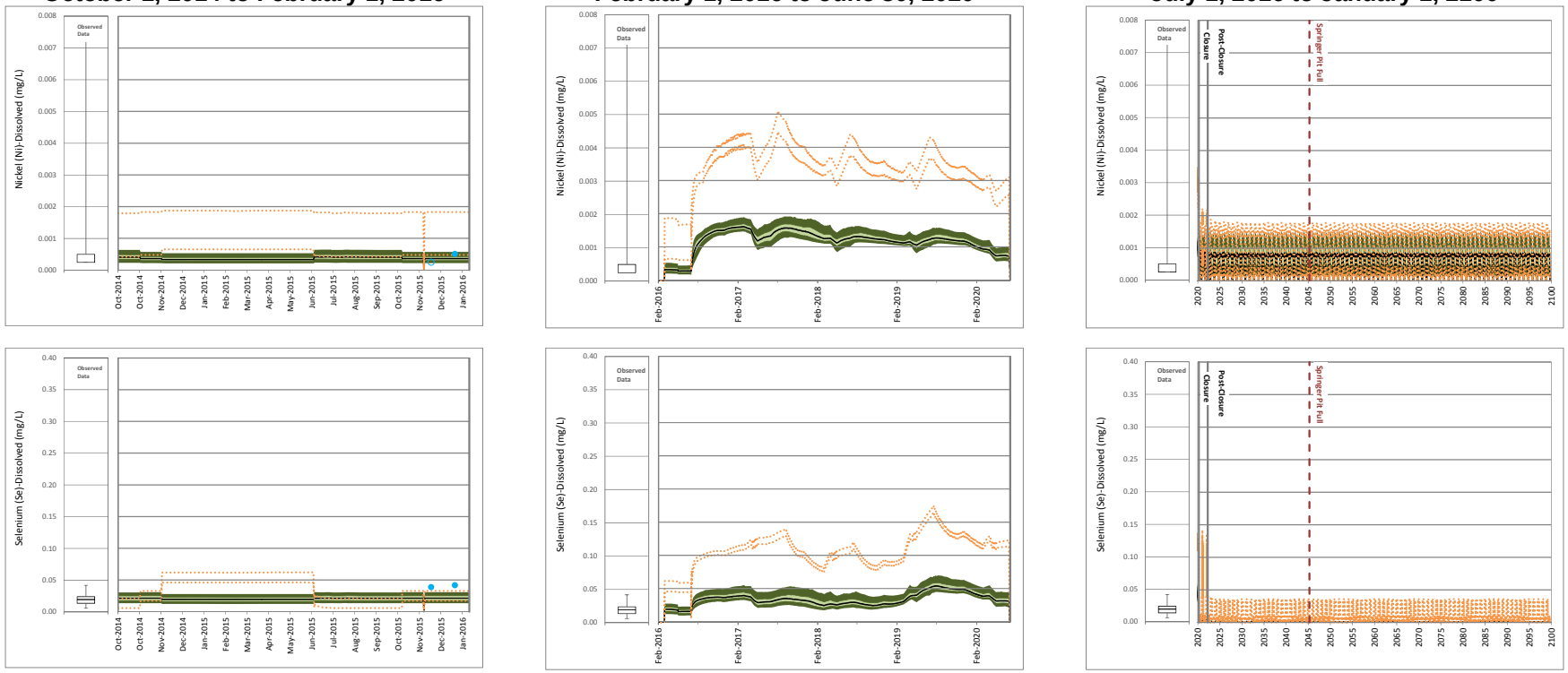
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

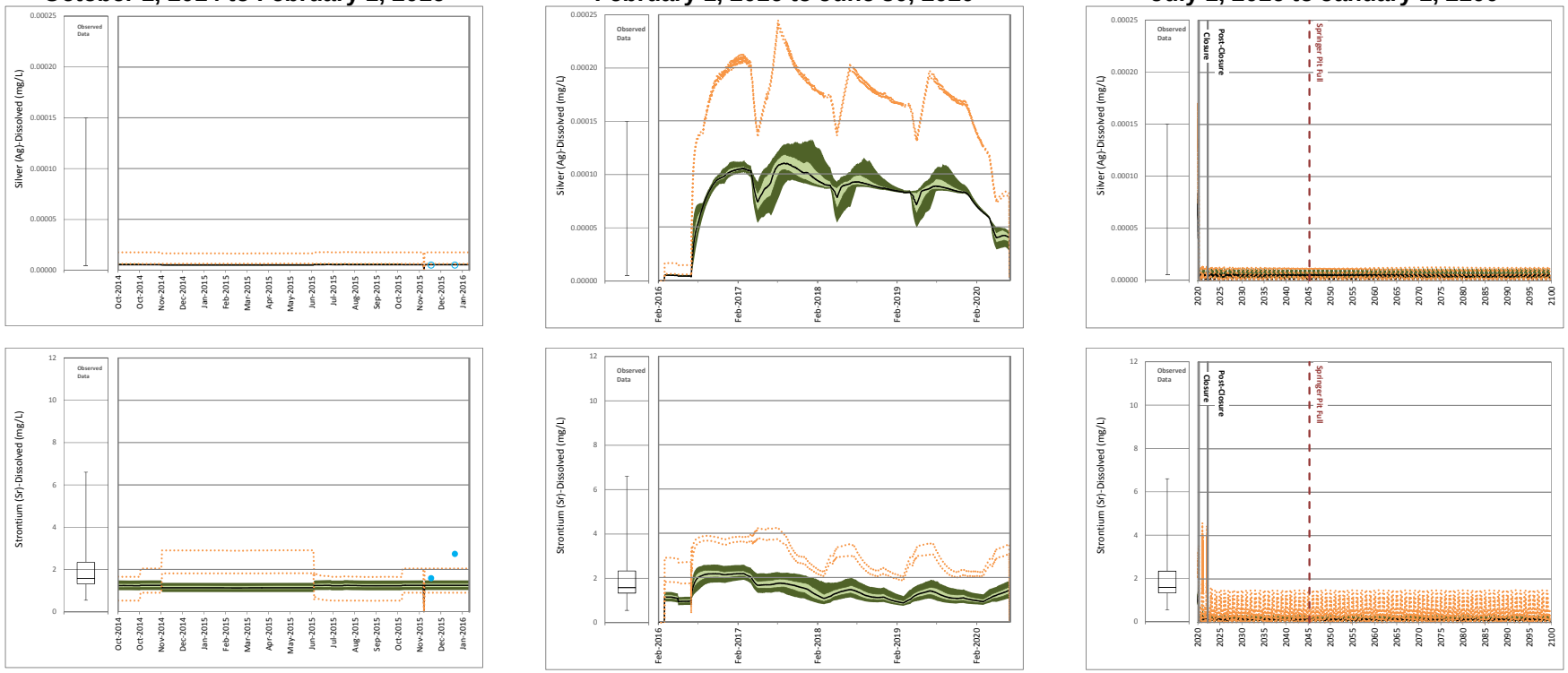
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

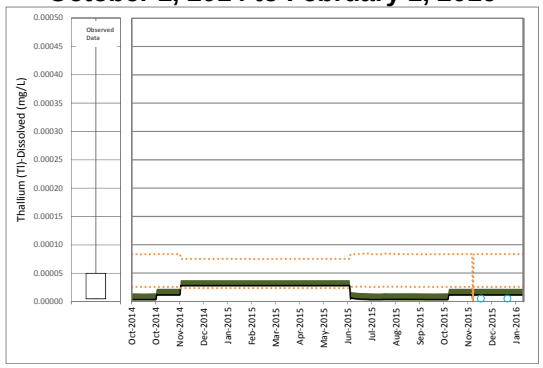
95th Percentile High, 5th Percentile Low

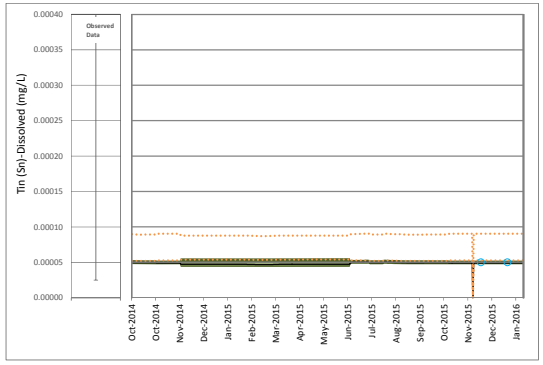
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

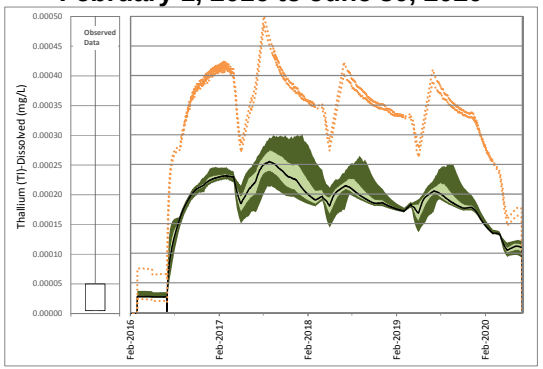
ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

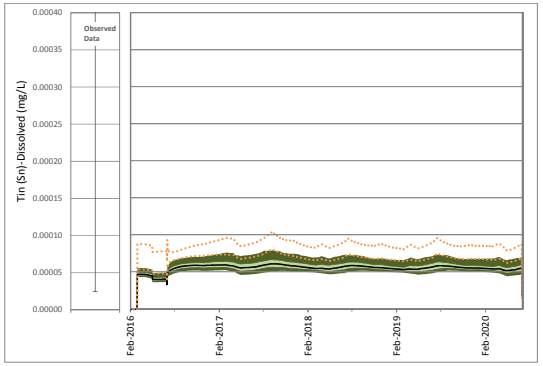
Calibration
October 1, 2014 to February 1, 2016



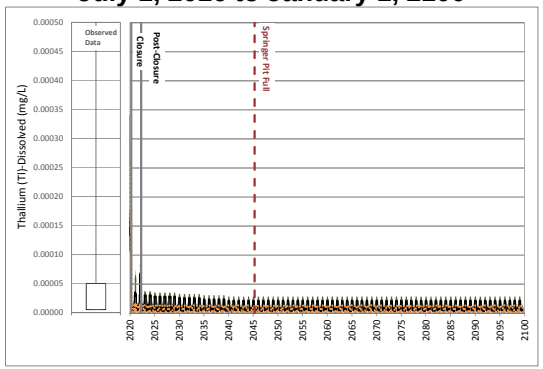


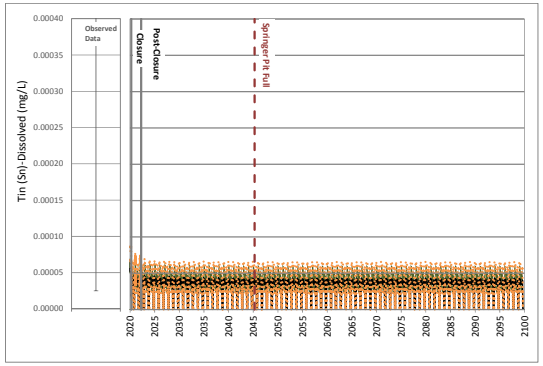
Operations
February 1, 2016 to June 30, 2020



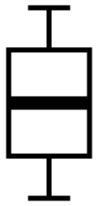


Closure and Post-closure
July 1, 2016 to January 1, 2100



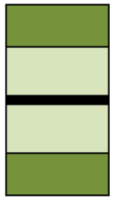


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

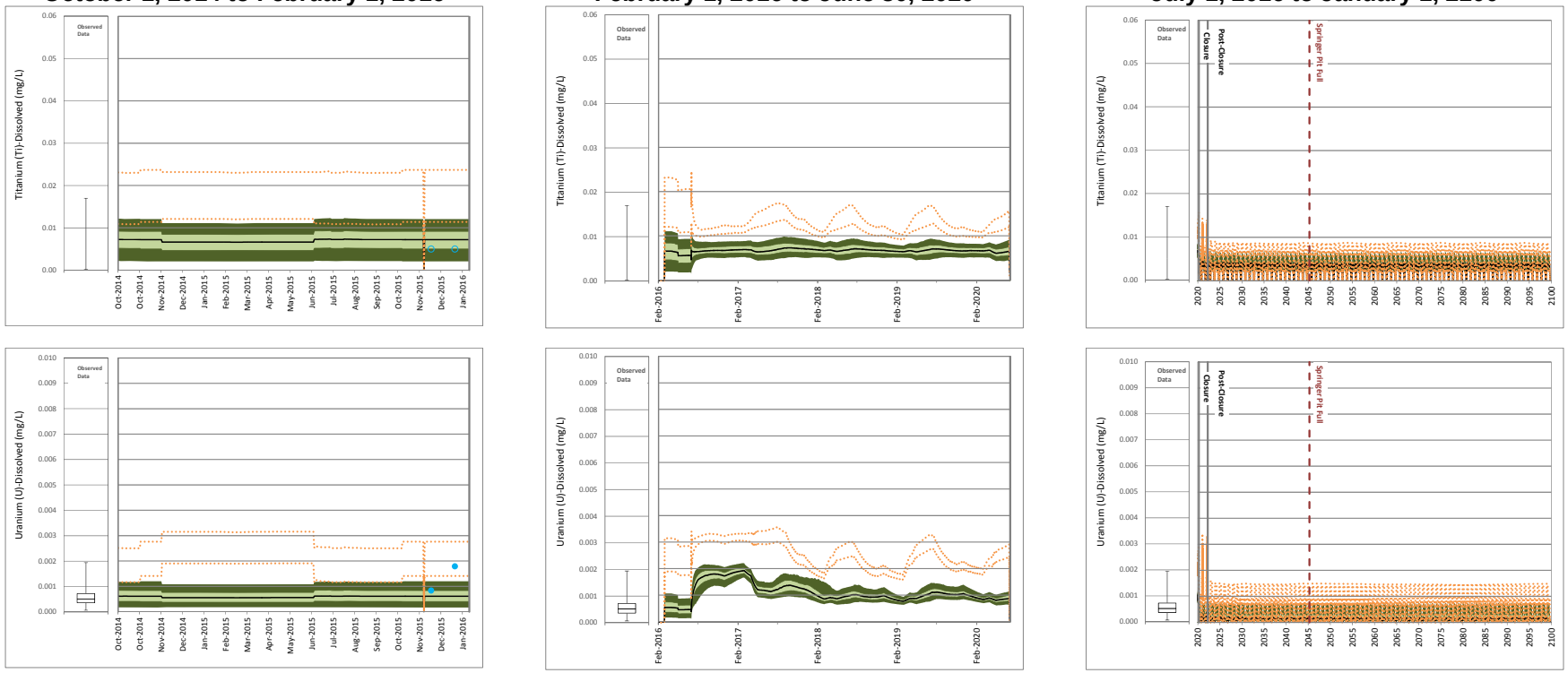
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

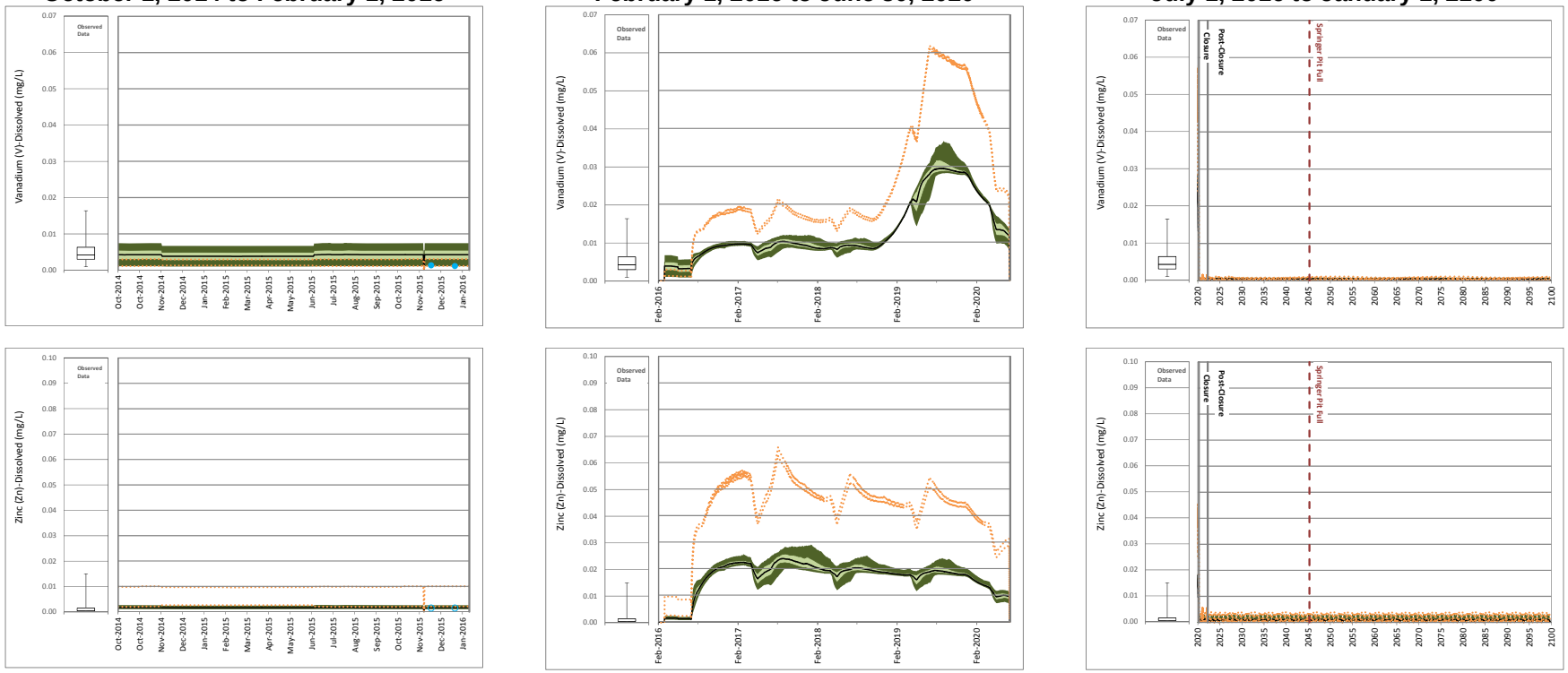
Golder Associates

ATTACHMENT B
Figure B11: Time Series Plots of Predicted TSF Supernatant Pond Water Quality

Calibration
October 1, 2014 to February 1, 2016

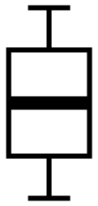
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig11-tsf.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

1.12 Wight Pit

Table B12 presents the maximum predicted median and 95th percentile results for the Wight Pit, calculated based on 500 realizations for Scenario 1 (Table B12a) and Scenario 2 (Table B12b). Time series plots for each modelled parameter are provided in Figure B12.

Table B12a:
Predicted Wight Pit Water Quality - Scenario 1

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	874	958	875	964	868	940	847	925	700	804
Total Dissolved Solids	mg/L	1297	1416	1296	1412	1288	1398	1255	1373	1040	1180
Major Ions											
Calcium	mg/L	262	287	262	290	260	282	255	278	215	246
Chloride	mg/L	6	9	6	9	5.7	8.6	5.4	8.1	4.2	6.2
Fluoride	mg/L	0.89	0.89	0.4	1	0.24	0.36	0.32	0.53	0.32	0.54
Magnesium	mg/L	54	59	54	59	53	57	51.0	56	40.0	46
Potassium	mg/L	2	3	2	3	2.0	2.3	2.0	2.4	1.8	2.3
Sodium	mg/L	28	28	22	29	18.0	21	19.0	24.0	18.0	24.0
Sulphate	mg/L	698	780	700	772	693	750	678.0	734	550.0	655
Nutrients											
Ammonia	mg/L (as N)	0.04	0.24	0.06	0.32	0.021	0.11	0.044	0.24	0.045	0.250
Nitrate	mg/L (as N)	28.0	32.0	29	33	27.0	32.0	25.00	30.0	16.00	21.0
Nitrite	mg/L (as N)	0.029	0.12	0.016	0.11	0.011	0.06	0.014	0.120	0.0140	0.120
Total Phosphorus	mg/L	0.038	0.054	0.038	0.058	0.037	0.046	0.036	0.046	0.027	0.046
Total Metals											
Aluminum	mg/L	0.49	0.5	0.49	0.5	0.49	0.5	0.5	0.52	0.51	0.52
Antimony	mg/L	0.001	0.0012	0.0008	0.0011	0.00053	0.00076	0.00059	0.00087	0.00059	0.00087
Arsenic	mg/L	0.0017	0.0025	0.002	0.003	0.0016	0.0025	0.0016	0.0024	0.0014	0.0022
Barium	mg/L	0.06	0.073	0.06	0.07	0.059	0.066	0.057	0.065	0.047	0.061
Beryllium	mg/L	0.00005	0.00013	0.000	0.0001	0.000048	0.00013	0.000045	0.00013	0.000043	0.00012
Boron	mg/L	0.41	0.45	0.28	0.51	0.17	0.28	0.22	0.40	0.23	0.41
Cadmium	mg/L	0.00036	0.00045	0.0001	0.00025	0.000063	0.00018	0.000085	0.00023	0.000086	0.00024
Chromium	mg/L	0.0011	0.0011	0.0012	0.0013	0.001	0.001	0.0011	0.0012	0.0011	0.0012
Cobalt	mg/L	0.0024	0.0024	0.0008	0.0011	0.00055	0.0008	0.00073	0.0013	0.00074	0.0013
Copper	mg/L	0.021	0.047	0.021	0.051	0.020	0.039	0.020	0.049	0.019	0.049
Iron	mg/L	0.56	0.62	0.56	0.62	0.56	0.61	0.57	0.62	0.58	0.62
Lead	mg/L	0.00017	0.00021	0.00018	0.0002	0.00017	0.00021	0.00017	0.0002	0.00017	0.0002
Lithium	mg/L	0.0094	0.012	0.006	0.01	0.0047	0.0081	0.0049	0.0087	0.0048	0.0087
Manganese	mg/L	0.38	0.54	0.09	0.52	0.063	0.29	0.084	0.57	0.085	0.59
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000024
Molybdenum	mg/L	0.15	0.16	0.1	0.13	0.075	0.10	0.086	0.13	0.086	0.13
Nickel	mg/L	0.0014	0.0015	0.0011	0.0015	0.0009	0.0013	0.0011	0.0016	0.0012	0.0016
Selenium	mg/L	0.04	0.067	0.04	0.064	0.039	0.055	0.0370	0.057	0.0270	0.056
Silver	mg/L	0.000010	0.00002	0.00001	0.00002	0.0000074	0.000018	0.000010	0.000021	0.000010	0.000021
Strontium	mg/L	6.1	6.8	4.7	8.0	3.3	4.7	3.7	6.2	3.7	6.4
Thallium	mg/L	0.000018	0.000065	0.00002	0.00008	0.000011	0.000037	0.000018	0.000065	0.000019	0.000067
Tin	mg/L	0.000097	0.00022	0.00012	0.00023	0.000069	0.0002	0.000097	0.00021	0.000098	0.00021
Titanium	mg/L	0.032	0.039	0.032	0.039	0.032	0.038	0.031	0.037	0.03	0.034
Uranium	mg/L	0.0043	0.0049	0.0024	0.0039	0.0016	0.0026	0.0020	0.0032	0.0020	0.0032
Vanadium	mg/L	0.002	0.0031	0.002	0.003	0.0019	0.0031	0.0021	0.003	0.0021	0.0027
Zinc	mg/L	0.012	0.012	0.009	0.012	0.007	0.0089	0.0078	0.012	0.0078	0.012
Dissolved Metals											
Aluminum	mg/L	0.005	0.013	0.0	0.01	0.0	0.01	0.02	0.03	0.02	0.03
Antimony	mg/L	0.001	0.001	0.0007	0.0009	0.00051	0.00058	0.00057	0.00069	0.00057	0.00069
Arsenic	mg/L	0.0015	0.0023	0.002	0.003	0.0014	0.0023	0.0014	0.0022	0.0012	0.002
Barium	mg/L	0.054	0.068	0.05	0.07	0.054	0.06	0.052	0.06	0.041	0.056
Beryllium	mg/L	0.00005	0.00005	0.000	0.0001	0.000048	0.00005	0.000045	0.000046	0.000043	0.000044
Boron	mg/L	0.41	0.41	0.28	0.47	0.17	0.25	0.22	0.36	0.23	0.38
Cadmium	mg/L	0.00036	0.00036	0.0001	0.00016	0.000059	0.000088	0.000081	0.00014	0.000082	0.00014
Chromium	mg/L	0.00048	0.0005	0.0006	0.0006	0.00033	0.0004	0.00049	0.0005	0.0005	0.0006
Cobalt	mg/L	0.00200	0.0020	0.00047	0.0008	0.00022	0.00047	0.00041	0.00096	0.00042	0.00099
Copper	mg/L	0.016	0.032	0.017	0.035	0.015	0.023	0.015	0.033	0.014	0.034
Iron	mg/L	0.015	0.076	0.014	0.07	0.01	0.07	0.03	0.07	0.03	0.07
Lead	mg/L	0.000029	0.000061	0.00003	0.00006	0.000026	0.00006	0.000029	0.000059	0.00003	0.000051
Lithium	mg/L	0.0091	0.009	0.006	0.008	0.0044	0.0052	0.0046	0.0058	0.0045	0.0058
Manganese	mg/L	0.36	0.52	0.08	0.5	0.048	0.27	0.069	0.55	0.070	0.57
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000024
Molybdenum	mg/L	0.15	0.15	0.1	0.12	0.075	0.089	0.086	0.11	0.086	0.110
Nickel	mg/L	0.00078	0.00092	0.0005	0.0009	0.00037	0.0007	0.00056	0.001	0.00058	0.001
Selenium	mg/L	0.04	0.062	0.04	0.06	0.039	0.05	0.0370	0.053	0.0270	0.052
Silver	mg/L	0.000010	0.000010	0.00001	0.00001	0.0000074	0.000008	0.000010	0.000011	0.000010	0.000011
Strontium	mg/L	6.0	6.4	4.7	7.6	3.3	4.3	3.7	5.8	3.6	6.0
Thallium	mg/L	0.000018	0.000056	0.00002	0.00007	0.000011	0.000027	0.000018	0.000056	0.000019	0.000057
Tin	mg/L	0.000097	0.00012	0.00012	0.00013	0.000069	0.00010	0.000097	0.00011	0.000098	0.00011
Titanium	mg/L	0.010	0.017	0.0099	0.017	0.0095	0.016	0.0092	0.015	0.0075	0.012
Uranium	mg/L	0.0043	0.0043	0.0024	0.0032	0.0016	0.0019	0.0019	0.0026	0.0019	0.0026
Vanadium	mg/L	0.0007	0.0018	0.001	0.002	0.00059	0.0018	0.00078	0.0017	0.0008	0.0014
Zinc	mg/L	0.010	0.010	0.008	0.011	0.0055	0.0074	0.0063	0.010	0.0063	0.010

NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

Table B12b:
Predicted Wight Pit Water Quality - Scenario 2

Parameter	Units	Calibration (10/1/2014 - 2/1/2016)		Operations (2/1/2016 - 7/1/2020)		Closure (7/1/2020 - 7/1/2022)		Post-Closure (7/1/2022 - 1/1/2050)		Long Term Post-Closure (1/1/2050 - 1/1/2100)	
		Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations	Maximum of Median Predicted Concentrations	Maximum of 95th Percentile Predicted Concentrations
Physical Parameters											
Hardness[a]	mg $CaCO_3$/L	1273	1323	1300	1352	1185	1231	1095	1137	736	766
Total Dissolved Solids	mg/L	1833	1890	1873	1933	1683	1736	1556	1604	1047	1077
Major Ions											
Calcium	mg/L	372	387	379	395	346	360	320	333	218	225
Chloride	mg/L	15	16	15	17	14.0	14.0	14.0	16.0	14.0	16.0
Fluoride	mg/L	0.89	0.89	0.8	1	0.74	0.78	0.71	0.75	0.57	0.59
Magnesium	mg/L	84	87	86	89	78	81	72.0	74	47.0	49
Potassium	mg/L	4	4	4	4	3.3	3.5	3.1	3.4	2.4	2.6
Sodium	mg/L	29	32	29	32	27.0	30	26.0	28.0	19.0	20.0
Sulphate	mg/L	1212	1258	1242	1289	1120	1161	1023.0	1060	646.0	667
Nutrients											
Ammonia	mg/L (as N)	0.21	0.21	0.21	0.21	0.130	0.13	0.120	0.13	0.093	0.096
Nitrate	mg/L (as N)	35.0	36.0	34	36	5.3	6.5	3.80	5.1	2.80	4.6
Nitrite	mg/L (as N)	0.47	0.49	0.47	0.49	1.400	1.4	1.300	1.300	0.9600	0.970
Total Phosphorus	mg/L	0.042	0.048	0.045	0.05	0.032	0.039	0.045	0.05	0.045	0.051
Total Metals											
Aluminum	mg/L	0.65	0.68	0.67	0.7	0.6	0.61	0.65	0.68	0.66	0.69
Antimony	mg/L	0.001	0.0012	0.0007	0.0009	0.00069	0.00089	0.00067	0.00087	0.00059	0.00077
Arsenic	mg/L	0.0019	0.0024	0.002	0.003	0.0016	0.0023	0.0020	0.0024	0.0020	0.0024
Barium	mg/L	0.08	0.083	0.08	0.08	0.076	0.079	0.073	0.076	0.057	0.059
Beryllium	mg/L	0.00010	0.00018	0.0001	0.0002	0.000099	0.00018	0.00010	0.00018	0.000094	0.00017
Boron	mg/L	0.41	0.45	0.34	0.43	0.32	0.4	0.31	0.39	0.25	0.31
Cadmium	mg/L	0.00054	0.00063	0.00055	0.00065	0.00050	0.00059	0.00046	0.00055	0.00029	0.00038
Chromium	mg/L	0.0011	0.0012	0.0012	0.0013	0.001	0.0011	0.0011	0.0012	0.0011	0.0012
Cobalt	mg/L	0.0075	0.0076	0.0076	0.0077	0.0070	0.007	0.0064	0.0065	0.0043	0.0043
Copper	mg/L	0.270	0.28	0.28	0.29	0.250	0.26	0.230	0.24	0.140	0.15
Iron	mg/L	0.6	0.64	0.61	0.65	0.58	0.63	0.6	0.64	0.6	0.64
Lead	mg/L	0.00025	0.00026	0.00025	0.00027	0.00022	0.00024	0.00024	0.00026	0.00024	0.00026
Lithium	mg/L	0.0094	0.012	0.006	0.009	0.0057	0.0087	0.0056	0.0085	0.0047	0.0076
Manganese	mg/L	1.10	1.10	1.0	1.1	0.95	1.0	0.91	0.97	0.74	0.77
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000023
Molybdenum	mg/L	0.39	0.4	0.39	0.41	0.36	0.38	0.330	0.35	0.220	0.23
Nickel	mg/L	0.0077	0.0082	0.0079	0.0084	0.0073	0.0076	0.0067	0.007	0.0045	0.0047
Selenium	mg/L	0.19	0.20	0.19	0.20	0.180	0.19	0.1600	0.17	0.1100	0.120
Silver	mg/L	0.000023	0.000034	0.00002	0.00004	0.000016	0.000027	0.000023	0.000034	0.000023	0.000035
Strontium	mg/L	6.5	6.9	6.6	7.0	6.0	6.4	5.6	6.0	3.8	4.3
Thallium	mg/L	0.000013	0.000024	0.00001	0.00002	0.000013	0.000023	0.000013	0.000023	0.000011	0.000023
Tin	mg/L	0.00012	0.00026	0.00013	0.00027	0.00012	0.00026	0.00012	0.00025	0.00011	0.00023
Titanium	mg/L	0.046	0.046	0.046	0.047	0.044	0.045	0.043	0.043	0.037	0.038
Uranium	mg/L	0.0046	0.0053	0.0047	0.0055	0.0043	0.005	0.0040	0.0047	0.0028	0.0035
Vanadium	mg/L	0.0037	0.0046	0.004	0.005	0.0031	0.0043	0.0037	0.0044	0.0037	0.0044
Zinc	mg/L	0.074	0.074	0.076	0.077	0.069	0.070	0.063	0.064	0.040	0.041
Dissolved Metals											
Aluminum	mg/L	0.16	0.19	0.18	0.21	0.11	0.12	0.16	0.19	0.17	0.2
Antimony	mg/L	0.001	0.001	0.0007	0.0008	0.00067	0.00071	0.00065	0.00069	0.00057	0.00059
Arsenic	mg/L	0.0017	0.0022	0.002	0.002	0.0014	0.0021	0.0018	0.0022	0.0018	0.0022
Barium	mg/L	0.074	0.078	0.08	0.08	0.07	0.074	0.067	0.07	0.052	0.054
Beryllium	mg/L	0.00010	0.00010	0.0001	0.0001	0.000099	0.0001	0.00010	0.00010	0.000094	0.000094
Boron	mg/L	0.41	0.41	0.34	0.39	0.32	0.37	0.31	0.35	0.25	0.27
Cadmium	mg/L	0.00053	0.00054	0.00055	0.00055	0.00049	0.00050	0.000450	0.00046	0.000290	0.00029
Chromium	mg/L	0.00049	0.00058	0.0005	0.0006	0.00038	0.0004	0.00049	0.0006	0.00049	0.0006
Cobalt	mg/L	0.00720	0.0073	0.0073	0.0074	0.00660	0.0067	0.00610	0.0062	0.00390	0.00400
Copper	mg/L	0.260	0.260	0.27	0.27	0.240	0.24	0.220	0.220	0.130	0.130
Iron	mg/L	0.057	0.097	0.06	0.1	0.04	0.08	0.06	0.1	0.06	0.1
Lead	mg/L	0.00010	0.00012	0.00011	0.00012	0.000073	0.000093	0.000098	0.00011	0.000099	0.00011
Lithium	mg/L	0.0091	0.009	0.006	0.006	0.0054	0.0058	0.0053	0.0056	0.0044	0.0047
Manganese	mg/L	1.00	1.10	1.0	1.1	0.94	1.0	0.900	0.95	0.720	0.75
Mercury	mg/L	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000023	0.0000023
Molybdenum	mg/L	0.39	0.39	0.39	0.4	0.36	0.36	0.330	0.33	0.220	0.220
Nickel	mg/L	0.0072	0.0076	0.0073	0.0078	0.0067	0.0071	0.0061	0.0065	0.0039	0.0042
Selenium	mg/L	0.19	0.20	0.19	0.20	0.180	0.18	0.1600	0.17	0.1100	0.110
Silver	mg/L	0.000023	0.000024	0.00002	0.00003	0.000016	0.000017	0.000023	0.000024	0.000023	0.000025
Strontium	mg/L	6.5	6.5	6.6	6.6	6.0	6.0	5.5	5.6	3.8	3.9
Thallium	mg/L	0.000013	0.000015	0.00001	0.00002	0.000013	0.000014	0.000013	0.000014	0.000011	0.000014
Tin	mg/L	0.00012	0.00016	0.00013	0.00017	0.00012	0.00016	0.00012	0.00015	0.00011	0.00013
Titanium	mg/L	0.023	0.024	0.024	0.024	0.022	0.023	0.020	0.021	0.015	0.015
Uranium	mg/L	0.0046	0.0047	0.0047	0.0048	0.0042	0.0044	0.0039	0.0040	0.0027	0.0029
Vanadium	mg/L	0.0024	0.0033	0.003	0.003	0.0018	0.003	0.0024	0.0031	0.0024	0.0031
Zinc	mg/L	0.072	0.073	0.075	0.075	0.068	0.068	0.062	0.062	0.039	0.039

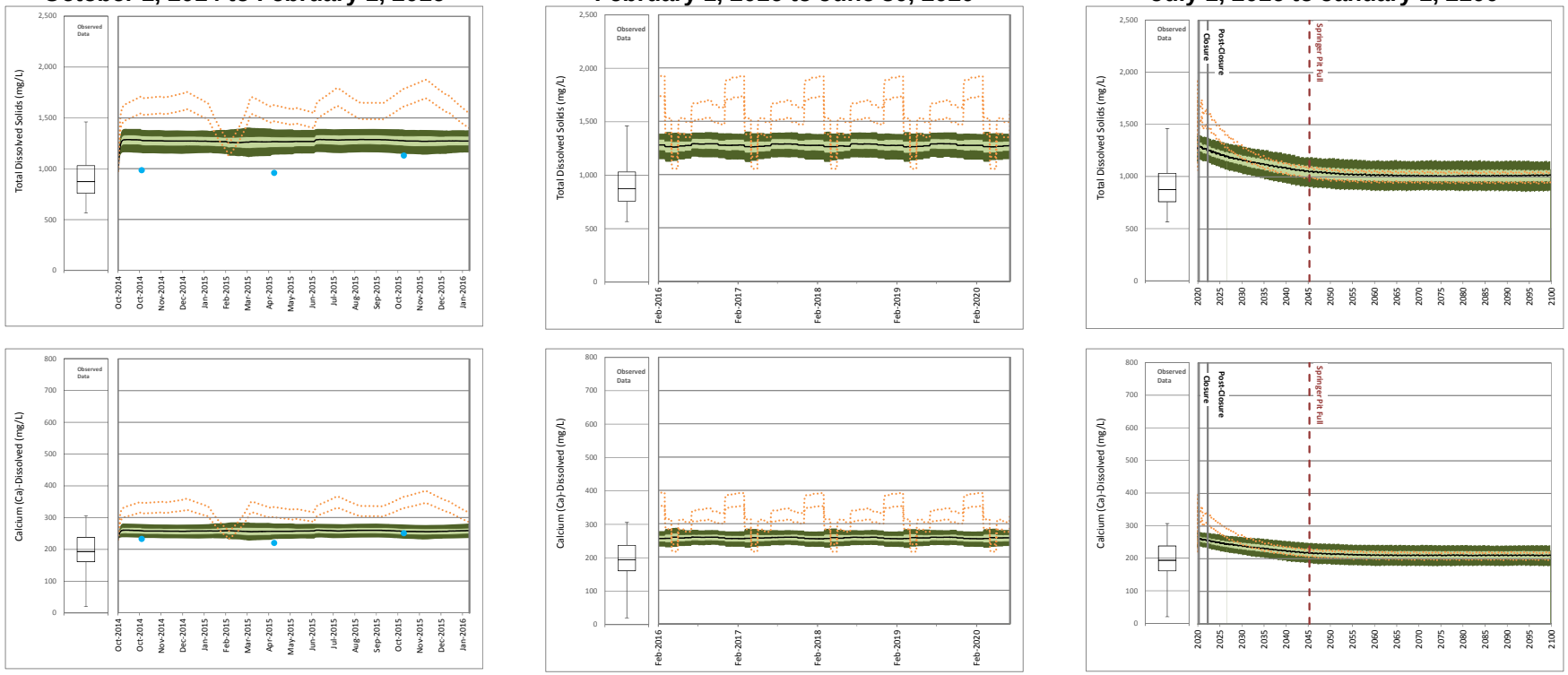
NOTES:
a) Calculated based on predicted calcium and magnesium concentrations

ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

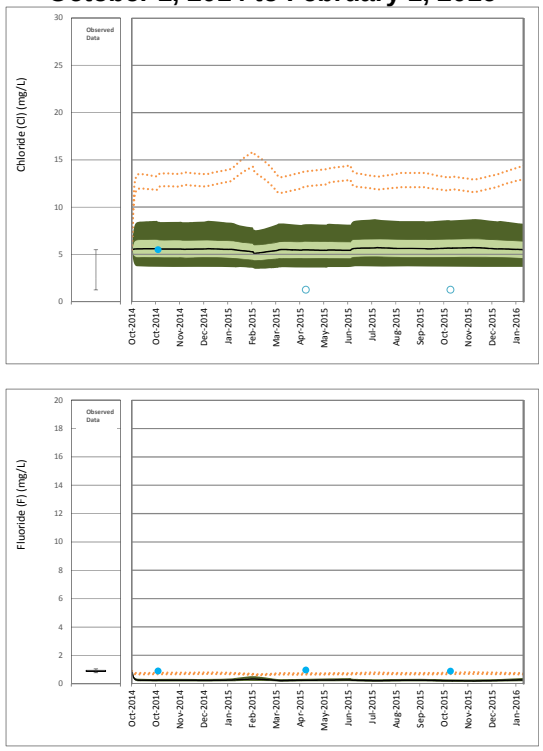
95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

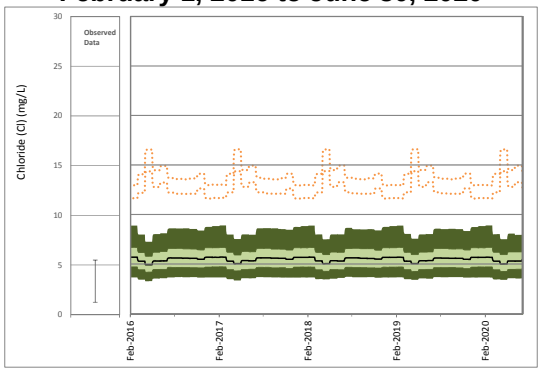
Golder Associates

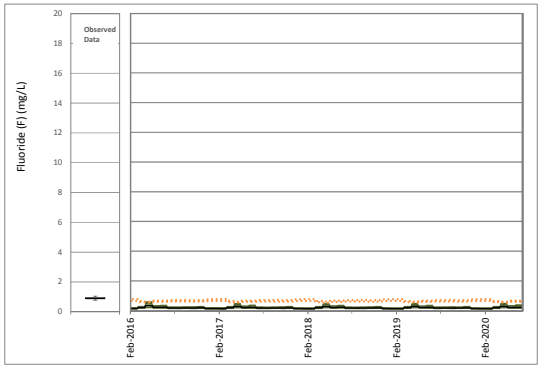
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

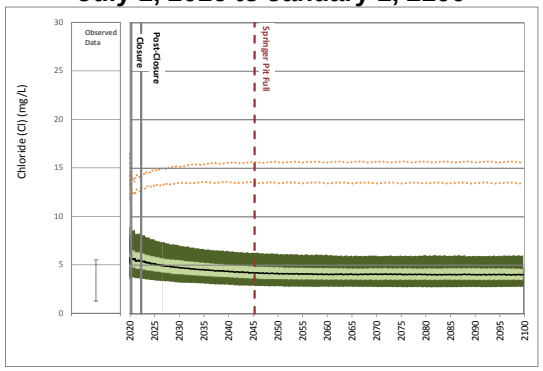


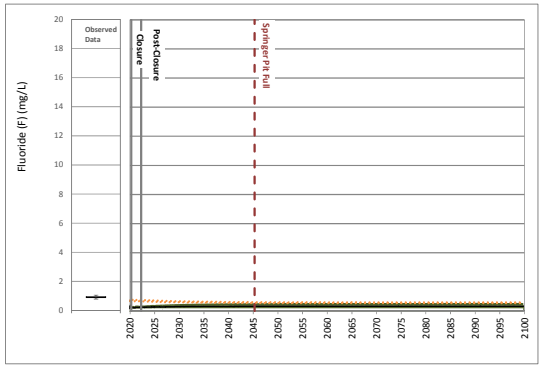
Operations
February 1, 2016 to June 30, 2020



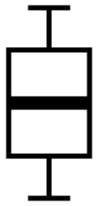


Closure and Post-closure
July 1, 2016 to January 1, 2100



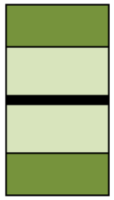


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

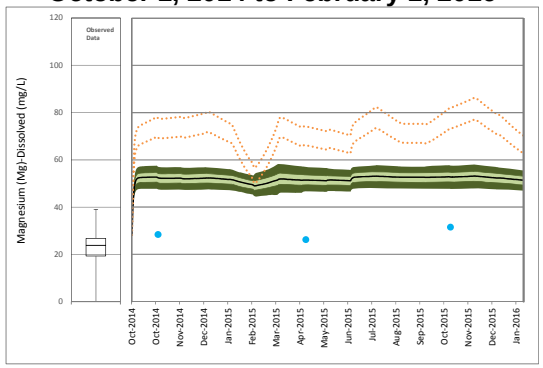
95th Percentile High, 5th Percentile Low

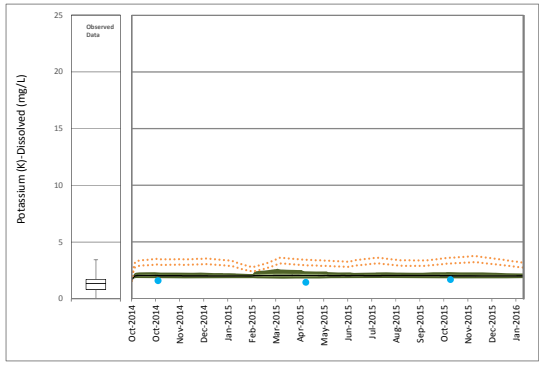
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

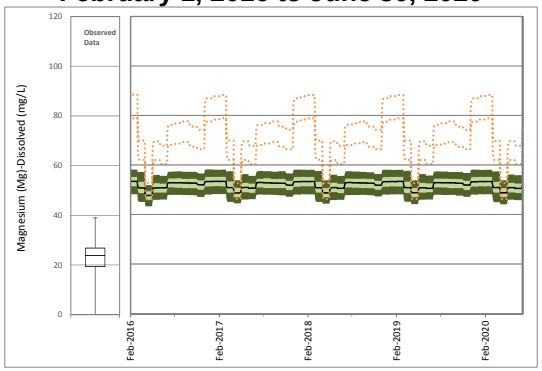
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

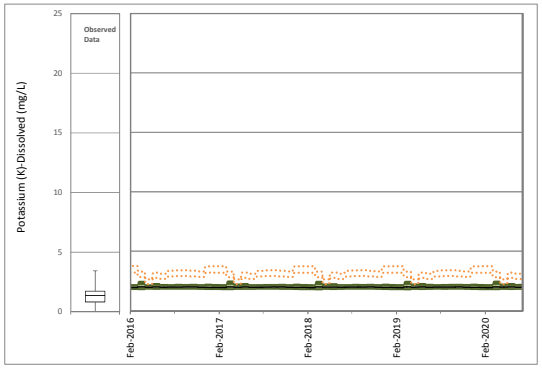
Calibration
October 1, 2014 to February 1, 2016



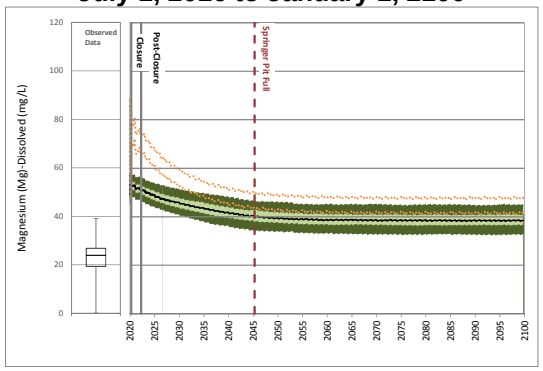


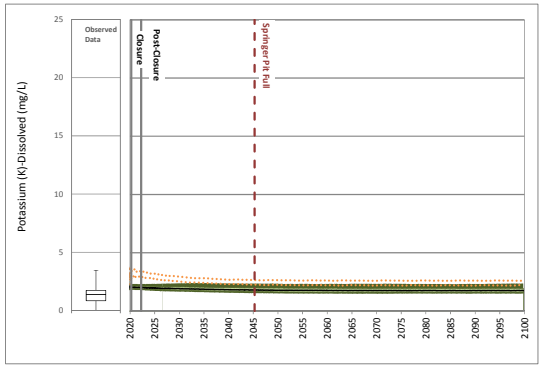
Operations
February 1, 2016 to June 30, 2020



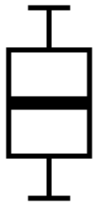


Closure and Post-closure
July 1, 2016 to January 1, 2100



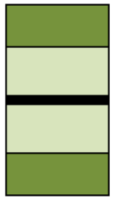


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

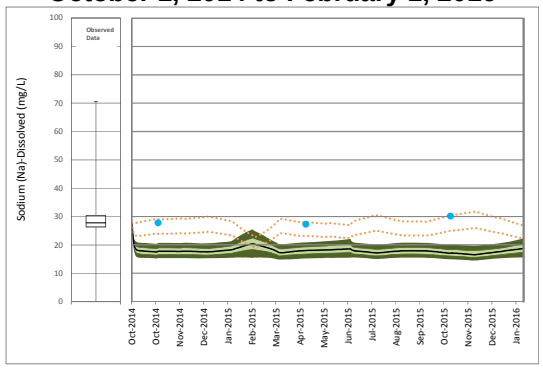
95th Percentile High, 5th Percentile Low

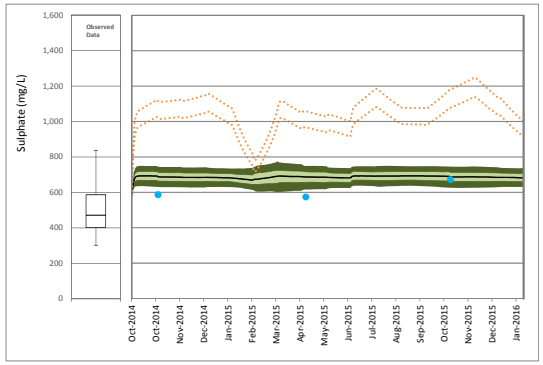
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

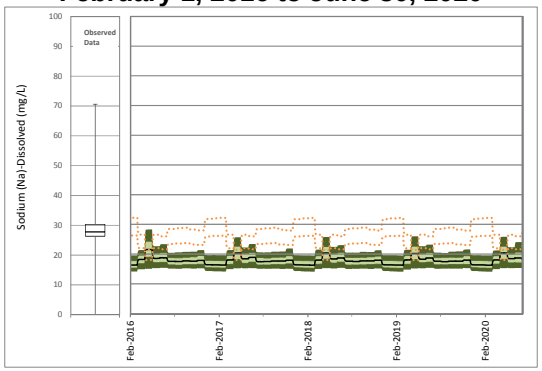
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

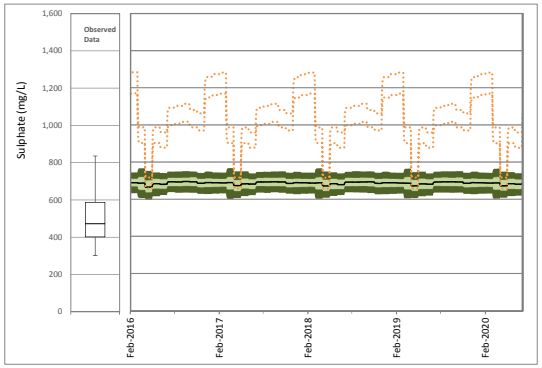
Calibration
October 1, 2014 to February 1, 2016



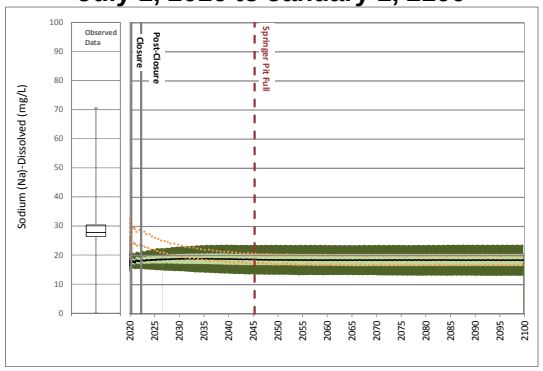


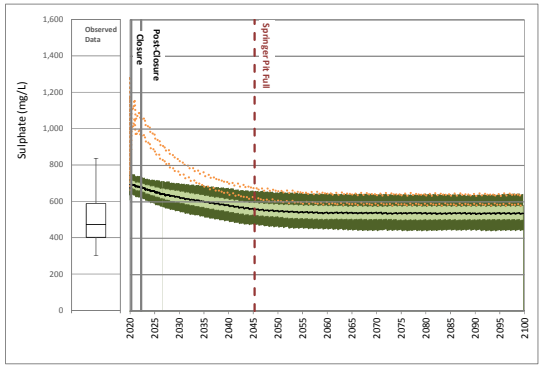
Operations
February 1, 2016 to June 30, 2020



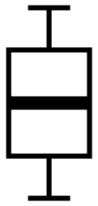


Closure and Post-closure
July 1, 2016 to January 1, 2100



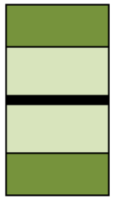


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

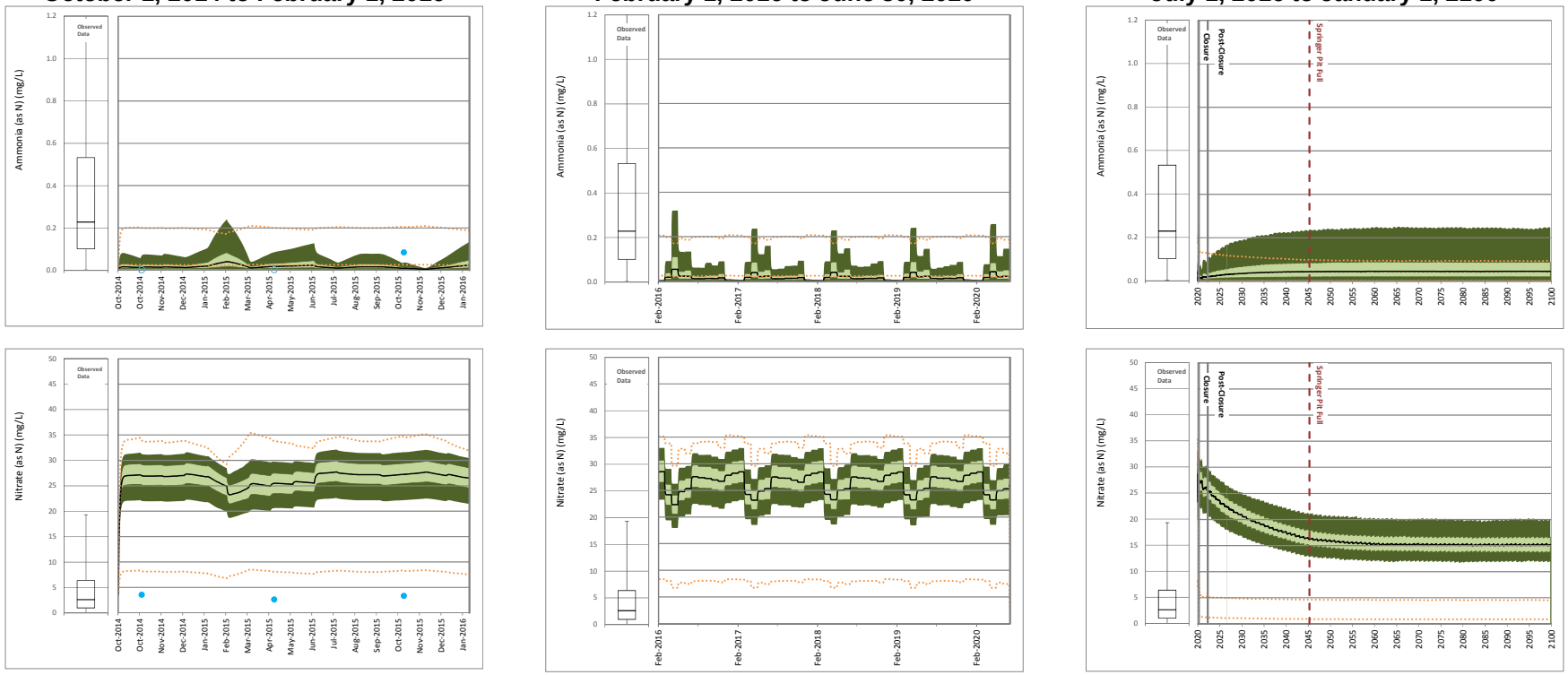
Golder Associates

ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

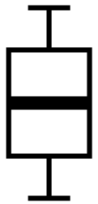
Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100

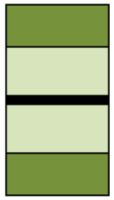


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

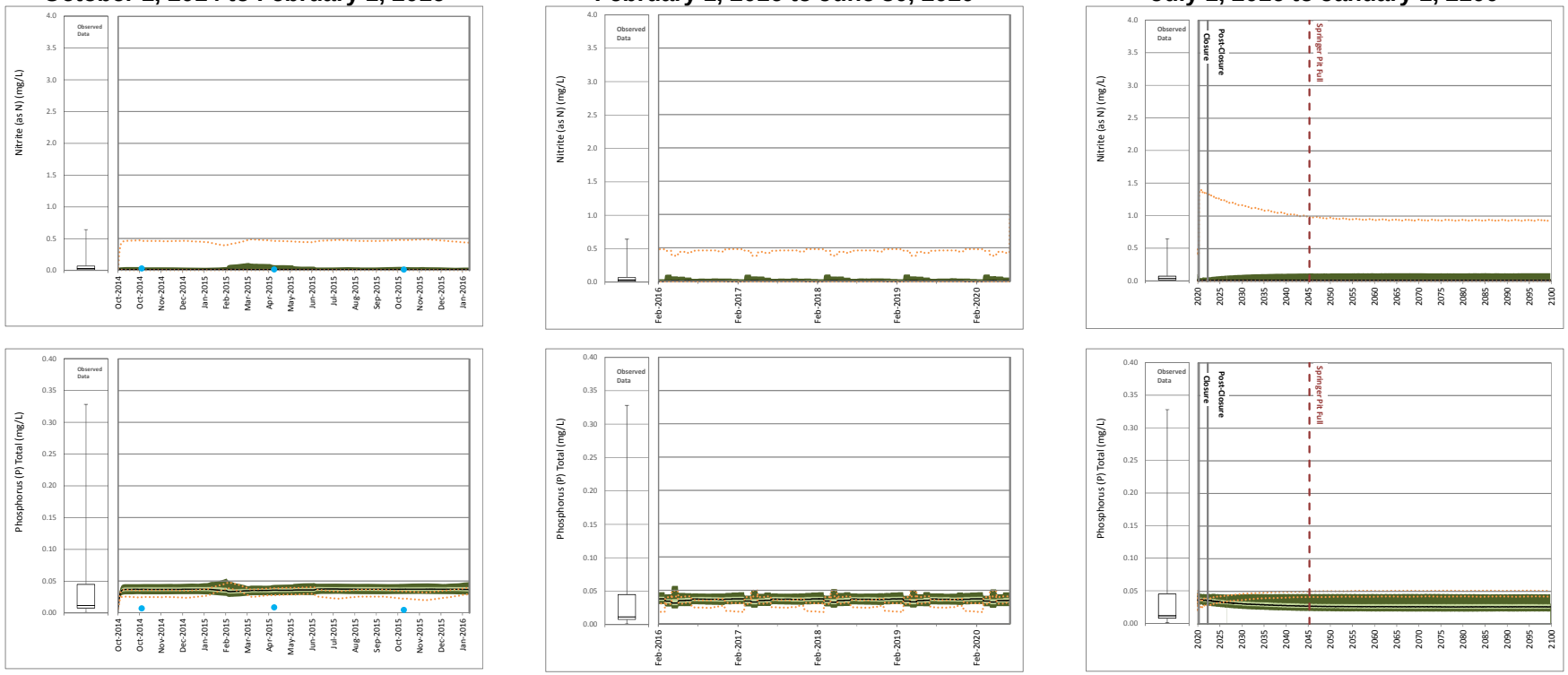
95th Percentile High, 5th Percentile Low

ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

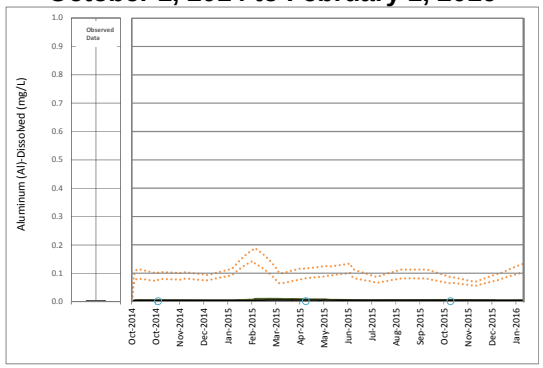
95th Percentile High, 5th Percentile Low

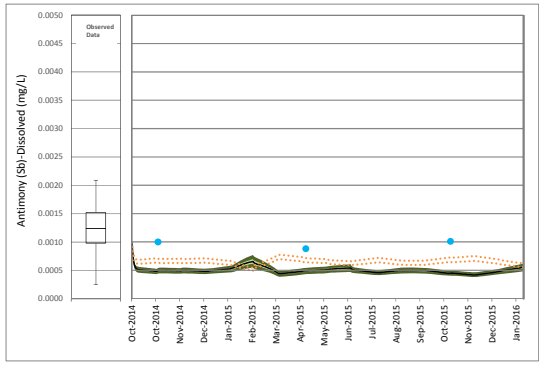
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

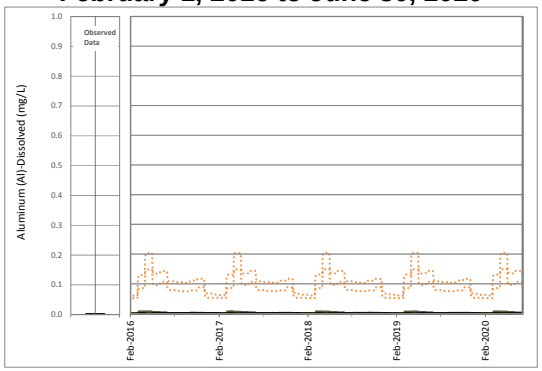
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

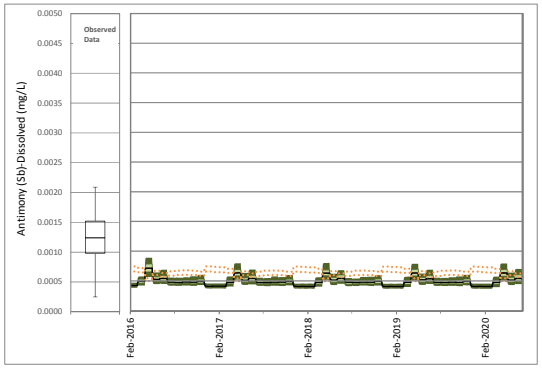
Calibration
October 1, 2014 to February 1, 2016



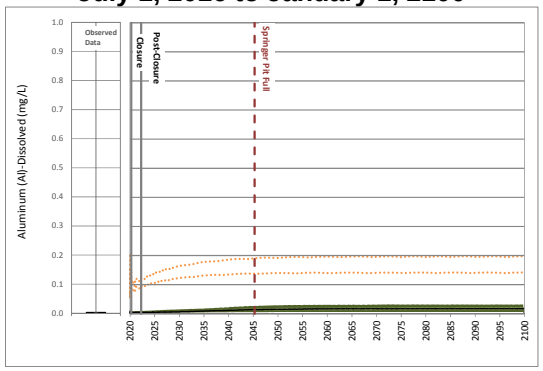


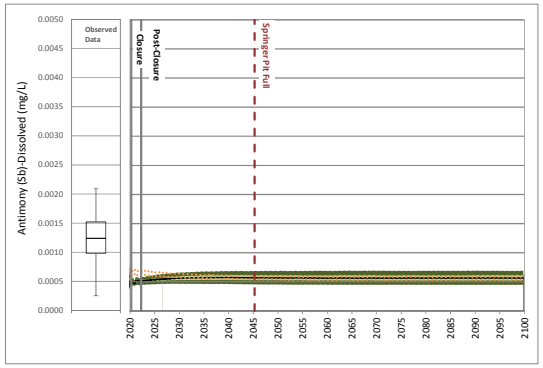
Operations
February 1, 2016 to June 30, 2020



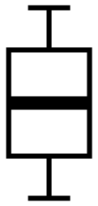


Closure and Post-closure
July 1, 2016 to January 1, 2100



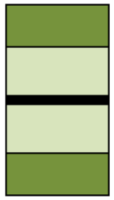


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

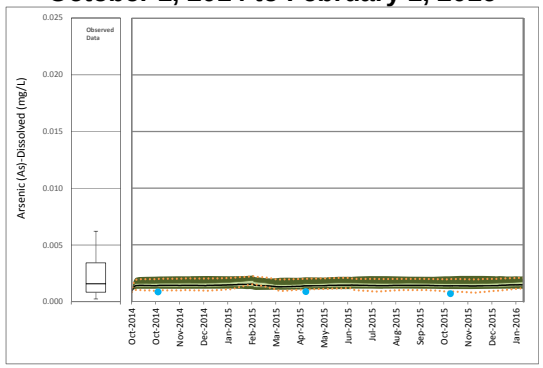
95th Percentile High, 5th Percentile Low

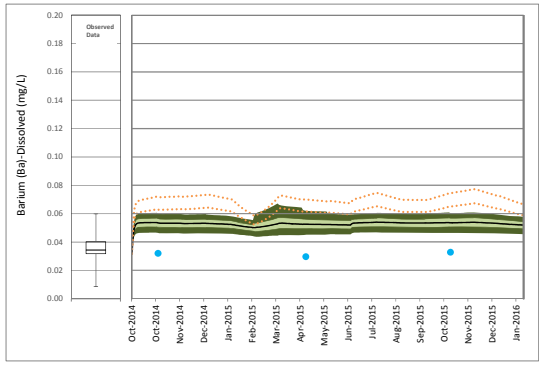
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

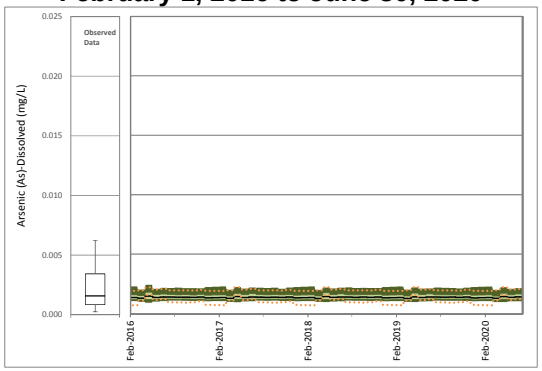
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

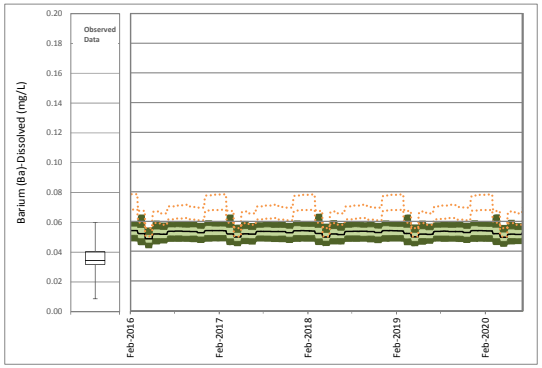
Calibration
October 1, 2014 to February 1, 2016



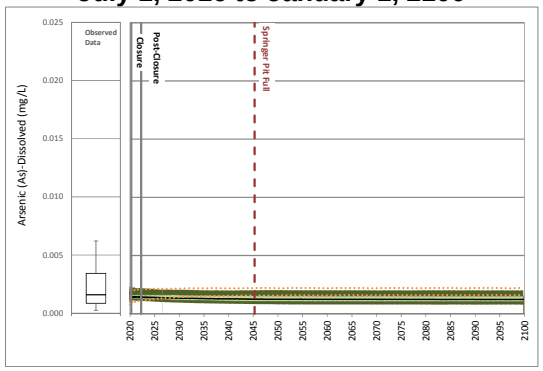


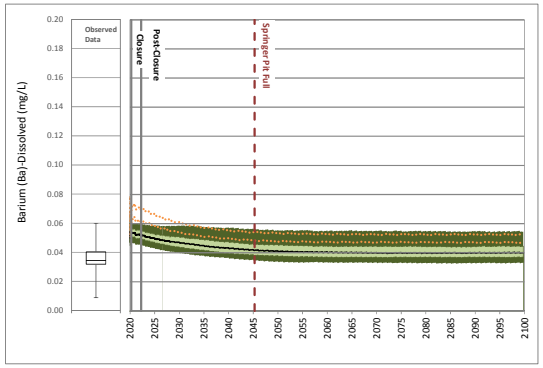
Operations
February 1, 2016 to June 30, 2020



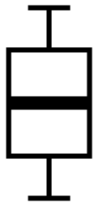


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

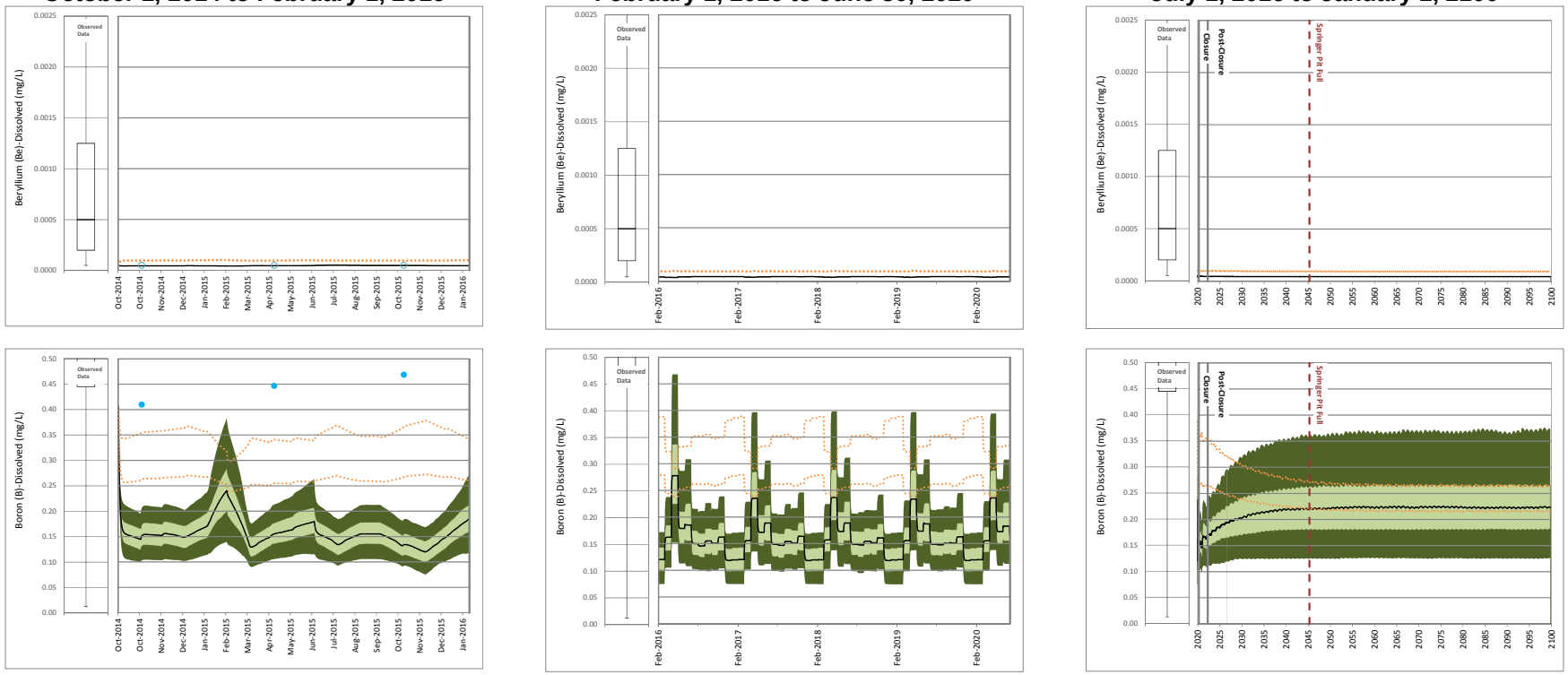
Golder Associates

ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

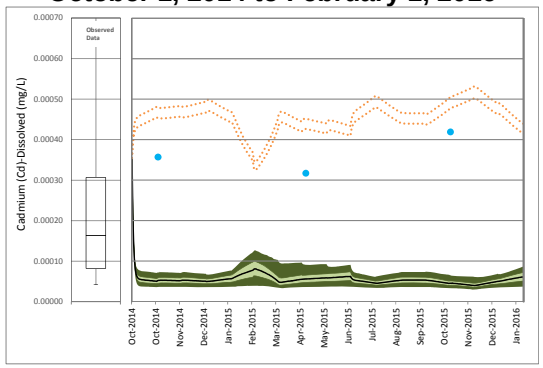
95th Percentile High, 5th Percentile Low

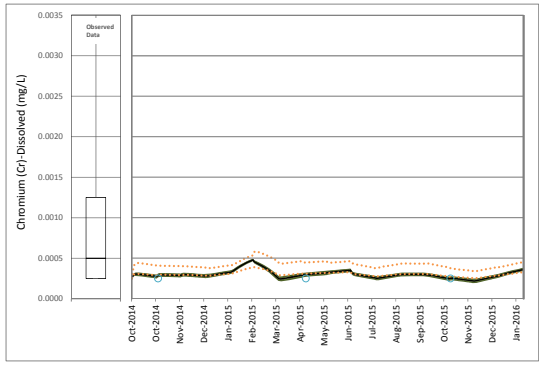
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

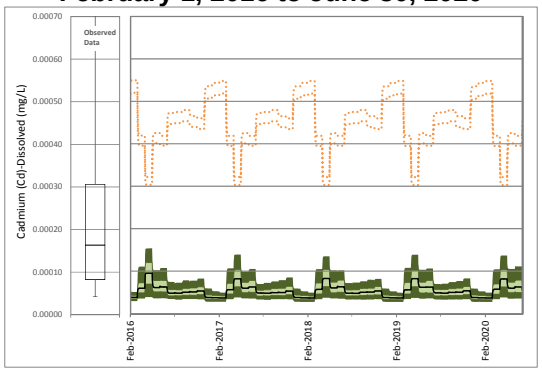
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

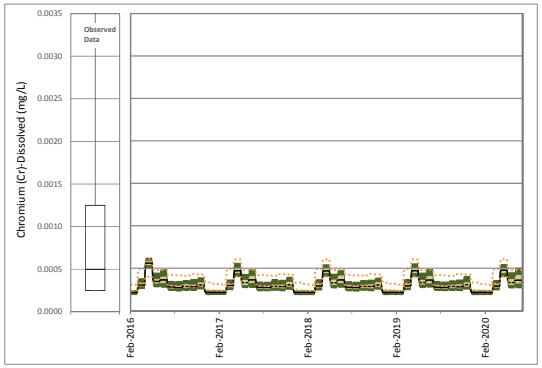
Calibration
October 1, 2014 to February 1, 2016



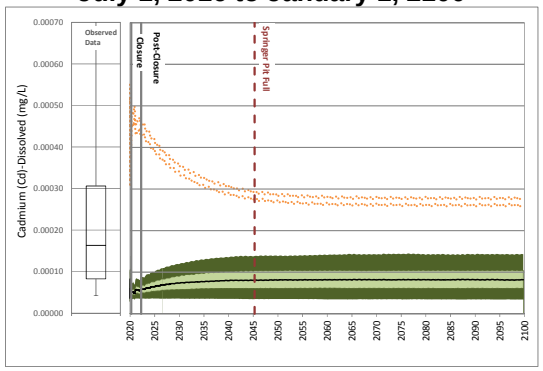


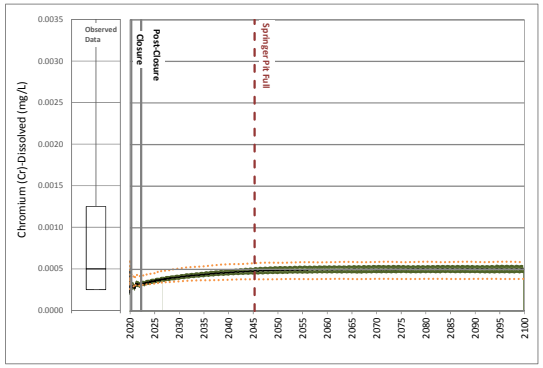
Operations
February 1, 2016 to June 30, 2020



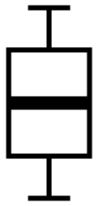


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

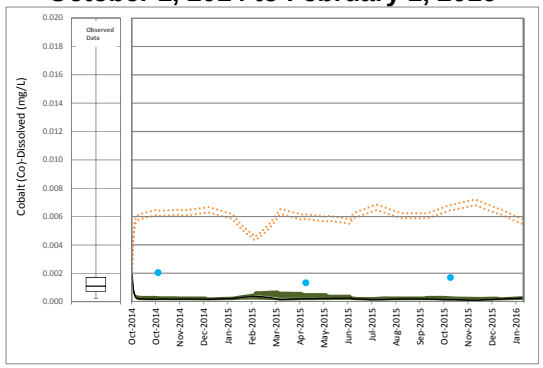
95th Percentile High, 5th Percentile Low

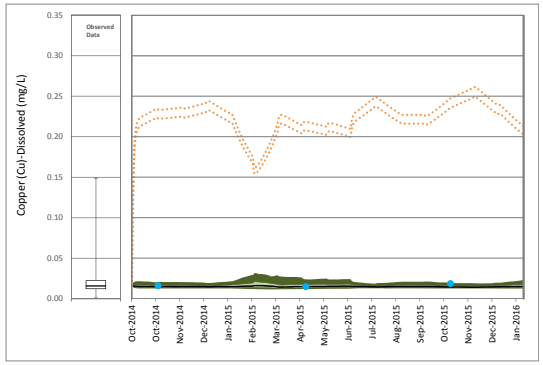
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

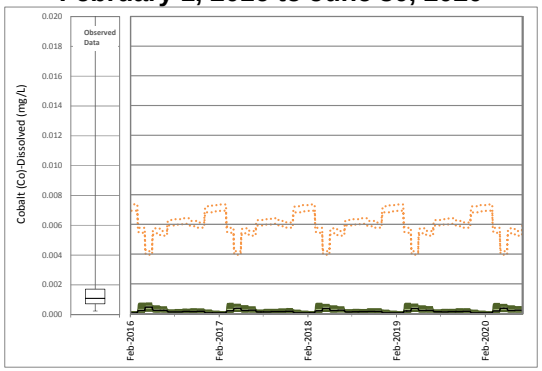
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

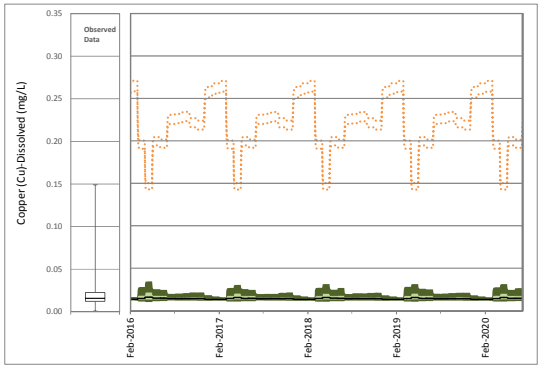
Calibration
October 1, 2014 to February 1, 2016



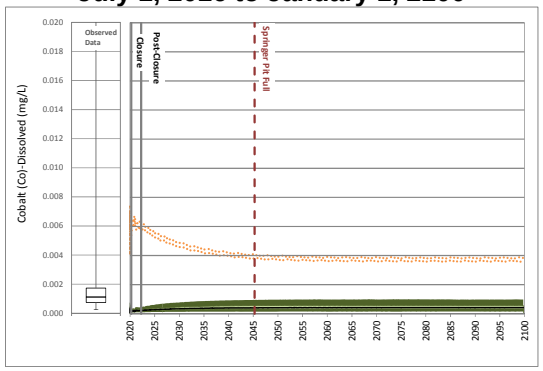


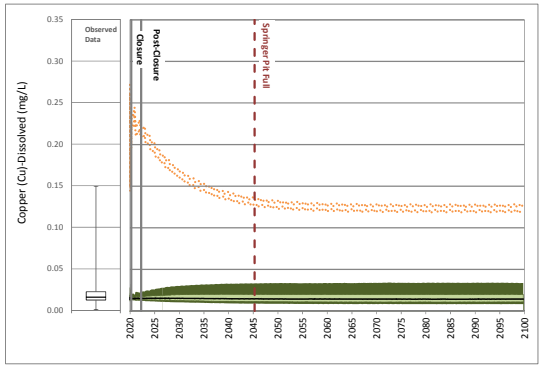
Operations
February 1, 2016 to June 30, 2020



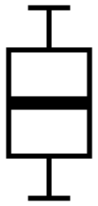


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

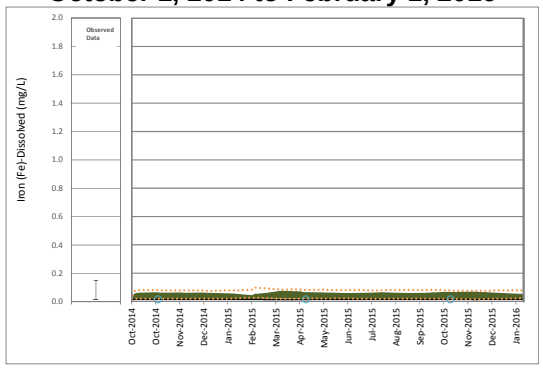
Scenario 2

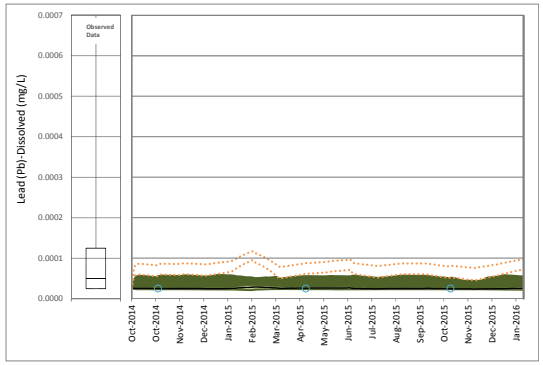
95th Percentile High, 5th Percentile Low

Golder Associates

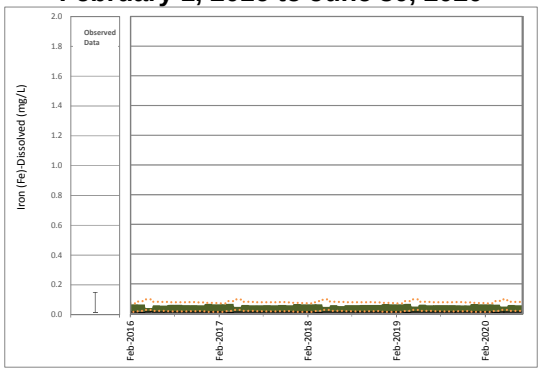
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

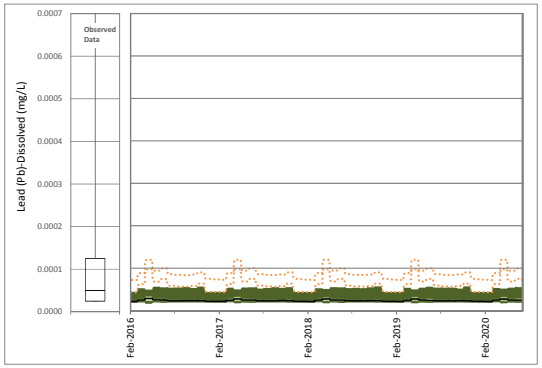
Calibration
October 1, 2014 to February 1, 2016



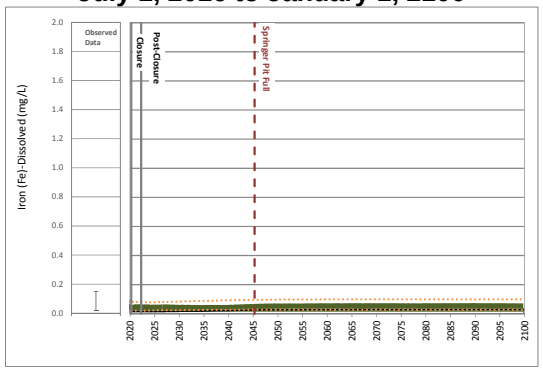


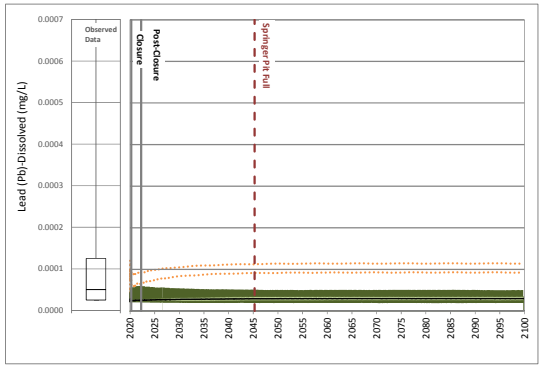
Operations
February 1, 2016 to June 30, 2020



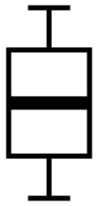


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

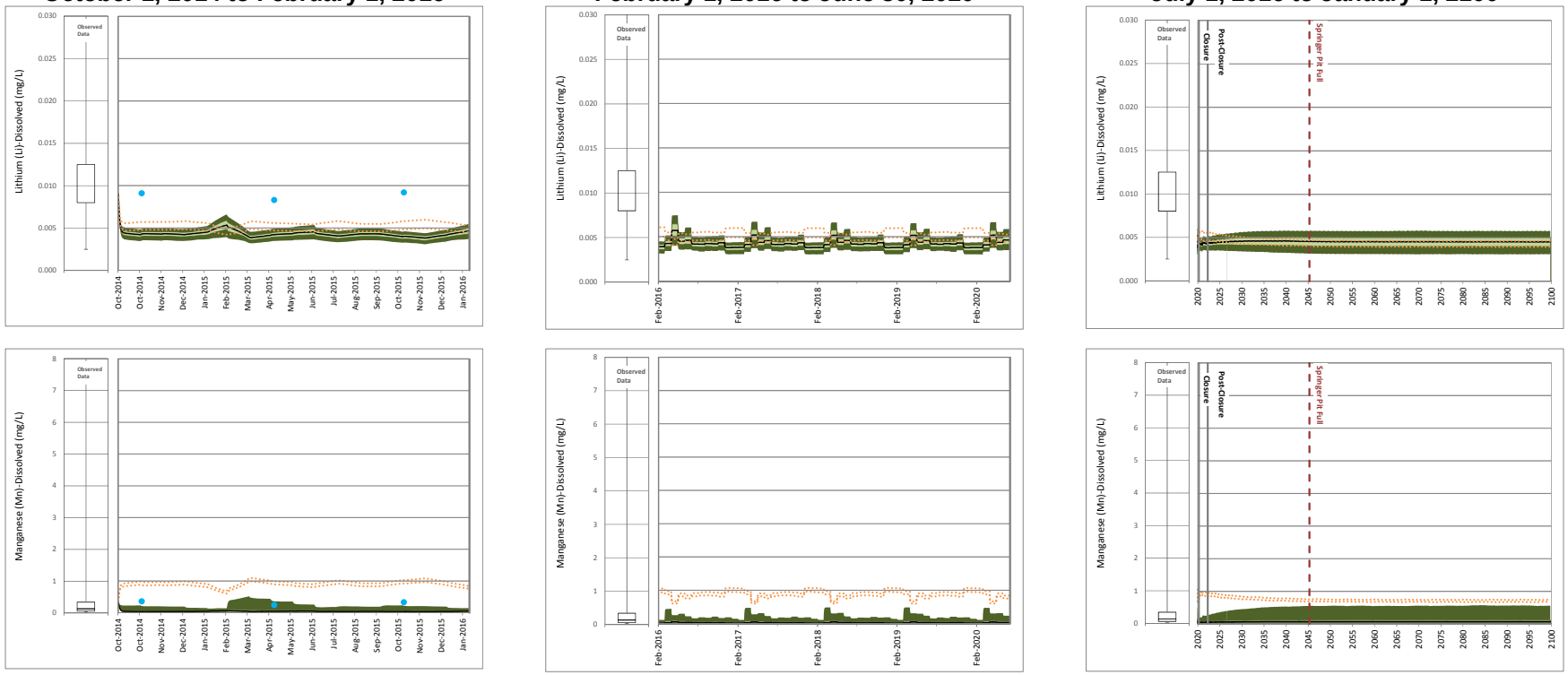
Golder Associates

ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

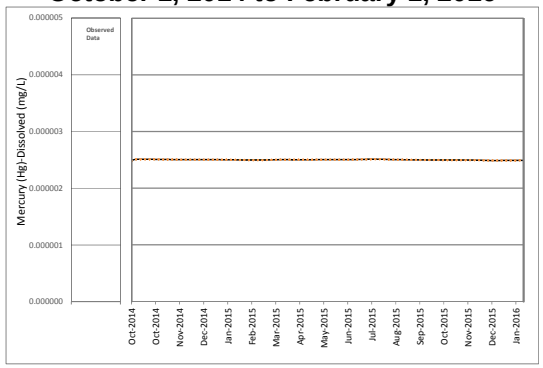
95th Percentile High, 5th Percentile Low

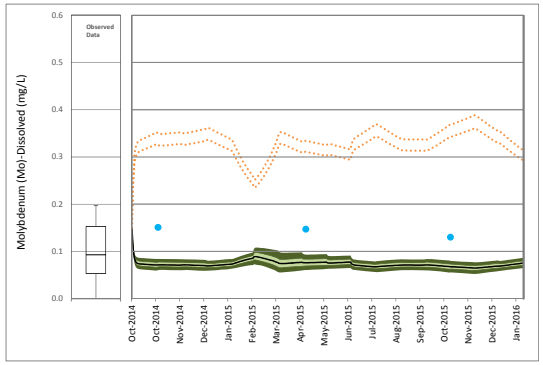
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

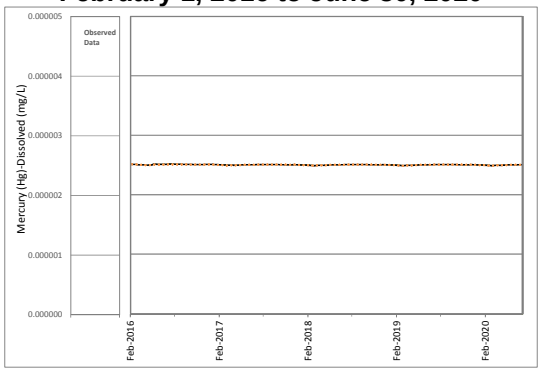
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

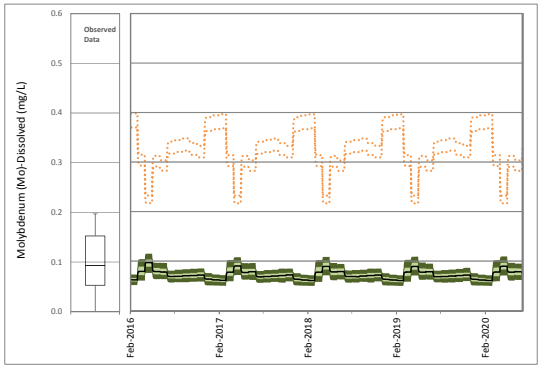
Calibration
October 1, 2014 to February 1, 2016



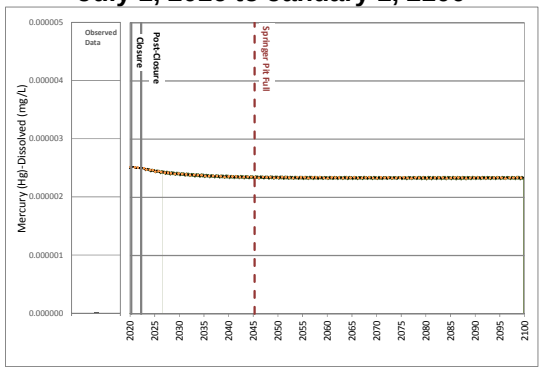


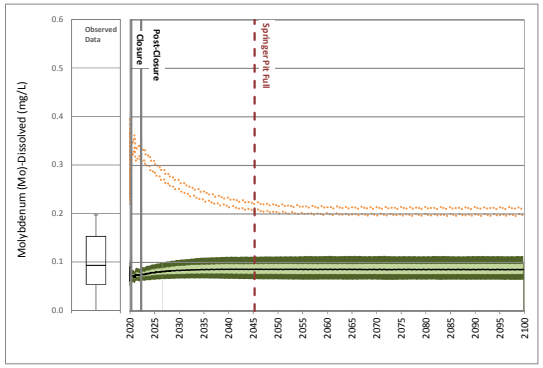
Operations
February 1, 2016 to June 30, 2020



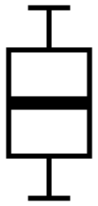


Closure and Post-closure
July 1, 2016 to January 1, 2100





Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

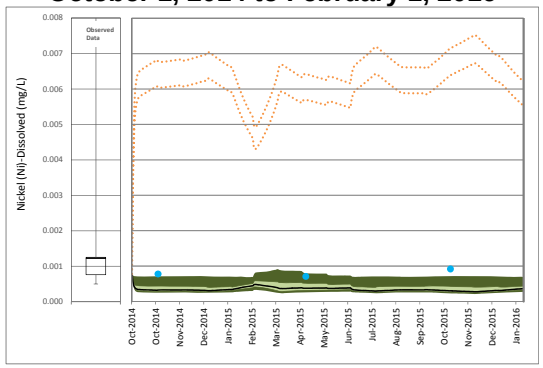
95th Percentile High, 5th Percentile Low

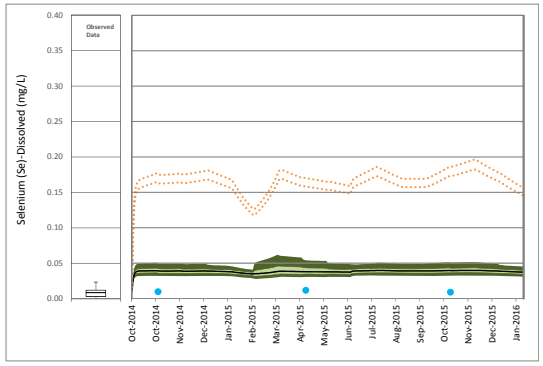
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

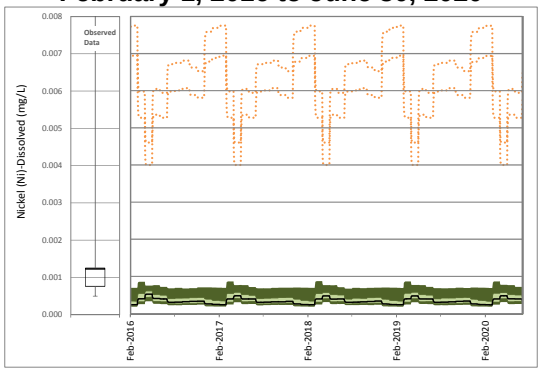
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

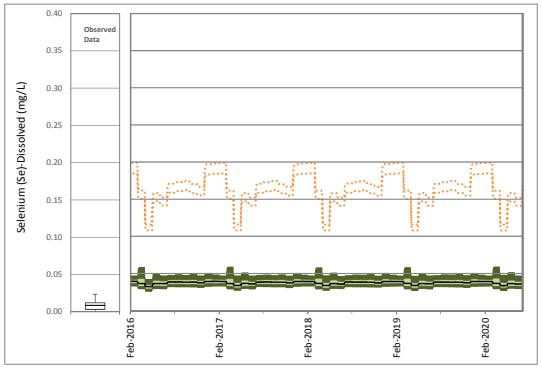
Calibration
October 1, 2014 to February 1, 2016



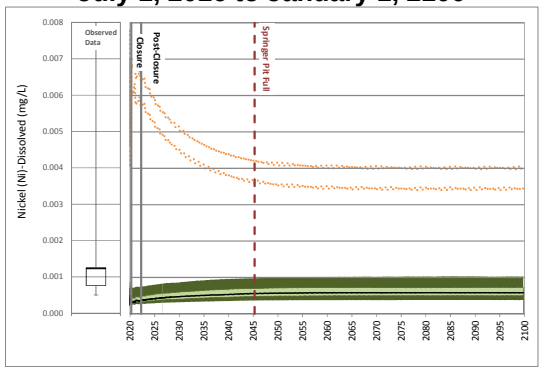


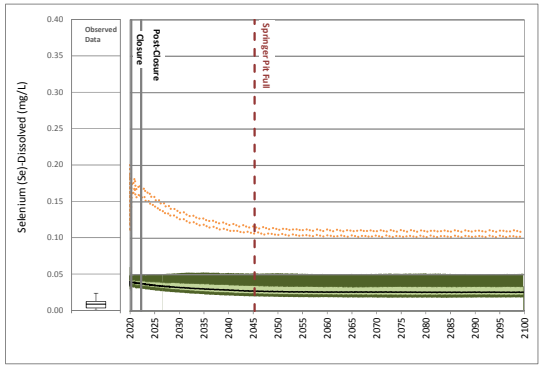
Operations
February 1, 2016 to June 30, 2020



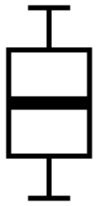


Closure and Post-closure
July 1, 2016 to January 1, 2100



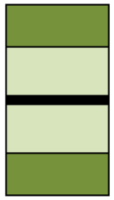


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

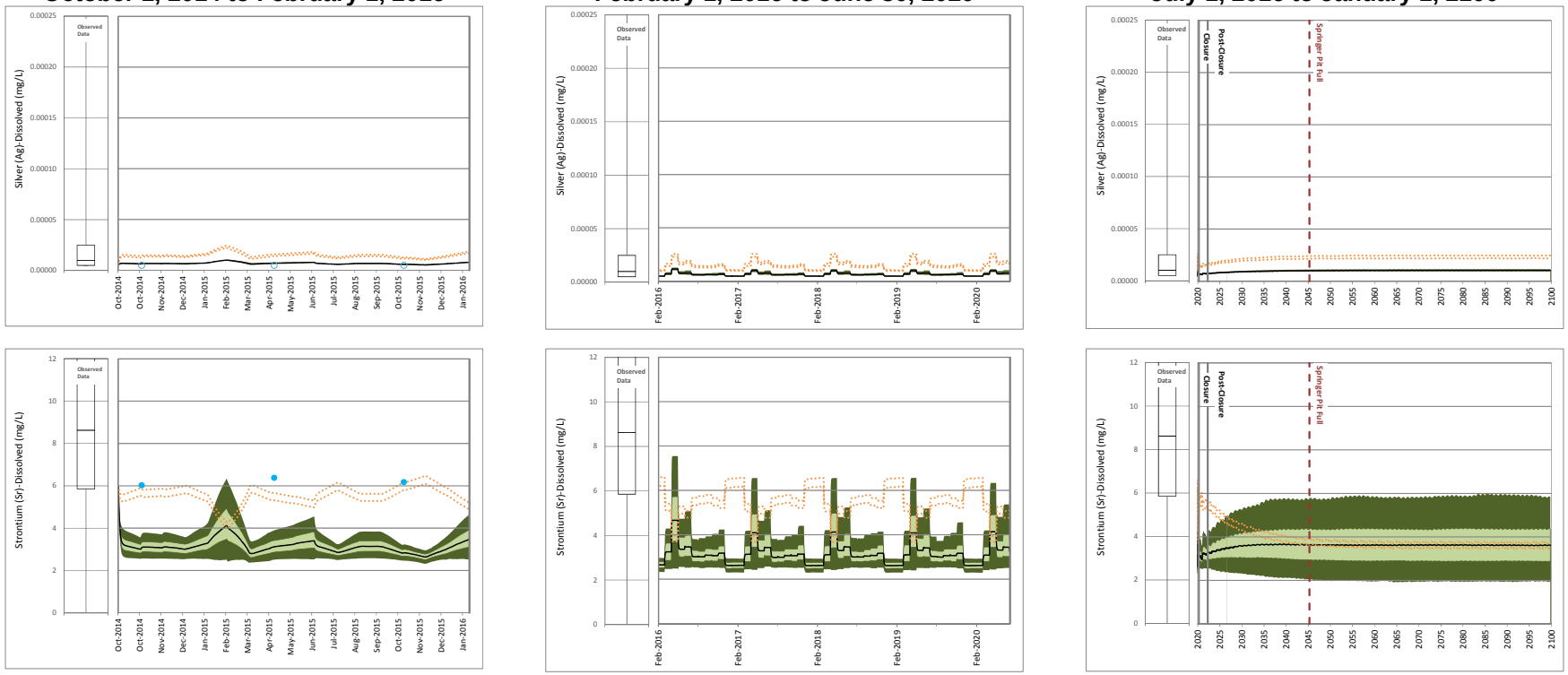
Golder Associates

ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



Site Monitoring Data

Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1

95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

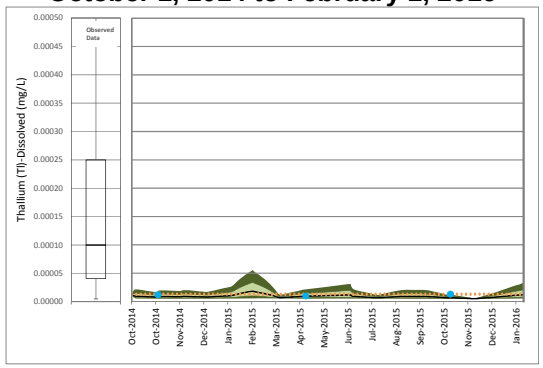
Scenario 2

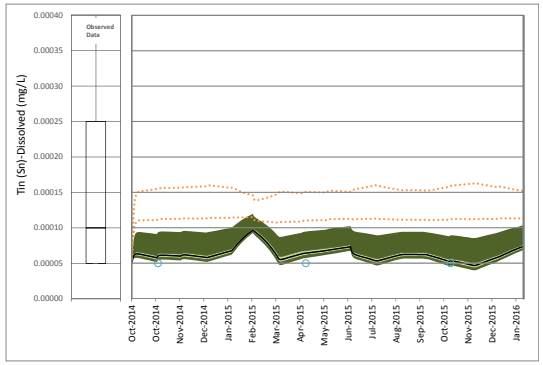
95th Percentile High, 5th Percentile Low

Golder Associates

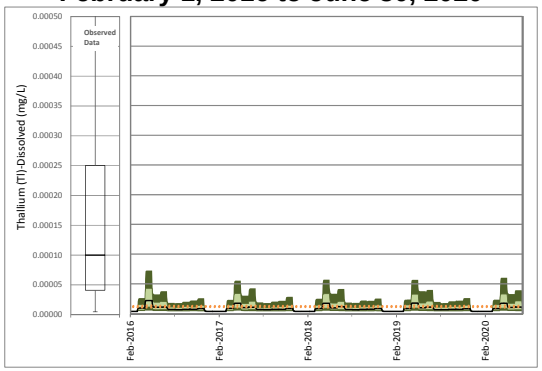
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

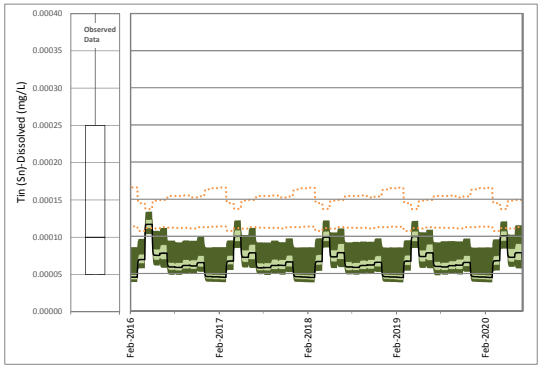
Calibration
October 1, 2014 to February 1, 2016



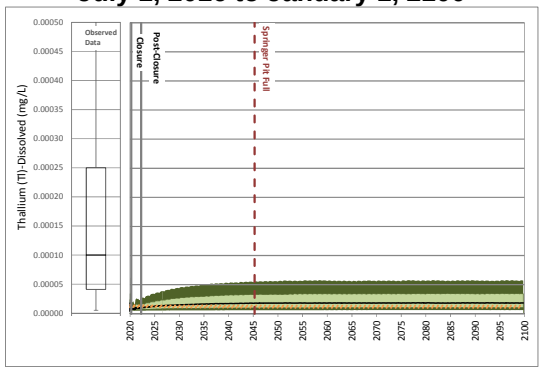


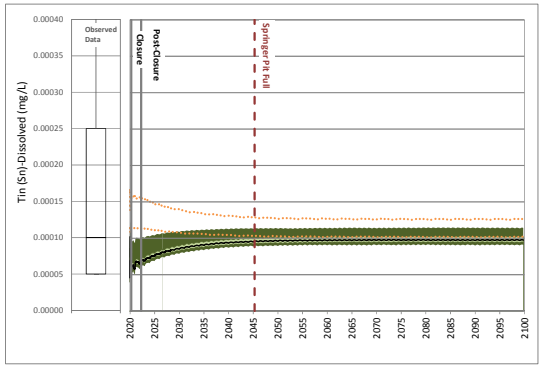
Operations
February 1, 2016 to June 30, 2020



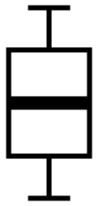


Closure and Post-closure
July 1, 2016 to January 1, 2100



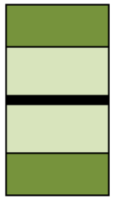


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

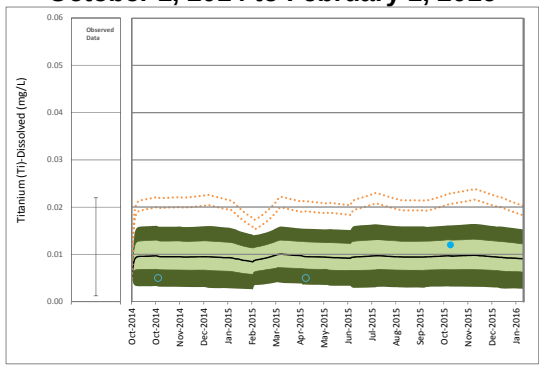
95th Percentile High, 5th Percentile Low

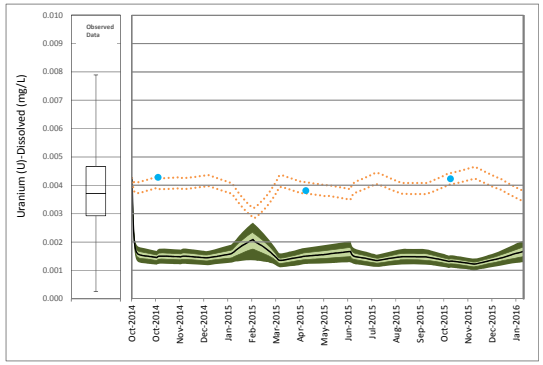
17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

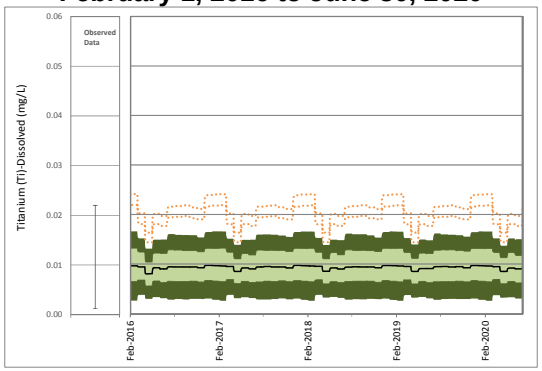
ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

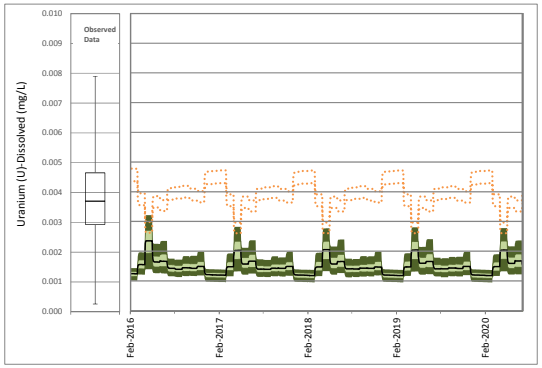
Calibration
October 1, 2014 to February 1, 2016



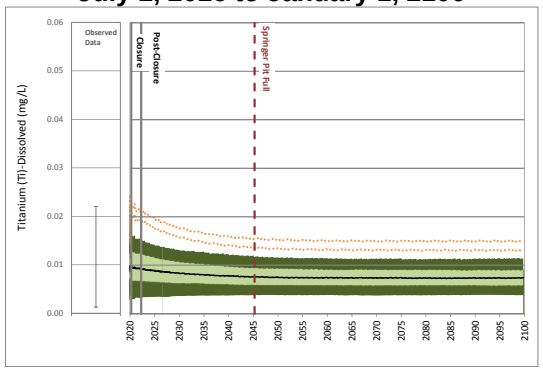


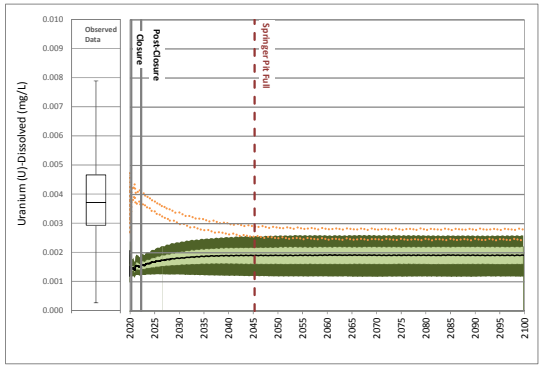
Operations
February 1, 2016 to June 30, 2020



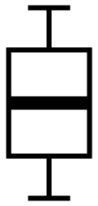


Closure and Post-closure
July 1, 2016 to January 1, 2100



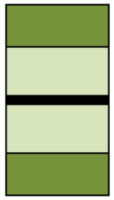


Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

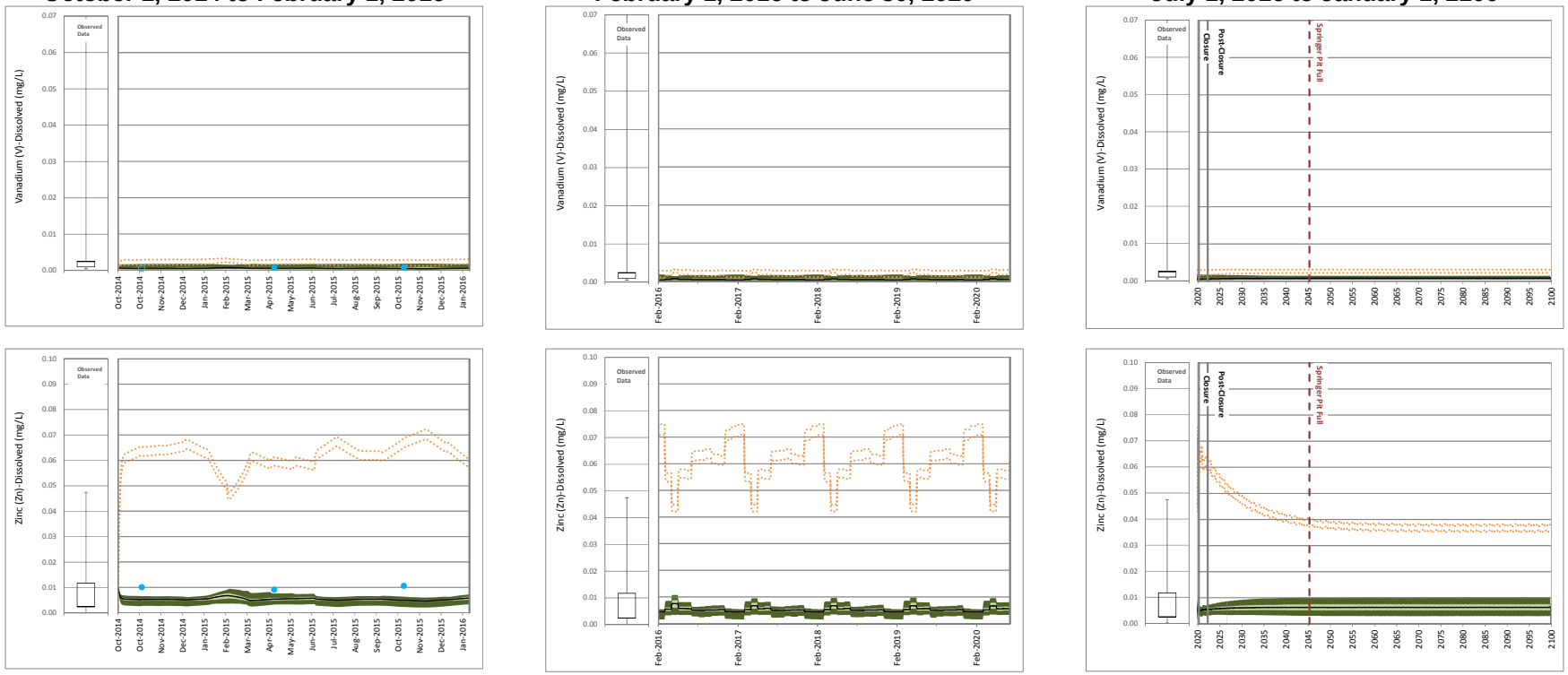
Golder Associates

ATTACHMENT B
Figure B12: Time Series Plots of Predicted Wight Pit Water Quality

Calibration
October 1, 2014 to February 1, 2016

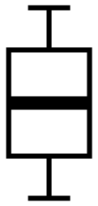
Operations
February 1, 2016 to June 30, 2020

Closure and Post-closure
July 1, 2016 to January 1, 2100



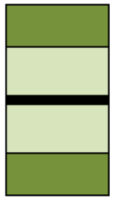
o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\figures\fig12-wightpit.docm

Site Monitoring Data



Maximum
75th Percentile
Median
25th Percentile
Minimum

Scenario 1



95th Percentile
75th Percentile
Median
25th Percentile
5th Percentile

Detected Values
Non- Detected Values

Scenario 2

95th Percentile High, 5th Percentile Low

17 October 2016
Reference No.
1411734-205-R-Rev0-16000

Golder Associates

2.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or comments, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Michael Herrell, MSc, PGeo
Associate, Senior Geochemist

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

MKH/JV/it/kp

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

o:\final\2014\1421\1411734\1411734-205-r-rev0-16000\1411734-205-r-rev0-16000-model results and time series figures 17oct_16.docx

REFERENCE

MPMC (Mount Polley Mining Corporation) 2015. Permit Amendment Application. Mount Polley Mine Return to Full Operations. Prepared for the Ministry of Energy and Mines. November 6, 2015.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates

APPENDIX E

Proposed Water Treatment Plan for Operations Phase Water Management

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-163-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Company

CC Jerry Vandenberg and Michael Herrell

FROM Henlo du Preez, Michael Bratty, Allan Bronsro and Thalita da Silva Sympovsky **EMAIL** Henlo_DuPreez@golder.com; Michael_Bratty@golder.com; Allan_Bronsro@golder.com; Thalita_daSilvaSympovsky@golder.com

PROPOSED WATER TREATMENT PLAN FOR OPERATIONS PHASE WATER MANAGEMENT – MOUNT POLLEY MINE

1.0 INTRODUCTION

The Mount Polley Mine (Mine) is a copper-gold mine owned and operated by Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation. The Mine site is located 56 km northeast of Williams Lake, British Columbia. As authorized by the BC Ministry of Environment (MoE) in the amendment to *Environmental Management Act* (EMA) Permit 11678, the Mine presently treats and discharges Mine contact water in accordance with a short-term water management plan (Golder 2015). Despite this permitted water discharge, there remains surplus volume of Mine contact water in the Springer Pit, and a positive water balance is predicted for the remainder of operations; as a result, there is a need to develop a Long-Term Water Management Plan.

Authorization for discharge of treated effluent as part of the Long-Term Water Management Plan requires an amendment to EMA Permit 11678. To support this amendment, a technical assessment of the effluent discharge is required to identify whether receiving water uses are impaired. That assessment, contained in the Technical Assessment Report (TAR), will be used by the MoE in its permitting decisions and by MPMC in its due diligence to verify that it meets the requirements of the EMA and the Metal Mining Effluent Regulations.

This technical memorandum supports MPMC's TAR by documenting the development of the water treatment plan for excess Mine contact water. The objectives of the memorandum are as follows:

- to define the conceptual influent design basis used to identify and evaluate water treatment requirements; depending on the results from bench test work, which is currently being undertaken, the water treatment plan will optimize existing equipment to meet new treatment targets and constraints for operations
- to describe the performance of the existing water treatment plant (WTP)
- to provide a description of the proposed optimization to the treatment process, including how the optimized process compares to best available technology (BAT)
- to predict the treated effluent quality, based on source water quality and expected treatment performance

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

The first step to analyzing any water treatment process is to establish an influent design basis for the selection and sizing of treatment technology options. The conceptual design basis is discussed in Section 2.0.

2.0 CONCEPTUAL INFLUENT DESIGN BASIS

A conceptual influent design basis was developed to evaluate whether the existing Actiflo® treatment system has the capacity to meet treatment requirements and, if not, to identify candidate technologies and potential treatment options for the stream targeted for treatment. During operations, the site water to be treated comes from two main sources: the water stored in the Springer Pit and the site runoff that collects in the Perimeter Embankment Till Borrow Pond (PETBP). Depending on seasonal fluctuations and operational requirements, the Mine has the ability to convey water from either of these two sources to the Actiflo treatment plant. The projected future behaviour of this feed stream was analyzed using GoldSim models for the following aspects:

- flow rate (Golder 2016a and Section 2.1 below)
- water quality (Golder 2016b and Section 2.2 below)

The GoldSim models were used for stochastic analyses to quantify the site-wide water balance and water quality under different climate scenarios and with variable source water quality.

2.1 Flow to Water Treatment Facilities

Golder Associates Ltd. (Golder) prepared a stochastic site-wide water balance model to predict Mine site discharge during operations (Golder 2016a). During operations, prior to 4 May 2016, Mine contact water from the PETBP was pumped to the existing WTP at a controlled rate. A direct pipeline from the Springer Pit to the WTP was completed on 4 May 2016, to feed the WTP. The Actiflo system has a design flow rate of 0.23 m^3/s (20,000 m^3/d). The existing maximum authorized total discharge rate is 0.3 m^3/s. When feed water already meets EMA Permit 11678 water quality limits, feed water flows exceeding the design flow may be passed through the WTP in a passive treatment mode as determined by online instrumentation whereby reagents are not added and mechanical mixing is not active. However, to cover the range of feed water qualities that do not already meet EMA Permit 11678 limits, a rate of 0.23 m^3/s was selected for the influent WTP design flow.

2.2 Water Quality in Feed to Treatment Facilities

Water quality predictions are based on the site water quality model (Golder 2016b), which uses a stochastic set of inputs to predict feed water quality over the life of the Mine. The 95th percentile predicted feed water quality from Springer Pit and Perimeter Embankment Till Borrow Pond was screened against proposed Quesnel Lake water quality targets as described in the TAR. Based on assessment of the predicted water quality (Table 1), copper and selenium are the only parameters that are predicted to potentially exceed the water quality targets without additional treatment. Copper concentrations have exceeded the existing EMA Permit 11678 water quality limits, and additional treatment is being investigated.

The maximum of the 95th percentile modelled selenium concentration (87 µg/L) was marginally higher than the proposed effluent limit of 75 µg/L (refer to Section 6.3.2, Effluent Permit Limits of TAR). The modelled values, however, are conservative (refer to Appendix D of TAR); concentrations in the current discharge have remained closer to 30 µg/L, and median long-term predictions are also in this range. It is therefore considered possible, but unlikely, that selenium treatment will be required. If operational monitoring data indicate that selenium concentrations in the discharge trend towards the maximum value of the modelled 95th percentile concentration, additional mitigation, such as reducing selenium concentrations prior to discharge using pit lake treatment, would be implemented.

A monitoring program is currently in place to detect trends in water quality parameters. While the 95th percentile predictions provide a conservative design basis, additional treatment capacity may be required, depending on the ability to bypass water that meets the discharge targets in the future.

Table 1: Operations Treatment Screening

Parameter	Units	Proposed Effluent Discharge Limit	Springer Pit	Perimeter Embankment Till Borrow Pond
Total Metals				
Arsenic	mg/L	0.028	0.0033	0.014
Chromium	mg/L	0.004	0.0013	0.002
Copper	mg/L	0.033	**0.048**	**0.049**
Iron	mg/L	1	0.76	0.69
Lead	mg/L	0.00082	0.00024	0.00041
Molybdenum	mg/L	0.36	0.17	0.18
Nickel	mg/L	0.0051	0.002	0.0024
Selenium	mg/L	0.075	**0.087**	**0.079**
Zinc	mg/L	0.059	0.011	0.026

Note:

Maximum 95th percentile predicted concentrations presented for Springer Pit and Perimeter Embankment Till Borrow Pond

Feed water quality values that exceed target values are highlighted in red.

3.0 EXISTING TREATMENT

In this section, the existing water treatment equipment is described and its site performance is evaluated. Subsequent actions that are needed to meet the most recent operational requirements are listed.

3.1 Actiflo Treatment Plant

The existing WTP makes use of a high-rate ballasted flocculation system, patented under the Actiflo name by Veolia Water Solutions & Technologies, which is a coagulation/sedimentation process. As the nascent floc particles agglomerate around the sand particles, they grow larger and heavier and settle rapidly. This enhanced settling allows clarifier designs with high overflow rates, short retention times (typically 8 to 10 minutes), and orders of magnitude smaller footprint than conventional systems (e.g., settling ponds) of similar capacity. The Actiflo process has the advantage of being able to handle wide variations in hydraulics and solids loading rates.

The high-rate ballasted flocculation unit is illustrated in Figure 1. The system includes one injection tank, one maturation tank, a settling tank, a recirculation pump, and a hydrocyclone. A coagulation stage or reaction stage located upstream of the high-rate ballasted flocculation is required. Feed water enters the process in the coagulation/reaction tank. Here, a coagulant is added to destabilize suspended solids and colloidal matter or to react with dissolved metals in the influent stream. After initial mixing, the water passes into the injection tank, where polymer is added as a flocculation aid and microsand is injected to promote floc settling. The sand particles provide “seeding” zones where the floc particles grow in the next process step.

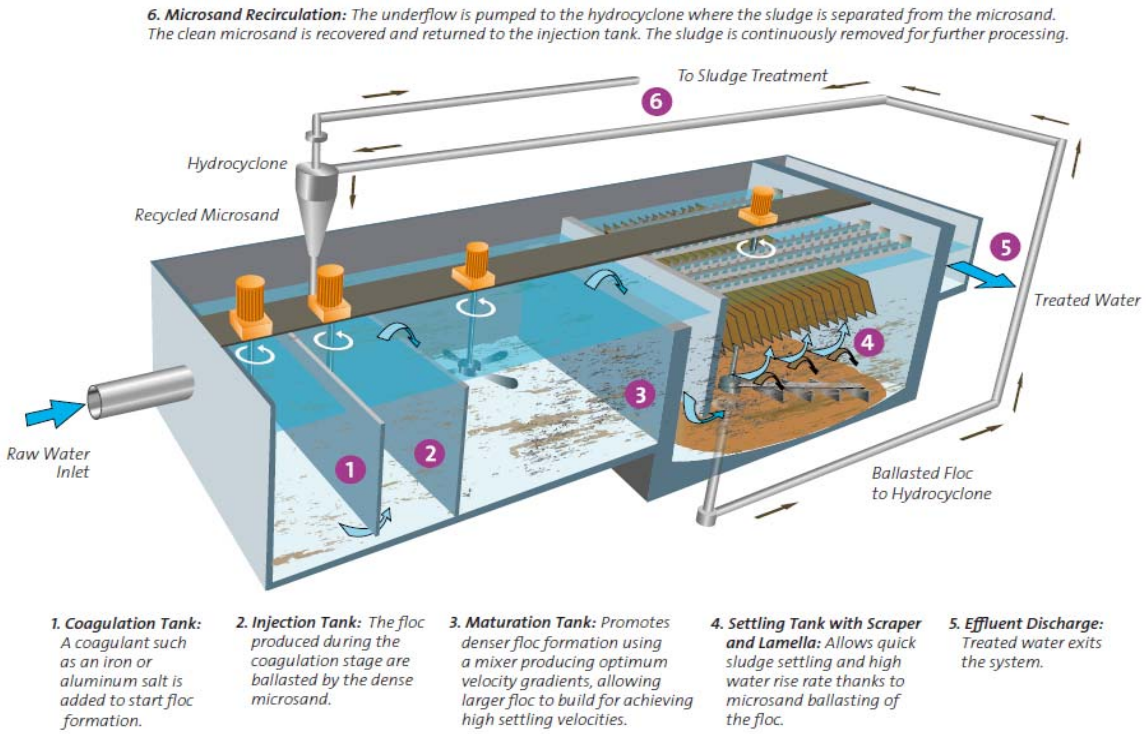


Figure 1: Schematic of the Actiflo Process

Source: Veolia (2016a).

The Actiflo process continues as water passes through an underflow passage from the injection tank into the maturation tank. In this tank, gentler mixing is used to encourage the formation of polymer bridges between the microsand and the suspended solids or metal hydroxides. The large specific surface area of microsand promotes polymer bridging and enmeshment of microsand and floc already in suspension. The fully formed ballasted flocs flow from the maturation tanks to the settling tank. In this tank, laminar conditions through the settling zone provide rapid and effective removal of the microsand/sludge flocs.

Clarified water exits the process via a series of collection troughs. The microsand/sludge flocs are collected at the bottom of the settling tank and pumped to a hydrocyclone for separation. Energy from pumping is converted to centrifugal forces within the body of the hydrocyclone, causing the sludge to separate from the higher density microsand (specific gravity of microsand = 2.65). After separation, the microsand is concentrated and discharged from the bottom of the hydrocyclone for reinjection into the injection tank for reuse. Sand lost from the system is typically less than 2 g/m^3 of treated water. The sludge is discharged from the top of the hydrocyclone because of its lighter density and may flow to a thickening tank or be discharged for final disposal.

Due to the large inventory of microsand in the system, the process can tolerate changing influent total suspended solids (TSS) and turbidity loadings much better than conventional clarifiers can. Settling rates on flocculated microsand are as fast as most conventional chemically assisted gravity settling processes. The process is not sensitive to temperature changes, unlike conventional clarifiers, and can be placed inside a building for freeze protection. Effluent TSS and turbidity levels achieved are consistently low, typically less than 10 mg/L for TSS, and turbidity ranges from 0.2 to 2 nephelometric turbidity units (NTU). The short (10-minute) hydraulic residence time in the clarifier enables the operator to quickly see the effects of process changes made to the system and enables system optimization and adjustments.

Because of the increased settling efficiency of the high-rate ballasted flocculation process, the footprint of this clarification unit is typically 1/20th the footprint compared to that of a conventional clarifier sized to treat the same flow rate. This small footprint makes this process particularly well suited for industrial applications, especially in winter operations.

For more design information of the Actiflo plant (model ACP-650), including an equipment list, hydraulic profile, field installation drawings, bill of materials, estimated chemical consumption, and piping and instrumentation diagrams, refer to Attachment A.

3.2 Performance

Since the commissioning of the Actiflo plant in October 2015 and the start of discharge on 1 December 2015, MPMC has been monitoring its performance. TSS and copper removal in particular has not consistently met design criteria while also meeting the flow design criterion of 0.23 m^3/s. An overview of the plant performance, and strategies employed by MPMC to improve performance, are described in more detail in the sections below.

The improvements in the plant equipment and/or operational procedures are expected to allow the plant to consistently meet the discharge targets and constraints.

3.2.1 Total Suspended Solids Removal

The Actiflo plant is designed to reduce TSS concentrations from a maximum of 2,000 mg/L to below 15 mg/L. A TSS concentration of 1,000 mg/L in the Springer Pit was selected in the short-term technical assessment to define the water quality for the influent design basis. This value was chosen as a conservative basis because it was not known at the time whether tailings being deposited into the Springer Pit would become re-suspended. Analysis of TSS monitoring data for the Springer Pit (Golder 2016c,d) indicates that sufficient sedimentation takes place inside the pit so that the pit water at the location of the barge remains below the TSS discharge limit of 15 mg/L. TSS data from the PETBP (Golder 2016e) as measured at the inflow of the WTP show that the TSS concentration is variable and not consistently below 15 mg/L. Therefore, some TSS removal from the mixture of the Springer Pit and the PETBP water is required when the two sources are mixed.

Operational data show that spikes in the WTP outflow TSS exceeding the 15 mg/L limit have been observed. In general, the performance of the Actiflo system can be improved through equalization of the feed and optimization of reagent doses. An optimization program for the MPMC Actiflo plant is being implemented.

From the time that the Actiflo plant came into operation, the TSS concentration in the feed has varied between approximately 5 and 20 mg/L. For the remainder of operations, there could be a risk of higher TSS concentrations as the water level in the Springer Pit is drawn down, or when treatment is required for water from other sources with elevated TSS concentrations.

MPMC has undertaken the following actions to study and manage the sediment load being discharged:

- a formal post-commissioning audit completed by Veolia (2016b) to optimize the system, maximize plant throughput, explore the possibility of increasing throughput beyond design flow, and provide additional training to MPMC operators
- increased water quality monitoring of the Springer Pit water column, including vertical profiles of water quality, and grab samples at multiple depths for several constituents (Golder 2016d)
- installation of a direct pipeline from the Springer Pit to the WTP in the short term, to minimize sediment contamination prior to treatment during drawdown of the pit
- standardized in-house testing and calibration methods for turbidity and TSS to facilitate process optimization
- analysis of TSS and turbidity data from WTP influent and effluent (Golder 2016e) to demonstrate that average monthly and maximum TSS discharge targets of 15 mg/L and 30 mg/L, respectively, can consistently be achieved

3.2.2 Copper Inflow to Treatment

It is evident from Table 1 that at some times during Mine operations, the maximum 95th percentile total and dissolved copper concentrations are predicted to exceed the target values.

Although total copper concentrations in the treated effluent discharge met the existing effluent permit limit from the commencement of discharge in December 2015 until March 2016, a trend of increasing concentrations was observed that resulted in exceedances being recorded in April 2016 (MPMC 2016). An analysis of site sample results over the same period suggests that site runoff water was the main source of elevated copper related to the these exceedances, which was compounded by freshet conditions when the site runoff flow conveyed through the WTP increased. At that time, Springer Pit copper concentrations remained lower than the discharge concentration.

The operation of the direct pipeline from the Springer Pit to the WTP has reduced copper loading in the feed water, and it will be available until water is drawn down in Springer Pit. The total copper concentration within the Springer Pit is below the EMA Permit 11678 limit, but the concentrations are variable and may not consistently meet EMA Permit 11678 limits in the future (Golder 2016d).

Due to the variability in copper inflow levels, MPMC has initiated bench test work to evaluate copper removal methods using different reagents and dosages to support the optimization of the existing Actiflo water treatment plant. This will provide MPMC with the operational flexibility to have a copper removal strategy in place should it wish to treat water sources with higher copper concentrations, or should the copper concentration in the Springer Pit rise as the water level is drawn down.

4.0 PROCESS OPTIMIZATION

As described in the short-term water management plan (Golder 2015), a BAT assessment was conducted, which led to the installation of an Actiflo treatment plant (described in Section 3.1).

The criteria considered in establishing BAT are contained in Attachment B. In the context of an existing WTP, the BAT analysis is focused on the potential optimization to existing treatment process or equipment to achieve the project objectives during operations for the following reasons:

- suitability, simplicity, and robustness of the existing system for removal of all of the constituents of concern, including copper
- proven ability to meet the objectives, under similar circumstances at other mines in Canada
- economics and reduced environmental footprint of existing infrastructure
- minimizing lead time for implementation

Following the operational phase, other technologies may be considered.

It is proposed to retain the existing Actiflo system for the operations phase. The reasons described in the short-term water management plan (Golder 2015) for selecting an Actiflo system as BAT are still valid, and the predicted additional treatment requirements could be achieved through optimization of the Actiflo system.

Having considered the performance of the current Actiflo system (as described in Section 3.0), it is proposed to optimize the treatment system to promote copper removal.

4.1 Copper Removal Process

MPMC adopted a work plan to outline steps to develop and demonstrate a conceptual plan to optimize the existing water treatment plant. The work will evaluate the use of trimercaptotriazine (TMT) and higher dosages of polyaluminum chloride (PAC) to achieve copper removal to low levels.

TMT is a commercial chelating agent used to precipitate heavy metals such as cadmium, copper, and zinc to form low-solubility metal precipitates. PAC, which is already being used as a coagulant on the existing Actiflo plant, does not require pH correction after dosage, produces less sludge, and performs better in cold water.

MPMC has initiated a work plan to conduct trials in Golder's Vancouver water treatment laboratory, using representative samples collected on site. The chemistry of TMT is simple and robust: TMT is used to sequester copper (and other divalent cations), while coagulant addition produces an aluminum hydroxide precipitate that adsorbs the TMT-metal complex. Depending on the initial concentration, TMT has shown removal rates in excess of 80% for the precipitation of copper. Furthermore, in some cases, low effluent copper levels can be met with coagulant addition alone.

It is expected that the TMT and coagulant process can be carried out in conjunction with the current water treatment process and infrastructure, with minor or no equipment additions, for the removal of fine or colloidal sediments and other metals. The process can be inhibited by competing metals, oxidants, or chelating agents, so the reagent dosages vary with changing feed water quality. The TMT and coagulant reagents are shipped as a liquid and dosed into the head of the existing system using simple metering pumps and automation. A real-time control system, based on flow and inlet turbidity to set the reagent doses, is envisioned. The TMT process does not reduce the hydraulic capacity of the plant.

Golder's engineers have direct design and operations experience with a similar process using similar equipment (Actiflo) at the Minto Mine in the Yukon, where the process met effluent targets.

The by-product of the process is a water treatment sludge, largely made up of aluminum hydroxide. The trace metals are typically stable, and the sludge will be disposed by conventional means, such as in tailings. The planned work will further characterize the sludge and establish suitable disposal methods.

4.2 Treated Water Quality

By optimizing the Actiflo system to include copper removal through TMT and/or increase PAC coagulant dosing, the dissolved copper concentration is expected to be reduced by at least 80%, subject to confirmation by bench test work. While very effective for copper removal, TMT is also effective for removing other base metals and its dosage can be adjusted if required.

The optimized Actiflo system is expected to reduce the concentration of metals in the treated water to below the proposed treated water quality targets provided in Table 1. The Actiflo is not designed to remove selenium, but selenium concentration will be monitored during operations and if needed a treatment solution for selenium removal will be implemented.

5.0 CONCLUSIONS

The following conclusions can be drawn for the work conducted to identify an operations phase treatment strategy for MPMC:

- Based on the site-wide water balance model, a maximum discharge flow rate of 0.6 m^3/s would mitigate the risk of uncontrolled discharge at the 99.5% confidence level. The existing Actiflo system has a design flow rate of 0.23 m^3/s (20,000 m^3/d). The water balance model predicts that an operational treatment rate of 0.23 m^3/s would be sufficient to meet overall discharge requirements, although provisions have been put in place to operate at 0.3 m^3/s in passive mode when feed water quality meets permit limits. A portion of the site-wide flow may pass through the treatment system, in passive mode, if the water quality meets the discharge requirements.
- The projected water quality for the treated discharge stream indicates that additional copper removal may be required, in addition to the current requirement for TSS removal.
- It is unlikely that selenium treatment will be required during operations. Selenium concentration will continue to be monitored and if required, additional mitigation, such as reducing selenium concentrations prior to discharge using pit lake treatment, would be implemented.
- Considering the site requirements, the BAT for the operational phase is determined to be an optimized Actiflo process. Adding TMT and coagulants would be expected to bring the effluent into compliance with the discharge permit, subject to confirmatory bench testing work being undertaken by MPMC.
- The existing equipment may be adapted to use TMT and aluminum coagulants (or aluminum coagulants alone) to reduce the copper concentration to below the target values. The TMT and coagulant processes are robust, and proven at other sites in Canada. The processes are also effective for removal of other base metals, should the need arise.

6.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or requirements, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Henlo du Preez, BEng
Senior Water Treatment Specialist

Michael Bratty, MEng, PEng
Senior Water Treatment Engineer

Allan Bronsro, MCIP, Peng
Associate, Senior Water Resources Engineer

Thalita da Silva Sympovsky, M.Eng., P.Eng.
Environmental/Process Engineer

HDP/MB/AB/cf/ls/pn/kp

Attachments: Study Limitations
Attachment A: Actiflo Unit
Attachment B: BAT Criteria

o:\final\2014\1421\1411734\1411734-163-tm-rev0-16000\1411734-163-tm-rev0-16000-ops treatment plan 17oct_16.docx

REFERENCES

Golder (Golder Associates Ltd.). 2015. Proposed Water Treatment System for Short-Term Water Management. Technical memorandum prepared for MPMC. Golder Doc. No. 1411734-033-TM-Rev0-12000. May 29, 2015.

Golder. 2016a. Water Balance Modelling Report: Mount Polley Mining Corporation. Provided as Appendix B to the Long-Term Technical Assessment Report.

Golder. 2016b. Water Quality Modelling Report: Mount Polley Mining Corporation. Provided as Appendix D to the Long-Term Technical Assessment Report.

Golder. 2016c. Site Conditions Update (#5) – Supplemental Water Management Information. Technical memorandum prepared for MPMC. Golder Doc. No. 1411734-120-TM-Rev0-12000. February 17, 2016.

Golder. 2016d. Springer Pit Water Column Investigation. Technical memorandum prepared for MPMC. Golder Doc. No. 1411734-142-TM-Rev0-12500. June 23, 2016.

Golder. 2016e. Water Treatment Plant Operation Support. Technical memorandum prepared for MPMC. Golder Doc. No. 1411734-141-TM-Rev0-1500. April 18, 2016.

MPMC (Mount Polley Mining Corporation). 2016. Mount Polley Mine Ceases Discharge of Treated Water due to and Exceedance of Permit Limit for Total copper at E304230 (Mount Polley Mine Effluent Discharge Location HAD-03), Stakeholder Notification Memorandum issued by Mount Polley Mining Corporation, April 22, 2016.

Veolia. 2016a. Actiflo: the ultimate clarifier. Available at http://technomaps.veoliawatertechnologies.com/processes/lib/municipal/3318,Brochure_Actiflo_EN_0915.pdf. Accessed June 2, 2016.

Veolia. 2016b. Mount Polley Mine - Audit Report on The Water Treatment Plant. Veolia reference number 5000 281502. February 2016. 24pp.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

ATTACHMENT A
Actiflo Unit

SUMMARY OF ACP-650

NOMENCLATURE/
BILL OF MATERIALS

TITRE/ TITLE	Rev.	DESCRIPTION	PAR/ BY:	APPR:	DATE:	Affaire / Contract	MOUNT POLLEY
SUMMARY OF ACP-650	0	SUBMITTAL FOR INSTALLATION	G.D.W	G.P.	2015-09-02		
	1						
	2					REF. No.	5000281502 Rev. 0
	3						
DESSIN /DWG #	4					Date:	2015-09-02

REV.	ITEM	QTE/QTY. Unit.	QTE/QTY. Total	DESCRIPTION		P&ID I.D./TAG	OBJECT ACCOUNT	SUBSIDIARY	FA/SA/FI SITE	P / N
				ACTIFLO UNIT - ACP-650						
				Application:						
				WasteWater Treatment Plant						
				Number of unit:						
				1 Actiflo (ACP)						
				Manufacturer:						
				Veolia Water						
				Actiflo Model						
				ACP-650						
				Equipement voltage						
				575V						
				ACTIFLO PROCESS						
					NOMINAL FLOW	**MAX. FLOW**				
				Capacity per unit	10,000 m³/d	20,000 m³/d				
				Rise rate	40 m/h	80 m/h				
				Retention time						
				Coagulation tank	2.3 mins	1.15 mins				
				Injection tank	2.3 mins	1.15 mins				
				Maturation tank	6.3 mins	3.15 mins				

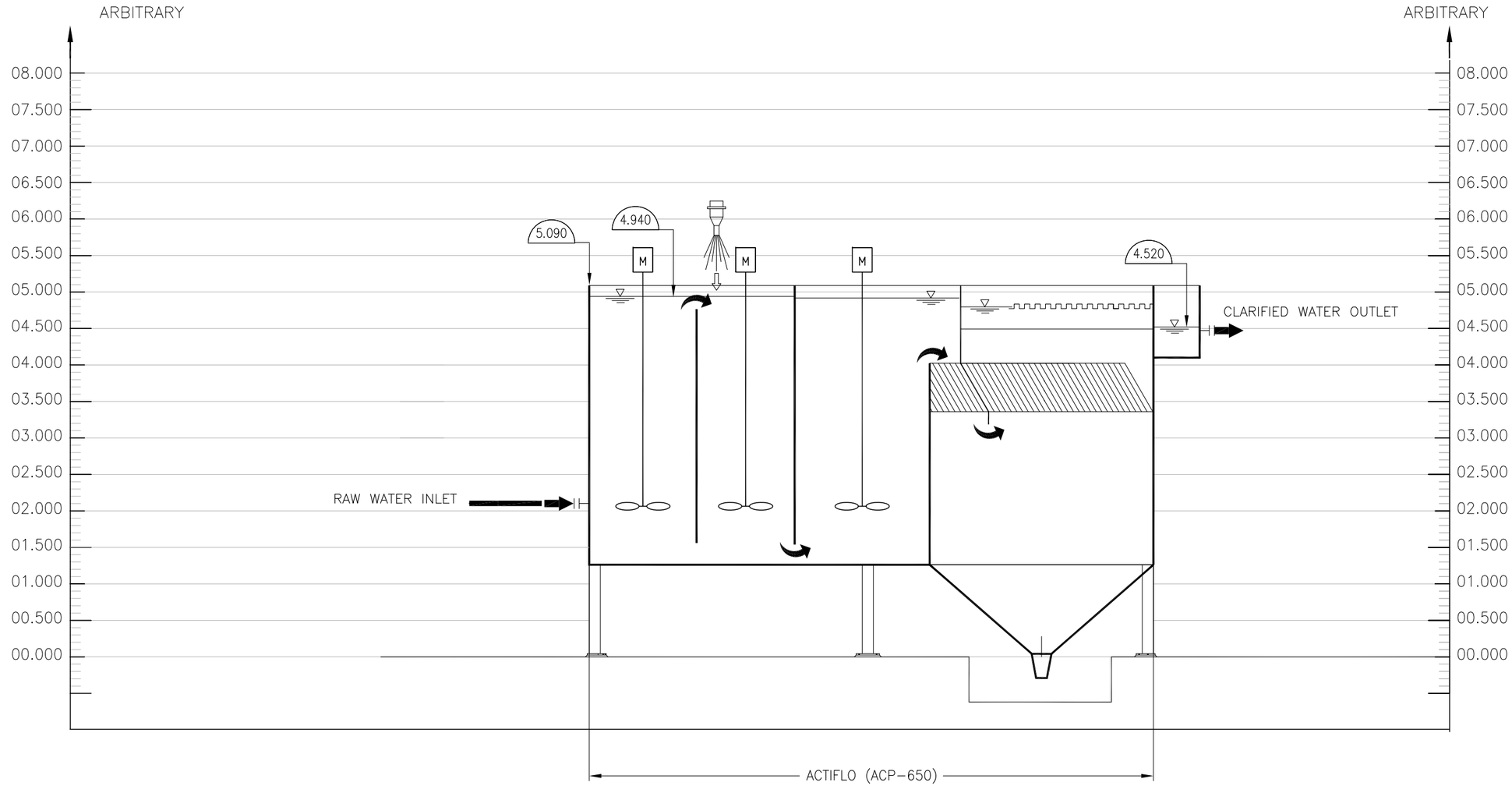
NOMENCLATURE/
BILL OF MATERIALS

TITRE/ TITLE	Rev.	DESCRIPTION	PAR/ BY:	APPR:	DATE:	Affaire / Contract	MOUNT POLLEY
SUMMARY OF ACP-650	0	SUBMITTAL FOR INSTALLATION	G.D.W	G.P.	2015-09-02		
	1						
	2					REF. No.	5000281502 Rev. 0
	3						
DESSIN /DWG #	4					Date:	2015-09-02

REV.	ITEM	QTE/QTY. Unit.	QTE/QTY. Total	DESCRIPTION	P&ID I.D./TAG	OBJECT ACCOUNT	SUBSIDIARY	FA/SA/FI SITE	P / N
				SETTLING TANK					
				Height of lamella pack:					
				610 mm [24"] vertical					
				Type:					
				DH85					
				Angle:					
				60 degrees from horizontal					
				Collection troughs:					
				3 per Actiflo unit					
				RECIRCULATION SYSTEM					
				Quantity of complete recirculation line:					
				2 per Actiflo unit Note: each recirculation line has one hydrocyclone and one pump					
				Recirculation rate @ Max. flow:					
				One (1) pump running with 75 m^3/h (9% recirculation)					
				Two (2) pump running with 150 m^3/h (18% recirculation)					
				Sludge production flow @ Max. flow:					
				60 m^3/h @ one pump running					

End of the list

HYDRAULIC PROFILE



DESIGN FLOW:

Qmax = 20 000 m³/d

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
1	FOR INSTALLATION	2015-08-13	SID	G.D.W	G.P.	N/A

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER SOLUTIONS & TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO VWS AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE, THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF VWS AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF VWS. VWS ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF VWS. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

DESIGNER	SID
DATE	2015-06-29
CHECKER	G.D.W.
DATE	2016-06-29
ENGINEER	G.P.
DATE	2016-06-29
SCALE:	1:50

TITLE: TENDER AQUAMOVE
HYDRAULIC PROFILE

CLIENT: MT. POLLEY MINE

VEOLIA WATER solutions & technologies
John Meunier
4105 Sartelon Street,
Saint-Laurent, Qc, Canada H4S 2B3
Tel: (514) 334-7230 / Fax: (514) 334-5070

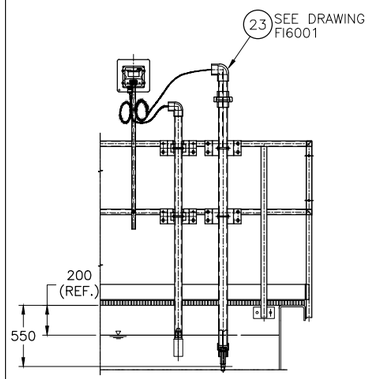
PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502 – HY001			1 OF 1	2

STD: "D" 22x34 | REF: | BAR = 1" AT PLOT SCALE

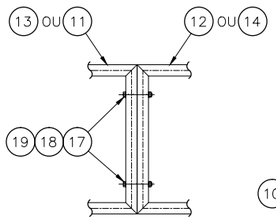
Sep 03, 2015 17:00:14 – \\CASTL11FS\Projets\2015\5000281502 – Mount Polley (ST98793)\15– Dessins execution_Drawings\7– HY\5000281502-HY001_1.dwg – wenguodo

FIELD INSTALLATION DRAWINGS & BOM

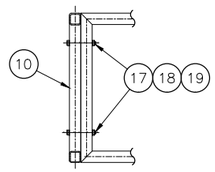
NOTES:
1- FOR BILL OF MATERIAL, SEE 5000281502-FI100.xls
2- PIPING SUPPORTS NOT SHOWN ARE BY OTHERS



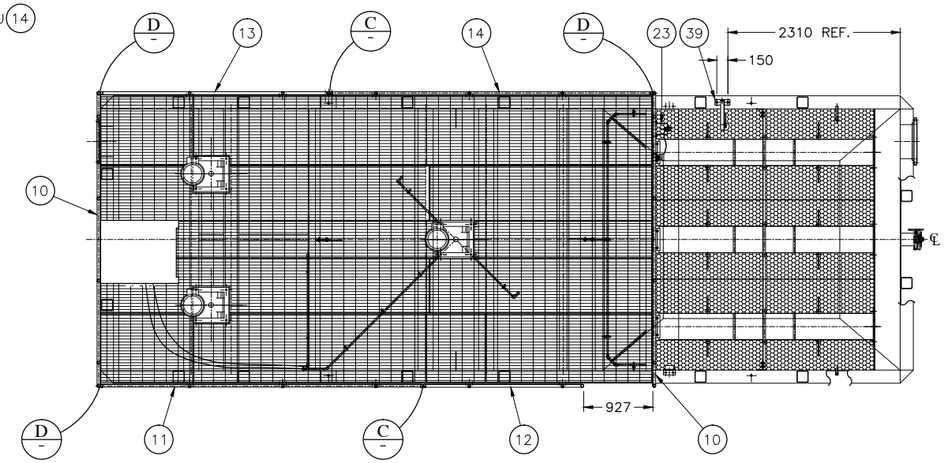
DETAIL E
SCALE: 1:20



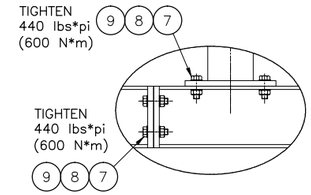
DETAIL C
SCALE: 1:10



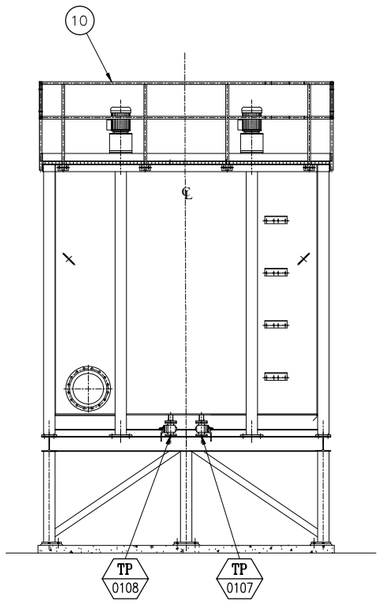
DETAIL D
SCALE: 1:10



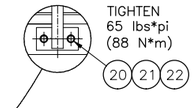
PLAN VIEW

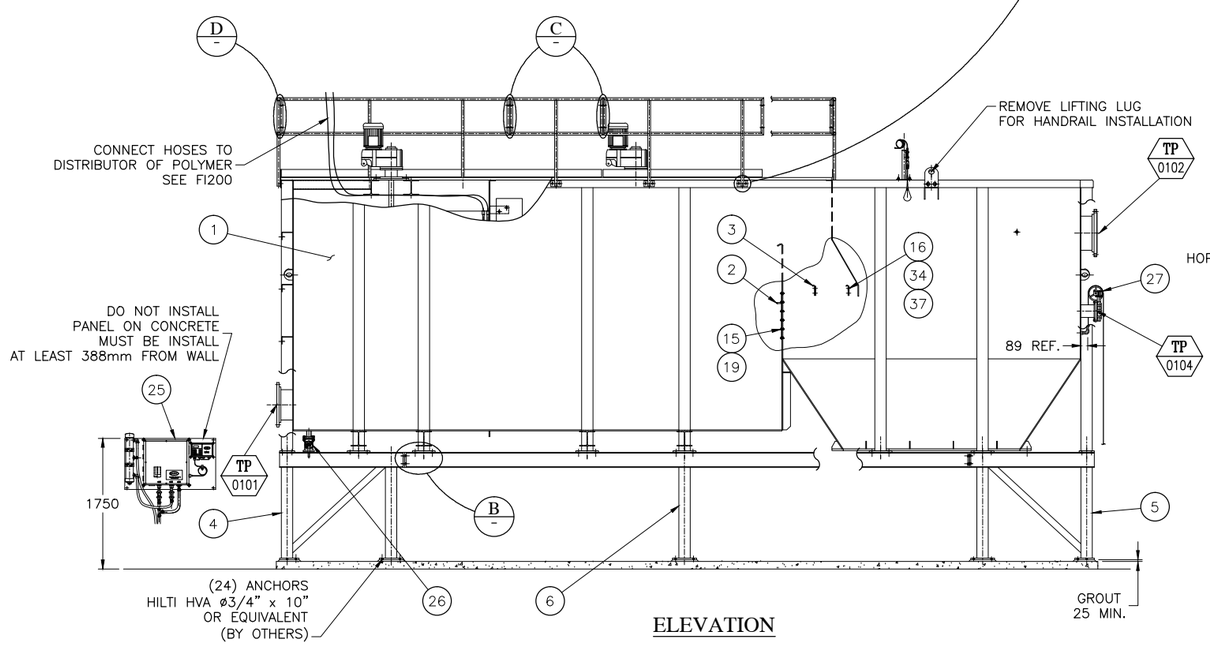


DETAIL B
SCALE: 1:10

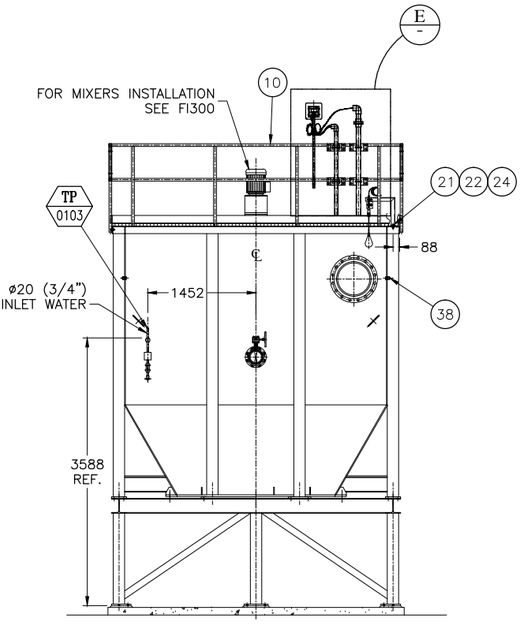


LEFT SIDE VIEW





ELEVATION



RIGHT SIDE VIEW

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
1	FOR INSTALLATION	2015-08-14	Y.R.	S.M.	G.P.	N/A

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE. THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE BY THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

DESIGNER	Y.R.
DATE	2015-08-13
CHECKER	S.M.
DATE	2015-08-13
ENGINEER	G.P.
DATE	2015-08-13
SCALE:	1:40

TITLE: ACTIFLO ACP-650
ACTIFLO TANK ASSEMBLY
FIELD INSTALLATION

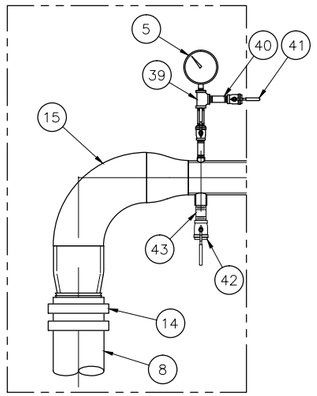
CLIENT: MOUNT POLLEY

VEOLIA
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada. Tel: (514) 334-7230

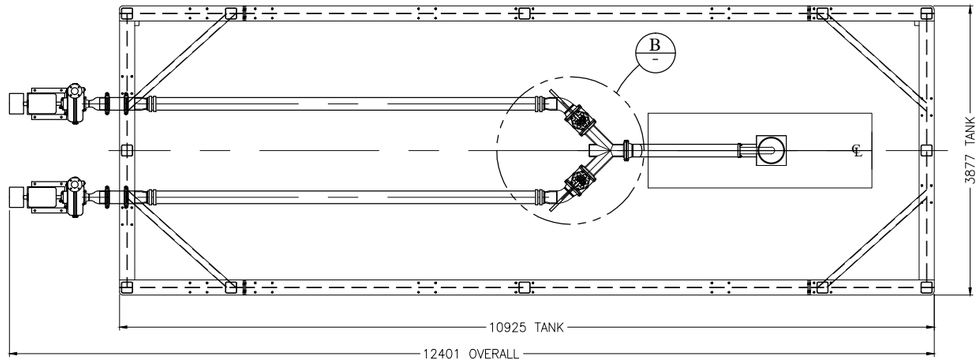
PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502 - FI100		ACP650	1 OF 1	1

STD: "D" 22x34 | REF: 2003_X-308 | BAR = 1" AT PLOT SCALE

Sep 03, 2015 8:26:24 - W:\2015\5000281502 - Mount Polley (ST98793)\15- Dessins execution_Drawings\5- FI\5000281502-FI100ACP650_1.dwg - iddirsma

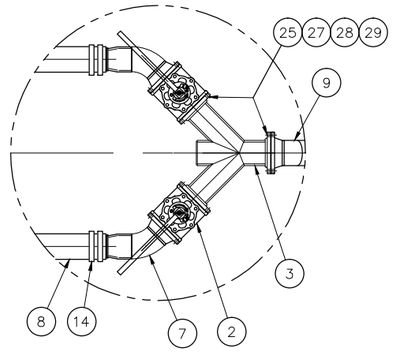


DETAIL D
SCALE: 1:10

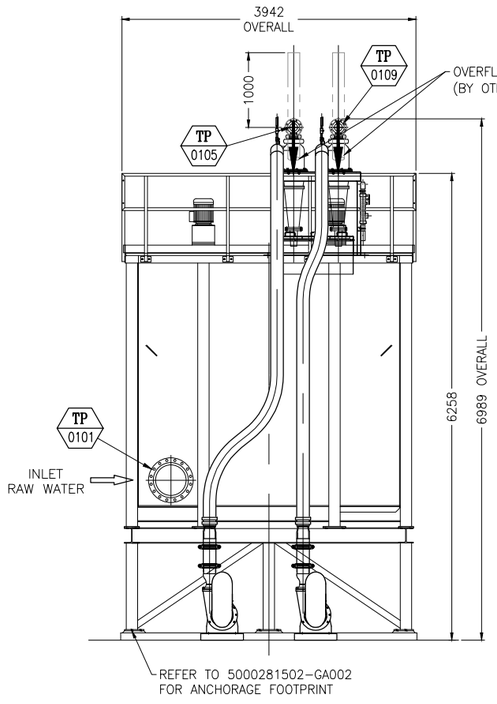


SECTION A-A

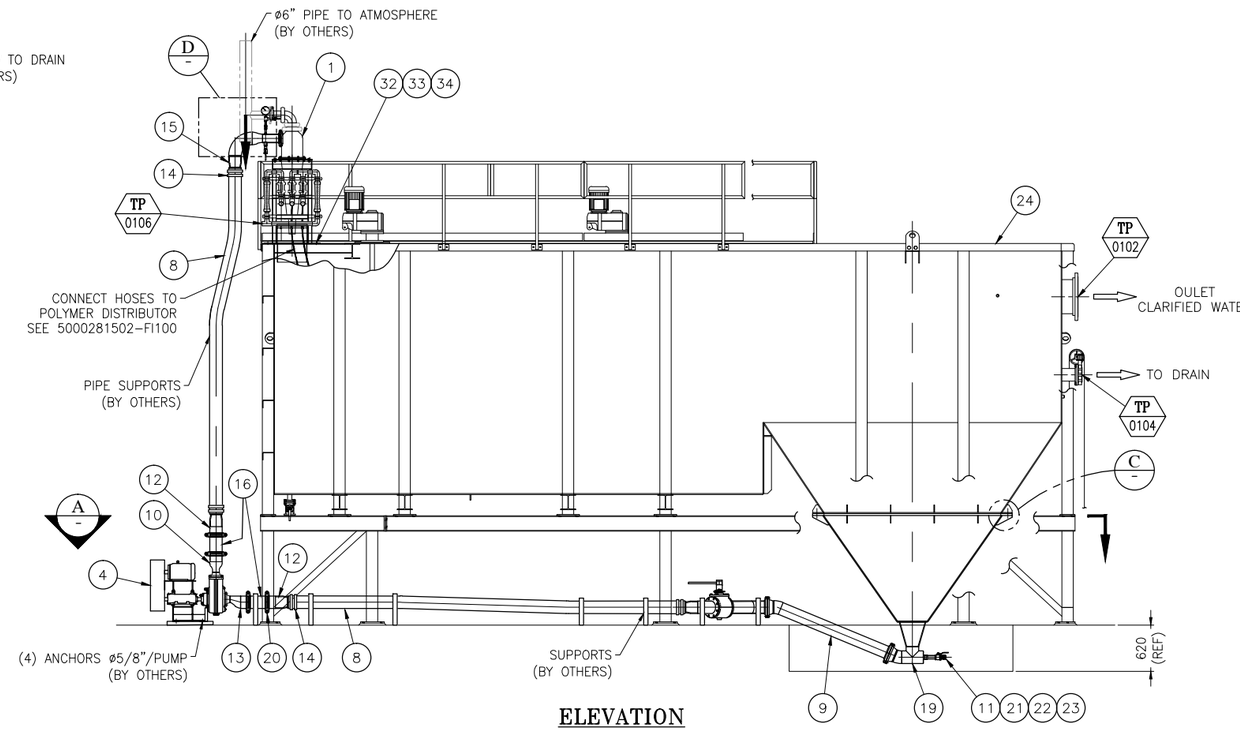
NOTES:
1 –FOR BILL OF MATERIAL:
SEE 50002811502–FI200.xls
2 –PIPING SUPPORTS NOT SHOWN ARE BY OTHERS



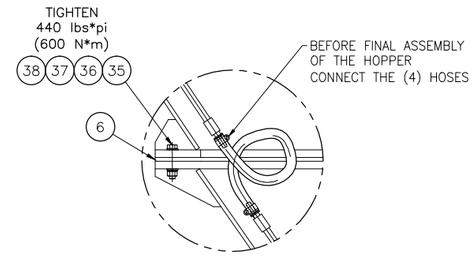
DETAIL B
SCALE: 1:20



LEFT SIDE VIEW



ELEVATION



DETAIL C
SCALE: 1:10

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
1	FOR INSTALLATION	2015–08–14	Y.R.	G.D.W	G.P.	N/A

STD: "D" 22x34 | REF: 2003_X–308 | BAR = 1" AT PLOT SCALE

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE. THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

	DATE
DESIGNER Y.R.	2015–08–13
CHECKER G.D.W	2015–08–13
ENGINEER G.P.	2015–08–13
SCALE:	1:40

TITLE: ACTIFLO ACP–650
RECIRCULATION LINE
FIELD INSTALLATION

CLIENT: MOUNT POLLEY

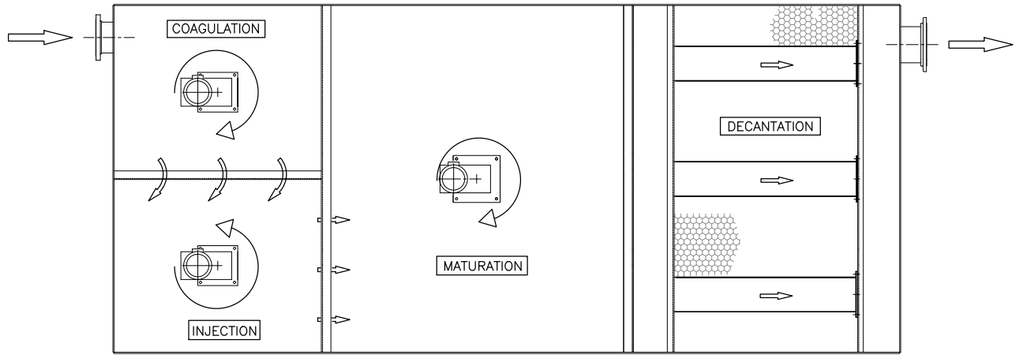
VEOLIA

VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc. Canada. Tél: (514) 334-7230

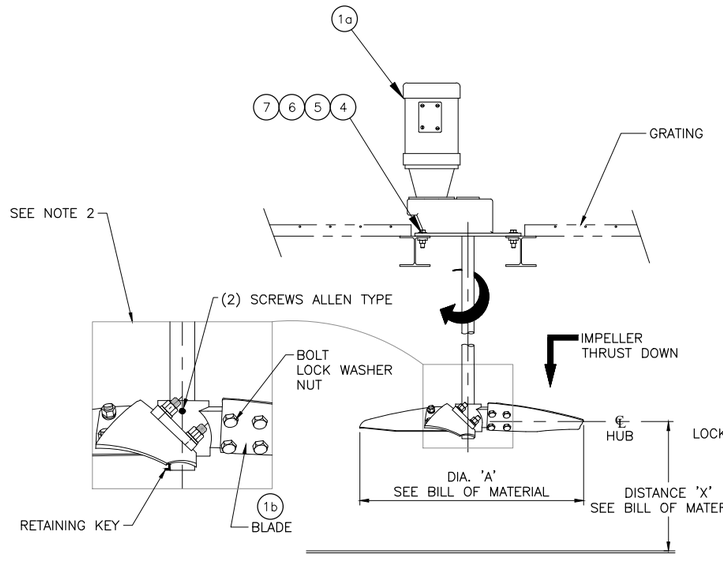
PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502 – FI200		ACP650	1 OF 1	1

Sep 03, 2015 8:26:56 – W:\2015\5000281502 – Mount Polley (ST98793)\15– Dessins execution_Drawings\5– FI\5000281502–FI200ACP650_1.dwg – iddframa

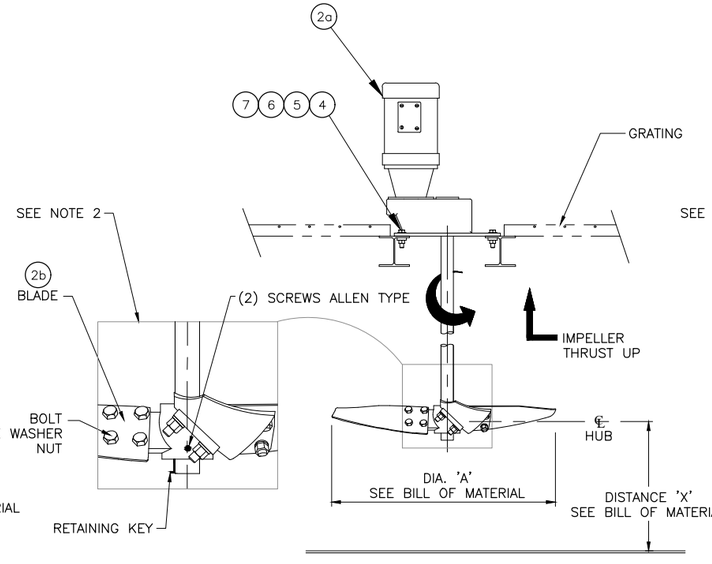
NOTES:
1- FOR BILL OF MATERIAL, SEE 5000281502-FI300.xls
2- HUB AND BLADES COULD BE SHIPPED LOOSE IF BLADE DIAMETER IS TO LARGE



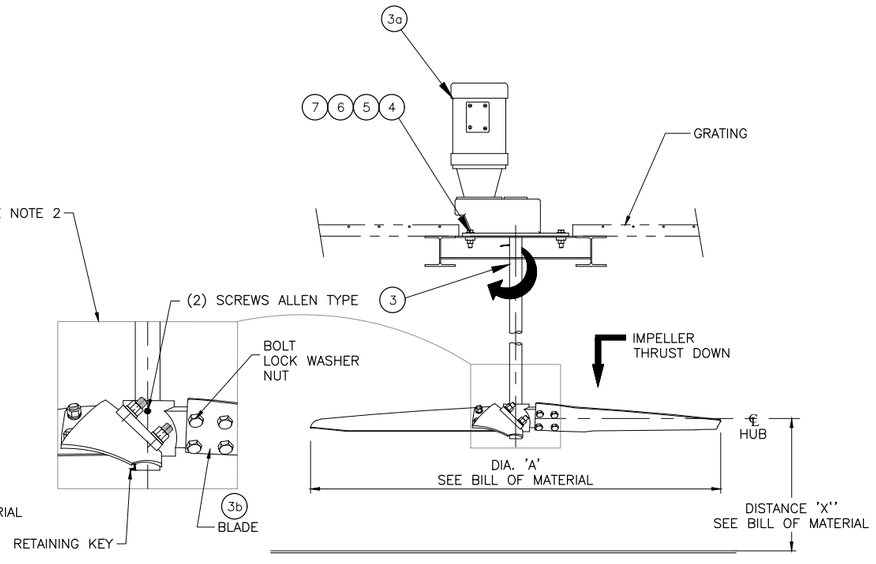
PLAN VIEW



COAGULATION TANK



INJECTION TANK



MATURATION TANK

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
1	FOR INSTALLATION	2015-08-14	Y.R.	S.M.	G.P.	N/A

STD: "D" 22x34 | REF: 2003_X-308 | BAR = 1" AT PLOT SCALE

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE, THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE BY THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

	DATE
DESIGNER Y.R.	2015-08-13
CHECKER S.M.	2015-08-13
ENGINEER G.P.	2015-08-13
SCALE:	1:40

TITLE: ACTIFLO ACP-650 MIXERS ASSEMBLY FIELD INSTALLATION

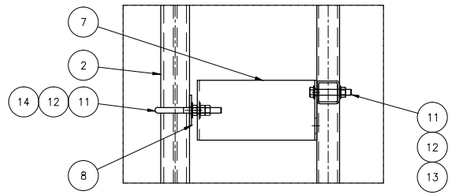
CLIENT: MOUNT POLLEY

VEOLIA

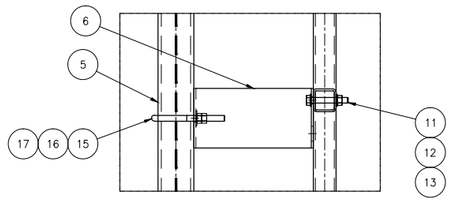
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada. Tel: (514) 334-7230

PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502 - FI300		ACP650	1 OF 1	1

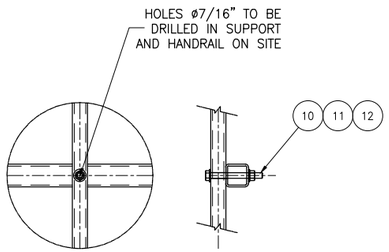
Sep 03, 2015 8:27:27 - W:\2015\5000281502 - Mount Polley (ST98793)\15- Dessins execution_Drawings\5- FI\5000281502-FI300ACP650_1.dwg - iddirsma



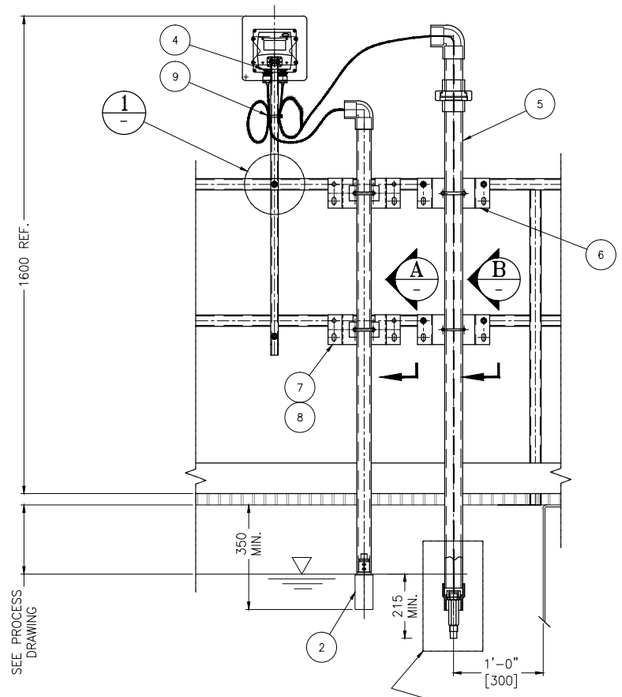
SECTION A
SCALE: 1:5

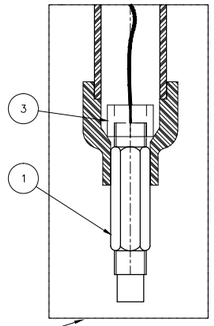


SECTION B
SCALE: 1:5



DETAIL 1
SCALE: 1:5





PROTECTIVE CAP ON PROBE SHALL BE MAINTAINED UNTIL STARTUP

ELEVATION

NOTES:

1– FOR PARTS LIST SEE BILL OF MATERIAL: 5000281502–FI6001.

2– FOR INSTALLATION POSITION SEE: 50002815021–FI100.

3– FOR INSTALLATION DETAILS SEE ALSO MANUFACTURER'S INSTRUCTIONS INCLUDED IN O&M MANUAL.

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
1	FOR INSTALLATION	2015–08–20	F.C.	G.D.W.	G.P.	N/A

STD: "D" 22x34 | REF: | BAR = 1" AT PLOT SCALE

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER SOLUTIONS & TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO VWS AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE. THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLIOT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF VWS AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF VWS. VWS ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF VWS. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

DESIGNER	DATE	
O.F.	2006–04–11	
CHECKER	DATE	
C.T.	2006–04–12	
ENGINEER	DATE	
–	–	
SCALE:	1:10	

TITLE: pH PROBE MODEL "DPD1R1", TURBIDIMETER MODEL "SOLITAX" AND TRANSMITTER SC200, FIELD INSTALLATION ON HANDRAILS

CLIENT: MOUNT POLLEY

VEOLIA Water Solutions & Technologies CANADA Inc.
4105 Sartelon Street,
Saint–Laurent, Qc, Canada H4S 2B3
Tel: (514) 334–7230 / Fax: (514) 334–5070

PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502 – FI6001		CTR2100	1 OF 1	1

Sep 03, 2015 8:27:57 – W:\2015\50002815O2 – Mount Polley (ST98793)\15– Dessins execution_Drawings\5– FI\50002815O2–FI6001CTR2100_1.dwg – iddfresno

VEOLIA

NOMENCLATURE/ BILL OF MATERIALS

TITRE/ TITLE	Rev.	DESCRIPTION	DATE	Rev	Ver/chk	Appr.	Affaire / Contract	MOUNT POLLEY
ACP-650 TANK ASSEMBLY	0							
	1	FOR INSTALLATION	2015-08-13	1	GP	PSM		
	2						REF. No.	5000281502 Rev. 1
	3							
DESSIN /DWG # FI-100	4						Date:	2015-08-13

REV.	ITEM		QTE/QTY. Unit.	QTE/QTY. Total	DESCRIPTION	INV. /Plan Ref. Drawing	P&ID I.D./TAG	Commentaires / Comments
	5000281502-FI100-	1	1	1	ACP-650 TANK	STOCK		
	5000281502-FI100-	2	1	1	ACCESS DOOR	FA104		
	5000281502-FI100-	3	2	2	LAMELLA SUPPORT	FA116		
	5000281502-FI100-	4	1	1	BASE#1 (LEFT HAND), 725 kg (1595 lbs)	STOCK		
	5000281502-FI100-	5	1	1	BASE#2 (RIGHT HAND), 725 kg (1595 lbs)	STOCK		
	5000281502-FI100-	6	2	2	BASE#3, 450 kg (990 lbs)/UNIT	STOCK		
	5000281502-FI100-	7	80	80	BOLT HEX. 3/4"-UNC x 3" LG., GRADE 8, ZINC	FXSC_____		
	5000281502-FI100-	8	80	80	NUT HEX. 3/4"-UNC, GRADE 8, ZINC	FXNU_____		
	5000281502-FI100-	9	160	160	FLAT WASHER 3/4" NOM., GRADE 8, ZINC	FXWA_____		
	5000281502-FI100-	10	2	2	HANDRAILS, 66 kg (146 lbs)/UNIT	STOCK		
	5000281502-FI100-	11	1	1	HANDRAILS, 73 kg (161 lbs)	STOCK		
	5000281502-FI100-	12	1	1	HANDRAILS, 40,5 kg (89 lbs)	STOCK		
	5000281502-FI100-	13	1	1	HANDRAILS, 52 kg (114 lbs)	STOCK		
	5000281502-FI100-	14	1	1	HANDRAILS, 73 kg (161 lbs)	STOCK		
	5000281502-FI100-	15	22	22	HEX. BOLT HD 3/8"-16 UNC x 1 1/2", 304	FXSCYS200376		
	5000281502-FI100-	16	8	8	HEX. BOLT HD 5/8"-11 UNC x 2", 304	FXSCYY200493		
	5000281502-FI100-	17	10	10	BOLT 3/8"-UNC x 3-1/2" LG., SS 304	FXSCYS200385		
	5000281502-FI100-	18	18	18	NUT HEX. 3/8"-UNC, SS 304	FXNUYS200206		
	5000281502-FI100-	19	58	58	FLAT WASHER 3/8" NOM., SS 304	FXWAYS200666		
	5000281502-FI100-	20	36	36	BOLT HEX. 1/2"-UNC x 1-1/2" LG., SS 304, ASTM F593C	FXSCYV200426		
	5000281502-FI100-	21	38	38	NUT HEX. 1/2"-UNC, SS 304, ASTM F594C	FXNUYV200213		
	5000281502-FI100-	22	76	76	FLAT WASHER 1/2" NOM., SS 304	FXWAYV200670		
	5000281502-FI100-	23	1	1	TRANSMITTER AND TURBIDITY SENSOR/ PH SENSOR	FI6001		
	5000281502-FI100-	24	2	2	HEX. HEAD SCREW Ø1/2"-13UNC x 1 3/4" (304)	FXSCYV200428		
	5000281502-FI100-	25	1	1	RAW WATER TURBIDIMETER PANEL	STOCK		
	5000281502-FI100-	26	2	2	PLUG VALVE ø50	STOCK		
	5000281502-FI100-	27	1	1	BUTTERFLY VALVE ø150	STOCK		
	5000281502-FI100-	28			NOT USED	_		
	5000281502-FI100-	29			NOT USED	_		
	5000281502-FI100-	30			NOT USED	_		
	5000281502-FI100-	31			NOT USED	_		
	5000281502-FI100-	32	LOT	LOT	MICROSAND	ST-011		
	5000281502-FI100-	33	1	1	CONTROL PANEL (NOT SHOWN ON DRAWING)	AUTOMATION		
	5000281502-FI100-	34	8	8	HEX. NUT 5/8"-11 UNC, 304	FXNUYY200221		
	5000281502-FI100-	35			NOT USED	_		
	5000281502-FI100-	36			NOT USED	_		
	5000281502-FI100-	37	16	16	FLAT WASHER 5/8", 304	FXWAYY200674		
	5000281502-FI100-	38	1	1	PLUG Ø3/4" MNPT, #150 (304)	FPPLSS302202		
	5000281502-FI100-	39	1	1	LEVEL SWITCH	SA6001		

Fin de la liste / End of list

VEOLIA

NOMENCLATURE/ BILL OF MATERIALS

TITRE/ TITLE	Rev.	DESCRIPTION	DATE	Rev	Ver/chk	Appr.	Affaire / Contract	MOUNT POLLEY
ACP-650 RECIRCULATION LINE	0							
	1	FOR INSTALLATION	2015-08-13	1	G.D.W.	G.P.		
	2						REF. No.	5000281502 Rev. 1
	3							
DESSIN /DWG # FI-200	4						Date:	2015-08-13

REV.	ITEM		QTE/QTY. Unit.	QTE/QTY. Total	DESCRIPTION	INV. /Plan Ref. Drawing	P&ID I.D./TAG	Commentaires / Comments
	5000281502-FI-200	1	1	1	HYDROCYCLONES	SA-500		
	5000281502-FI-200	2	2	2	PLUG VALVE ø6", 304	ST-999-003		
	5000281502-FI-200	3	1	1	RECIRCULATION "Y" PIPE ø6"	FA102		
	5000281502-FI-200	4	2	2	RECIRCULATION PUMP	ST-999-001		
	5000281502-FI-200	5	2	2	PRESSURE GAUGE 0-60 PSI ASHCROFT	5IMPSGG300401		
	5000281502-FI-200	6	1	1	HOPPER GASKET	FA106		
	5000281502-FI-200	7	2	2	RECIRCULATION PIPE ø6"	FA102		
	5000281502-FI-200	8	1	1	FLEXIBLE TUBE Ø6" ID, Ø170mm OD, GREEN FDA,150PSI ALFAGOMMA 720LG-6 LG. APPROX.: 16,320 mm	FTTUCS305972		
	5000281502-FI-200	9	1	1	RECIRCULATION PIPE ø6"	FA102		
	5000281502-FI-200	10	2	2	CONCENTRIC REDUCER ø6" x ø3"	FA102		
	5000281502-FI-200	11	1	1	CAM LOCK MALE ø1 1/2" x FNPT, PART "A", 316	FPADSS314244		
	5000281502-FI-200	12	4	4	RECIRCULATION PIPE ø6"	FA102		
	5000281502-FI-200	13	2	2	ECCENTRIC REDUCER ø6" x ø3"	FA102		
	5000281502-FI-200	14	12	12	HOSE CLAMP W4, Ø162mm x Ø174mm (304)	FXCLZL306213		
	5000281502-FI-200	15	2	2	RECIRCULATION PIPE ø6"	FA102		
	5000281502-FI-200	16	4	4	RECIRCULATION PIPE ø6"	FA102		
	5000281502-FI-200	17			NOT USED	-		
	5000281502-FI-200	18			NOT USED	-		
	5000281502-FI-200	19	1	1	HOPPER DETAIL	FA105		
	5000281502-FI-200	20	8	8	RIGIDE COUPLING "GRUVLOCK" Ø6", SEAL EPDM (GALV.) STYLE-07	FPAD_____		
	5000281502-FI-200	21	1	1	BALL VALVE Ø1 1/2" FNPT, "FULL PORT" (316) PMP	ST-999-004		
	5000281502-FI-200	22	1	1	NIPPLE ø1 1/2" x 4" LONG, MNPT, 304	FPNISS302200		
	5000281502-FI-200	23	1	1	NIPPLE ø1 1/2" x 2" LONG, MNPT, 304	FPNISS312727		
	5000281502-FI-200	24	1	1	TANK ASSEMBLY	FI100		
	5000281502-FI-200	25	5	5	GASKET FLANGE Ø6",FF, 1/8" TH (RED RUBBER)	SEGAFP200126		
	5000281502-FI-200	26			NOT USED	-		
	5000281502-FI-200	27	40	40	HEX. HD BOLT ø3/4"-10 UNC x 3 1/2", 304	FXSCZC200548		
	5000281502-FI-200	28	40	40	HEX. NUT ø3/4"-10 UNC, 304	FXNUZC200229		
	5000281502-FI-200	29	80	80	FLAT WASHER ø3/4", 304	FXWAZD200680		
	5000281502-FI-200	30			NOT USED	-		
	5000281502-FI-200	31			NOT USED	-		
	5000281502-FI-200	32	4	4	HEX. HD BOLT ø5/8"-11 UNC x 1 1/2", 304	FXSCYY200491		
	5000281502-FI-200	33	4	4	HEX. NUT ø5/8"-11 UNC, 304	FXNUYY200221		
	5000281502-FI-200	34	8	8	FLAT WASHER ø5/8", 304	FXWAYY301425		
	5000281502-FI-200	35	30	30	HEX. HD BOLT ø3/4"-10 UNC x 4", GRADE 8, ZINC	FXSC_____		
	5000281502-FI-200	36	30	30	HEX. NUT ø3/4"-10 UNC, GRADE 8, ZINC	FXNU_____		
	5000281502-FI-200	37	30	30	LOCK WASHER ø3/4", GRADE 8, ZINC	FXWA_____		
	5000281502-FI-200	38	60	60	FLAT WASHER ø3/4", GRADE 8, ZINC	FXWA_____		
	5000281502-FI-200	39	2	2	TEE ø1/2" FNPT, 304	FPTESS202724		
	5000281502-FI-200	40	6	6	NIPPLE 1/2 x 3", 304	FPNISS302608		
	5000281502-FI-200	41	4	4	BALL VALVE Ø1/2" FNPT, "FULL PORT" (BRASS)	VABLBR200260		
	5000281502-FI-200	42	2	2	BALL VALVE Ø1" FNPT, "FULL PORT" (BRASS)	VABLBR200262		
	5000281502-FI-200	43	2	2	NIPPLE 1 x 3", 304	FPNISS314056		
	5000281502-FI-200	44			NOT USED	-		

End of list

VEOLIA

NOMENCLATURE/ BILL OF MATERIALS

TITRE/ TITLE	Rev.	DESCRIPTION	DATE	Rev	Ver/chk	Appr.	Affaire / Contract	MOUNT POLLEY
ACP-650 - MIXERS ASSEMBLY	0							
	1	FOR INSTALLATION	2015-08-13	0A	GP	PSM		
	2						REF. No.	5000281502 Rev. 1
	3							
DESSIN /DWG # FI-300	4						Date:	2015-08-13

REV.	ITEM		QTE/QTY. Unit.	QTE/QTY. Total	DESCRIPTION	INV. /Plan Ref. Drawing	P&ID I.D./TAG	Commentaires / Comments
	5000281502-FI300-	1a	1	1	COAGULATION MIXER	STOCK		
					MODEL : "ENVIREQUIP" MODEL: MIX-TECH EVG 5-5			
					MODEL: MIX-TECH EVG 5-5			
					MTL : SS 304L			
					C/W 5 HP MOTOR, 575 Vac / 3 ph / 60 Hz, 1770 rpm, TEFC, HE			
					WEIGHT : 287 kg			
	5000281502-FI300-	1b	1	1	COAGULATION MIXER BLADES	STOCK		
	5000281502-FI300-	2a	1	1	INJECTION MIXER	STOCK		
					MODEL : "ENVIREQUIP" MODEL: MIX-TECH EVG 5-5			
					MODEL: MIX-TECH EVG 5-5			
					MTL : SS 304L			
					C/W 5 HP MOTOR, 575 Vac / 3 ph / 60 Hz, 1770 rpm, TEFC, HE			
					WEIGHT : 287 kg			
	5000281502-FI300-	2b	1	1	INJECTION MIXER BLADES	STOCK		
	5000281502-FI300-	3a	1	1	MAURATION MIXER	STOCK		
					MODEL : "ENVIREQUIP" MODEL: MIX-TECH EVG 5-5			
					MODEL: MIX-TECH EVG 5-3			
					MTL : SS 304L			
					C/W 3 HP MOTOR, 575 Vac / 3 ph / 60 Hz, 1770 rpm, TEFC, HE			
					WEIGHT : 393 kg			
	5000281502-FI300-	3b	1	1	MATURATION MIXER BLADES	STOCK		
	5000281502-FI300-	4	12	12	BOLT HEX. 7/8"-UNC x 2-1/2" LG., SS. 304	FXSCYI200316		
	5000281502-FI300-	5	12	12	NUT HEX. 7/8"-UNC, SS 304	FXNUYI200193		
	5000281502-FI300-	6	12	12	WASHER PLATE 7/8" NOM., SS 304	FXWAYI200658		
	5000281502-FI300-	7	12	12	SPRING WASHER 7/8" NOM., SS 304	FXWAYI200659		

Fin de la liste / End of list

VEOLIA

NOMENCLATURE/ BILL OF MATERIALS

TITRE/ TITLE	Rev.	DESCRIPTION	DATE	Rev	Ver/chk	Appr.	Affaire / Contract	MOUNT POLLEY
CLARIFIIED WATER pH METER "DPD1R1", TURBIDIMETER "SOLITAX" & SC200 CONTROLLER FIELD INSTALLATION	1	FOR INSTALLATION	2015-08-20	F.C.	G.D.W.	G.P.		
	2							
	3						REF. No.	5000281502 Rev. 1
	4							
DESSIN /DWG # FI6001	5						Date:	2015-07-16

REV.	ITEM		QTE/QTY. Unit.	QTE/QTY. Total	DESCRIPTION	INV. /Plan Ref. Drawing	P&ID I.D./TAG	Commentaires / Comments
	5000281502-FI6001-	1	1	1	pH PROBE "DPD1R1"	ST-004-2	AE 2-014	
	5000281502-FI6001-	2	1	1	CLARIFIED WATER TURBIDIMETER MODEL: "SOLITAX" C/A SC200 CONTROLLERASSEMBLY	SA6011	AIT 2-013 AIT 2-014 AE 2-013	
	5000281502-FI6001-	3	1	1	HALF COUPLING Ø1" FNPT, #150, 1 9/16" DE (304)	FPADSS312210		
	5000281502-FI6001-	4	2	2	CABLE CONNECTOR Ø1/2" CABLE Ø3/16" @ Ø5/8", IPEX (PVC)	CECKGU200251		
	5000281502-FI6001-	5	1	1	PIPE SUPPORT & GUIDE FOR pH PROBE 2" DIA. PVC x 1850mm LG.	FA151		
	5000281502-FI6001-	6	2	2	MOUNTING BRACKET 200mm LG.FOR pH PROBE SS304L FOR HANDRAIL INSTALLATION	FA6009		
	5000281502-FI6001-	7	2	2	MOUNTING BRACKET 200mm LG.FOR SOLITAX SS304L FOR HANDRAIL INSTALLATION	FA6012		
	5000281502-FI6001-	8	2	2	MOUNTING PLATE LG.FOR SOLITAX SS304L FOR HANDRAIL INSTALLATION	FA6013		
	5000281502-FI6001-	9	1	1	CABLE TIE 7" NYLON BLACK	FXTIYO200120		
	5000281502-FI6001-	10	2	2	HEX. HEAD SCREW Ø3/8"-16UNC x 3 1/2" (304)	FXSCYS200385		
	5000281502-FI6001-	11	28	28	FLAT WASHER Ø3/8", SAE TYPE N (304)	FXWAYS200666		
	5000281502-FI6001-	12	22	22	HEX.NUT Ø3/8"-16UNC (304)	FXNUYS200206		
	5000281502-FI6001-	13	8	8	HEX. HEAD SCREW Ø3/8"-16UNC x 2 1/2" (304)	FXSCYS200380		
	5000281502-FI6001-	14	2	2	U BOLT PIPE Ø1 1/2", ROD Ø3/8"-16UNC, EXTENDED (304)	FXUBZE200617		
	5000281502-FI6001-	15	2	2	U BOLT PIPE Ø2", ROD Ø1/4"-20UNC, EXTENDED (304)	FXUBZG200620		
	5000281502-FI6001-	16	8	8	HEX.NUT Ø1/4"-20UNC (304)	FXNUYP200199		
	5000281502-FI6001-	17	4	4	FLAT WASHER Ø1/4", SAE TYPE N (304)	FXWAYP200662		

Fin de la liste / End of list

ESTIMATED CHEMICALS CONSUMPTION

ESTIMATED CHEMICALS CONSUMPTION

Project:	**MOUNT POLLEY**
Poject No.	**5000281502**
Version:	**1**

Total Max. Flow:	**20 000** m^3/d

Liquid Polyaluminum Chloride

	MIN.	AVERAGE	MAX.
Dosage (ul/L)	**100**	**150**	**250**
Volume per day (L /d)	2 000	**3 000**	5 000
Volume per hour (L /h) @	83	**125**	208
Alum volume per year (m^3/y)		**1095**	
Metering pump (1) maximum capacity			**220 L/h**
Metering pump (2) maximum capacity			**400 L/h**

Dry Polymer

Solution concentration: 0,20% @ nominal flow = 2 g/L

		MIN.	AVERAGE	MAX.
Dosage (mg/L or g/m^3)		1,00	**1,50**	3,00
Dry weight per day (kg/d)		20	**30**	60
Volume per day (L /d) @	0,20%	10 000	**15 000**	30 000
Volume per hour (L /h) @	0,20%	417	**625**	1 250
Dry polymer dosage per year (kg/y)		7 300	**10 950**	21 900
Metering pump maximum capacity				**1250 L/h**

Microsand

	MIN.	AVERAGE	MAX.
Losses (g/m^3)	1,00	**2,00**	3,00
Dry weight per day (kg/d)	20	**40**	60
Microsand per year (kg/yr)	7 300	**14 600**	21 900

Note:
. The data listed hereinabove is for information only and under no gurantee.
. The jar test should be used to determine the optimum dosing rate.

FLOWS AND LINES

- NEW MAIN FLOW
- EXISTING MAIN FLOW
- FUTURE MAIN FLOW
- NEW SECONDARY FLOW
- EXISTING SECONDARY FLOW
- FUTURE SECONDARY FLOW
- CHEMICALS
- BY OTHERS
- MATERIAL SPECIFICATION CHANGE (CS / SS)
- ( ) AVERAGE FLOW
- [ ] PEAK FLOW

ABBREVIATIONS

A TO C	–	AIR TO CLOSE
A TO O	–	AIR TO OPEN
AVG	–	AVERAGE
B/EL	–	BOTTOM ELEVATION
CL	–	CENTER LINE
CFM	–	CUBIC FEET PER MINUTE
CW	–	CITY WATER (POTABLE)
DIA	–	DIAMETER
DWG	–	DRAWING
EL	–	ELEVATION
F.C.	–	FAIL CLOSED
F.O.	–	FAIL OPEN
FRL	–	FILTER\REGULATOR\LUBRICATOR
GAL	–	GALLONS
GPD	–	GALLONS PER DAY
GPH	–	GALLONS PER HOUR
GPM	–	GALLONS PER MINUTE
HB	–	HOSE BIB
HG	–	INCHES OF MERCURY
HI	–	HIGH
HOA	–	HAND/OFF/AUTO
HP	–	HORSEPOWER
IA	–	INSTRUMENT AIR
ID	–	INSIDE DIAMETER
INV	–	INVERT
LO	–	LOW
MH	–	MANHOLE
MW	–	MANWAY
N.C.	–	NORMALLY CLOSED
N.O.	–	NORMALLY OPEN
OAL	–	OVERALL LENGTH
O.D.	–	OUTSIDE DIAMETER
OF	–	OVERFLOW
PA	–	PLANT AIR
PSIG	–	POUNDS PER SQUARE INCH – GAUGE
PW	–	PLANT WATER
RED	–	REDUCER
RPM	–	REVOLUTIONS PER MINUTE
SCFM	–	STANDARD CUBIC FEET PER MINUTE
SCH	-	SCHEDULE
SG	-	SPECIFIC GRAVITY
SP	-	SETPOINT
SSH	-	STRAIGHT SIDE HEIGHT
STD	-	STANDARD
SW	-	SEAL WATER
SWD	-	SIDE WATER DEPTH
TDH	-	TOTAL DYNAMIC HEAD(FT OF FLUID)
T/EL	-	TOP ELEVATION
TYP	-	TYPICAL
VAC	-	VACUUM
VSD	-	VARIABLE SPEED DRIVE
WC	-	WATER COLUMN
WD	-	WATER DEPTH
WL	-	WATER LEVEL
WV	-	WORKING VOLUME (DOES NOT INCLUDE FREEBOARD OR HEEL)

VALVE SYMBOLS

- ANGLE
- BALL
- BUTTERFLY
- CHECK VALVE
- CHECK
- DIAPHRAGM
- VALVE NOT SPECIFIED
- GLOBE
- KNIFE
- NEEDLE
- PINCH
- PLUG
- PRESSURE REDUCING
- RELIEF ON LINE
- RELIEF
- SQUEEZE
- THREE WAY
- FOUR WAY
- FLOAT VALVE
- VACUUM BREAKER
- AIR RELEASE
- HOSE BIBB
- INTEGRAL BLOCK & BLEED
- PENSTOCK
- WASTE PLUG
- MULTI–FONCTION VALVE
- CALIBRATION COLUMN
- EVENT
- AIR TRAP

ACTUATORS

- CYLINDER
- DIAPHRAGM–SPRING
- ELECTRO HYDRAULIC
- ELECTRO PNEUMATIC
- MOTOR
- SOLENOID
- POSITIONER * – TYPE

PIPING AND TUBING MATERIALS

ABS	–	ACRYLONTRILE BUTADIENE STYRENE TRUSS PIPE
ALM	–	ALUMINUM PIPE OR TUBING
ARP	–	ALUMINUM REINFORCED PLASTIC PIPE
BL	–	BLACK IRON PIPE
BPT	–	BRAIDED PLASTIC TUBING–PVC
CI	–	CAST IRON PIPE
CISP	–	CAST IRON SOIL PIPE
CMCP	–	CORRUGATED METAL CULVERT PIPE
CMH	–	CHEMICAL HOSE
CMP	–	CORRUGATED METAL PIPE
COP	–	COPPER PIPE
CPVC	–	CHLORINATED POLYVINYL CHLORIDE PIPE
CS	–	CARBON STEEL PIPE
DI	–	DUCTILE CAST IRON PIPE
ERP	–	EPOXY RESIN PIPE
FRP	–	FIBERGLASS REINFORCED PLASTIC PIPE
GS	–	GALVANIZED STEEL PIPE
HOSE	–	FLEXIBLE HOSE
HSI	–	HIGH SILICON IRON PIPE
KLS	–	PVDF LINED STEEL PIPE (KYNAR ® LINED TYPICAL)
KYN	–	PVDF (KYNAR ® TYPICAL)
MI	–	CARBON STEEL PIPE W/MALLEABLE IRON FITTINGS
NEO	–	NEOPRENE HOSE
NI	–	NICKEL ALLOY PIPE
NLS	–	NEOPRENE LINED STEEL PIPE
PEP	–	POLYETHYLENE PIPE
PETB	–	POLYETHYLENE TUBING
PLS	–	POLYPROPYLENE LINED STEEL PIPE
POP	–	POLYPROPYLENE PIPE
PRP	–	PHENOLIC RESIN PIPE
PVC	–	POLYVINYL CHLORIDE PIPE
PVC HOSE	–	POLYVINYL CHLORIDE HOSE
PVDF	–	POLYVINYLIDENE FLUORIDE PIPE
RBR	–	RUBBER HOSE
RCCP	–	REINFORCED CONCRETE CULVERT PIPE
RCP	–	REINFORCED CONCRETE PIPE
SAR	–	SARAN TUBING
SLH	–	SLUDGE HOSE
SLS	–	SARAN LINED STEEL PIPE
SS	–	STAINLESS STEEL PIPE OR TUBING
TEF	–	TEFLON TUBING
TI	–	TITANIUM ALLOY PIPE
TLS	–	TEFLON LINED STEEL PIPE
TYB	–	TYGON ® TUBING–BRAIDED
TYG	–	TYGON ® TUBING–UNBRAIDED

INSTRUMENTATION AND RELATED ITEMS

- CAPILLARY TUBING
- ELECTRICAL
- HYDRAULIC
- PNEUMATIC
- DATA LINK
- FLUME
- MAGNETIC FLOW METER
- SONIC FLOW METER
- TURBINE FLOW METER
- VENTURI
- WEIR
- VORTEX SENSOR
- ROTAMETER

INSTRUMENT SYMBOLS

	PRIMARY LOCATION ***NORMALLY ACCESSIBLE TO OPERATOR	FIELD MOUNTED	AUXILIARY LOCATION ***NORMALLY ACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	1 (* IP1**)	2	3
SHARED DISPLAY, SHARED CONTROL	4	5	6
COMPUTER FUNCTION	7	8	9
PROGRAMMABLE LOGIC CONTROL	10	11	12

* SYMBOL SIZE MAY VARY ACCORDING TO THE USER'S NEEDS AND THE TYPE OF DOCUMENT. A SUGGESTED SQUARE AND CIRCLE SIZE FOR LARGE DIAGRAMS IS SHOWN ABOVE. CONSISTENCY IS RECOMMENDED.

** ABBREVIATIONS OF THE USER'S CHOICE SUCH AS IP1 (INSTRUMENT PANEL #1), IC2 (INSTRUMENT CONSOLE #2), CC3 (COMPUTER CONSOLE #3), ETC., MAY BE USED WHEN IT IS NECESSARY TO SPECIFY INSTRUMENT OR FUNCTION LOCATION.

*** NORMALLY INACCESSIBLE OR BEHIND–THE–PANEL DEVICES OR FUNCTIONS MAY BE DEPICTED BY USING THE SAME SYMBOL BUT WITH DASHED HORIZONTAL BARS, I.E.

PIPING ACCESSORIES

- FUNNEL
- DIAPHRAGM SEAL
- DRESSER COUPLING
- EJECTOR/EDUCTOR
- EXPANSION JOINT
- FLANGED CONNECTION
- FLEXIBLE HOSE
- HOSE CONNECTION
- PIPE TO TUBING ADAPTER
- INSULATION
- INSULATED PIPE WITH ELECTRIC HEAT TRACE (E)
- INSULATED PIPE WITH STEAM HEAT TRACE (S)
- VACUUM BREAKER
- PULSATION DAMPENER
- END CAP DISCONNECT
- QUICK DISCONNECT
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- RUPTURE DISK
- BASKET FILTER
- MIXING VALVE
- SIGHT FLOW INDICATOR
- STRAINER
- UNION
- STEAM TRAP
- AIR FILTER
- AIR LUBRICATOR
- AIR REGULATOR
- COMB. AIR FILTER/ REGULATOR W/GAUGE
- FLOW ORIFICE
- SIGHT FLOW STRAINER
- SPECTACLE BLIND (OPEN)
- SPECTACLE BLIND (CLOSE)
- PIGTAIL SIPHON
- STATIC MIXER
- INJECTION QUILL
- STOP LOG

ISA INSTRUMENT IDENTIFICATION TABLE

	FIRST LETTER		SUCCEEDING LETTERS	
	PROCESS VARIABLE	MODIFIER (IF NEEDED)	READOUT OR COMPUTER FUNCTION	MODIFIER (IF NEEDED)
A	ANALYSIS		ALARM	
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE		CONTROL	
D	USER'S CHOICE	DIFFERENTIAL		
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)	
F	FLOW RATE	RATIO (FRACTION)		
G	USER'S CHOICE		GLASS, VIEWING DEVICE	
H	HAND			HIGH
I	CURRENT (ELECTRICAL)		INDICATE	
J	POWER	SCAN		
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE	CONTROL STATION	
L	LEVEL		LIGHT	LOW
M	USER'S CHOICE	MOMENTARY		MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE (RESTRICTION)	
P	PRESSURE, VACUUM		POINT (TEST CONNECTION)	
Q	QUANTITY	INTEGRATE, TOTALIZE		
R	RADIATION		RECORD	
S	SPEED, FREQUENCY	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECH. ANALYSIS		VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL	
X	UNCLASSIFIED	X–AXIS	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y–AXIS	RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z–AXIS	DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

LEGEND BASED ON ISA STANDARD S 5.1

INSTRUMENT TAG NUMBERS

TIC 103 – INSTRUMENTATION IDENTIFICATION OR TAG NUMBER
103 – LOOP NUMBER
TIC – FUNCTIONAL IDENTIFICATION
NOTE: HYPHENS ARE OPTIONAL AS SEPARATORS

ELECTRICAL AND RELATED ITEMS

- (S) (S) – SELECTOR SWITCHES
- VFD – VARIABLE FREQUENCY DRIVE
- EM – EMERGENCY POWER
- (I) – INTERLOCK
- – PILOT LIGHT

LINE NUMBER IDENTIFICATION

1"–P–110–CS–I

- I – INSULATION
- CS – MATERIAL CLASS
- 110 – LINE NUMBER
- P – FLUID SERVICE DESIGNATION
- 1" – LINE SIZE

LINE CONTINUATIONS

- INDICATES A LINE GOING TO OR COMING FROM BATTERY LIMITS (CONTRACT LIMITS)
- 5 / A 2 – INDICATES CONTINUATION OF LINE IS ON SHEET NUMBER 5 (SAME DRAWING NUMBER) IN ZONE A 2
- SHT 5 – INDICATES CONTINUATION OF A SIGNAL IS ON SHEET NUMBER 5

EQUIPMENT TAG NUMBERS

MXXXX	AGITATORS, AERATORS
BXXXX	AIR HANDLING–BLOWERS, COMPRESSORS, DRYERS
RXXXX	CLARIFIERS, THICKENERS, SEPARATORS
FXXXX	FILTERS–VACUUM, PRESSURE, CENTRIFUGES
PXXXX	PUMPS
TXXXX	TANKS
EXXXX	HEAT EXCHANGER
IXXXXX	SOFTENERS, DEMINERALIZERS
ROXXXX	REVERSE OSMOSIS UNITS
SGXXXX	STEAM GENERATORS

VALVE & ACCESSORY TAG

VXXXX	VALVE
EJXXXX	EXPANSION JOINT
HXXXX	HOSE
FXXXX	FILTER
SXXXX	STRAINER
SBXXXX	SPECTACLE BLIND
STXXXX	STEAM TRAP

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
2	FOR INSTALLATION	2015–09–02	SID	G.D.W.	G.P.	N/A
01	FOR APPROVAL	2015–08–03	Y.R.	G.D.W.	G.P.	N/A

STD: "D" 22x34 | REF: ED09–PI003 | BAR = 1" AT PLOT SCALE

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE. THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

DESIGNER	Y.R.
DATE	2015–07–29
CHECKER	G.D.W.
DATE	2015–07–29
ENGINEER	G.P.
DATE	2015–07–29
SCALE:	P.A.E.

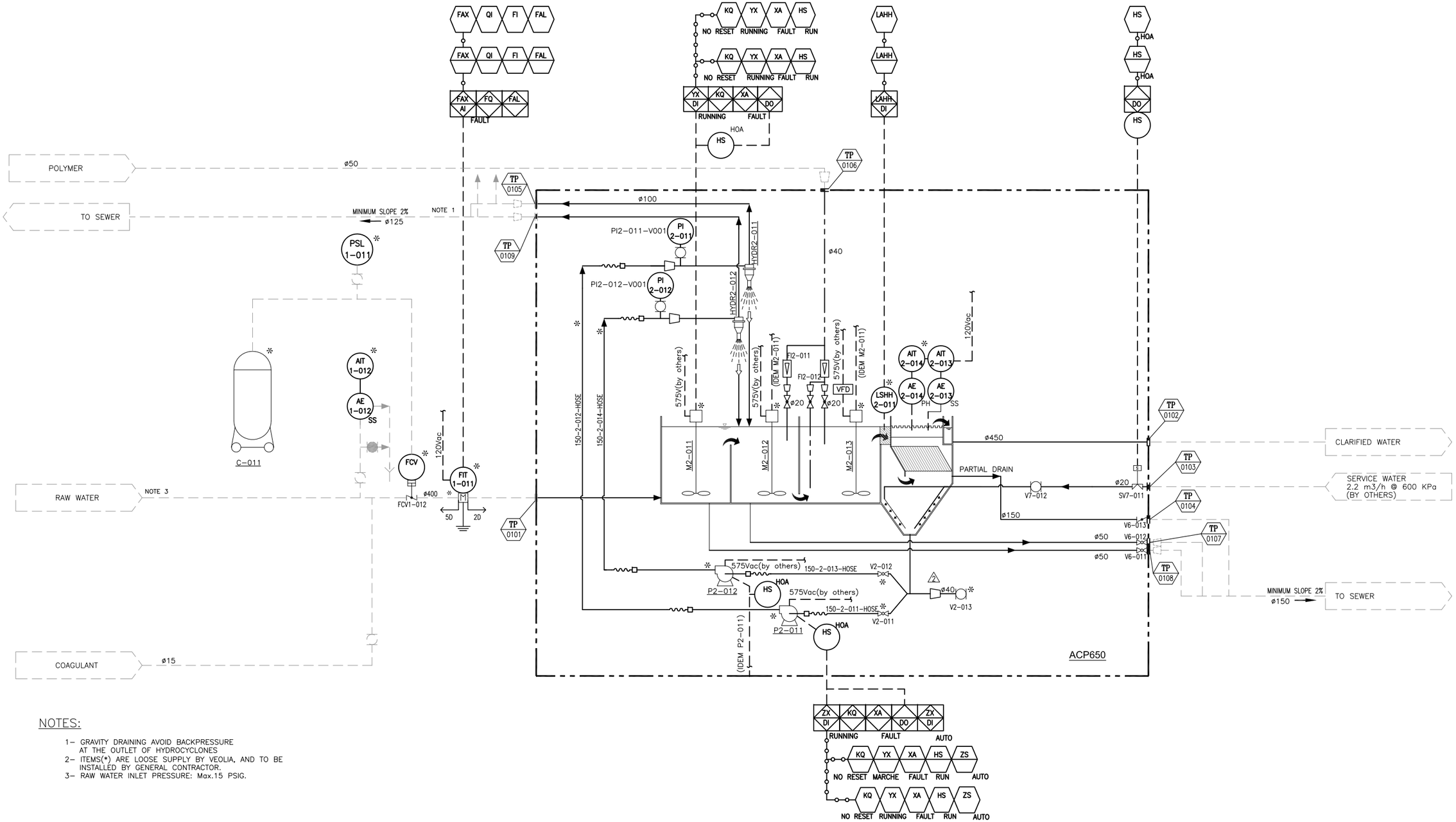
TITLE: PROCESS AND INSTRUMENTATION DIAGRAM
WATER TREATMENT SYSTEM
LEGEND

CLIENT: MOUNT POLLEY

VEOLIA
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada, Tel: (514) 334-7230

PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502 – PI000		PCH0000	1 OF 1	2

Sep 03, 2015 18:47:31 – \\CASTL115\Projets\2015\5000281502 – Mount Polley (5198793)\15– Dessins execution_Drawings\8– PI\5000281502–PI001@PI004_2 EN COURS.dwg – wengupodo



NOTES:

1– GRAVITY DRAINING AVOID BACKPRESSURE AT THE OUTLET OF HYDROCYCLONES
2– ITEMS(*) ARE LOOSE SUPPLY BY VEOLIA, AND TO BE INSTALLED BY GENERAL CONTRACTOR.
3– RAW WATER INLET PRESSURE: Max.15 PSIG.

C–011
COMPRESSOR
5.4 SCFM(9.2m3/h) @90 PSI
AIT TANK; 56.8 L
15 A; 120V/60Hz; 1750 RMP

M2–011
MIXER
COAGULATION TANK
MOTOR 5 HP
575V/3Ph/60Hz

M2–012
MIXER
INJECTION TANK
MOTOR 5 HP
575V/3Ph/60Hz

M2–013
MIXER
MATURATION TANK
MOTOR 3 HP
575V/3Ph/60Hz

P2–011/P2–012
RECIRCULATION PUMP
DEBIT: 75 m /h
MOTOR 20 HP
575V/3Ph/60Hz

* SUPPLIED BY JMI
SUPPLIED BY JMI
SUPPLIED BY JMI
CHEMICALS SUPPLIED BY JMI
BY OTHERS OR EXISTANT
SKID LIMITS

PNEUMATIC
ELECTRICITY OR CONTROL
DATA LINK
E HEAT TRACED PIPING WITH INSULATION

SCADA (OPTIONAL)
LOCAL HMI
ON LOCAL PLC
DI,DO,AI,AO : PLC I/O
BAR = 1" AT PLOT SCALE

STD: "D" 22x34
REF: ED09–PI003

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
2	FOR INSTALLATION	2015–09–02	SID	G.D.W.	G.P.	N/A
1	FOR APPROVAL	2015–08–07	Y.R.	G.D.W.	G.P.	N/A

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE. THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

		DATE
DESIGNER	Y.R.	2015–07–29
CHECKER	G.D.W.	2015–07–29
ENGINEER	G.P.	2015–07–29
SCALE:	P.A.E.	

TITLE: PROCESS AND INSTRUMENTATION DIAGRAM
WATER TREATMENT SYSTEM
ACTIFLO (ACP650)

CLIENT: MOUNT POLLEY

VEOLIA
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada. Tel: (514) 334-7230

PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502 – PI001		PCH0000	1 OF 1	2

Sep 04, 2015 8:52:50 – \\CASTL11FS\Projets\2015\5000281502 – Mount Polley (ST98793)\15– Dessins execution_Drawings\8– P\5000281502–PI001@PI004_2 EN COURS.dwg – wmgupta

Sep 04, 2015 9:12:06 - \\CASTL11FS\Projets\2015\5000281502 - Mount Polley (ST987933)\15- Dessins execution_Drawings\8- P\5000281502-PI001@PI004_2 EN COURS.dwg - wangjiaobo

COAGULANT
TO ACTIFLO
PI002

BUILDING INSIDE

VENT
TO A SAFE LOCATION

LIT 9-511 *

ø50

TP 0211

TP 0212

TP 0213

MW ø600

ø75 ø150 ø75 ø25

O.F.

SPILL CONTAINER

TANK A

TANK B

COAGULANT
FILLING BY TRUCK
(BY OTHERS)

TP 0215

ø75

T9-511

TP 0214

ø75

BUCKET BY OTHERS
water H = 300mm max

SPILL CONTAINER BY OTHERS

T9-511
COAGULANT TANK
MTL: XLPE
VOL: 6900 GALLONS
SIZE: ø10FT

TP 0203

TP 0202

P9-511-V003

ø15

P9-511-V004

JB9-510

ø25

BPV9-511
S.P. 40 PSI

RV9-511
S.P. 50 PSI

ø25

120V(by others)

CYL9-511

P9-511

VFD

FIC

ø25

CYL9-511-V001

ø25

P9-511-V002

ø15

P9-511-V001

SKID 0201

TP 0201

P9-511-V005

P9-511
DOSING PUMP (COAGULANT #1)
DEBIT: 220 l/h @ 40PSI
MOTOR: 1 HP
120V/1Ph/60Hz

TP 0206

TP 0205

P9-512-V003

ø15

P9-512-V004

JB9-511

ø25

BPV9-512
S.P. 40 PSI

RV9-512
S.P. 50 PSI

ø25

120V(by others)

CYL9-512

P9-512

VFD

FIC

ø40

ø50

ø25

CYL9-512-V001

ø25

P9-512-V002

ø15

P9-512-V001

SKID 0202

TP 0204

P9-512-V005

P9-512
DOSING PUMP (COAGUALNT #2)
DEBIT: MAX. 400 l/h @ 40PSI
MOTOR: 1 HP
120V/1Ph/60Hz

* SUPPLIED BY JMI
SUPPLIED BY JMI
SUPPLIED BY JMI
CHEMICALS SUPPLIED BY JMI
BY OTHERS OR EXISTANT
SKID LIMITS

PNEUMATIC
ELECTRICITY OR CONTROL
DATA LINK
E HEAT TRACED PIPING WITH INSULATION

AI SCADA (OPTIONAL)
LOCAL HMI
ON LOCAL PLC
DI,DO,AI,AO : PLC I/O

BAR = 1" AT PLOT SCALE

STD: "D" 22x34

REF: ED09-PI003

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
2	FOR INSTALLATION	2015-09-02	SID	G.D.W.	G.P.	N/A
1	FOR APPROVAL	2015-08-07	Y.R.	G.D.W.	G.P.	N/A

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE. THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

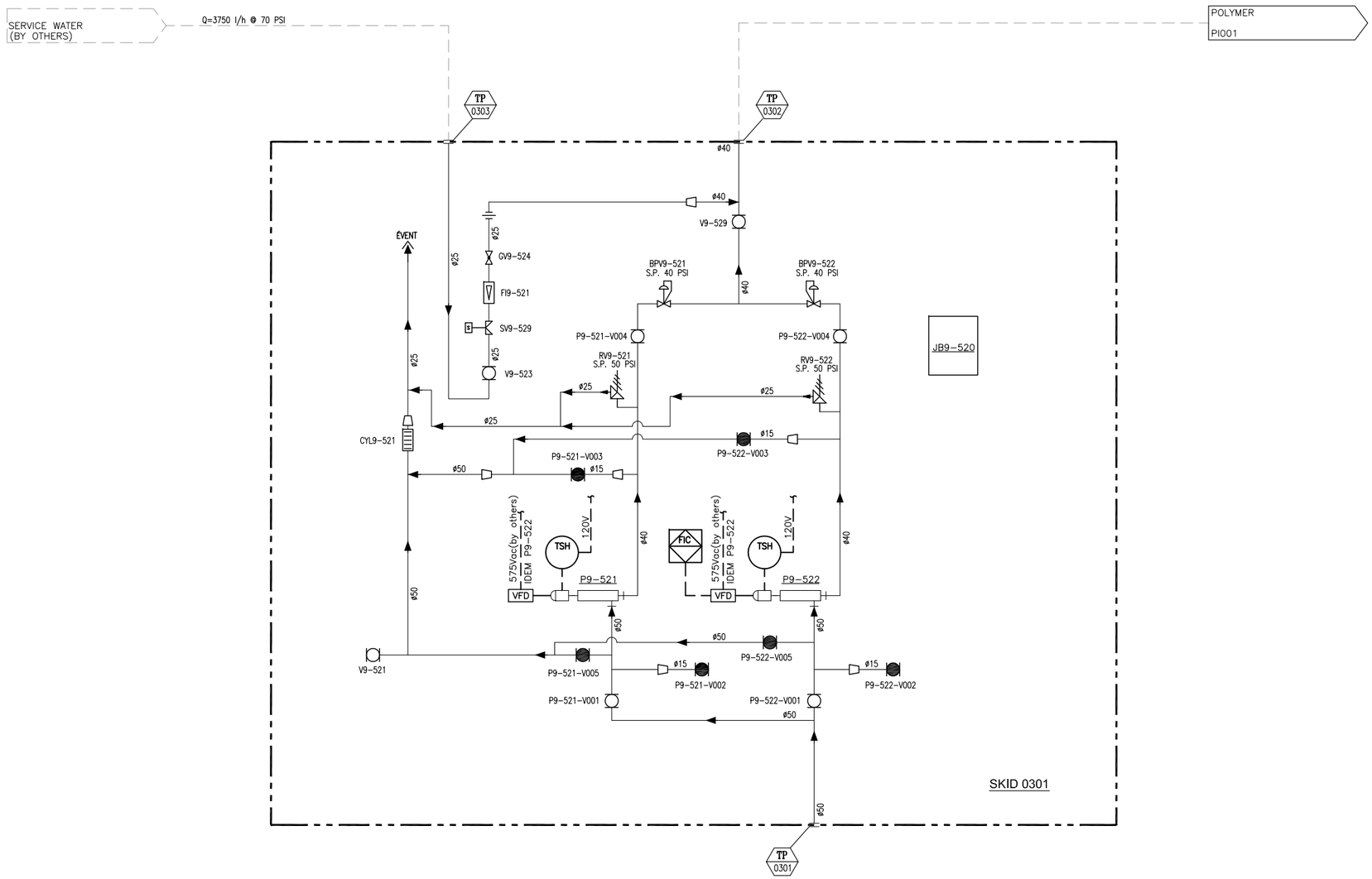
DESIGNER	Y.R.
DATE	2015-07-29
CHECKER	G.D.W.
DATE	2015-07-29
ENGINEER	G.P.
DATE	2015-07-29
SCALE:	P.A.E.

TITLE: PROCESS AND INSTRUMENTATION DIAGRAM
WATER TREATMENT SYSTEM
COAGULANT #1 AND COAGULANT #2

CLIENT: MOUNT POLLEY

VEOLIA
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada, Tel: (514) 334-7230

PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502	PI002	PCH0000	1 OF 1	2



P9-521
DOSING PUMP
MAX. FLOWRATE: 1294 l/h
MOTOR: 1 HP
575V/3Ph/60Hz

P9-522
DOSING PUMP
MAX. FLOWRATE: 1294 l/h
MOTOR: 1 HP
575V/3Ph/60Hz

* SUPPLIED BY JMI
SUPPLIED BY JMI
SUPPLIED BY JMI
CHEMICALS SUPPLIED BY JMI
BY OTHERS OR EXISTANT
SKID LIMITS

PNEUMATIC
ELECTRICITY OR CONTROL
DATA LINK
E HEAT TRACED PIPING WITH INSULATION

AI SCADA (OPTIONAL)
LOCAL HMI
ON LOCAL PLC
DI,DO,AI,AO : PLC I/O

BAR = 1" AT PLOT SCALE

STD: "D" 22x34

REF: ED09-PI003

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
2	FOR INSTALLATION	2015-09-02	SID	G.D.W.	G.P.	N/A
1	FOR APPROVAL	2015-08-07	Y.R.	G.D.W.	G.P.	N/A

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE, THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

DESIGNER	Y.R.
DATE	2015-07-29
CHECKER	G.D.W.
DATE	2015-07-29
ENGINEER	G.P.
DATE	2015-07-29
SCALE:	P.A.E.

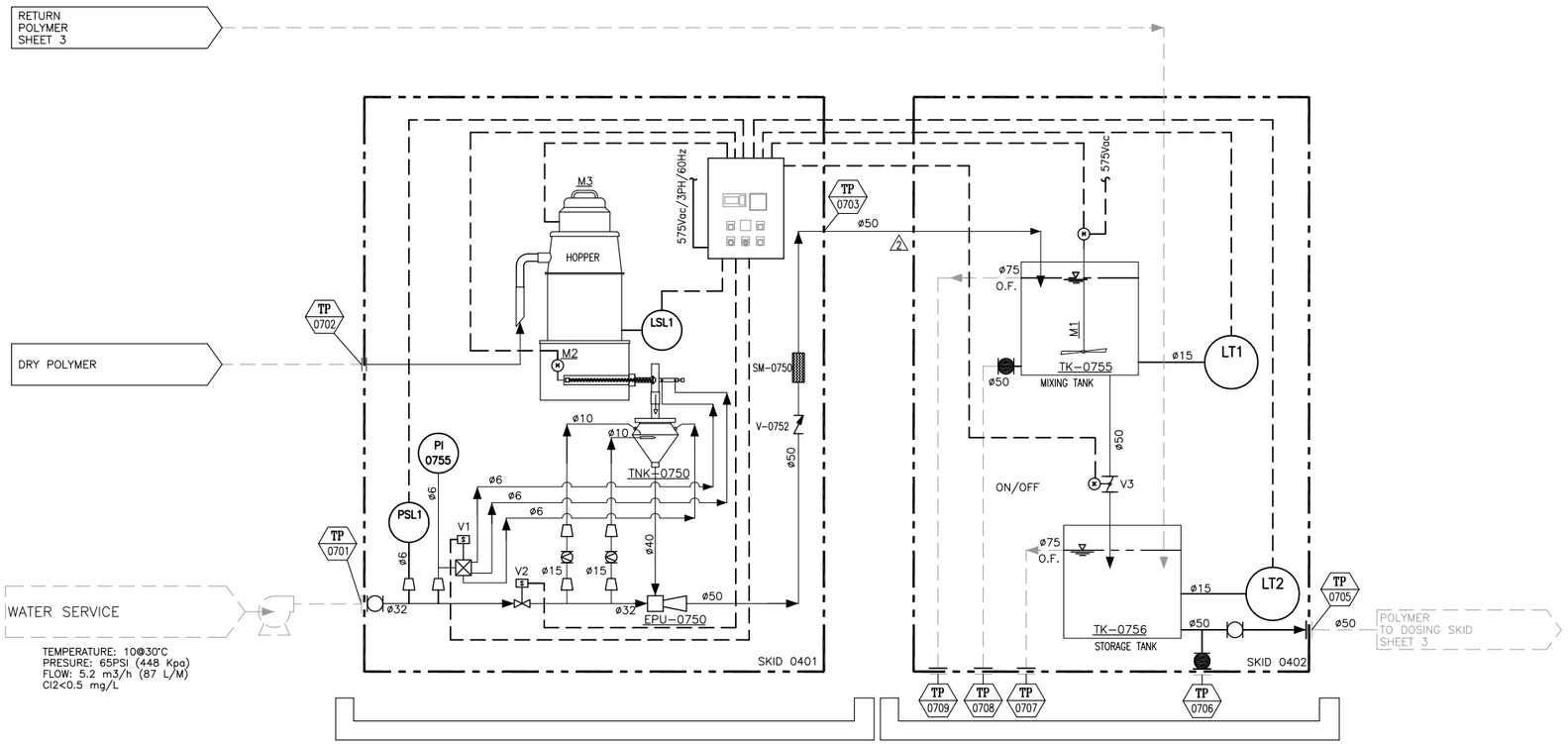
TITLE: PROCESS AND INSTRUMENTATION DIAGRAM
WATER TREATMENT SYSTEM
POLYMER

CLIENT: MOUNT POLLEY

VEOLIA
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc. Canada, Tel: (514) 334-7230

PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502	PI003	PCH0000	1 OF 1	2

Sep 03, 2015 18:48:16 - \\CASTL11FS\Projets\2015\5000281502 - Mount Polley (ST98793)\15- Dessins execution_Drawings\8- PI\5000281502-PI001@PI004_2 EN COURS.dwg - wwegsudo



M3
VACUUM CONVEYOR
#642A 16585

120V/9.2Amp

M2
FEEDER SCREW&BLENDING DRIVE

POWER Req.: 0.5HP
VOLTAGE: 575V/3Ph/60Hz

TNK-0755
MIXING TANK
VOLUME: 2500L

TNK-0756
STORAGE TANK
VOLUME: 2500L

MXR-0755
POLYMER MIXER MOTOR
MODEL:EVG1-2.0
POWER Req.: 2.0HP
VOLTAGE: 575V/3Ph/60Hz

✲ SUPPLIED BY JMI
SUPPLIED BY JMI
SUPPLIED BY JMI
CHEMICALS SUPPLIED BY JMI
BY OTHERS OR EXISTANT
SKID LIMITS

PNEUMATIC
ELECTRICITY OR CONTROL
DATA LINK

E HEAT TRACED PIPING WITH INSULATION

AI SCADA (OPTIONAL)
LOCAL HMI
ON LOCAL PLC
DI,DO,AI,AO : PLC I/O

STD: "D" 22x34

REF: 5000214065-PI002

BAR = 1" AT PLOT SCALE

REV	DESCRIPTION	DATE	REV'D	CHK'D	APV'D	ECN
2	FOR INSTALLATION	2015-09-02	SID	G.D.W.	G.P.	N/A
1	FOR APPROVAL	2015-08-11	Y.R.	G.D.W.	G.P.	N/A

CONFIDENTIALITY AND INTELLECTUAL PROPERTY NOTICE
ALL INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF VEOLIA WATER TECHNOLOGIES CANADA INC. AND IS PROTECTED BY ALL APPLICABLE LAWS, INCLUDING BUT NOT LIMITED TO COPYRIGHT AND OTHER INTELLECTUAL PROPERTY LAWS. THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO V.W.T. AND ARE SUBMITTED IN CONFIDENCE. THEY ARE NOT TRANSFERABLE. THEY MUST BE USED ONLY FOR THE PURPOSE FOR WHICH THE DOCUMENT IS EXPRESSLY SUBMITTED AND NO IMPLICIT LICENCE IS GRANTED OTHERWISE BY THE SUBMISSION OF THIS DOCUMENT. THEY ARE CONFIDENTIAL AND PRIVILEGED INFORMATION OF V.W.T. AND THEY MUST NOT BE DISCLOSED, REPRODUCED, LOANED, REMITTED OR USED IN ANY OTHER MANNER WITHOUT THE EXPRESS WRITTEN CONSENT OF V.W.T. V.W.T. ASSUMES NO RESPONSIBILITY OR LIABILITY FOR THE USE OF THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN FOR ANOTHER PROJECT, OR IN A MANNER THAT DOES NOT RELATE TO THE FITNESS OR PURPOSE OF THIS DOCUMENT. IN NO EVENT SHALL THIS DOCUMENT OR THE DESIGN CONCEPTS AND INFORMATION CONTAINED HEREIN BE USED IN A MANNER DETRIMENTAL TO THE INTEREST OF V.W.T. ALL COPYRIGHT, PATENT AND OTHER INTELLECTUAL PROPERTY RIGHTS ARE RESERVED. ACCEPTANCE OF THE DELIVERY OF THIS DOCUMENT CONSTITUTES AGREEMENT TO THESE TERMS AND CONDITIONS.

DESIGNER	Y.R.	DATE 2015-07-29
CHECKER	G.D.W.	DATE 2015-07-29
ENGINEER	G.P.	DATE 2015-07-29
SCALE:	P.A.E.	

TITLE: PROCESS AND INSTRUMENTATION DIAGRAM
DRY POLYMER PREPARATION SYSTEM
HYDRAPOL 2500L

CLIENT: MOUNT POLLEY

VEOLIA
VEOLIA WATER TECHNOLOGIES CANADA INC. 4105 Sartelon, Saint-Laurent, Qc, Canada, Tel: (514) 334-7230

PROJECT	DRAWING	INTERNAL	SHEET	REV
5000281502	PI004	PCH0000	1 OF 1	2

Sep 03, 2015 18:48:28 - \\CASTL11FS\Projets\2015\5000281502 - Mount Polley (ST98703)\15- Dessins execution_Drawings\8- PI\5000281502-PI001@PI004_2 EN COURS.dwg - wengupotab

ATTACHMENT B
BAT Criteria

1.0 BEST AVAILABLE TECHNOLOGY

Mount Polley Mining Corporation (MPMC) will base the operational water treatment plan on best available technologies economically achievable (BATEA), in a similar manner as was done for the Short-Term Technical Assessment Report (Golder 2015). The difference between best available technology (BAT) and BATEA is that BATEA includes proposed treatment improvements that could be used to augment the BAT to yield better treated water quality.

In the context of an existing water treatment plant, the BATEA analysis is focused on the modifications to existing equipment to achieve the project objectives.

1.1 Definition and Regulatory Context

The regulatory context for defining BAT effluent regulations to achieve a discharge water quality that is not deleterious is provided by the Metal Mining Effluent Regulation (MMER), registered in June 2002 pursuant to the *Fisheries Act*. The MMER prescribes authorized concentration limits for substances in mine effluents that discharge to waters frequented by fish. The regulated parameters are arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids (TSS), Radium 226, and pH.

The BC Ministry of Environment (MoE) also provides guidance for the preparation of the TAR and specifically refers to the application of the concept of an initial dilution zone (IDZ) in surface waters. The guidance document states:

> *The IDZ is the initial portion of a larger mixing zone applied to a specific effluent discharge. The concept recognizes the role of dilution in mitigating the effects of effluents and that there is an accepted area of higher concentrations of contaminants prior to where full mixing occurs. [The Ministry of Environment]'s Best Achievable Technology (BAT) policy puts requirements on dischargers for treating effluents to a high standard and does not rely on dilution alone to mitigate potential impacts. IDZs are typically only allowed when BAT has been applied.* (MoE 2014)

1.2 A Review of BAT for Mines in Canada and an Assessment of BATEA

The following discussion requires clarification of the terms BAT and BATEA. BAT in the context of this document, and the permit application it supports, is intended to be the best technology that MPMC can practicably achieve within the constraints of the current realities at the site. BATEA is used to align the work reported here with BAT for the wider mining industry in Canada. A recent study (Pouw et al. 2015) did just that and the term BATEA was introduced to include proposed treatment improvements that could be used to augment the current BAT to yield better treated water quality. What is considered BAT for the MPMC operations phase water treatment plan as opposed to BATEA for the entire industry in the long term may therefore not be the same.

Pouw et al. report that Environment Canada is undertaking a review of the MMER within a context of a multi-stakeholder consultation process to obtain feedback on proposed changes through a series of meetings and workshops. Hatch was commissioned by the Mine Environment Neutral Drainage (MEND) Program, on behalf of regulatory and industry stakeholders, to complete a study of water management and treatment practices at mining operations in Canada and to identify BATEA for the augmentation of mining effluent treatment (Hatch 2014).

The following table excerpt reproduced from Pouw et al. (2015) summarizes the proposed BATEA for the base metal sub-sector of the mining industry and provides the model effluent treatment flowsheet, proposed BATEA, and the effluent quality achieved by the industry subsector as measured through case study data from 31 treatment operations surveyed (Table 1). The model effluent treatment flowsheet referred to here is in essence the current industry best practice treatment process for (in this case) the base metal mining sector in Canada. The term flowsheet is used to collectively refer to the combination of treatment steps that make up the water treatment process (also called the block flow diagram).

Table 1: Summary of Proposed BATEA for the Base Metal Subsector

Model Effluent Treatment Flowsheet	Proposed BATEA	Effluent Quality
■ hydroxide precipitation for metals ■ coagulant and flocculant dosing and pond-based settling for TSS ■ natural degradation of ammonia ■ pH adjustment with CO_2	model flowsheet *(model effluent treatment)* +: polymeric organosulphide reagents for metals polishing[(a)]	Al < 0.79 mg/L As <0.01 mg/L Cu <0.03 mg/L Fe <0.30 mg/L Pb <0.02 mg/L Ni <0.05 mg/L Se <0.04 mg/L Zn <0.02 mg/L TSS <10 mg/L NH_3/NH^{4+} <4 mg/L

a) This column describes the proposed augmentation of the model flowsheet to achieve the effluent quality in the column on the right. Stated in a different way, this is the additional treatment step that could be added to the model flowsheet that is proposed as an economically achievable means of achieving improved water quality in the effluent. In this case organosulphide reagents are proposed to lower metals concentrations.

Source: Pouw et al, 2015.

1.3 Process Outline for Defining BAT

The following process describes how BAT was defined for the short-term water treatment plan for the Mount Polley Mine site.

Step 1: Identify Potential Technologies or Options

In this step, the potential technologies or options that could be implemented were identified. Categories of potential technologies considered were:

- water diversion practices
- water treatment processes
- waste handling options (water treatment sludge)
- energy-efficient equipment and processes
- engineering practices

The focus was on proven technologies because of the need to continue with the existing active water treatment and not to disrupt discharge.

Step 2: Eliminate Technically Infeasible Options

From the list of potential technologies, those that do not meet the definition of BAT were identified and eliminated. Technologies were eliminated if they were found to be technically infeasible based on physical, chemical, or engineering principles, or where technical difficulties would prevent the successful use of the technology option at the Mount Polley Mine.

Step 3: Consider the Reliability of Each Option

Each technically feasible option was ranked in terms of the probability that the technology will operate according to its specifications. Reliability was based on on-site performance, published performance data, and case studies, as well as Golder's in-house expertise.

Step 4: Rank Technically Feasible Options by Control Effectiveness

The efficiency of removal of TSS and metals for each of the technically feasible options from Step 2 was evaluated. This removal efficiency was then used to rank the options, along with the comparative technologies at other mine sites, by referring to cases studies and published reports, as well as discussions with and submissions from technology vendors.

Step 5: Consider the Cost-Effectiveness of Each Option

The cost-effectiveness of each option was determined by conducting rough cost estimates based on capacity factored methods, parametric models, and analogous operations at other mining sites around the world. This was done as a Class-5 cost estimate as defined by the Association for the Advancement of Cost Engineering.

Step 6: Select BAT

The removal efficiency, reliability, and cost-effectiveness rankings from Steps 3, 4, and 5, respectively, were used to make a recommendation on which option is BAT.

REFERENCES

Golder (Golder Associates Ltd.). 2015. Technical Assessment Report in Support of an Effluent Permit Amendment prepared for MPMC. Golder Doc. No. 1411734-030-R-Rev0-12000. May 29, 2015.

Hatch. 2014. Study to Identify BATEA for the Management and Control of Effluent Quality from Mines. Available at mend-nedem.org/wp-content/uploads/MEND_3.50.1_BATEA.pdf

Pouw K, Campbell K, Babel L. 2015. *Best Available Technologies Economically Achievable (BATEA) to Manage Effluent from Mines in Canada.* The 10th International Conference on Acid Rock Drainage and the International Mine Water Association's Annual Meeting, ICARD-IMWA 2015. Santiago, Chile.

o:\final\2014\1421\1411734\1411734-163-tm-rev0-16000\attachments\attachment b\attachment b - rev 0 - bat criteria.docx

APPENDIX F

Closure Water Treatment Plan – Conceptual Design

17 October 2016

REPORT ON

Mount Polley Mine Closure Water Treatment - Conceptual Design

Submitted to:
Mount Polley Mining Corporation
Box 12
Likely, BC
V0L 1N0

Attention: Mr. Luke Moger

REPORT

Reference Number: 1411734-150-R-Rev0-16000

Distribution:

1 Electronic Copy - Mount Polley Mining Corporation
1 Hard Copy - Golder Associates Ltd.

Golder Associates

Glossary of Terms

Abbreviation	Definition
BC	British Columbia
BCR	biochemical reactor
BLM	biotic ligand model
BOD	biochemical oxygen demand
BOE	basis of estimate
CAD	Canadian dollars
DO	dissolved oxygen
FWS	free water surface
HRT	hydraulic retention time
MPMC	Mount Polley Mining Corporation
PETBP	Perimeter Embankment Till Borrow Pond
SED	sedimentation pond
SPC	sulphide polishing cell
SSF	subsurface
TDS	total dissolved solids
TSF	Tailings Storage Facility
TSS	total suspended solids
WQG	water quality guideline
%	percent
°C	degrees Celsius
ha	hectare
kg/yr	kilograms per year
L/s	litres per second
m	metre

Abbreviation	Definition
m^2	square metre
m^3	cubic metre
m^3/d	cubic metres per day
m^3/s	cubic metres per second
masl	metres above sea level
mg/L	milligrams per litre
mg/L (as N)	milligrams per litre as nitrogen
mol/d	moles per day
mol/m^3-day	moles per cubic metre per day
w/w	wet weight

Executive Summary

Mount Polley Mining Corporation (MPMC) is evaluating technology options for treating Mine contact water in the Closure and Post-closure phases. An option that reflects the stated preference of MPMC and some stakeholders is the use of a passive water treatment system and return of water to pre-development watersheds.

As a first step toward a passive, distributed system, a conceptual design of a centralized passive treatment system was developed. For this design basis, it is assumed that all Mine contact water would be conveyed to a common treatment facility located on the Tailings Storage Facility and on the Polley Flats area, with treated water discharged to Hazeltine Creek.

The conceptual passive treatment system would have a total footprint of 96 ha, and a design treatment capacity of 13,000 m^3/d, subject to confirmation in future phases of design, as well as potential optimizations to the Closure drainage system such as diverting higher quality water from some areas of the reclaimed mine directly to nearby watersheds, and refining the input water quality data. The system is designed to reduce concentrations of key constituents of potential concern, most notably copper, selenium and sulphate, to levels within acceptable discharge targets. The system, however, is unlikely to meet phosphorous concentration targets. The conceptual passive treatment system consists of the following main process units: sedimentation pond, biochemical reactors, sulphide polishing cells, and constructed wetlands.

To support the development of the Post-closure treatment concept, a conceptual design for a passive treatment pilot plant was also developed. The pilot plant would have a total footprint of 1.5 ha, and a design treatment capacity of 55 m^3/d. The pilot plant would be constructed and run during Operations, providing the opportunity to not only demonstrate the feasibility of the passive treatment system components listed above, but also to test, refine and size alternative treatment components and design approaches, as required. Further optimization may be gained during this period as the models used to generate inputs to the conceptual design are validated, which would provide a higher level of confidence, and consequently, require a lower level of conservatism in the inputs. Apart from the described passive process units, the following alternative process units are included with the conceptual pilot plant: biochemical reactor with inert material, sulphide reactor, aeration cascade, and aerated and settling ponds.

In this report, it is noted that the sizing of the system is primarily driven by the load removal of constituents of potential concern, and as such could conceptually also be apportioned to the distributed sources at design sizes relative to their respective load contributions.

A trade-off study should be conducted to compare the passive and semi-passive treatment concepts with active treatment concepts. Once the most suitable treatment option is selected, bench or pilot testing should be performed before implementation of the full-scale treatment system.

Table of Contents

GLOSSARY OF TERMS i

EXECUTIVE SUMMARY iii

1.0 INTRODUCTION 1

1.1 Background 1

1.2 Previous Work 1

2.0 SCOPE OF WORK 2

2.1 Summary and Limitations 2

2.2 Water Treatment Phases 2

2.2.1 Operations 3

2.2.2 Closure and Post-closure 3

2.2.3 Pilot Testing 4

3.0 TREATMENT TECHNOLOGY SCREENING 5

3.1 Introduction 5

3.2 Selected Technologies 5

4.0 CONCEPTUAL INFLOW DESIGN CRITERIA 6

5.0 POST-CLOSURE PROCESS DESCRIPTION 8

5.1 Water Treatment Location 9

5.2 Sedimentation Pond 10

5.3 Biochemical Reactor 11

5.3.1 Design Description 12

5.3.2 List of Assumptions 13

5.4 Sulphide Polishing Cell 14

5.4.1 Design Description 14

5.4.2 List of Assumptions 15

5.5 Constructed Wetlands 16

5.5.1 Description 16

5.5.2 List of Assumptions 18

5.6 Treatment System Footprint 18

5.7 Process Limitations 19
6.0 GENERAL DESIGN ASSUMPTIONS 20
7.0 PILOT TESTING 21
7.1 Introduction 21
7.2 Conceptual Inflow Design Criteria 21
7.3 Facility Location 22
7.4 Process Description 22
7.5 Biochemical Reactors 23
7.5.1 Design Description 23
7.5.2 List of Assumptions 24
7.6 Sulphide Reactor 25
7.6.1 Design Description 25
7.6.2 List of Assumptions 25
7.7 Sulphide Polishing Cell 26
7.7.1 Design Description 26
7.7.2 List of Assumptions 27
7.8 Constructed Wetlands 28
7.8.1 Design Description 28
7.8.2 List of Assumptions 29
7.9 Aeration Cascade 30
7.9.1 Design Description 30
7.9.2 List of Assumptions 31
7.10 Aerated and Settling Ponds 31
7.10.1 Design Description 31
7.10.2 List of Assumptions 32
7.11 Treatment System Footprint 32
7.12 Process Limitations 33
8.0 DISCUSSION AND NEXT STEPS 34
9.0 CLOSURE 35
REFERENCES 36

STUDY LIMITATIONS **37**

TABLES

Table 1: Water Treatment Phases 2
Table 2: Post-closure Inflow Design Criteria 7
Table 3: Qualitative Process Unit Matrix of Design Constituents 9
Table 4: Sedimentation Pond Design 11
Table 5: Biochemical Reactor Design Parameters 12
Table 6: Sulphide Polishing Cell Design Parameters 14
Table 7: Influent Water Quality/Quantity for Wetland Design Considerations 17
Table 8: Closure System Footprint 18
Table 9: Pilot Biochemical Reactor Design Parameters 23
Table 10: Sulphide Reactor Design Parameters 25
Table 11: Sulphide Polishing Cell Design Parameters 26
Table 12: Influent Water Quality/Quantity for Wetland Design Considerations 28
Table 13: Design Criteria for the Cascade Aeration 30
Table 14: Design Criteria for the Aeration Pond 32
Table 15: Operations and Pilot System Footprint 33

ATTACHMENTS

ATTACHMENT A
Figures

ATTACHMENT B
Copper Target Derivation

ATTACHMENT C
Selenium Target Derivation

1.0 INTRODUCTION

1.1 Background

To support the Mount Polley Mining Corporation (MPMC) water management strategy, Golder Associates Ltd. (Golder) has developed this conceptual plan for treating contact water from the Mount Polley Mine (the Mine). MPMC is evaluating technology options for treating Mine contact water in the Closure and Post-closure phases. An option that reflects the stated preference of MPMC and some stakeholders is the use of a passive water treatment system and return of water to pre-development watersheds.

As a first step toward a passive, distributed system, a conceptual design of a centralized passive treatment system was developed. For this design basis, it is assumed that all Mine contact water would be conveyed to a common treatment facility located on the Tailings Storage Facility and on the Polley Flats area, with treated water discharged to Hazeltine Creek. It is noted that the sizing of the system is primarily driven by the load removal of constituents of potential concern, and as such could conceptually also be apportioned to the distributed sources at design sizes relative to their respective load contributions.

Other optimizations may lead to reduced sizing of the system presented herein, such as diverting higher quality water from some areas of the reclaimed Mine directly to nearby watersheds, and reducing conservatism in inputs to the design as the models used to generate inputs are validated with operational data.

The purpose of this plan is to demonstrate, at a conceptual level, how passive or semi-passive water treatment technology could be used to meet the Mine's long-term (Post-closure) requirements with respect to water discharges to the receiving environment. Ideally, a transition towards such passive or semi-passive water treatment will phase out the currently operational active treatment (Veolia) water treatment plant (WTP) utilized at the Mine.

1.2 Previous Work

In June 2016, Golder completed a preliminary review of active, passive, and semi-passive water treatment systems for contact water at the Mine (Golder 2016a), summarized in Section 3 below.

This report is intended to provide additional detail for passive and semi-passive technologies identified in the screening report in the context of more detailed water quality information that has since been developed.

2.0 SCOPE OF WORK

2.1 Summary and Limitations

The scope of this document is limited to considering passive (including semi-passive) treatment systems to show how these could be integrated into the Mine's Closure and Post-closure plans. There is potential to construct one such passive treatment system in the Polley Flats area near Polley Lake (see Figure 01), with piloting in the near term and full-scale implementation in the long term.

With respect to the Polley Flats area, if considering Post-closure flows generated from the entire Mine site (i.e., centralized flow), it is unlikely to be large enough to accommodate a completely passive full-scale treatment system. Therefore, other areas are shown as candidates as well. In this regard, one of the objectives of piloting is to define the area required for passive treatment, as it is the stated goal of MPMC to return water, to the maximum extent practicable, back to natural (i.e., pre-mining) watersheds, which may require multiple passive treatment systems across the Mine site.

It may be appropriate, however, to also consider piloting and evaluating one or more active technologies for comparison. This work could be done concurrently with the proposed work on the passive plant, but is not discussed further herein.

As noted in Golder 2016a, two main advantages of passive systems are the infrequent maintenance and low power required compared to active systems; however, the flow rates (and therefore surface area) projected to be required for a passive system to treat the entirety of Mine contact water for the Closure and Post-closure scenarios are higher than is usually practical for passive plants. Reduction of this flow rate would likely be possible through incorporation of specific water management considerations into reclamation and closure planning. However, it is not guaranteed that a passive or semi-passive system would prove to be the preferred option, once the results of the pilot testing are in hand.

2.2 Water Treatment Phases

The conceptual plan to treat Mine contact water over the Mine's Operations phase through to Post-closure is considered in this section. The scopes of work for the various life stage phases are presented in Table 1 and followed by more detailed descriptions.

Table 1: Water Treatment Phases

Phases	Operations	Closure	Post-closure
Timeframe	July 2016 – July 2020	July 2020 – July 2022	July 2022 – 2100
Mine activities	Active mining	Reclamation and rehabilitation	None
Water treatment approach	Active treatment Bench testing and piloting of passive/semi-passive treatment technologies	Transitional phase from active treatment to passive/semi-passive treatment	Passive/semi-passive treatment

2.2.1 Operations

The Operations phase ranges from the time that full operations resume (projected to be in July 2016 for the purpose of this report), continues for the duration of active mining, and ends in July 2020 when active mining will cease under the currently authorized Mine plan. The Mine's existing WTP consists of an Actiflo (Veolia) solids settling and metals removal system that discharges via Hazeltine Creek and a diffuser system into Quesnel Lake. To meet the water treatment requirements for the remainder of the Operations phase of the Mine, Golder developed a separate water treatment plan (Golder 2016b, TAR Appendix E) that describes the projected modifications and additions required to the Actiflo system. Attachment A, Figure 2 shows the site plan for treatment during Operations.

2.2.2 Closure and Post-closure

The period following active mining is defined as Closure and ranges from July 2020 to July 2022, by which time mining operations would have ceased and reclamation work would have commenced. Closure is followed by a period defined as Post-closure, defined nominally for the purposes of this work from July 2022 to 2100. It is envisioned that water treatment will transition from relying on the Actiflo system to a more passive treatment system in Post-closure, or sooner if feasible. Apart from applying source control measures, MPMC intends to mitigate Mine contact water at source by means of distributed passive treatment systems, and to restore water flow into the natural watersheds. This reflects an aspirational goal rather than an environmental imperative, as the active WTP and diffuser system could continue to be used to manage the Mine's contact water during Closure and Post-closure.

There is considerable chemical and flow variability associated with the impacted site water sources, and also significant differences in the potential receiving environments. These factors indicate that a distributed treatment system may be appropriate; however, a centralized passive treatment system was developed, which assumes that all the water sources would be combined before treatment, and then discharged to a single receiving environment (i.e., Hazeltine Creek). In this report, it is noted that the sizing of the system is primarily driven by the load removal of constituents of concern, and as such could conceptually also be apportioned to the distributed sources at design sizes relative to their respective load contributions. Reduction of the flow rate requiring treatment would also be possible through incorporation of specific water management considerations into reclamation and closure planning.

Attachment A, Figure 1, shows the conceptual site plan for treatment during the Post-closure phase.

2.2.3 Pilot Testing

To support the development of the Post-closure treatment concept, a conceptual design for a passive treatment pilot plant is presented in this document. In concept, the pilot plant would be constructed and run during Operations, providing the opportunity to not only demonstrate the feasibility of all the passive treatment system components proposed for the Post-closure phase, but also to test, refine and size alternative treatment components and design approaches, as required. Due to the unprecedented scale (considering total flow required to be treated, even if potentially across multiple treatment systems) for which Post-closure treatment may be required at the Mine, the pilot plant is designed with added features to test and demonstrate how active components (e.g., chemical dosing equipment, and instrumentation and control features) could potentially improve the efficiency of the passive treatment technologies proposed for Post-closure. Although designed to demonstrate Post-closure technologies, it is envisioned that the pilot plant would treat Operations quality water, with the ability to either discharge to the receiving environment or return the treated water to the WTP.

Attachment A, Figure 2, shows the site plan for the pilot treatment facility.

3.0 TREATMENT TECHNOLOGY SCREENING

3.1 Introduction

The preliminary technology screening (Golder 2016a) was based on conservative assumptions to identify a large number of potential constituents of concern, and consequently a broad range of constituent-specific treatment technologies that could be applied.

The screening exercise documented the advantages and disadvantages associated with active and passive treatment technologies. Active treatment systems can be capital intensive and require control systems, regular reagent and labour inputs, and typically rely on electrical and mechanical processes for routine operation. In contrast, although passive treatment systems may also be capital intensive to construct, they do not require reagent inputs or electrical/mechanical processes, but harness naturally available means such as microbial activity and topography, and may require regular, but less frequent, maintenance to operate.

Consideration was also given to semi-passive treatment systems in which active and passive components may be used in conjunction with each other to improve treatment efficiency and minimize footprint and costs, while providing flexibility to treat a variety of flows and loads.

3.2 Selected Technologies

The screening of active, passive, and semi-passive treatment technologies that were developed during the preliminary screening were used to inform the development of treatment options for the conceptual treatment plan described in this document.

At the request of MPMC, Golder considered a passive system to treat the site runoff during the Post-closure phase. Due to the potential practical and economical limitations of a passive system in terms of the maximum flow rate that can be successfully treated and the large footprint requirement, it is proposed that a semi-passive system as well as the passive system components be piloted during Operations. Refer to Section 7.0 for a detailed description and conceptual design of the proposed pilot plant.

The passive treatment process selected for Post-closure consists of the following technology components:

- sedimentation pond (SED) for total suspended solids (TSS) and particulate metal removal as an alternative to the sedimentation achieved in the Springer Pit, the SED will function as a pre-treatment step for the passive treatment system
- biochemical reactor (BCR) for the removal of sulphate, nitrate, most dissolved metals, and selenium
- sulphide polishing cell (SPC) for removal of reduced sulphur
- subsurface (SSF) constructed wetland for the removal of biochemical oxygen demand (BOD) generated by the BCR
- free water surface (FWS) constructed wetland for further BOD polishing and manganese removal

4.0 CONCEPTUAL INFLOW DESIGN CRITERIA

The following section describes the conceptual inflow design criteria for the Post-closure water treatment phase.

For developing the Post-closure treatment concept, it was assumed that most site runoff will converge in the Perimeter Embankment Till Borrow Pond (PETBP), from which water will be pumped (via additional site water management systems) to the Springer Pit for flow equalization and storage, while the Mine water associated with the Temporary Northwest (NW) Potentially Acid Generating (PAG) Stockpile system (9K Sump, NW PAG Sump) will be directly pumped to the Springer Pit. This is particularly proposed during periods of high flows (i.e., freshet). The system was designed with flexibility so that direct treatment of surface water runoff from catchment areas nearby the proposed water treatment system is possible, as TSS removal can be provided by SED. From the Springer Pit, water will then be pumped to a centralized passive water treatment system. Although it is not envisioned to rely on pumping in Post Closure, pumping was included as a starting point for the development of the Post Closure treatment concept. Directing all water to the Springer Pit, and then metering out over nine months of the year, is not a preferred option, especially during Closure, and would represent a large pumping cost in Post-closure.

Following the same rationale used during preliminary screening (Golder 2016a), the combination of a 50th percentile (median) flow rate with a 95th percentile concentration was selected for the Post-closure design criteria. With the Springer Pit providing flow equalization for the proposed treatment system, median flows could be used for the design.

Golder prepared a stochastic site water balance model to predict Post-closure flows for the period of July 2020 to 2100. Fiftieth percentile (median) monthly flows for each month of the year were modelled, from which the maximum median predicted monthly flows were extracted. Winter month flows (December to February) are forecast to be significantly smaller than the flows for other months. Because of cold climate conditions, some of the biological water treatment components may not operate well during winter months due to lower biological activity, so maximum monthly flow rates from January to December were added and averaged for a period of nine months, and the predicted median flow rate of 13,000 m^3/d was selected for conceptual water treatment design for Post-closure (this assumes that all the yearly site runoff could be treated during a nine month period).

As part of the proposed conceptual design, TSS will be removed during a pre-treatment step using a SED (which was sized to treat water that has not passed through Springer Pit) and the associated particulate metals concentrations will be reduced accordingly. Thus, water quality was predicted using a stochastic probabilistic model for the PETBP and the 95th percentile concentration of constituents of concern, assuming a TSS concentration of 15 mg/L to the main water treatment system, was selected as a design criterion. Water quality target values for discharge to Hazeltine Creek (without considering an initial dilution zone) based on post-closure and existing hardness were used to screen the predicted water quality for the PETBP, and the results are shown in Table 2.

Table 2: Post-closure Inflow Design Criteria

Parameter	Units	Hazeltine Creek Post Closure Treatment Water Quality Targets		Closure
		Post Closure no Dilution	Notes	13,000 m^3/d
Major Ions				
Sulphate	mg/L	309	D	841
Nutrients				
Ammonia	mg/L (as N)	0.100	D	0.19
Nitrate	mg/L (as N)	3.0	D	19
Nitrite	mg/L (as N)	0.020	D	0.52
Total phosphorus	mg/L	0.030	B	0.048
Total Metals				
Antimony	mg/L	0.009	E	0.0011
Beryllium	mg/L	0.00013	E	0.00038
Chromium	mg/L	0.001	E	0.0019
Cobalt	mg/L	0.004	D	0.005
Copper	mg/L	0.019	A	0.054
Iron	mg/L	1.0	D	1.1
Manganese	mg/L	1.4	D	2.1
Mercury	mg/L	0.00002	D	0.000024
Selenium	mg/L	0.010	C	0.11
Dissolved Metals				
Aluminum[(a)]	mg/L	0.050	D	0.094
Antimony	mg/L	0.0009	E	0.0011
Beryllium	mg/L	0.00013	E	0.00037
Cobalt	mg/L	0.004	D	0.0044
Copper	mg/L	0.019	A	0.044
Manganese	mg/L	1.4	D	2.1
Selenium	mg/L	0.010	C	0.11

Notes:

X = Indicates concentration exceeding the HAC preliminary treatment WQ targets for post closure no dilution.

*a) = Treatment Target specifically for Dissolved Metals.

A = Derivation of copper target is provided in Attachment B.

B = pre-breach mean 0.033; pre-discharge mean 0.03.

C = Derivation of selenium target is provided in Attachment C.

D = approved 30- d WQG

E = working 30- d WQG

5.0 POST-CLOSURE PROCESS DESCRIPTION

Surface water from the different site sources will be pumped to the Springer Pit for storage, sedimentation and equalization. From the Springer Pit, water will be pumped to the centralized water treatment system, which will consist of the following passive treatment components:

- one SED (parallel to the Springer Pit)
- four BCRs
- 16 SPCs
- 16 SSF wetlands
- four FWS wetlands

The treatment system will be split into four identical trains to allow modular construction, distributed layout, and sequential maintenance. Apart from the Springer Pit and the SED (which is provided as an alternative sedimentation feature), which are common units preceding all four trains, each train will consist of the following treatment components:

- one BCR
- four SPCs, operating in parallel
- four SSF wetlands, operating in parallel
- one FWS wetland

It is expected that the Springer Pit and the SED will reduce the feed water TSS concentration. From there, the water should be discharged to four BCR trains. The BCRs are expected to remove nitrate, aluminum, antimony, cobalt, copper, and selenium, and to partially remove sulphate from the water. Due to the organic nature of the BCR substrate media, it is expected that the water discharged from the BCR will have high BOD along with phosphorus and ammonia content. The effluent from each BCR cell should discharge into the SPCs, from which sulphide is expected to be removed through iron precipitation. The effluent from each SPC should be discharged by gravity into an SSF wetland cell, where the bulk of the BOD is expected to be removed. For each train, water from the SSF wetland cells will flow by gravity into a common FWS wetland, which is expected to remove manganese, and to polish BOD prior to discharge into Hazeltine Creek.

The relative change in constituents that have design implications are qualitatively demonstrated in Table 3 for each of the process units listed above and described in the sections that follow. The information provided here is for conceptual design purposes only and subject to confirmation with bench and pilot testing work.

Table 3: Qualitative Process Unit Matrix of Design Constituents

Parameter	Feed	Springer Pit / SED	BCRs	SPCs	SSFs	FWS
TDS	●	●	●	●	●	*
TSS	●	○	○	○	-	-
Sulphate	●	●	○	-	-	-
Nitrate/nitrite	●	●	○	○	○	-
Total phosphorous	○	○	●	*	*	*
Selenium	●	●	-	-	-	-
Manganese	●	●	●	●	●	-
Aluminum	●	●	-	-	-	-
Antimony	●	●	-	-	-	-
Cadmium	●	●	-	-	-	-
Cobalt	●	●	-	-	-	-
Copper	●	●	-	-	-	-
Zinc	●	●	-	-	-	-
Other metals	●	●	○	○	○	*
BOD	-	-	●	●	○	*

● Indicates presence of constituent.

○ Indicates relative presence compared to what is indicated by ●.

- Indicates removal to below expected target values.

* Indicates uncertainty as to either removal efficiency or target values.

SED = sedimentation pond; BCR = biochemical reactor; SPC = sulphide polishing cell; SSF = subsurface; FWS = fresh water surface; TDS = total dissolved solids; TSS = total suspended solids; BOD = biochemical oxygen demand.

The process flow diagram for Closure is provided in Attachment A, Figure 3.

The following sections will discuss each component of the passive water treatment system in more detail.

5.1 Water Treatment Location

Because of the passive nature of the water treatment system, the SED and treatment cells need to be arranged so that water will flow by gravity within the treatment system. The topography of the terrain needs to be assessed in more detail during the detailed design of the passive treatment system so that appropriate static pressure is provided for successful water flow through the system. Earthworks and pressure requirements for operation of each water treatment component were not assessed during the conceptual design of the water treatment system.

Several potential locations were considered, but not evaluated in detail:

- Polley Flats area
- on top of the Tailings Storage Facility (TSF)
- at the Old Till Borrow Pit (near Gavin Lake Bridge), and adjacent to (south of) the TSF

For the purposes of the central passive treatment concept design, the Polley Flats area of approximately 30 ha, adjacent to Polley Lake and Hazeltine Creek, was selected for placement of part of the conceptual water treatment system. Because the total footprint of the passive treatment system proposed exceeds 30 ha, a portion of the treatment system was located at the Polley Flats area (for easy effluent discharge into Hazeltine Creek) and the rest located in other areas.

During Post-closure, the TSF will accumulate local runoff in a pond to be located in the north-west corner. The maximum operating level of the pond will be at 966.6 metres above sea level (masl). A sloped beach area will be built and an area of approximately 150 ha located above the 966.6 masl line may be available for placement of the water treatment system.

Alternatively, the Old Till Borrow Pit location, near the Gavin Lake Bridge, could be used. The area is currently undeveloped. Based on the results of piloting and future design refinement, additional locations may be feasible, preferably in locations well-suited to the preferred Post-closure distributed discharge strategy, and taking into consideration other factors, such as topography, potential future TSF expansion and rehabilitation plans.

For this conceptual design, the water treatment system is located in the Polley Flats and the TSF, as described.

5.2 Sedimentation Pond

The SED is included as an alternative sedimentation feature to the Springer Pit and discharges to four individual BCRs (downstream). For the main configuration, Mine contact water will initially be conveyed to the Springer Pit to provide flow equalization and sedimentation, from where it will be pumped to BCRs. Alternatively, Mine contact water can also be conveyed through the SED at a maximum design flow rate of 22,000 m^3/d (0.26 m^3/s). This represents the sum of the maximum monthly flows for a 1-in-10 year event (90th percentile), divided by nine months. Although the other treatment components were sized to treat the median flow rate of 13,000 m^3/d, the SED was designed to accommodate a higher hydraulic flow rate to allow for additional hydraulic equalization during freshet. At the initial stages of Post-closure, higher concentrations of constituents are more likely to occur, and provision is made for the rest of the treatment system to be bypassed and the outflow from the Springer Pit or SED to be discharged to Quesnel Lake through the Operations phase's diffuser system.

The primary design objective of the SED is to lower the TSS of Mine contact water, which will reduce the particulate component of metal constituents prior to discharge to the BCRs. The current permit for the existing short-term effluent discharge (*Environmental Management Act* Permit 11678) allows a maximum TSS level of 15 mg/L to be discharged to Quesnel Lake, via Hazeltine Creek and a diffuser. Considering this, the purpose of the SED is to reduce the incoming Mine contact water TSS level at the pond discharge point.

The SED dimensions are based on the design criteria set out by the BC Ministry of Environment (MOE 2015) which primarily uses the Stokes settling theory to calculate the required effective pond surface area. The Stokes equation is used to calculate the settling velocity for a range of particle diameters from a sediment sample taken from site runoff. The range in settling velocities is compared to the pond critical settling velocity, in the direction of the pond depth, based on the incoming flow rate divided by the effective surface area of pond. This comparison is used to calculate the sediment mass fraction removed from the inflow at the pond discharge point. The pond dimensions are adjusted to achieve an effective pond surface area that results in the targeted TSS being met. The SED is sized to remove particle sizes above 15 microns. The TSS removal rate will depend on the particle size distribution properties of the site run off water, and would need to be confirmed as part of the detailed design. The SED conceptual design includes an internal pond length of 110 m, width of 25 m and a depth of 4 m. The internal batter slopes are 3H:1V, and the berm crest width is 5 m to allow access for maintenance vehicles. The SED also includes inactive storage for deposited sediments to a maximum depth of 2 m, an active storage level of 1 m depth and freeboard of 1 m. The inlet and outlet pipes have design invert elevations to allow the pond level to achieve the effective pond surface area prior to discharging to the biochemical reactor cells. The SED design is summarized in Table 4.

Table 4: Sedimentation Pond Design

Design Attribute	Unit	Value
Internal pond length	m	110
Internal width	m	25
Depth	m	4
Internal batter slopes	ZH:1V	3
Berm crest width	m	5
Inactive storage for deposited sediment	m	2
Active storage depth	m	1
Freeboard	m	1

For this conceptual design, the particle settling velocity calculation is based on a single sample and more sampling will be required to confirm this calculation in the next design phase.

5.3 Biochemical Reactor

The design of the BCR is based on design guidelines by the Interstate Technology and Regulatory Council (ITRC 2013) and has been informed by previous bench and pilot testing as well as full scale designs by Golder. The pilot plant work at the Mine site on passive remediation by means of a bioreactor (Baldwin et al. 2015) was also reviewed.

The BCR consists of a lined pond filled with carbon source substrate and submerged water column, where oxygen is consumed by microorganisms, and anaerobic conditions prevail. The anaerobic conditions are ideal for development of microorganisms that use organic substrate as a nutrient source, such as sulphate and selenium reducing bacteria.

Sulphate reducing bacteria oxidize organic matter, produce bicarbonate, raise the pH and alkalinity content of the water, and are able to convert sulphates present in the feed water to sulphides, which should bind with soluble metals and form insoluble metal sulphides. Because plants are not required in anaerobic BCRs, and to maintain anaerobic conditions, this system can be constructed underground or buried. In cold climates, BCRs need to be covered to maintain biological activity and to optimize the performance of the system during cold months.

Due to the organic nature of the BCR substrate media, as biodegradable material is broken down under anaerobic conditions, contaminants contained in the substrate media may be released. It is expected that the water discharged from the BCR will have high BOD along with phosphorus and ammonia content, and metals associated with specific substrate media. One of the objectives during bench testing is to optimize the substrate composition to minimize phosphate, BOD, and metal leaching from the substrate media components.

5.3.1 Design Description

The flow from the Springer Pit or SED should be equally split and distributed to four BCRs operating in parallel. The BCR design requirements for removal of selenium, nitrate and sulphate were compared. As the minimum hydraulic retention time (HRT) required for sulphate removal is greater than that required for selenium or nitrate removal, sulphate removal HRT is the limiting factor, and hence was selected as the main design criterion.

The BCR relies on sulphate reduction and metal sulphide precipitation to reduce metal concentrations. If there is excess sulphide present, the sulphate removal depends on the sum of the metal loads to the BCR. The resulting total metal load along with sulphate load were estimated and compared, and the results are presented in Table 5. Because the sulphate load is greater than the total metal load, the system would remove the metals of concern and only a portion of the sulphate. The remaining sulphate (now in the reduced sulphide form) is removed in the SPC, located downstream of the BCR.

The BCR system was designed to remove aluminum, antimony, cobalt, copper, selenium, nitrate, and a portion of sulphate from the water. The design parameters for the BCR are summarized in Table 5.

Table 5: Biochemical Reactor Design Parameters

Parameter	Units	Value
Total flow to BCR system	m^3/d	13,000
Flow per BCR	m^3/d	3,300
pH	pH units	8.0
Total metal load	mol/d	160
Sulphate load	mol/d	110,000
Hydraulic retention time for sulphate removal	days	11

BCR = biochemical reactor; mol/d = moles per day.

The minimum required footprint for each BCR cell based on sulphate removal was found to be 42,000 m^2.

The BCR has a total depth of 3.0 m, which consists of the following:

- 2 m substrate
- 0.3 m bottom gravel discharge
- 0.3 m free water with wood chips
- 0.4 m freeboard

The substrate layer volume consists of the following:

- 60% wood chips
- 19% hay
- 1% manure
- 20% limestone

The side slope was assumed to be 3H:1V. Details of the proposed BCR geometry (typical cross-section) are shown on the Closure Sections provided in Attachment A, Figure 5.

The static water head required for BCR operation needs to be determined during future work. Additionally, during detailed design, the substrate hydraulic conductivity must be taken into consideration for the head loss calculation. The hydraulic conductivity of the substrate can be established during bench- and pilot-scale testing.

The system was conceptually designed such that it may be operated in both upflow and downflow modes, facilitated by a suitable valve arrangement. Upon start-up, the BCR could leach high concentrations of BOD, which would need to be recirculated through the system until a steady state BOD concentration of 60 mg/L is achieved. A bypass line for water to be recirculated through the BCR during commissioning and start-up needs to be considered during the next phase. Recirculation may be carried out by installing a pump at the BCR outlet and by opening and closing appropriate valves. The pump must be capable of providing a minimum water head (to be determined) to feed the BCR at 0.15 m^3/s.

5.3.2 List of Assumptions

The assumptions used for the conceptual design of the BCR system include the following:

- A flow meter will be provided upstream of each BCR.
- Suitable substrate for the BCR will be available.
- The substrate media will have a porosity close to 50%.
- Pilot or bench testing on Mine contact water will be performed to confirm the design and sizing criteria (e.g., substrate composition and porosity, and hydraulic retention time).

- The main mode of operation will be in the upflow configuration.
- The BCR material will be replaced every 10 to 15 years, or as required. Material replacement frequency should be reviewed during detailed design.

For a list of general design assumptions, refer to Section 6.0.

5.4 Sulphide Polishing Cell

The SPC is a lined pond filled with wood chips mixed with sacrificial iron material, submerged in water. The sacrificial iron can be obtained from various sources. Since the Mine site has magnetite available, it is proposed to consider using magnetite as a potential source of sacrificial iron.

The SPC is designed with a bottom-fed vertical flow configuration which should preserve the anaerobic state of the BCR effluent as it comes into contact with the iron and wood chips mixture. An anaerobic state is required to remove the remaining sulphide from the BCR by precipitating it as iron sulphide. Failure to remove sulphides would result in the sulphide being oxidized back to sulphate.

The introduction of a SPC will have the added benefit that it could potentially remove phosphate through iron co-precipitation. This is something that will be confirmed through the proposed bench and pilot testing.

The media containing the iron source and wood chips mixture (referred to as the “iron sponge”) will be consumed over time and, if exhausted, may require replacement with fresh media. The design can be optimized to allow media replacement when required.

5.4.1 Design Description

The flow from each BCR will be equally split and distributed into to four SPCs operating in parallel. Design parameters for the SPCs is are provided in Table 6.

Table 6: Sulphide Polishing Cell Design Parameters

Parameter	Units	Value
Total flow to SPC system	m^3/d	13,000
Flow per SPC	m^3/d	810
Sulphate to be bound	mol/d	84,000
Iron required for sulphate removal	mol/d	84,000
Sacrificial iron required	kg/yr	1,700,000
Controlling iron sponge req. per cell	m^3	7600
Minimum SPC HRT	days	0.5
Calculated HRT for SPC system	days	8.0

SPC = sulphide polishing cell; HRT = hydraulic retention time; mol/d = moles per day.

The footprint of the system is proportional to HRT. The minimum required footprint for each SPC cell based on sulphate removal was found to be 6,200 m^2.

Each SPC has a total depth of 4.0 m, which consists of the following:

- 3 m of polishing media (iron sponge)
- 0.3 m bottom gravel discharge
- 0.3 m free water with wood chips
- 0.4 m freeboard

The iron sponge volume consists of the following:

- 35% wood chips
- 65% sacrificial iron (e.g., magnetite)

Side slopes are assumed to be 2H:1V.

Details of the proposed SPC geometry (typical cross-section) are shown on the Closure Sections provided in Attachment A, Figure 5.

The static water head required for the SPC operation needs to be determined during future work. Additionally, during detailed design, the substrate hydraulic conductivity must be taken into consideration for head loss calculations. The hydraulic conductivity of the polishing media, as well as its composition, needs to be verified during bench-scale and pilot testing. The magnetite available on site needs to be sampled to determine the iron concentration in it and suitability for use as sacrificial iron.

5.4.2 List of Assumptions

The assumptions made in the conceptual design of the SPC system include the following:

- Sufficient hydraulic pressure will be available to operate the SPC in the upflow mode of operation.
- A flow meter will be provided upstream of each SPC.
- Magnetite and wood chips will be available as substrate for the SPC.
- The amount of iron in the magnetite will be sufficient to be used as sacrificial iron material.
- The iron concentration in the media will be at a minimum 40%.
- The polishing media will have a porosity close to 50%.

- Pilot or bench testing with Mine contact water will be performed to confirm the design and sizing criteria (e.g., iron sponge material and porosity, and hydraulic retention time).
- The SPC material will be replaced every 10 years, or when required. Material replacement frequency should be reviewed during detailed design. If more metal constituents of concern co-precipitate with iron, then more frequent replacement of the polishing media might be required.

For a list of general design assumptions, refer to Section 6.0.

5.5 Constructed Wetlands

Constructed wetlands are manmade structures designed to mimic processes occurring in natural wetlands in removing pollutants from the water. In wetlands, there are high degrees of interaction between soil chemistry, nutrient cycles, and habitat, amongst others. A constructed wetland consists of a shallow lined basin filled with substrate, with either submerged water in the case of SSF wetlands, or open water in the case of FWS wetlands, and often with aquatic plants. Anaerobic and aerobic bacteria can exist in both SSF and FWS wetlands, although aerobic conditions tend to prevail in a FWS wetland because of the open water surface. A constructed wetland is typically provided as a polishing step following biological treatment of wastewater.

5.5.1 Description

Although the Mine contact water is not expected to have high levels of BOD, there is a possibility of appreciable levels of BOD being released from the BCR. In addition, a BCR typically is not effective for manganese removal, which is one of the parameters of concern in the Mine contact water. Hence, the constructed wetland system is designed mainly for BOD and manganese removal. The design calculations are based on guidelines provided by Ziemkiewicz et al. (2002) and the US Environmental Protection Agency (US EPA 1988, 1993).

For this conceptual design, a passive system composed of sixteen SSF horizontal flow wetland cells and four FWS wetland cells is proposed. The passive system incorporates the benefits of both SSF and FWS wetlands. The SSF cells are designed to remove the majority of the BOD load while being less exposed to the effects of cold climates, whereas the FWS cells are designed to polish the BOD level down to 5 mg/L in Hazeltine Creek, assuming no assimilative capacity in the creek. The FWS cells are also designed to provide aerobic treatment for manganese removal.

Design temperatures, and influent and effluent BOD levels, are important considerations for wetland sizing. Golder considered water temperatures from site monitoring data (2006 to 2016) for the sizing of the wetlands, excluding the coldest months of the year when ice conditions prevail. Since biological activity decreases with temperature, the wetland design size increases to compensate for the lower biological activity.

The expected influent water quality and quantity following the SPC for the wetland design considerations is summarized in Table 7.

Table 7: Influent Water Quality/Quantity for Wetland Design Considerations

Parameter	Units	Value
Flow	m^3/d	13,000
Temperature	°C	0.5
pH	pH units	6.8 to 8.5
Design BOD	mg/L	70
Dissolved manganese concentration	mg/L	1.6

BOD = biochemical oxygen demand.

During start-up, elevated BOD levels are expected and will need to be managed with interim measures such as returning the wetland discharge to the wetland inflow.

The minimum required footprint for each SSF wetland cell based on BOD removal was found to be 21,000 m^2.

Each of the SSF wetland cells is expected to have a total depth of 1.4 m consisting of the following:

- 1 m substrate
- 0.72 m water (the water level is below the substrate)
- 0.4 m freeboard

The substrate layer would consist of the following:

- 0.95 m medium sand
- 0.05 m fine sand

The SSF wetland cells are expected to be placed in areas with a natural slope of 1.5% for drainage. Flow would be equally distributed to each of the SSF cells.

The minimum required footprint for each FWS wetland cell based on BOD and manganese removal was found to be 81,000 m^2 to 82,000 m^2. The areas of some FWS cells are slightly different due to site constraints.

Each of the FWS wetland cells is expected to have a total depth of 1.6 m, consisting of the following:

- 0.35 m substrate
- 0.6 m water (the water level is above the substrate)
- 1 m freeboard (to account for additional head loss due to the SSF cells and to provide flexibility in the water level and capacity)

The substrate layer would consist of the following:

- 0.3 m medium sand
- 0.05 m fine sand

The FWS wetland cells are expected to be designed with a slight slope for drainage. As with the flow distribution to the SSF cells, the FWS cells would be designed with equal distribution of flow. Details of the proposed SSF and FWS cells geometry (typical cross-sections) are shown on conceptual provided in Attachment A, Figure 6.

5.5.2 List of Assumptions

The assumptions used to design the constructed wetland system include the following:

- The final topography of the Mine site at Closure would be suitable for the construction of the wetland cells.
- The substrate media would have a porosity close to 40%.
- Pilot testing with Mine contact water would be performed to confirm the design and sizing criteria (e.g., hydraulic conductivity, temperature dependent rate constant, porosity, evapo-transpiration rate, vegetation viability, and root penetration).

For a list of general design assumptions, refer to Section 6.0.

Preliminary conceptual plans and sections are provided in Attachment A, Figures 1 and 6.

5.6 Treatment System Footprint

The passive system is estimated to have a total footprint of approximately 96 ha. Table 8 shows the breakdown areas for the different components of the passive system.

Table 8: Closure System Footprint

Unit Process Name	Unit	Area per Unit (m^2)	Total (m^2)
SED	1	6,800	6,800
BCR	4	42,000	170,000
SPC	16	6,200	99,000
SSF wetland	16	21,000	336,000
FWS wetland	4	82,000	330,000
Estimated total footprint area (accounting for berms and offsets)	-	-	960,000

SED = sedimentation pond; BCR = biochemical reactor; SPC = sulphide polishing cell; SSF = subsurface; FWS = free water surface.

5.7 Process Limitations

The passive water treatment system was conceptually designed so that its effluent should be able to meet the target water quality limits for all constituents of concern as identified in Table 2. The predicted influent chemistry does not fully account for seasonal variations. This means the 95th percentile predicted concentrations of some constituents may typically only be associated with seasonal low flow scenarios. These seasonal variations were not considered in the design.

There are some constituents that could either not be removed effectively or that could be introduced at concentrations that might not meet target water quality limits. The issues around these constituents will be addressed through additional model refinement, pilot testing, design optimization, and receiving environment assessment work.

It is expected that phosphorus may be introduced by the substrate used in the BCR, and a concentration of 1 to 3 mg/L in the effluent from the BCR could be expected. Although this impact could potentially be reduced through iron co-precipitation in the SPC and the wetlands, the phosphorus concentration in the effluent water prior to discharge may not meet the target water quality limit as provided in Table 2.

Although the treatment system is designed to reduce the sulphate concentration in the feed water and with sulphate being a major component in total dissolved solids (TDS), the TDS will be reduced concurrently. However, this TDS removal benefit is off-set by the alkalinity introduced by the BCR during treatment, with the net effect resulting in the TDS concentration being unchanged.

The BCR is also expected to leach out high concentrations of BOD in the range of 100 to 600 mg/L during start-up (which will require flow recirculation), and around 60 mg/L when steady state is achieved. Although the constructed wetlands are designed to remove the BOD load, the BOD concentration will need to be monitored downstream of the treatment system. A discharge BOD concentration of between 5 to 10 mg/L to Hazeltine Creek is expected. This BOD effluent concentration range could exceed discharge limits, and the latter needs to be confirmed.

Depending on the composition of the substrate being used, it is possible that metals and other constituents may also leach from the BCR. These constituents should be monitored during bench and pilot testing.

6.0 GENERAL DESIGN ASSUMPTIONS

The following is a list of general assumptions that are applicable to the conceptual designs presented in this report:

- The final topography of the Mine site at Closure will be suitable for the construction of each of the system components.
- Input parameters will be as specified in the design criteria.
- The required water head will be confirmed during detailed design stage.
- Earthworks were not considered for conceptual design.
- The substrate media will be available, where appropriate.
- The minimum required footprint where presented for individual process units, do not make provision for berms.

7.0 PILOT TESTING

The following section describes a pilot plant that could be installed to test and refine the passive water treatment system described conceptually above. The fundamental processes in the pilot plant are the same as those in the full-scale plant, so to reduce repetition, the technology descriptions refer to sections above. The sizing and other design specifications listed in Section 7 refer to the pilot plant. Certain aspects of the pilot plant that are applicable to semi-passive optimizations are provided in Section 7 but are not listed for the full-scale system as these have not been applied to the full-scale conceptual design.

7.1 Introduction

For passive treatment systems, the concept design is typically followed by bench tests using laboratory scale equipment to confirm some of the design assumptions and parameters. Based on the information obtained from the bench tests, a pilot-scale plant could then be constructed. The pilot scale is followed by a demonstration-scale plant where all the design components are often run in such a way as to represent a first module of the full-scale plant. For some commercially available active treatment systems, suppliers shorten this process to only conduct pilot testing before full-scale implementation.

The primary purpose of the pilot system is to demonstrate the Post-closure passive treatment concept; however, it is designed with added features to also test and demonstrate semi-passive treatment concepts. This is an approach where the efficiency and footprint associated with passive treatment technologies can potentially be improved upon, through the introduction of active components (e.g., chemical dosing equipment, and instrumentation and control features).

The typical range for pilot plant flow rates are 1 to 10 gpm (or 5 to 55 m^3/day). It becomes difficult to control flow rates below 5 m^3/day, while a flow rate of 55 m^3/day is usually sufficient to inform full-scale design of a fully proven technology concept. Demonstration-scale plants are typically run with flow rates of between 5 and 20 gpm (27 and 109 m^3/day), and are sized to as the first module of a multi-modular full-scale application.

7.2 Conceptual Inflow Design Criteria

Golder selected a flow rate of 55 m^3/d for this passive treatment pilot plant, a flow rate that is in a range where it overlaps with the demonstration-scale plant. At this flow rate, the passive and semi-passive treatment principles could be piloted and/or demonstrated on a scale that could either be applied to the design of a full-scale facility or used as a template for a modular approach.

Since the intention of the pilot plant is to demonstrate Post-closure treatment technologies, the Post-closure inflow water quality design criteria are used for the pilot plant (see Section 4.0), but at the smaller flow rate of 55 m^3/day. However, since the pilot testing will be conducted during Operations, the feed water will be sourced either from the Springer Pit or the PETBP (prior to Actiflo treatment), or from the Actiflo outflow (in case TSS removal upstream of the pilot system is required). The pilot plant outflow will ideally discharge to Hazeltine Creek, with the option to return the outflow to the Actiflo plant if it is not suitable for direct discharge to Hazeltine Creek.

7.3 Facility Location

It is proposed that the pilot system be located in the Polley Flats area, in a location independent of the location for which a Closure treatment system is being proposed. For the pilot system overall site plan drawing, refer to Attachment A, Figure 2.

7.4 Process Description

Golder has proposed to evaluate the treatment efficacy for the Post-closure passive water treatment system downstream of the SED through pilot testing, during which the performance of a passive and variation of semi-passive systems would be evaluated over a minimum period of one full year, but ideally for a period of two years.

The components of the passive Post-closure system are as follows:

- BCR (filled with substrate)
- SPC
- SSF wetland
- FWS wetland
- aeration cascade

The semi-passive system proposed for pilot testing uses some active components with the purpose of enhancing the performance of the passive system. The semi-passive components that will be tested are:

- BCR (inert material filled) with active addition of molasses and nutrients
- sulphide reactor, to which ferric or ferrous chloride will be actively added
- mechanically aerated pond, followed by a settling pond

The conceptual pilot system was designed with sufficient operational flexibility to allow for alternative process configurations to be selected, as illustrated in the pilot system process flow diagram (see Attachment A, Figure 4). The following process components are common to all treatment configurations that will be tested:

- metal/sulphate removal
- sulphide removal
- BOD removal
- manganese removal

The components of the pilot system will be described in more detail in the following sections.

7.5 Biochemical Reactors

For the technology description, refer to Section 5.3

7.5.1 Design Description

Two types of BCRs are being considered for the pilot system: one filled with substrate (conventional), and another filled with inert material. The substrate filled BCR will be able to operate without molasses and nutrient addition; however, it is proposed to also conduct pilot tests when active molasses and nutrient addition takes place, to determine if the performance of the BCR or its footprint can be reduced through active chemical addition. The BCR filled with inert material will require constant chemical addition. Aside from the difference in fill material, both BCRs were designed identically.

The BCRs will be able to take in water either from the Springer Pit or the PETBP (prior to Actiflo treatment), or from the Actiflo outflow (in case TSS removal upstream of the pilot system is required). Both BCRs are designed to operate either independently or with equally split flows. The BCR system was designed to remove aluminum, antimony, copper, selenium, nitrate, and a portion of sulphate from the water.

Similar to the Post-closure BCR described in Section 5.3, the minimum HRT required for sulphate removal was found to be the limiting factor for this design. Table 9 summarizes the design parameters for the BCR.

Table 9: Pilot Biochemical Reactor Design Parameters

Parameter	Units	Value
Total flow to BCR	m^3/d	55
pH	pH units	8.0
Total metal load	mol/d	0.7
Sulphate load	mol/d	482
Sulphate removal load	mol/m^3-day	0.3
Hydraulic retention time for sulphate removal	days	11

BCR = biochemical reactor; mol/d = moles per day; mol/m^3-day = moles per cubic metre per day.

The footprint of the system increases with an increase in HRT. The minimum required footprint for the BCR based on sulphate removal was found to be 1,800 m^2.

The BCR has a total depth of 3.0 m, which consists of the following:

- 2 m substrate
- 0.3 m bottom gravel discharge
- 0.3 m free water with wood chips
- 0.4 m freeboard

For the BCR which filled with substrate, the substrate volume consists of the following:

- 60% wood chips
- 19% hay
- 1% manure
- 20% limestone

For the BCR filled with inert material, the bed volume will consist of crushed gravel.

Side slopes are assumed to be 3H:1V.

Details of the proposed BCR geometry (typical cross-section) are shown on the pilot sections provided in Attachment A, Figure 7.

The portable pump must be capable of providing a minimum water head (to be determined) to feed the BCR at 0.150 m^3/s.

For details of the design description that is similar to what was previously presented, refer to Section 5.3.1.

7.5.2 List of Assumptions

The assumptions used to design the BCR systems were presented in Section 5.3.2. Pilot plant specific assumptions include the following:

- The pilot system will be run for at least two full years to properly assess start-up and long-term removal rates of the constituents of concern.
- Bench testing with Mine contact water will be performed to confirm the design and sizing criteria (e.g., substrate composition and porosity, hydraulic retention time).
- Power will be available for molasses and nutrient dosing.
- Feed water from the PETBP or Springer Pit will be available for pilot testing.
- Although a design flow of 55 m^3/d was assumed for the BCRs, the system was designed with flexibility so that higher flows rates can be tested to evaluate the limitation of the system.
- Molasses and nutrient addition quantities and flows will be established during detailed design.

For a list of general design assumptions, refer to Section 6.0.

7.6 Sulphide Reactor

As part of the semi-passive system, it is proposed that sulphide removal be achieved through iron co-precipitation with dosing of ferric and ferrous chloride. A sulphide reactor consists of a plastic, vertical, closed-top tank in which the iron sulphide reaction will take place.

7.6.1 Design Description

The flow from the BCR system will be sent to the SPC system, which will consist of a sulphide reactor and a SPC. Either sulphide reactor or SPC were designed to be able to operate independently and to treat the full pilot testing flow. For sulphide removal, an adequate amount of ferric or ferrous chloride needs to be added to the water. The sulphide reactor design parameters are defined in Table 10.

Table 10: Sulphide Reactor Design Parameters

Parameter	Units	Value
Total flow to SPC	m^3/d	55
Sulphate to be bound	mol/d	360
Influent sulphide	mg/L	620
Iron required for sulphate removal	mol/d	360
Ferric chloride procured strength	% w/w	39
Ferrous chloride procured strength	% w/w	36
Iron dose as percentage of sulphide produced	%	10
Specific gravity of procured ferric chloride solution	-	1.4
Specific gravity of procured ferrous chloride solution	-	1.2
Usage period of ferric or ferrous chloride solution	months	1
Maximum flow rate of continuous dosing pump	L/s	7.4
Estimated ferric chloride dosing	L/month	323
Estimated ferrous chloride dosing	L/month	319

SPC = sulphide polishing cell; mol/d = moles per day.

Since the estimated ferric chloride dosing rate is higher than ferrous chloride, the sulphide reactor was sized based on the estimated required ferric chloride dosing. It is proposed that a 0.35 m^3 (90 US gallons, 0.9 m [34 inches] in diameter by 0.9 m [36 inches]) high) vertical, closed-top tank with graduation marks be provided.

7.6.2 List of Assumptions

The assumptions used to design the sulphide reactor include the following:

- Either ferric or ferrous chloride will be added to precipitate sulphide.
- A flow meter will be provided upstream of the sulphide reactor.

- Bench-scale testing with Mine contact water will be performed to confirm the design, ferric/ferrous chloride dosing, and sizing criteria.
- Power will be available for molasses and nutrient dosing.
- Feed water from the PETBP or Springer Pit will be available for pilot testing.
- Although design flow for the sulphide reactor was assumed to be 55 m^3/d, the system was designed with flexibility so that higher flows rates can be tested to evaluate the limitation of the system.
- The introduction of chloride into the treatment system's effluent resulting from the ferrous or ferric chloride dosing will be evaluated during pilot testing.
- Required contact time for iron sulphide precipitation will be determined during pilot testing.
- A storage tank for the ferric/ferrous chloride solution will be provided and a metering pump will be available for ferric/ferrous chloride addition.
- Cleaning frequency of the sulphide reactor will be determined during pilot testing.

For a list of general design assumptions, refer to Section 6.0.

7.7 Sulphide Polishing Cell

For technology description, refer to Section 5.4.

7.7.1 Design Description

The flow from the BCR system will be sent to the SPC system. For design of the SPC it was considered to receive the full flow from the BCR and that it would operate independently of chemical addition. Similarly to the Closure SPC, sulphide removal will depend on the availability of sacrificial iron. The design parameters for the SPC are shown in Table 11.

Table 11: Sulphide Polishing Cell Design Parameters

Parameter	Units	Value
Total flow to SPC	m^3/d	55
Sulphate to be bound	mol/d	357
Iron required for sulphate removal	mol/d	357
Sacrificial iron required	kg/yr	7,268
Controlling iron sponge required	m^3	103
Minimum SPC HRT	days	0.5
Calculated HRT for sulphide removal	days	2.9

SPC = sulphide polishing cell; HRT = hydraulic retention time; mol/d = moles per day.

The footprint of the system increases with an increase in HRT. The minimum required footprint for the SPC was estimated based on sulphate removal, and it was found to be 1,200 m^2.

The SPC has a total depth of 3.0 m, which consists of the following:

- 2 m of polishing media (iron sponge)
- 0.3 m bottom gravel discharge
- 0.3 m free water with wood chips
- 0.4 m freeboard

The iron sponge volume consists of the following:

- 35% wood chips
- 65% sacrificial iron (magnetite)

The SPC slope was considered to be 3H:1V.

Details of the proposed SPC geometry (typical cross-section) are shown on the Pilot Sections provided in Attachment A, Figure 7.

For details of the design description similar to what was previously presented for the Post-closure process, refer to Section 5.4.1.

7.7.2 List of Assumptions

The assumptions used to design the SPC system were presented in Section 5.4.2. Assumptions specific to the pilot plant include the following:

- A flow meter will be provided upstream of the SPC.
- Bench-scale testing on Mine contact water will be performed to confirm the design and sizing criteria (e.g., iron sponge composition and porosity, hydraulic retention time).
- The SPC material will be replaced after two years, if needed.
- Feed water from PETBP or Springer Pit will be available for pilot testing.
- Although design flow for the SPC was assumed to be 55 m^3/d, the system was designed with sufficient flexibility to allow testing of higher flows in order to evaluate the load limitations of the system.

For a list of general design assumptions, refer to Section 6.0.

7.8 Constructed Wetlands

For a technology description, refer to Section 5.5.

7.8.1 Design Description

The pilot passive system consists of subsurface and free water surface wetlands, and an aeration cascade structure, all of which are placed downstream of the sulphide polishing cell. Although the Mine water from the Springer Pit or PETBP is not expected to have high levels of BOD, there is a possibility of appreciable levels of BOD being released from the BCR.

The pilot system was designed with flexibility, so that the semi-passive system may also incorporate the benefits of both SSF and FWS wetlands. The SSF cell is designed to remove the majority of the BOD load while minimizing water loss due to evaporation and being less exposed to the effects of cold climates, whereas the FWS cell is designed to polish the BOD level down to the proposed target for BOD in Hazeltine Creek, assuming no assimilative capacity in the creek. The FWS cell is also designed to provide aerobic treatment for manganese removal.

Similar to what was discussed in Section 5.5.1, design temperatures, and influent and effluent BOD are important considerations for wetland sizing.

Table 12 summarizes the expected influent water quality and quantity post BCR for the wetland design considerations.

Table 12: Influent Water Quality/Quantity for Wetland Design Considerations

Parameter	Units	Value
Flow	m^3/d	55
Temperature	°C	0.5
pH	pH units	6.8 to 8.5
Design BOD	mg/L	70
Dissolved manganese concentration	mg/L	1.6

BOD = biochemical oxygen demand.

During start-up, elevated BOD levels are expected and will need to be managed with interim measures such as returning the wetland discharge to the wetland inflow.

The minimum required footprint for each SSF wetland cell based on BOD removal was found to be 1,800 m^2.

The SSF wetland cell is expected to have a total depth of 1.4 m, consisting of the following:

- 1 m substrate
- 0.72 m water (where the water level is below the substrate)
- 0.4 m freeboard

The substrate layer would consist of the following:

- 0.95 m medium sand
- 0.05 m fine sand

The SSF wetland cell is to be placed in areas with natural slope of 1% for drainage. The minimum required footprint for the FWS wetland cell based on BOD and manganese removal was found to be 2,200 m^2.

The FWS cell is expected to have a total depth of 1.6 m, consisting of the following:

- 0.35 m substrate
- 0.6 m water (the water level is above the substrate)
- 1 m freeboard (to account for additional head loss due to the SSF cell and to provide flexibility in the water level and capacity)

The substrate layer consists of the following:

- 0.3 m medium sand
- 0.05 m fine sand

The FWS wetland cell is designed with a slight slope for drainage. Details of the proposed SSF and FWS cells geometry (typical cross-section) are shown on conceptual drawings provided in Attachment A, Figure 7.

7.8.2 List of Assumptions

The assumptions used to design the constructed wetland system include the following:

- The final topography of the site at Closure will be suitable for the construction of the BCR and wetland cells.
- An FWS can take several years to reach maturity.
- The substrate media will have a porosity close to 40%.

For a list of general design assumptions, refer to Section 6.0.

Preliminary conceptual plans and sections are provided in Attachment A, Figures 2 and 7.

7.9 Aeration Cascade

Aeration cascade is a low cost and low energy method to raise dissolved oxygen (DO) levels, especially if the site conditions permit the design of gravity flow. Aeration cascade utilizes the available discharge head to create turbulence as the water falls in a thin film over a series of steps.

7.9.1 Design Description

Golder has proposed to investigate the impact of the addition of aeration cascade in between the SSF wetland cell and FWS wetland cell as a measure to supplement the removal of BOD and manganese through addition of oxygen to the water. Oxygen is required for both biological activity for BOD removal downstream of the FWS wetland cell, as well as for the oxidation of soluble manganese.

For this conceptual design, the steps are expected to be lined with limestone to produce a net alkaline water which would facilitate in the removal of manganese. The performance of cascade aeration depends on the length and height of the cascade, initial oxygen level, required discharge DO, and Mine water temperature.

Design temperature, as well as influent and effluent DO, are important considerations for the sizing of the cascade aeration. Golder has considered the minimum and maximum temperatures from representative monitoring data set (2006 to 2016) for the sizing of the cascade aeration.

Table 13 summarizes the design criteria for cascade aeration.

Table 13: Design Criteria for the Cascade Aeration

Parameter	Units	Value
Flow	m^3/d	55
Temperature	°C	0.1 to 20
Influent DO (assumed)	mg/L	0.1
Effluent DO	mg/L	6

DO = dissolved oxygen.

Golder has adopted the more conservative scenario for the design of the cascade aeration (summer condition) due to the lower saturation of DO at higher temperature.

The minimum required footprint for the aeration cascade based on oxygen addition was found to be 0.4 m^2, influent distribution.

The cascade is expected to have a total height of 4 m, consisting of the following:

- 20 steps lined with limestone
- step height of 0.2 m
- step length of 0.45 m
- step width of 0.04 m

7.9.2 List of Assumptions

The assumptions used to design the aeration cascade system include the following:

- The final topography of the site would be suitable for the construction of the cascade structure.
- Limestone material would be available for the lining of the steps.
- Input parameters would be as specified in the design criteria section.

Preliminary conceptual plans and sections are provided in Attachment A, Figures 2 and 7.

7.10 Aerated and Settling Ponds

In an aeration pond, sufficient retention time and active aeration are provided for the biological removal of contaminants to take place. Following the aeration pond, water is allowed to settle in the settling pond whereby the suspended solids generated from the aeration process are removed through a settling process.

7.10.1 Design Description

In the active technology train, Golder has proposed an aerated pond and a settling pond following the sulphide reactor to remove the BOD from the BCR and sulphide reactor process as well as to remove the soluble manganese not removed by the BCR and sulphide reactor process.

In the aeration pond, active aeration would be provided via a set of blowers and diffuser system to provide sufficient mixing and oxygen for BOD removal through biological activity to take place. The biological and oxidation process would generate sludge that would be removed from the water by means of a settling pond. Periodically, the sludge would have to be removed from the settling pond. Following the settling pond, the flow would be directed to the FWS wetland for manganese removal. An option is allowed to directly discharge the effluent from the settling pond provided the manganese level is acceptable.

Design temperature, influent water quality, oxygen concentration to be maintained in the pond and effluent water quality are important considerations for the sizing of the aeration pond. Golder has considered representative site water temperatures from the monitoring data (2006 to 2016) for the sizing of the aeration pond.

Table 14 summarizes the design criteria for the aeration pond.

Table 14: Design Criteria for the Aeration Pond

Parameter	Units	Value
Flow	m^3/d	55
Temperature	°C	0.1
Influent DO (assumed)	mg/L	0.1
Influent total Kjeldahl nitrogen (assumed)	mg/L	6
Influent total sulphur (assumed)	mg/L	208
Oxygen concentration to be maintained in water	mg/L	6
Effluent BOD	mg/L	<5

DO = dissolved oxygen; BOD = biochemical oxygen demand.

The minimum required footprint for the aerated pond and settling pond based on the design criteria above was found to be 720 m^2 and 390 m^2 respectively.

The aeration pond would have a total depth of 2.4 m with a freeboard of 0.3 m, whereas the settling pond would have a total depth of 2.7 m with a freeboard of 0.6 m.

7.10.2 List of Assumptions

The assumptions used to design the aeration pond include the following:

- Aeration will be supplied with a diffuser system.
- Power will be available for aeration system.

For a list of general design assumptions, refer to Section 6.0.

Preliminary conceptual plans and sections are provided in Attachment A, Figures 2 and 7.

7.11 Treatment System Footprint

The pilot plant system is estimated to have a total footprint of approximately 1.5 ha. Table 15 shows the breakdown of areas for the different components of this system.

Table 15: Operations and Pilot System Footprint

Unit Process Name	Unit	Area per Unit (m^2)	Total Area (m^2)
BCR	2	1,800	3,600
SPC	1	1,200	1,200
SSF wetland	1	1,800	1,800
Sulphide reactor	1	0.6	0.6
FWS wetland	1	2,200	2,200
Aeration pond	1	720	720
Settling pond	1	390	390
Estimated total footprint area (accounting for berms and offsets)	-	-	15,000

BCR = biochemical reactor; SPC = sulphide polishing cell; SSF = subsurface; FWS = fresh water surface.

7.12 Process Limitations

The pilot passive system shares similar limitations to those of the Closure passive system in the sense that the system may introduce additional phosphorus, alkalinity and BOD to the discharge water, while TDS is not likely to be reduced. Additionally, it is expected that the effluent from the pilot system might not meet the discharge limits for phosphorus. These parameters would specifically be included in the performance monitoring program of the pilot plant. Depending on the performance of the plant, effluent can either be discharged (if within established compliance limits), or returned for reprocessing using the existing WTP. For design criteria of these constituents, refer to Section 7.2. A discharge BOD concentration of between 5 and 10 mg/L is expected from the pilot system. This BOD and TDS effluent concentrations could exceed discharge limits, and would need to be confirmed.

The pilot system was designed with flexibility to allow for operation of some active components, transforming the system into a semi-passive treatment. When the active components are in operation, it is expected that the BOD and phosphorus concentrations in the effluent would decline. Conversely, should ferrous/ferric chloride be selected as iron source for the sulphide reactor, it is expected that the chloride concentration in the effluent water would increase. Through piloting, design assumptions and parameters could be confirmed. The piloting phase is also used to modify and optimize the design approaches, and it also presents an opportunity to study and monitor potential constituents of concern.

8.0 DISCUSSION AND NEXT STEPS

Although the footprint of the full-scale passive treatment system represented in this report is large, the size may be reduced through refinement and optimization of the inflow design criteria, specifically in terms of seasonal variations in water quality, source water isolation and treatment, and reduction of the total flow requiring treatment through strategies such as incorporation specific water management considerations into reclamation and closure planning and design. It is possible that the size associated with this conceptual passive treatment system may be further reduced through bench- and pilot-scale testing and incorporation of the aforementioned potential mitigation strategies, which may include the adoption of a semi-passive system.

A trade-off study could be undertaken to compare the life-cycle costs and risks associated with active treatment systems to those of the conceptual passive and semi-passive treatment components described in this document. Following the trade-off study, bench testing or piloting work could be conducted to confirm the passive and semi-passive treatment components' design parameters, and to compare these with commercially available active treatment systems.

Golder recommends that MPMC take the following next steps to advance the proposed concept:

- Confirm the conceptual influent basis of design for Post-closure water treatment, once the output from the site water quality and site water balance models as well as the water quality targets are finalized. Conservatism in design inputs may be reduced after these models have been validated and uncertainty in future predictions has been reduced.
- Identify optimization potential strategies (i.e., flow reduction and water quality improvement measures) that can be implemented and incorporated into modelling, Mine operations and Mine planning for reclamation and closure.
- Complete sensitivity analyses for the design basis to understand the impact of potential optimization strategies and incorporate resulting scenarios into bench- and pilot-scale development.
- Conduct a high-level trade-off study and a risk assessment between the passive and semi-passive treatment concepts developed in this report and alternative commercially available active treatment technologies.
- Pending the results of the trade-off study, further refinement of bench and/or pilot testing scenarios would be recommended to confirm and compare treatment processes.

If the high-level trade-off study could be conducted before the end of 2016, the bench and/or pilot testing could be well-established by 2018, which would leave sufficient time for the full-scale treatment system to be designed and constructed to be operational before 2022.

9.0 CLOSURE

This conceptual design was done out of Golder's Vancouver Office, with senior review by Tom Rutkowski (PE, MSc, Associate, Senior Engineer), from Golder's Denver Office, who is a leading water treatment specialist. Mr. Rutkowski's entire career has been spent in the field of water treatment with a focus on mine water treatment. He has worked extensively on treatment of selenium and passive treatment of metals. Mr. Rutkowski's project experience includes evaluation and development of process solutions, including bench and pilot plant studies, multi-disciplinary design of treatment facilities, and direct construction of treatment facilities.

We trust the above meets your present requirements. If you have questions or additional requirements, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Thalita da Silva Sympovsky, MEng, PEng
Environmental/Process Engineer

Henlo du Preez, BEng
Senior Water Treatment Specialist

Allan Bronsro, MSc, PEng
Associate, Senior Water Resources Engineer

TdSS/HDP/APB/TR/bb/it/kp

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

o:\final\2014\1421\1411734\1411734-150-r-rev0-16000\1411734-150-r-rev0-16000-water treatment conceptual design 17oct_16.docx

REFERENCES

Baldwin, SA, Mirjafari P, Rezahdebashi M, Subedi G, Taylor J, Moger L, McMahen K, Frye A. 2015. Start-Up of a Passive Remediation Bioreactor for Sulfate and Selenium Removal from Mine Tailings Water, Paper presented at 10th International Conference on Acid Rock Drainage. Santiago, Chile, April 21–24, 2015

Golder (Golder Associates Ltd.) 2016a. Mount Polley Long-Term Water Management – Identification of Feasible Water Treatment Systems Technical Memorandum by Golder, Draft Technical Memorandum submitted to Luke Moger, Mount Polley Mining Corporation, Rev. 0, May 10, 2016.

Golder. 2016b. Proposed Water Treatment Plan for Operations Phase Water Management, Draft Technical Memorandum submitted to Mount Polley Mining Corporation, Rev. B, June 7, 2016.

ITRC (Interstate Technology Regulatory Council) 2013. Biochemical Reactors for Mining-Influenced Water, Guidance Document, prepared by The Interstate Technology & Regulatory Council, Biochemical Reactors for Mining-Influenced Waste Team, November 2013.

MOE (BC Ministry of Environment). 2015. Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining. Version 1.0. December 2015.

US EPA (US Environmental Protection Agency). 1988. Constructed Wetlands and Aquatic Plan Systems for Municipal Wastewater Treatment. US EPA, December 1988.

US EPA. 1993. Subsurface flow constructed wetland for wastewater treatment - A Technology Assessment. US EPA, July 1993.

Ziemkiewicz PF, Skousen JG, Simmons J. 2002. Long-term Performance of Passive Acid Mine Drainage Treatment Systems. West Virginia Surface Mine Drainage Task Force Symposium Papers.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

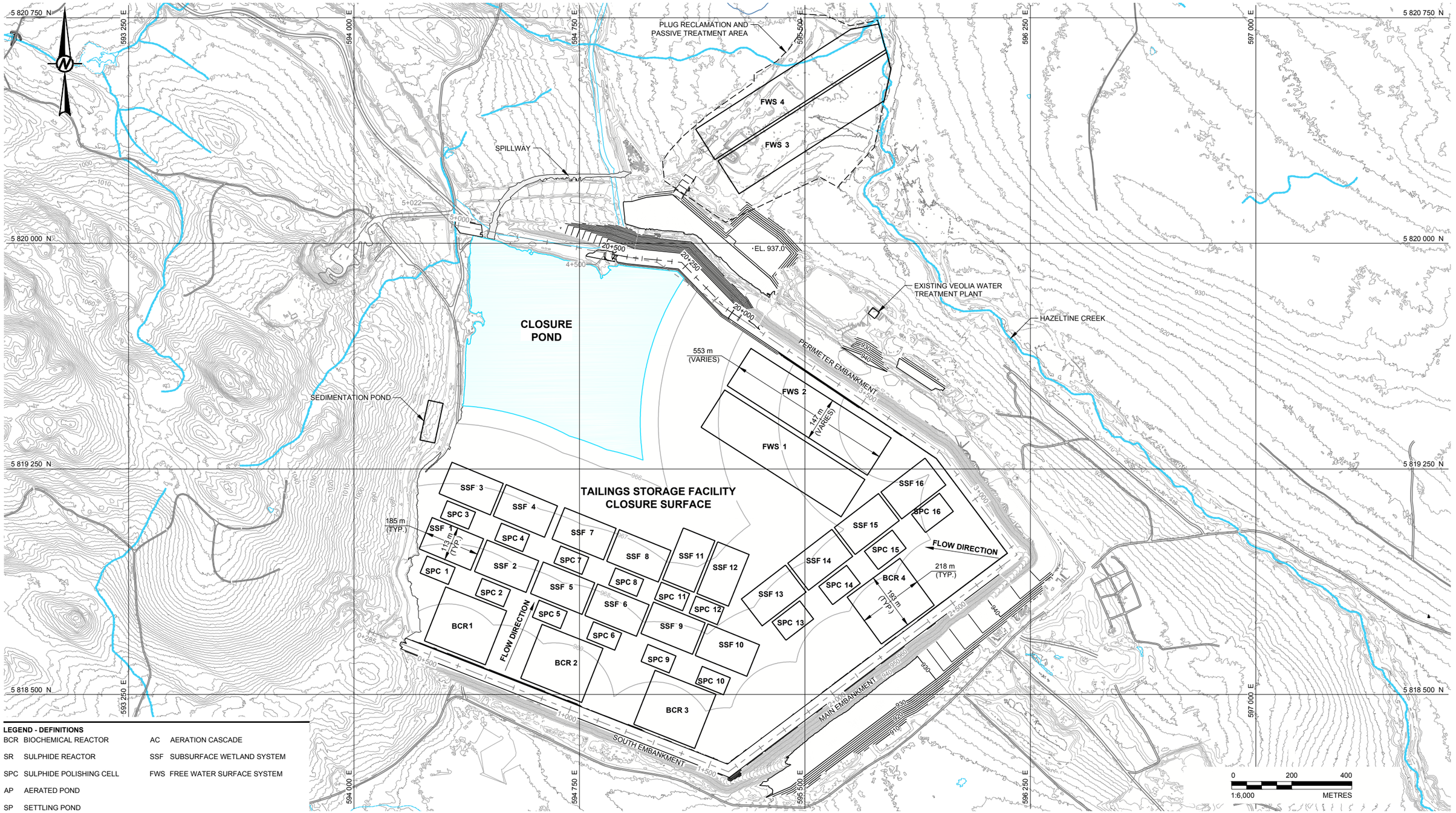
This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation (MPMC). It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by MPMC, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. MPMC may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

ATTACHMENT A

Figures



LEGEND - DEFINITIONS

BCR	BIOCHEMICAL REACTOR	AC	AERATION CASCADE
SR	SULPHIDE REACTOR	SSF	SUBSURFACE WETLAND SYSTEM
SPC	SULPHIDE POLISHING CELL	FWS	FREE WATER SURFACE SYSTEM
AP	AERATED POND		
SP	SETTLING POND		

LEGEND

4+400 — + — SETOUT LINE - S.O.L. - ORIGINAL ALIGNMENT (SEE REFERENCE 3)

NOTES

1. ALL UNITS IN METRES UNLESS OTHERWISE NOTED. ELEVATIONS ARE IN METRES RELATIVE TO TAILINGS GRID DATUM.
2. COORDINATES ARE SHOWN IN TAILINGS GRID.
3. CONTOUR INTERVAL 2 m MINOR AND 10 m MAJOR. CONTOURS OF THE MOUNT POLLEY MINE SITE (SEE REFERENCE 1) WERE COMBINED WITH THE UPDATED TAILINGS STORAGE FACILITY SURVEY (SEE REFERENCE 2).
4. FOR CLOSURE CELL SPECIFICATIONS AND DETAILS, REFER TO FIGURES 6 AND 7.

REFERENCES

1. BASE TOPOGRAPHY PROVIDED BY MPMC, FILE NAME: "MtPolley_20140805_1m_LiDAR_Contour.dwg", RECEIVED: SEPTEMBER 3, 2014.
2. TOPOGRAPHY PROVIDED BY MPMC, FILE NAMES: "10cm contours full tailings.dxf" AND FILE: "10cm Hazeltine 3 Reprocessed.dxf", SURVEYED: MAY 27, 2015, RECEIVED: JUNE 11, 2015 AND FILE: "151015 ASBUILT SURFACE.msr", RECEIVED: OCTOBER 15, 2015.
3. S.O.L - ORIGINAL ALIGNMENT PROVIDED BY BGC ENGINEERING INC., DRAWING NO. 01, DRAWING TITLE, "SI PLANNING PLAN MAP", PROJECT NO. P14178, FILE NAME: "ACAD-01.DWG", DATED: SEPTEMBER 2014.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-30
DESIGNED	TdSS
PREPARED	MSH
REVIEWED	TdSS/HC/LA
APPROVED	AB

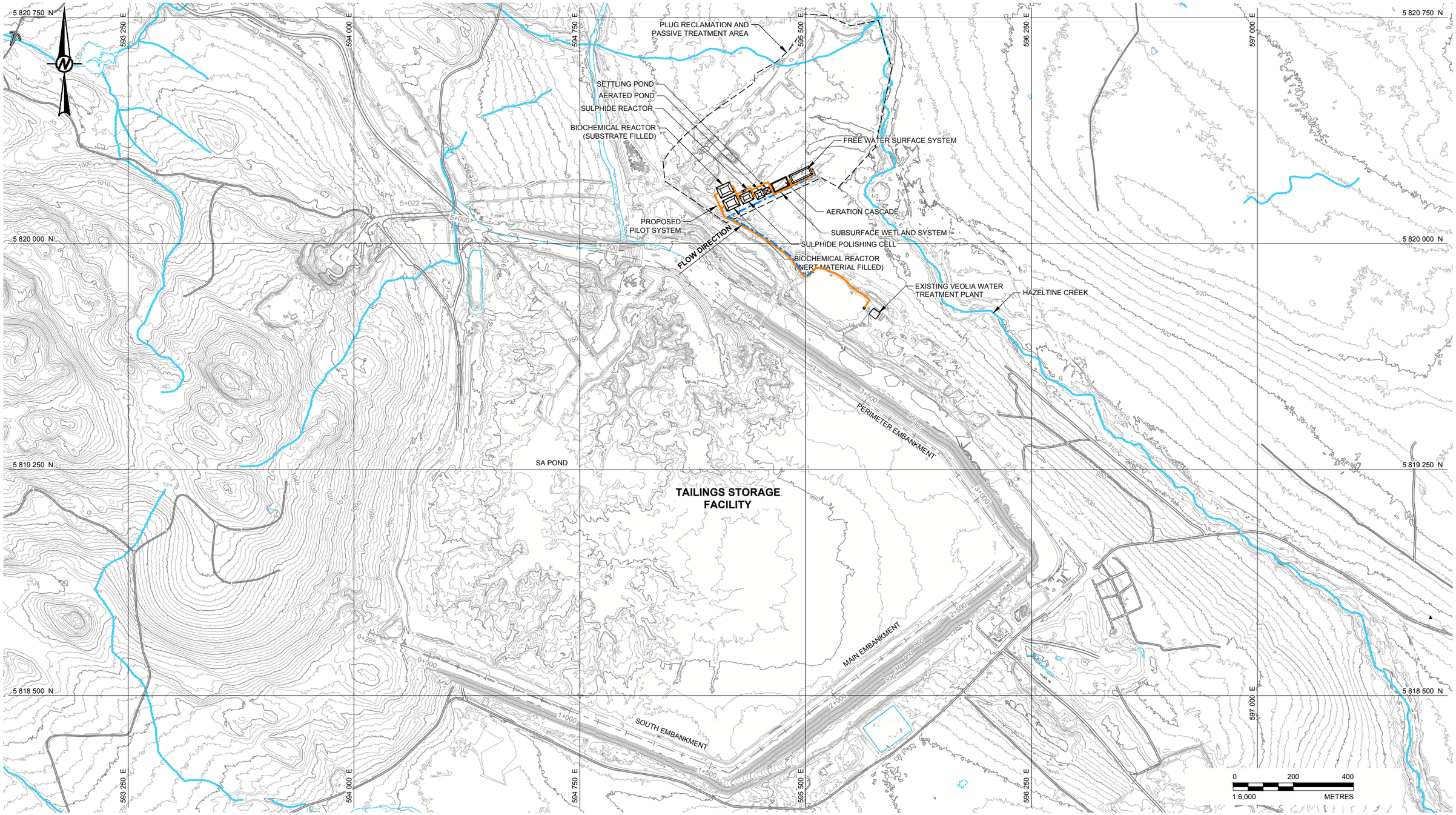
PROJECT
MOUNT POLLEY CLOSURE WATER TREATMENT SYSTEM

TITLE
MOUNT POLLEY WATER TREATMENT SYSTEM CLOSURE - OVERALL SITE PLAN

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
1411734	16000/3004/150	0	1

Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\Phase 16000\Task 3004\DWG\Doc. 150\ | File Name: 1411734-16000-3004-150_01.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
25 mm



LEGEND

4+400 — + — SETOUT LINE - S.O.L. - ORIGINAL ALIGNMENT (SEE REFERENCE 3)

NOTES

1. ALL UNITS IN METRES UNLESS OTHERWISE NOTED. ELEVATIONS ARE IN METRES RELATIVE TO TAILINGS GRID DATUM.
2. COORDINATES ARE SHOWN IN TAILINGS GRID.
3. CONTOUR INTERVAL 2 m MINOR AND 10 m MAJOR. CONTOURS OF THE MOUNT POLLEY MINE SITE (SEE REFERENCE 1) WERE COMBINED WITH THE UPDATED TAILINGS STORAGE FACILITY SURVEY (SEE REFERENCE 2).
4. FOR CLOSURE CELL SPECIFICATIONS AND DETAILS, REFER TO FIGURE 8.

REFERENCES

1. BASE TOPOGRAPHY PROVIDED BY MPMC, FILE NAME: "MtPolley_20140805_1m_LiDAR_Contour.dwg", RECEIVED: SEPTEMBER 3, 2014.
2. TOPOGRAPHY PROVIDED BY MPMC, FILE NAMES: "10cm contours full tailings.dxf" AND FILE: "10cm Hazeltine 3 Reprocessed.dxf", SURVEYED: MAY 27, 2015, RECEIVED: JUNE 11, 2015 AND FILE: "151015 ASBUILT SURFACE.msr", RECEIVED: OCTOBER 15, 2015.
3. S.O.L - ORIGINAL ALIGNMENT PROVIDED BY BGC ENGINEERING INC., DRAWING NO. 01, DRAWING TITLE, "SI PLANNING PLAN MAP", PROJECT NO. P14178, FILE NAME: "ACAD-01.DWG", DATED: SEPTEMBER 2014.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-30
DESIGNED	TdSS
PREPARED	TAK
REVIEWED	TdSS/HC/LA
APPROVED	AB

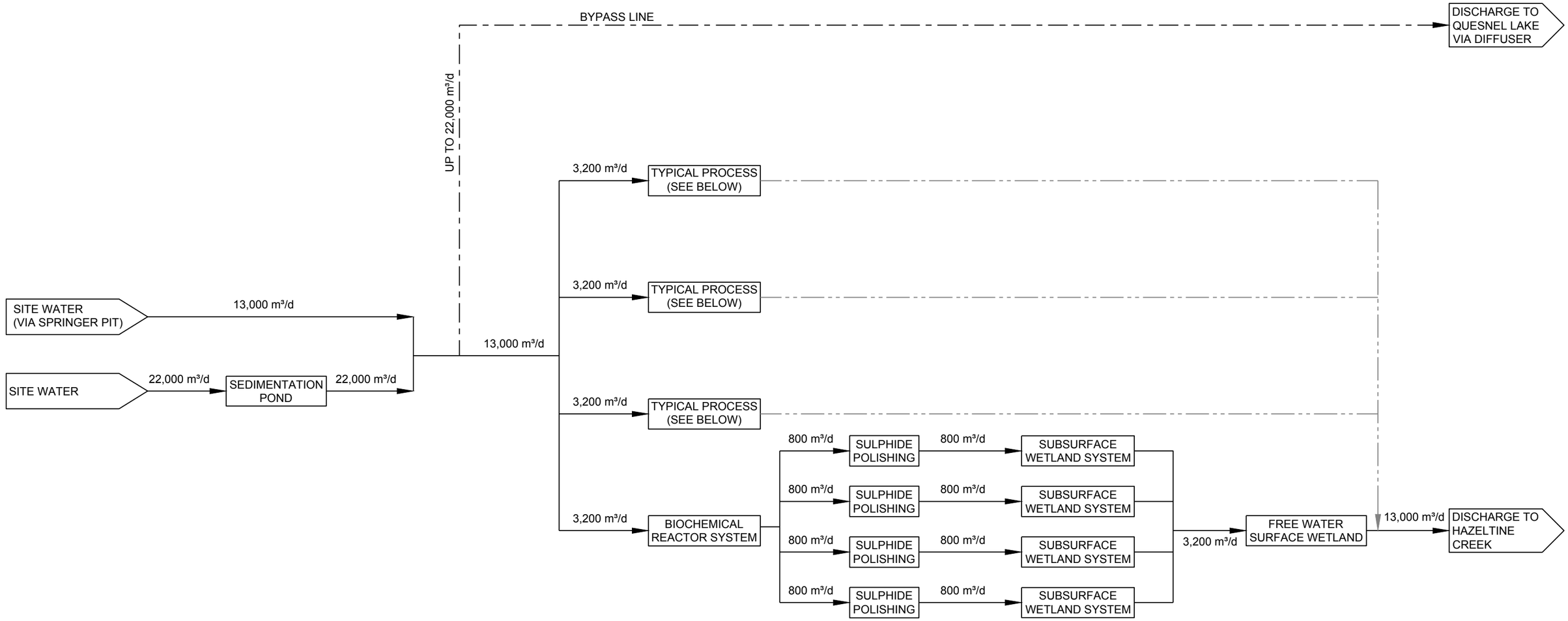
PROJECT
MOUNT POLLEY CLOSURE WATER TREATMENT SYSTEM

TITLE
MOUNT POLLEY WATER TREATMENT SYSTEM OPERATIONS & PILOT SYSTEM - OVERALL SITE PLAN

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
1411734	16000/3004/150	0	2

Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\Phase 16000\Task 3004\DWG\Doc. 150\ | File Name: 1411734-16000-3004-150_02.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D
25 mm



LEGEND

NORMAL FLOW PATH

OPTIONAL FLOW PATH

CLIENT: MOUNT POLLEY MINING CORPORATION

CONSULTANT: Golder Associates

PROJECT: MOUNT POLLEY CLOSURE WATER TREATMENT SYSTEM

TITLE: **MOUNT POLLEY WATER TREATMENT SYSTEM CLOSURE - BLOCK FLOW DIAGRAM / CONCEPTUAL PASSIVE SYSTEM**

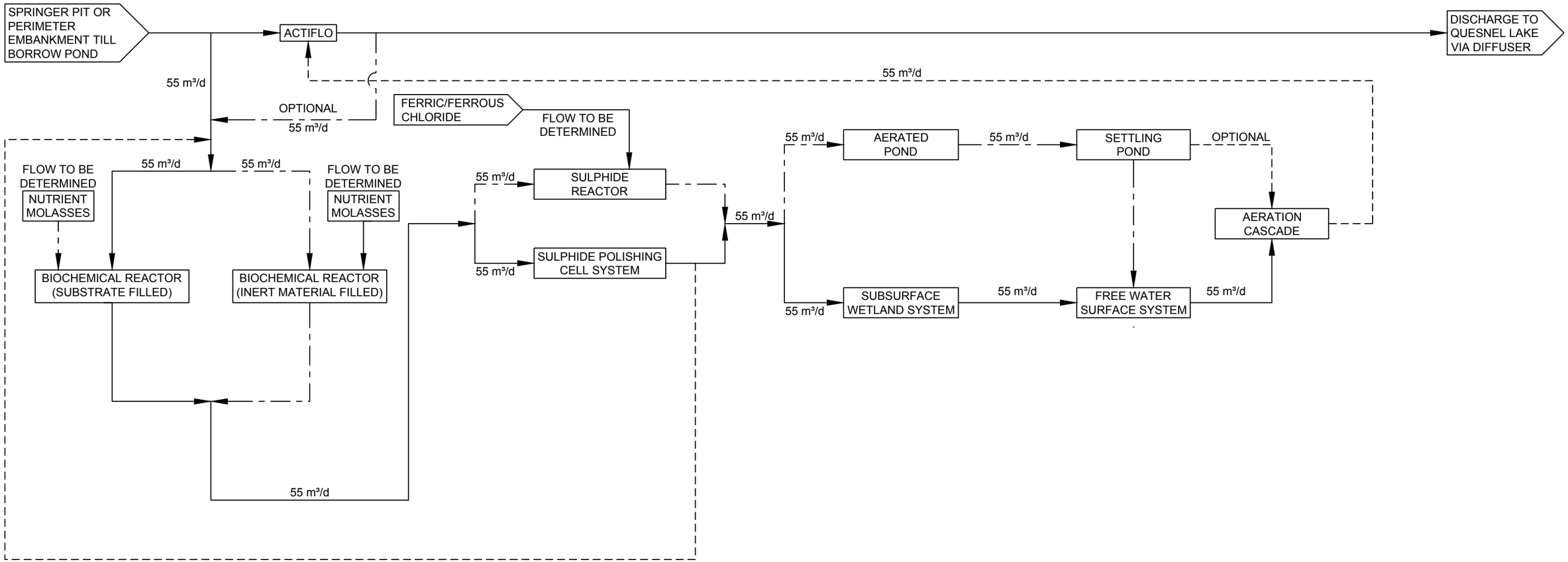
YYYY-MM-DD	2016-09-30
DESIGNED	TdSS
PREPARED	MSH
REVIEWED	TdSS/HC/LA
APPROVED	AB

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
1411734	16000/3004/150	0	3

Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\Phase 16000\Task 3004\DWG\Doc. 150\ | File Name: 1411734-16000-3004-150_03.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm



LEGEND

- NORMAL FLOW PATH
- OPTIONAL FLOW PATH
- OPTIONAL RECIRCULATION LINE

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-30
DESIGNED	TdSS
PREPARED	MSH
REVIEWED	TdSS/HC/LA
APPROVED	AB

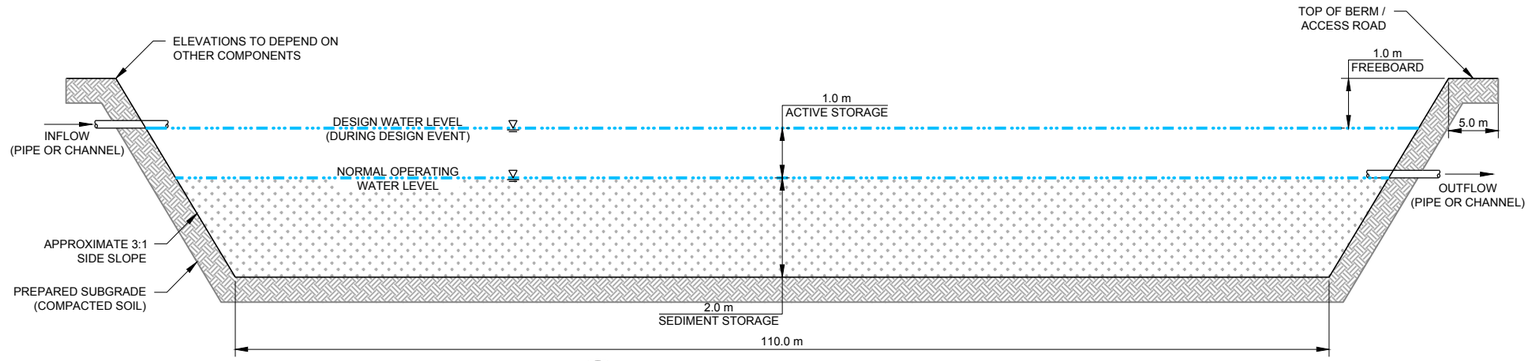
PROJECT
MOUNT POLLEY CLOSURE WATER TREATMENT SYSTEM

TITLE
MOUNT POLLEY WATER TREATMENT SYSTEM
PILOT - BLOCK FLOW DIAGRAM

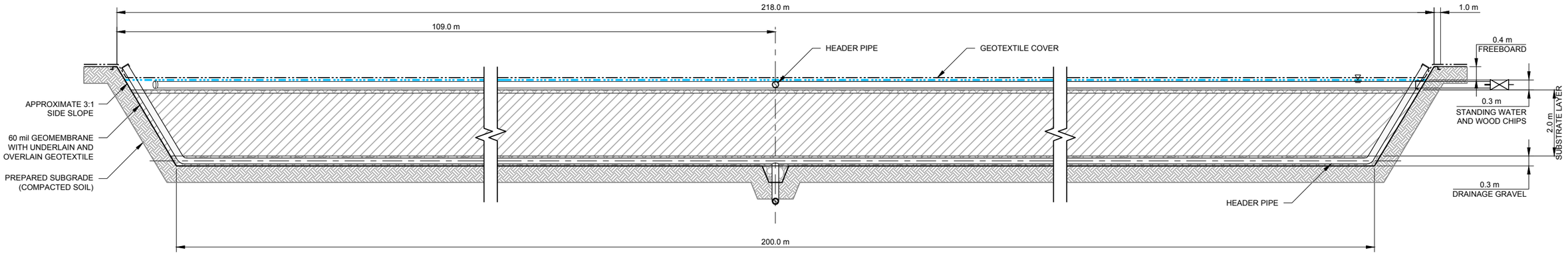
PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
1411734	16000/3004/150	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25 mm
0

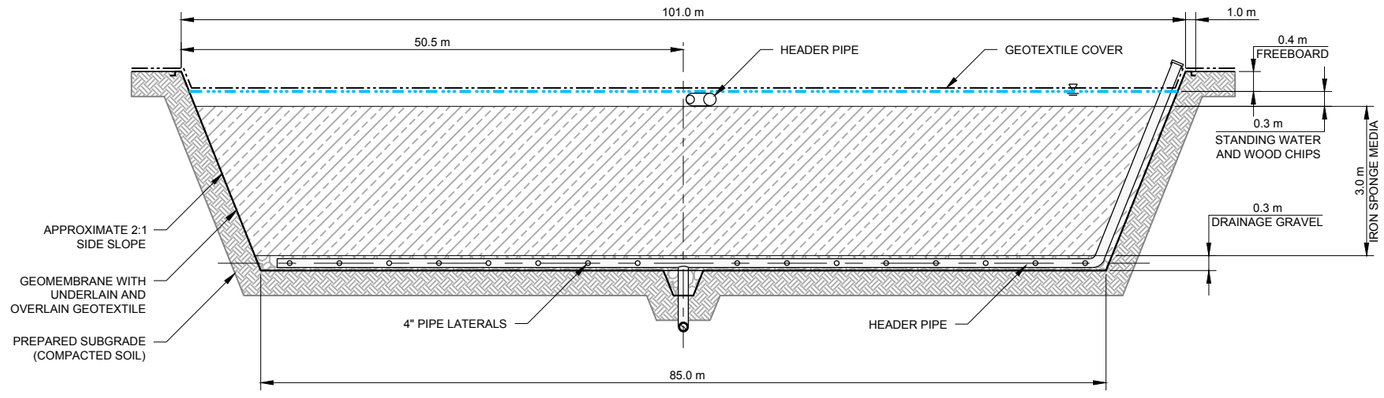
Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\Phase 16000\Task 3004\DWG\Doc. 150\ | File Name: 1411734-16000-3004-150_04.dwg



NOT TO SCALE A TYPICAL SECTION THROUGH SEDIMENTATION POND



NOT TO SCALE B TYPICAL SECTION THROUGH BCR



NOT TO SCALE C TYPICAL SECTION THROUGH SULPHIDE POLISHING CELL

LEGEND

- WATER LEVEL
- SUBSTRATE
- IRON SPONGE MEDIA
- SEDIMENT
- DRAINAGE GRAVEL
- PREPARED SUBGRADE

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. PIPES SHOWN FOR CLARITY ONLY, AND ARE NOT TO SCALE.
3. ALL SECTIONS CUT THROUGH LONGEST PORTION OF EACH CELL.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-30
DESIGNED	TdSS
PREPARED	TAK
REVIEWED	TdSS/HC/LA
APPROVED	AB

PROJECT
MOUNT POLLEY CLOSURE WATER TREATMENT SYSTEM

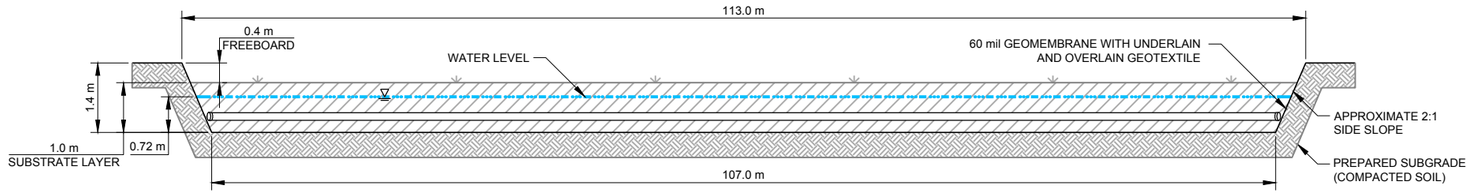
TITLE
MOUNT POLLEY WATER TREATMENT SYSTEM CLOSURE SECTIONS (1 OF 2)

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
1411734	16000/3004/150	0	5

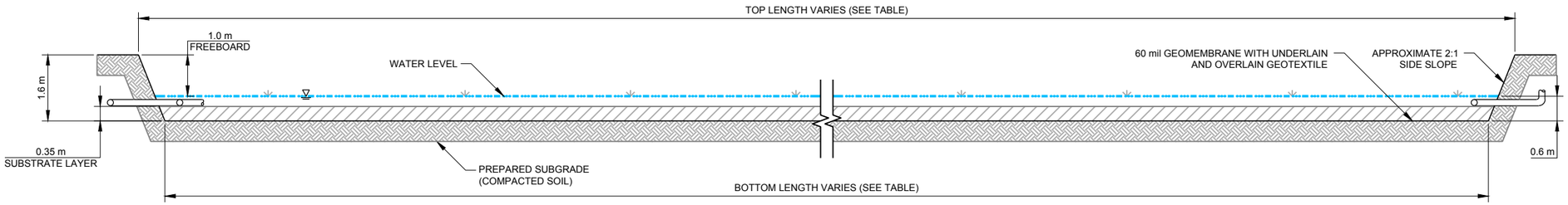
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\Phase 16000\Task 3004\DWG\Doc. 150\ | File Name: 1411734-16000-3004-150_05+06.dwg



NOT TO SCALE D TYPICAL SUBSURFACE CONSTRUCTED WETLAND CELL SECTION



NOT TO SCALE E TYPICAL FREE WATER SURFACE CONSTRUCTED WETLAND SECTION

CELL	TOP LENGTH (m)	BOTTOM LENGTH (m)
FWS 1	553	546
FWS 2	553	546
FWS 3	631 (AVG.)	619
FWS 4	679 (AVG.)	673

LEGEND

- WATER LEVEL
- SUBSTRATE
- PREPARED SUBGRADE

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. PIPES SHOWN FOR CLARITY ONLY, AND ARE NOT TO SCALE.
3. ALL SECTIONS CUT THROUGH LONGEST PORTION OF EACH CELL.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

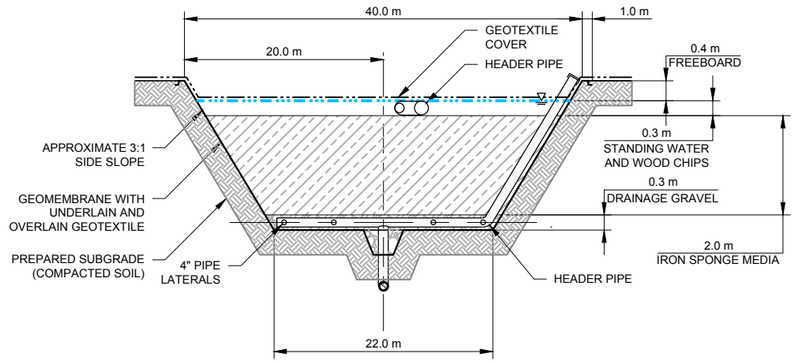
YYYY-MM-DD	2016-09-30
DESIGNED	TdSS
PREPARED	TAK
REVIEWED	TdSS/HC/LA
APPROVED	AB

PROJECT
MOUNT POLLEY CLOSURE WATER TREATMENT SYSTEM

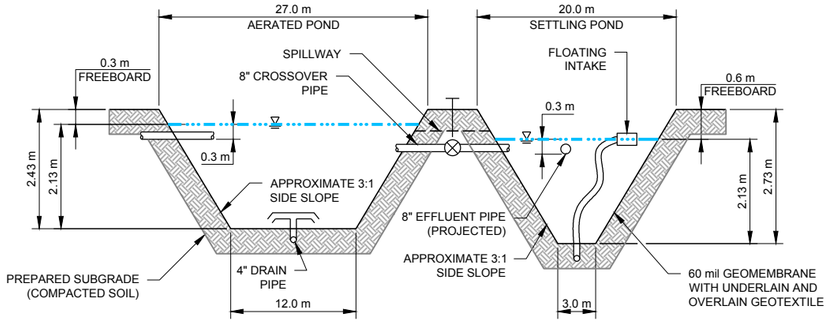
TITLE
MOUNT POLLEY WATER TREATMENT SYSTEM
CLOSURE SECTIONS (2 OF 2)

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
1411734	16000/3004/150	0	6

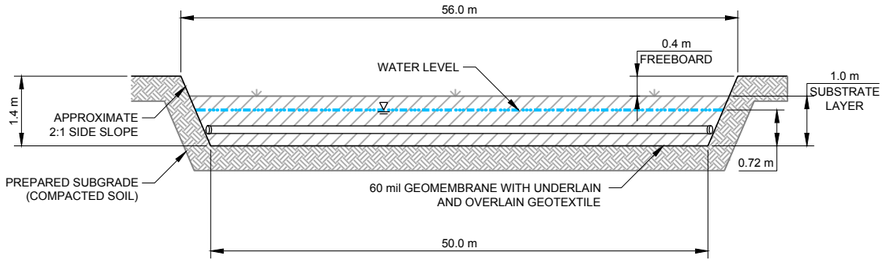
Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\Phase 16000\Task 3004\DWG\Doc. 150\ | File Name: 1411734-16000-3004-150_05+06.dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25 mm
0



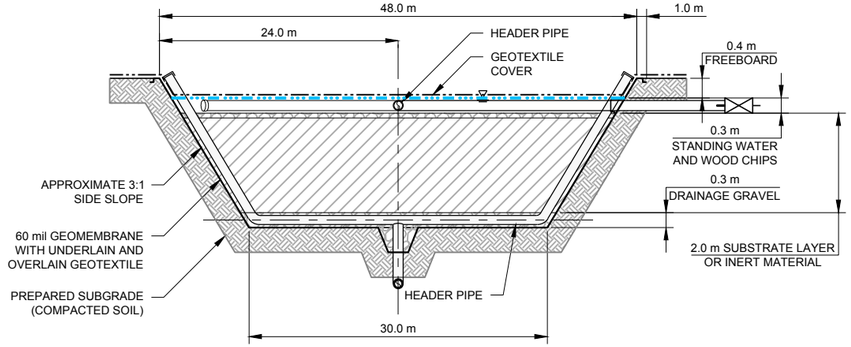
NOT TO SCALE F TYPICAL SECTION THROUGH SULPHIDE POLISHING CELL



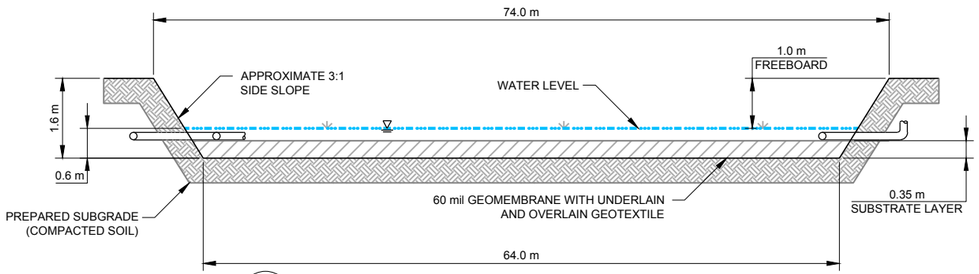
NOT TO SCALE G TYPICAL AERATED AND SETTLING POND SECTION



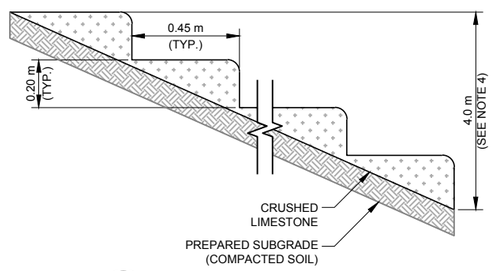
NOT TO SCALE H TYPICAL SUBSURFACE CONSTRUCTED WETLAND CELL SECTION



NOT TO SCALE I TYPICAL SECTION THROUGH BCR



NOT TO SCALE J TYPICAL FREE WATER SURFACE CONSTRUCTED WETLAND SECTION



NOT TO SCALE K TYPICAL AERATION CASCADE SECTION

LEGEND

- WATER LEVEL
- SUBSTRATE
- IRON SPONGE MEDIA
- CRUSHED LIMESTONE
- DRAINAGE GRAVEL
- PREPARED SUBGRADE

NOTES

1. ALL UNITS ARE IN METRES UNLESS OTHERWISE NOTED.
2. PIPES SHOWN FOR CLARITY ONLY, AND ARE NOT TO SCALE.
3. ALL SECTIONS CUT THROUGH LONGEST PORTION OF EACH CELL.
4. AERATION CASCADE CONSISTS OF 20 STEPS.

CLIENT
MOUNT POLLEY MINING CORPORATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-30
DESIGNED	TdSS
PREPARED	TAK
REVIEWED	TdSS/HC/LA
APPROVED	AB

PROJECT
MOUNT POLLEY CLOSURE WATER TREATMENT SYSTEM

TITLE
MOUNT POLLEY WATER TREATMENT SYSTEM PILOT SECTIONS

PROJECT NO.	PHASE/TASK/DOC.	REV.	FIGURE
1411734	16000/3004/150	0	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

0

Path: \\golder.gds\gal\burnaby\CAD-GIS\Client\1413803\1411734\Phase 16000\Task 3004\DWG\Doc. 150\ | File Name: 1411734-16000-3004-150_07.dwg

ATTACHMENT B

Copper Target Derivation

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-175-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

CC Elaine Irving and Jerry Vandenberg

FROM Kerrie Serben and Adrian de Bruyn **EMAIL** Kerrie_Serben@golder.com, Adrian_deBruyn@golder.com

MOUNT POLLEY MINE – DEVELOPMENT OF A TREATMENT TARGET FOR COPPER IN HAZELTINE CREEK USING THE BIOTIC LIGAND MODEL

Golder Associates Ltd. (Golder) is pleased to provide Mount Polley Mining Corporation (MPMC) with the following technical memorandum describing the approach adopted to develop a treatment target for copper in Hazeltine Creek in the vicinity of the Mount Polley Mine (the Mine). The following analysis is intended to support closure planning for the Mine. It is understood that development and approval of a permit limit for copper will require further consultation with British Columbia Ministry of Environment (MOE) prior to Closure. The purpose of the treatment target is to provide a receiving environment target for use in the conceptual design of a passive treatment system for Closure that may be piloted during the four-year Operations period. The treatment target is intended to be applicable to Closure and Post-closure conditions in which mine contact waters are returned to pre-development watersheds. These periods are nominally defined as beginning in July of 2020 and 2022, respectively, based on the current mine plan.

1.0 INTRODUCTION

Copper (Cu) can be toxic to aquatic life, but at low concentrations it is an essential nutrient for both aquatic plants and animals (US EPA 1985). In natural waters, copper occurs primarily as the divalent cupric ion (Cu^{2+}) in free and complexed forms. The cupric ion is the most readily available form of copper (Suedel et al. 1996) and is highly reactive, forming complexes and precipitates with organic and inorganic constituents and suspended solids in the water column (US EPA 1985). As a result, water quality characteristics can substantially affect the toxicity and bioavailability of copper to aquatic life. Generally, a decrease in copper toxicity is observed as water hardness increases because water hardness in natural waters is controlled by the presence of calcium and magnesium that compete with metal cations for binding sites on the gills of aquatic organisms (ICME 1995). For this reason, the 30-day BC Water Quality Guideline (BC WQG) for copper is hardness dependent (MOE 1987).

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

1.1 Approach to Develop Treatment Target

Setting the treatment target for copper by adopting the hardness-dependent BC WQG was not appropriate for Hazeltine Creek because copper concentrations in the creek were above this guideline prior to mine construction. At the pre-mine mean hardness level of 54 mg/L, the BC WQG for Hazeltine Creek is 2.16 µg/L total copper, whereas pre-mine mean copper concentrations reported by Minnow Environmental Inc. (Minnow 2014) were 2.5 µg/L dissolved copper and 3 µg/L total copper. In addition, the BC WQG does not consider exposure and toxicity modifying factors such as pH and dissolved organic carbon (DOC) that, in addition to hardness, have been shown to influence the binding, speciation, and biological availability of copper (US EPA 2007). A more comprehensive approach to evaluating copper bioavailability is the biotic ligand model (BLM), which currently serves as the basis for recommended site-specific freshwater criteria for copper in the United States. The BLM is considered by the US Environmental Protection Agency (US EPA) to utilize the best available science (US EPA 2007). Therefore, the BLM was used to set a treatment target for copper in Hazeltine Creek.

1.2 Biotic Ligand Model Overview

The BLM predicts copper toxicity by simulating copper accumulation at the “biotic ligand” that represents the site of toxic action in biota (HydroQual 2007a). BLM copper toxicity predictions have been shown to be consistent with measured values in published studies (US EPA 2007). The BLM uses receiving water characteristics to develop site-specific water quality criteria. A comparison of US EPA criteria in Figure 1 using the BLM and the hardness-based equation illustrates how both models characterize a similar effect of hardness at low DOC concentrations, but the BLM additionally accurately characterizes a decrease in the toxicity of copper when DOC is increased to 10 mg/L.

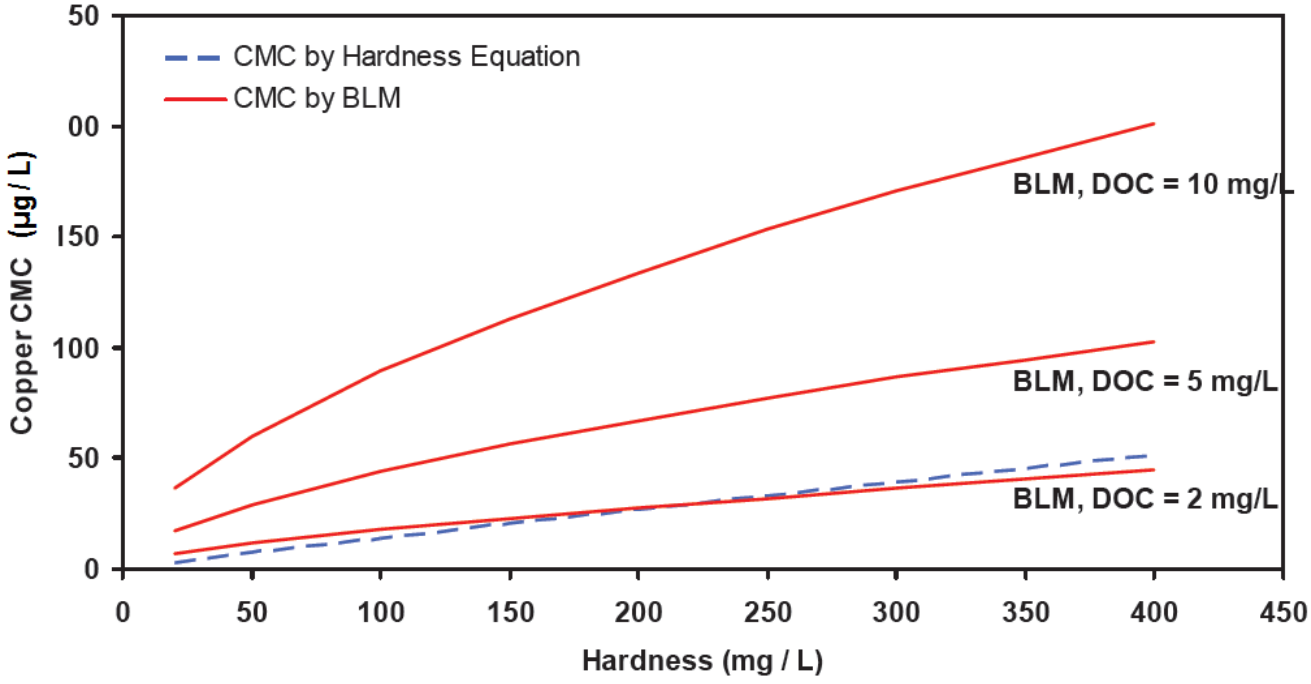


Figure 1: US Environmental Protection Agency Criterion Maximum Concentration Calculated Using Hardness Equation and Biotic Ligand Model

Source: US EPA 2007.

CMC = criterion maximum concentration; BLM = biotic ligand model; DOC = dissolved organic carbon.

Detailed information regarding the development of the BLM is provided in US EPA (2007); the following provides a brief summary. The toxicity database for the BLM was derived using acute medial lethal concentration (LC_{50}) data from approximately 350 tests that included 15 species of invertebrates, 22 species of fish, and 1 species of amphibian, and represented 27 different genera (US EPA 2007). These LC_{50} values were generated using various exposure conditions and thus were normalized to a reference exposure condition, specifically moderately hard reconstituted water[1]. Species mean acute values were calculated, then grouped by genus to calculate genus mean acute values. The 5th percentile of genus mean acute values was used as the final acute value. This final acute value was divided by a factor of two to derive the dissolved copper criterion maximum concentration (CMC), which is defined by US EPA as "*an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect*" (US EPA 2016).

To derive a chronic criterion, the final acute value is divided by a final acute to chronic ratio (ACR) to derive the final chronic value, which is then used as the chronic criterion concentration (CCC). The final ACR for copper is 3.22, calculated as the geometric mean of the ACRs for sensitive freshwater species, daphnids (i.e., *Ceriodaphnia dubia*, *Daphnia magna*, *D. pulex)*, chinook salmon (*Oncorhynchus tshawytscha)*, and rainbow trout (*O. mykiss),* along with the one saltwater species ACR for sheepshead minnow (*Cyprinodon variegatus)* (US EPA 2007). The CCC is defined by US EPA as "*an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.*"

The BLM derives a CCC for dissolved copper and to convert to total copper a conversion factor of 1.04 is used per US EPA guidance (US EPA 2016).

2.0 METHODS

2.1 Biotic Ligand Model Input Requirements

The BLM Windows user interface, Version 2.2.3 (HydroQual 2007b) was used to derive the treatment target for copper. The water quality parameters necessary to run the BLM are:

- physical parameters (water temperature and pH)
- DOC and proportion of humic acid
- major cations (calcium, magnesium, sodium, and potassium)
- major anions (sulphate and chloride)
- alkalinity
- sulphide

[1] Moderately hard reconstituted water was defined as water temperature = 20°C, pH 7.5, DOC = 0.5 mg/L, calcium = 14 mg/L, magnesium = 12 mg/L, sodium = 26.3 mg/L, potassium = 2.1 mg/L, sulphate = 81.4 mg/L, chloride = 1.90 mg/L, alkalinity = 65.0 mg/L, and sulphide = 0.0003 mg/L.

Hardness is calculated in the model from calcium and magnesium concentrations. In general, the proportion of humic acid is not measured in water quality assessments; this is recognized by US EPA (2007) and is not considered a deterrent to running the BLM. As recommended by the BLM user guide (HydroQual 2007a), the humic acid proportion of DOC was assumed to be 10%. Sulphide is listed as an optional input parameter, but currently does not affect the BLM as research is needed to better characterize metal-sulphide interactions. Metal-sulphide interactions can occur, and will likely be incorporated into the BLM's equilibrium in the future (Grosell 2012; HydroQual 2007a). The sulphide concentration was assumed to be 1×10^{-10}, based on the BLM user guide's recommendation (HydroQual 2007a).

The copper BLM was developed and calibrated under a range of water quality parameters, which reflect conditions in the toxicity tests selected to support BLM development. However, US EPA (2015) does note that the BLM can be used when input parameter concentrations fall outside of the calibration ranges. For the treatment target development study presented here, some input parameters and temperature, in particular, had measured values that fell outside of the calibration ranges. In these cases, the BLM was run with the original measured value as well as with the upper or lower bound of the calibration range for that parameter.

2.2 Receiving Environment Chemistry Inputs

For the purposes of this treatment target development study, it was assumed that existing water chemistry would provide an appropriate representation of water quality in Hazeltine Creek during Closure; this is considered conservative, as copper concentrations in Hazeltine Creek water are anticipated to decrease as a result of ongoing rehabilitation works. Ongoing monitoring during the next four years of mine operations will verify this. For comparison purposes, the BLM was also run using pre-mine water quality data for Hazeltine Creek.

Summaries of datasets used in the model runs are provided below.

2.2.1 Hazeltine Creek Pre-mine Conditions

Hazeltine Creek pre-mine baseline conditions were characterized by water quality data collected prior to the initiation of mining operations (i.e., from 1990 to 1996). Mean values for relevant input parameters were obtained from the aquatic environment description report issued by Minnow (2014) and used for the BLM (Attachment 1, Table 1).

2.2.2 Hazeltine Creek Existing Conditions

Existing conditions in Hazeltine Creek were characterized using water samples collected after channel reconstruction and the stabilization of water quality conditions following the August 2014 tailings dam failure (June and November 2015—all monitoring stations in upper and lower Hazeltine Creek) as well as samples collected between December 2015 and April 2016 upstream of the treated effluent discharge. A total of 56 water chemistry samples were collected during this time period, of which 54 samples had measured values for all BLM-required input parameters. Water chemistry results of individual samples were included in the model run (Attachment 1, Table 2).

3.0 RESULTS

Measured values for water temperature were often lower than the lower bound of the calibration range, particularly during the late fall or early spring sampling events. However, adjusting water temperature to the lower bound of the calibration range either did not change or slightly increased the resulting CCC. Therefore, using CCCs derived with measured temperatures resulted in a lower (more conservative) treatment target.

In a few cases in the Hazeltine Creek existing conditions dataset, measured calcium and sulphate concentrations were slightly higher than the upper bound of their calibration ranges. Adjusting these input parameters to the upper bound of the calibration range had little or no effect on the resulting CCC.

Detailed summaries of the BLM outputs for each dataset are provided below.

3.1 Hazeltine Creek Pre-mine Conditions

Using mean measured concentrations of input parameters, the total copper CCC generated by the BLM under pre-mine conditions was 32 µg/L (Table 1).

Table 1: Predictions of the Copper Biotic Ligand Model for Hazeltine Creek Pre-mine Conditions

Dataset	Final Acute Value (µg/L)	Criterion Maximum Concentration for Dissolved Copper (µg/L)	Criterion Continuous Concentration for Dissolved Copper (µg/L)	Criterion Continuous Concentration for Total Copper (µg/L)
Mean – 1990 to 1996	99	50	31	32

The dataset for pre-mine conditions summarized by Minnow (2014) is limited, which consequently constrained the usefulness of the BLM approach using this dataset. Minnow (2014) provided mean, median, and 95th percentile values for most of the required input parameters (with the exception of water temperature and chloride); however, there were only 19 samples for pH, alkalinity, and sulphate; 12 samples for calcium, magnesium, potassium, and sodium; and six samples for DOC.

- Pre-mine mean water temperature was not provided in Minnow 2014 and was assumed to be 7.1°C, which was the mean temperature measured in Hazeltine Creek pre-breach (2011 to 2014).
- Pre-mine chloride concentrations were not included in the summarized dataset (Minnow 2014), and were assumed to be non-detect (at a detection limit of 0.5 mg/L) for the BLM run. This assumption is conservative because lower chloride concentrations would yield a lower CCC.

Because of the limited dataset for pre-mine conditions, the copper treatment target for Hazeltine Creek was selected based on existing conditions (Section 3.2).

3.2 Hazeltine Creek Existing Conditions

Total copper CCCs calculated for the 54 individual samples with sufficient water quality data ranged from 14 to 73 µg/L, with an overall mean of 31 µg/L (Table 2). The highest CCCs were associated with samples collected in June–July 2015 and March–April 2016 (Figure 2), in samples having the highest DOC within the dataset (greater than or equal to 11 mg/L; March–April 2016) or samples having high pH (greater than or equal to 8.4) co-occurring with DOC greater than or equal to 6.5 mg/L (June–July 2016) (Attachment 1, Table 2). However, lower DOC and lower pH were observed in other samples collected around the same time, and these concentrations were not considered to be indicative of a seasonal trend. The majority of CCCs were between 20 and 30 µg/L (Figure 2), with the 5th and 10th percentile equal to 19 µg/L and 20 µg/L, respectively (Table 2).

Table 2: Predictions of the Copper Biotic Ligand Model for Hazeltine Creek Existing Conditions

Dataset	Final Acute Value (µg/L)	Criterion Maximum Concentration for Dissolved Copper (µg/L)	Criterion Continuous Concentration for Dissolved Copper (µg/L)	Criterion Continuous Concentration for Total Copper (µg/L)
Range of results	42–226	21–113	13–70	14–73
Mean of results	97	49	30	31
5th percentile of results	58	29	18	19
10th percentile of results	61	31	19	20

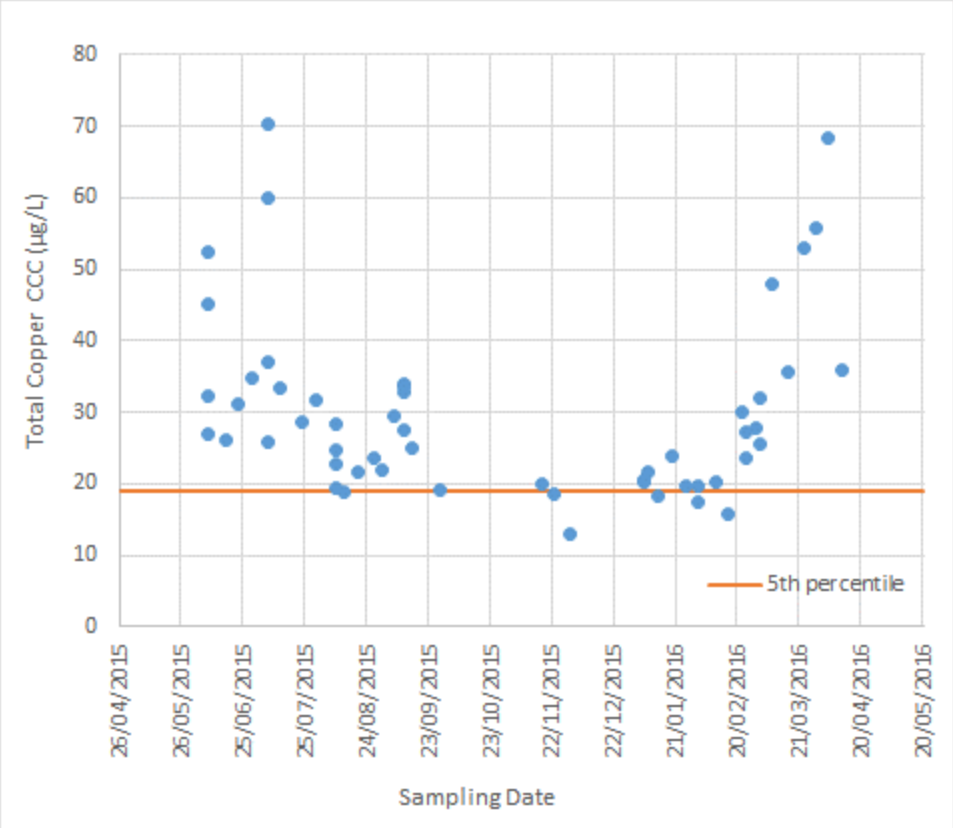


Figure 2: Temporal Distribution of Total Copper Criterion Continuous Concentrations for Individual Samples from Hazeltine Creek under Existing Conditions

CCC = criterion continuous concentration.

The 5th percentile of 19 µg/L total copper was selected as the treatment target for Hazeltine Creek, which is consistent with the guidance given by US EPA (2015) for selecting a single numeric site-specific criterion from multiple BLM-derived instantaneous criteria. The use of the 5th percentile suggests that 5% of the time the water quality conditions in Hazeltine Creek may yield a scenario whereby copper is more bioavailable, and the instantaneous CCC may be lower than the treatment target. However, this scenario is expected to occur infrequently (less than or equal to 5% of the time). In addition, the proposed treatment target is lower than the lowest CMC derived using the existing conditions dataset (i.e., 21 µg/L; Table 2). The CMC represents a concentration that aquatic life in Hazeltine Creek could be exposed to briefly without resulting in an unacceptable effect. Therefore, the proposed treatment target is expected to be protective under short-term and long-term exposure conditions.

The proposed treatment target is further supported by an analysis previous reported in MPMC (2009). A site-specific water quality objective (SSWQO) for copper in Hazeltine Creek was developed using the water effects ratio (WER) approach. Toxicity tests in Hazeltine Creek water and laboratory water indicated WERs ranging from 2.5 to 28.8 for the site, which resulted in a calculated SSWQO value of 14 µg/L for low-DOC conditions. Under conditions of higher hardness, calculated SSWQO values ranged from 18 to 33 µg/L. Thus, similar estimates of protective copper concentrations were derived using the experimental approach described in MPMC (2009) and the BLM calculation used herein.

3.3 Summary

The use of the BLM approach for Hazeltine Creek pre-mine conditions was limited due to the available water quality data. However, the total copper CCC based on mean values for pre-mine conditions (32 µg/L) was similar to the mean CCC for existing conditions (31 µg/L), which suggests that general water quality conditions in Hazeltine Creek pre-mine and existing conditions may have been relatively similar, and setting the treatment target for Hazeltine Creek using existing conditions is defensible. In addition, the proposed treatment target was selected as a lower bound estimate of the available CCC generated using individual samples from the existing conditions dataset, which yields a more conservative target than if the mean pre-mine conditions were used.

Both CCCs are higher than the hardness-dependent BC WQG because the BLM considered the influence of other exposure and toxicity modifying factors, including pH and DOC, on copper bioavailability. The similarity between the two CCCs is due to the relative influence of pH and DOC. For pre-mine conditions, mean pH was slightly alkaline (i.e., pH 7.5) and mean DOC concentration was relatively high (i.e., 14 mg/L; Attachment 1, Table 1). Existing conditions in Hazeltine Creek are characterized by a more alkaline pH (i.e., mean = pH 8.0), but lower DOC concentrations (i.e., mean = 6.5 mg/L; Attachment 1, Table 2). The relative importance of DOC and pH in the BLM is further illustrated in the sensitivity analysis (Section 4.0).

4.0 MODEL SENSITIVITY

Trials using the BLM were run to determine sensitivity of the model to changes of the individual inputs. Mean concentrations in the Hazeltine Creek existing conditions dataset were assumed (Attachment 1, Table 2), then each individual parameter was increased 25%, while holding the remaining parameters constant. As pH is based on a log scale, it was tested at pH 7.4 and 8.7 (i.e., minimum and maximum measured values) to simulate realistic variations in pH. The resulting CCCs were reported as a percentage of the original (Table 3).

With the exception of pH and DOC, a 25% change in any parameter did not change the CCC by more than 6% (Table 3). An increase in pH from 8.0 to 8.7 resulted in CCC for copper that was 63% higher, whereas decreasing pH to 7.4 reduced the CCC by 47%. Increasing DOC by 25% caused the CCC to increase by 25% (Table 3). Based on these results, the BLM used to derive the treatment target is most sensitive to changes in pH and DOC.

Table 3: Sensitivity of the Biotic Ligand Model to 25% Increases in Individual Parameters with Other Parameters Unchanged

Parameter	Original Concentration[a]	Increased 25%	Original CCC (µg/L)[a]	CCC After 25% Increase in Parameters (µg/L)	% Change
Water temperature (°C)	7.7	9.625	27.1	27.5	1.8%
pH[b]	8.0	7.4	27.1	14.5	-46.5%
pH[b]	8.0	8.7	27.1	44.1	62.9%
Humic acid (%)	10	12.5	27.1	28.7	5.9%
Dissolved organic carbon (mg/L)	6.5	8.125	27.1	33.8	25.0%
Calcium (mg/L)	55	68.75	27.1	28.0	3.4%
Magnesium (mg/L)	9.0	11.25	27.1	27.4	1.4%
Potassium (mg/L)	1.6	2.0	27.1	27.1	0.2%
Sodium (mg/L)	12	15	27.1	27.1	0.0%
Sulphate (mg/L)	67	83.75	27.1	26.8	-0.8%
Chloride (mg/L)	1.6	2.0	27.1	27.1	0.0%
Alkalinity (mg/L)	123	153.75	27.1	27.0	-0.2%
Sulphide (mg/L)	-	-	-	-	-

a) The original parameter concentrations and CCC presented are for mean concentrations in Hazeltine Creek under existing conditions.

b) pH was tested at pH 7.4 and 8.7, which corresponds to minimum and maximum measured values.

BLM = biotic ligand model; CCC = criterion continuous concentration; – = sensitivity analysis was not conducted for sulphide because this parameter is not currently considered in the model.

5.0 UNCERTAINTY

As with all models, the BLM has limitations based on its assumptions and data inputs. Model limitations were mainly related to uncertainty associated with measured water quality used as inputs and that not all potential BLM parameters were measured or predicted (e.g., humic acid and sulphide were not incorporated). Specific uncertainties associated with the use of the BLM to derive a treatment target for Hazeltine Creek at Closure are assessed in Table 4. The assessment concluded that the identified uncertainties had low influence on the interpretation or use of the BLM results for the purpose of deriving a treatment target. The predictive ability of the BLM and conservative assumptions incorporated are expected to offset the uncertainties in parameterization, such that the BLM model as implemented is expected to be more accurate than through the use of hardness alone.

Table 4: Uncertainties Associated with the Copper Biotic Ligand Model Approach to Derive a Treatment Target for Hazeltine Creek at Closure

Uncertainty Source / Assumption	Influence on the Interpretation or Use of the BLM Results
Some measured values of input parameters were outside the calibration range	**Low**—US EPA (2015) states that "*The BLM can be used when the parameters, particularly temperature, fall outside these ranges, as these ranges reflect data available at time of model calibration."* The analysis described in Section 3.0 indicated that when this occurred, conservatism in the treatment target selection increased.
Use of existing conditions to define future conditions	**Low**—Using existing condition model inputs could lead to lower or higher copper BLM-derived treatment targets if future concentrations vary substantially from this condition. ■ Increased DOC concentrations would mitigate copper toxicity (Grosell 2012) and result in a higher BLM-derived treatment targets for copper. ■ Increased pH would also mitigate copper toxicity, but a decrease in pH would exacerbate copper toxicity. ■ Geochemical testing at the Mine indicates that long-term changes in pH in mine waters is not likely. The reasonableness of the input parameters used in this assessment will be assessed over time through ongoing water quality monitoring in Hazeltine Creek during operations. The BLM can be used to update the proposed BLM-derived treatment target as required; however, the selection of treatment targets based on lower bound estimate of the distribution of CCCs derived using individual samples is a conservative approach that accounts for this uncertainty.

BLM = biotic ligand model; CCC = criterion continuous concentration; DOC = dissolved organic carbon.

6.0 CONCLUSION

Based on the BLM approach and using existing conditions, the proposed treatment target for total copper in Hazeltine Creek is 19 µg/L (Table 5). As defined by the US EPA, the CCC represents a concentration that aquatic life in Hazeltine Creek could be exposed to indefinitely without resulting in an unacceptable effect. Therefore, setting the treatment target as the 5th percentile of the distribution of CCC provides an appropriate level of protection for aquatic life in Hazeltine Creek.

Table 5: Summary of Treatment Targets for Hazeltine Creek

Receiving Environment	Input Data Description	Dissolved Copper (µg/L)	Total Copper (µg/L)	Notes
Hazeltine Creek	Individual samples (Jun–Nov 2015, upstream of discharge Dec–April 2016), 54 samples	18	19	Based on 5th percentile of the distribution of CCC for total copper

CCC = criterion continuous concentration.

7.0 CLOSURE

The reader is referred to the Study Limitations, which follows the text and forms an integral part of this memorandum.

We trust that the information provided in this technical memorandum is sufficient for your present needs. If you have any questions, please do not hesitate to contact the undersigned at (306) 667-1531.

GOLDER ASSOCIATES LTD.

Kerrie Serben, MSc
Environmental Scientist

Adrian de Bruyn, PhD, RPBio
Associate, Senior Environmental Scientist

KCS/EC/EI/ADB/cf/pn/kp

Attachments: Study Limitations
Attachment 1: Water Quality Input Concentrations

o:\final\2014\1421\1411734\1411734-175-tm-rev0-16000\1411734-175-tm-rev0-16000-copper blm hac 17oct_16.docx

REFERENCES

Grosell M. 2012. Copper. In Wood CM, Farrell AP, Brauner CJ (eds), *Homeostasis and Toxicology of Essential Metals*. Fish Physiology Volume 31 A. Academic Press / Elsevier, New York, NY, USA, pp 53-133.

HydroQual (HydroQual, Inc.). 2007a. *The Biotic Ligand Model Windows Interface, Version 2.2.3: User's Guide and Reference Manual*. Mahwah, NJ, USA.

HydroQual. 2007b. *Biotic Ligand Model, Version 2.2.3*. Available online: http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/pollutants/copper/2007_index.cfm. Accessed: February 27, 2012.

ICME (International Council on Metals and the Environment). 1995. *Persistence, bio-accumulation and toxicity of metals and metal compounds*. ICME. Ottawa, ON, Canada.

Minnow (Minnow Environmental Inc.). 2014. *Aquatic Environmental Description Report: Mount Polley Mine Discharge of Treated Water to Polley Lake*. Prepared for: Mount Polley Mining Corporation, Likely, BC.

MOE (British Columbia Ministry of Environment). 1987. *Water Quality Criteria for Copper: Overview Report*. Available at: http://www.env.gov.bc.ca/wat/wq/BCguidelines/copper/copper.html.

MPMC (Mount Polley Mining Corporation). 2009. *Mount Polley Mine Technical Assessment Report for a Proposed Discharge of Mine Effluent*. In Support of an Application for the Discharge of Mine Effluent Under the Waste Discharge Regulation of the *British Columbia Environmental Management Act*.

Suedel BC, Deaver E, Rodgers JH. 1996. *Experimental factors that may affect toxicity of aqueous and sediment-bound copper to freshwater organisms*. Arch Environ Contam Toxicol 30:40-46.

US EPA (United States Environmental Protection Agency). 1985. *Ambient water quality criteria for copper – 1984*. EPA 440/5-84-031. Office of Water Regulations and Standards, Criteria and Standards Division. Washington, DC, USA.

US EPA. 2007. *Aquatic Life Ambient Freshwater Quality Criteria - Copper*. 2007 Revision. EPA-822-R-07-001. U.S. EPA Office of Water. Washington, DC, USA. 204 pp.

US EPA. 2015. *Supplementary Training Materials for Aquatic Life Criteria – Copper*. Training materials on Copper BLM: Data Requirements. Website: https://www.epa.gov/wqc/aquatic-life-criteria-copper-documents. Accessed May 24, 2016.

US EPA. 2016. *National Recommended Water Quality Criteria.* Website: http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm. Accessed May 24, 2016.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

ATTACHMENT 1
Water Quality Input Concentrations

Table 1: Water Quality Input Concentrations for Hazeltine Creek Pre-Mine Conditions

Station	Sampling Date	Water Temperature (°C)	pH	DOC (mg/L)	Humic Acid (%) [a]	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Alkalinity (mg/L)	Sulphide (mg/L) [a]
Mean (Minnow 2014)	1990 to 1996	7.1 [b]	7.5	14	10	17	3	0.44	3.2	3	0.5 [c]	63	1×10^{-10}

Notes: Red values = values outside of the BLM calibration range. The BLM was run with the original measured value as well as the upper or lower bound of the calibration range, as appropriate.
a) Humic acid and sulphide concentrations were assumed per the BLM user guide (HydroQual 2007a).
b) Temperature not reported; assumed 7.1°C, which was the mean temperature measured in Hazeltine Creek pre-breach (2011 to 2014). Because 7.1°C is less than the lower bound of the calibration range, the BLM was also run with at the lower bound calibration range for temperature (i.e., 10°C).
c) Chloride not reported; assumed non-detected at a detection limit of 0.5 mg/L.
DOC = dissolved organic carbon; BLM = biotic ligand model.

Table 2: Water Quality Input Concentrations for Hazeltine Creek Existing Conditions

Station	Sampling Date	Water Temperature (°C) [a]	pH	DOC (mg/L)	Humic Acid (%) [b]	Calcium (mg/L) [c]	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulphate (mg/L) [d]	Chloride (mg/L)	Alkalinity (mg/L)	Sulphide (mg/L) [b]
Mean of all available samples	Jun to Nov 2015 and upstream of discharge Dec 2015 to Apr 2016	7.7	8.0	6.5	10	55	9.0	1.6	12	67	1.6	123	1×10^{-10}
HAC-01b	06/09/2015	18.0	8.064	6.18	10	48.3	8.3	1.41	11.2	49.2	1.39	128	1×10^{-10}
HAC-01b	16/06/2015	18.1	8.091	5.22	10	51.8	9.76	1.68	11.4	49.4	1.4	141	1×10^{-10}
HAC-01b	22/06/2015	18.8	8.093	6.11	10	55.8	9.85	1.55	11.2	54.4	1.47	132	1×10^{-10}
HAC-01b	29/06/2015	22.1	8.137	6.07	10	56.6	10.6	1.83	12.1	53.6	1.47	148	1×10^{-10}
HAC-01b	07/07/2015	18.7	7.998	5.74	10	47.6	8.53	1.76	11.3	49.3	1.37	130	1×10^{-10}
HAC-05	07/07/2015	23.4	8.633	6.66	10	42.9	6.39	1.53	9.94	47	1.32	104	1×10^{-10}
HAC-08	07/07/2015	21.6	8.262	6.03	10	45.2	7.38	1.67	10.6	49.3	1.35	114	1×10^{-10}
HAC-10	07/07/2015	23.1	8.698	7.51	10	42.3	5.95	1.42	9.35	46.9	1.29	101	1×10^{-10}
HAC-01b	13/07/2015	19.6	8.164	6.23	10	46.2	7.9	1.52	10.4	50	1.37	118	1×10^{-10}
HAC-01b	23/07/2015	17.1	8.14	5.68	10	47.9	8.11	1.45	11	47	1.35	118	1×10^{-10}
HAC-01c	30/07/2015	18.4	8.114	6.28	10	49.8	8.35	1.5	10.6	48.8	1.41	124	1×10^{-10}
HAC-01c	08/06/2015	17.4	8.124	5.39	10	47.4	8.16	1.7	11.3	47.6	1.34	129	1×10^{-10}
HAC-05	08/06/2015	18.9	8.655	6.46	10	44.6	6.17	1.49	10.1	45.7	1.33	110	1×10^{-10}
HAC-08	08/06/2015	17.2	8.284	5.6	10	47.3	7.6	1.68	11.3	49.6	1.34	122	1×10^{-10}
HAC-10	08/06/2015	20.1	8.437	6.58	10	41.3	5.61	1.5	9.79	47.1	1.27	98	1×10^{-10}
HAC-01c	13/08/2015	19.2	7.87	4.73	10	49.3	9.18	1.65	11.4	48	1.48	135	1×10^{-10}
HAC-01c	20/08/2015	15.4	8.117	4.35	10	53	10.3	1.59	11.9	47.7	1.44	156	1×10^{-10}
HAC-01c	27/08/2015	18.8	8.161	4.16	10	59.3	12	1.68	12.9	49.4	1.6	160	1×10^{-10}
HAC-01c	31/08/2015	17.5	8.082	4.27	10	59	12.9	1.75	13.9	49.9	1.51	167	1×10^{-10}
HAC-01c	09/08/2015	12.7	8.17	4.45	10	57.7	12.6	1.62	13.4	50.3	1.47	170	1×10^{-10}
HAC-05	09/08/2015	11.5	8.15	5.81	10	57.2	10.7	1.48	12.1	42.6	1.75	157	1×10^{-10}
HAC-08a	09/08/2015	11.7	8.31	4.37	10	59.7	13.2	1.65	15.9	58.8	1.45	164	1×10^{-10}
HAC-10	09/08/2015	13.8	7.62	7.09	10	44.8	6.09	1.41	9.97	48.3	1.36	99.1	1×10^{-10}
HAC-01c	15/09/2015	10.6	8.367	4.3	10	60.1	13	1.7	14.3	55.6	1.59	175	1×10^{-10}
HAC-01c	28/09/2015	8.6	8.06	4.31	10	62.8	13.6	1.62	14.8	62.4	1.6	170	1×10^{-10}

ATTACHMENT 1
Water Quality Input Concentrations

Station	Sampling Date	Water Temperature (°C) [a]	pH	DOC (mg/L)	Humic Acid (%) [b]	Calcium (mg/L) [c]	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulphate (mg/L) [d]	Chloride (mg/L)	Alkalinity (mg/L)	Sulphide (mg/L) [b]
HAC-05a	11/09/2015	4.8	8.346	6.82	10	53.5	8.17	1.58	10.9	62.2	1.68	124	1×10^{-10}
HAC-08	11/09/2015	3.1	8.439	6.43	10	59.1	10.6	1.61	12.5	72.4	1.73	132	1×10^{-10}
HAC-10	11/09/2015	5.8	8.204	6.14	10	44.5	5.91	1.43	9.37	48.2	1.37	99.4	1×10^{-10}
HAC-12	11/09/2015	2.5	8.314	6.69	10	64	12.1	1.65	13	81.4	1.81	145	1×10^{-10}
HAC-12	17/11/2015	0.8	7.99	5.24	10	55.1	9.73	1.31	11.2	55.1	1.46	135	1×10^{-10}
HAC-12	23/11/2015	0.3	7.99	4.88	10	54.1	9.6	1.31	10.8	54.2	1.45	135	1×10^{-10}
HAC-12	30/11/2015	0.1 [e]	7.62	4.73	10	58.1	10.6	1.27	11.3	54.4	1.46	143	1×10^{-10}
HAC-10	05/01/2016	0.1 [e]	8.02	5.44	10	43.1	5.72	1.45	9.44	48.1	1.34	100	1×10^{-10}
HAC-10	01/02/2016	0.7	7.86	5.93	10	46.8	6.14	1.47	10.5	49.9	1.41	99.5	1×10^{-10}
HAC-10	24/02/2016	2.4	8.1	6.77	10	43.5	5.94	1.41	9.81	47.8	1.34	95.5	1×10^{-10}
HAC-10	02/03/2016	1.7	8.06	6.58	10	44.8	5.83	1.36	9.55	48	1.37	94.8	1×10^{-10}
HAC-13	05/01/2016	0.1 [e]	7.98	5.6	10	50.4	6.93	1.46	11.3	57.5	1.59	113	1×10^{-10}
HAC-13	07/01/2016	0.1 [e]	7.96	6.04	10	48	6.46	1.34	9.5	52.8	1.43	99.9	1×10^{-10}
HAC-13	12/01/2016	0.3	7.81	5.81	10	48.1	6.52	1.44	9.87	55.1	1.54	107	1×10^{-10}
HAC-13	19/01/2016	0.8	8.06	6.08	10	49.7	6.58	1.48	10.4	55.6	1.51	100	1×10^{-10}
HAC-13	26/01/2016	0.2	7.78	6.35	10	53.8	7.3	1.58	11.5	65.9	1.67	107	1×10^{-10}
HAC-13	01/02/2016	0.7	7.66	6.32	10	54.5	7.47	1.57	11.8	67.1	1.68	111	1×10^{-10}
HAC-13	09/02/2016	0.6	7.73	6.85	10	52.6	7.22	1.47	11.2	62.1	1.58	107	1×10^{-10}
HAC-13	15/02/2016	0.1 [e]	7.44	7.29	10	52.3	7.76	1.54	11.4	70.1	1.73	108	1×10^{-10}
HAC-13	22/02/2016	2.1	8.06	7.53	10	53.5	7.29	1.55	10.6	64.9	1.61	105	1×10^{-10}
HAC-13	24/02/2016	2.3	7.8	7.48	10	49.7	7.19	1.56	11.4	63.2	1.59	105	1×10^{-10}
HAC-13	29/02/2016	2.1	8.06	7	10	51.4	7.11	1.55	10.9	63.2	1.6	106	1×10^{-10}
HAC-13	02/03/2016	2.7	8.3	6.86	10	49.2	7	1.52	10.6	61.1	1.58	105	1×10^{-10}
HAC-13	08/03/2016	3.6	8.08	11	10	86.3	13.2	2.07	16.9	149	2.7	130	1×10^{-10}
HAC-13	15/03/2016	2.4	7.96	9.65	10	54.7	7.79	1.51	11.3	75.6	1.7	106	1×10^{-10}
HAC-13	23/03/2016	2.7	7.999	12.5	10	121	19.5	3.14	24.6	268	4	145	1×10^{-10}
HAC-13	29/03/2016	7.4	8.009	12.3	10	134	20.4	3.07	28	288	4.1	147	1×10^{-10}
HAC-13	04/04/2016	5.7	7.903	17.7	10	93.1	14.8	3.01	20.3	184	2.67	127	1×10^{-10}
HAC-13	11/04/2016	5.4	8.259	7.9	10	39.8	5.48	1.17	7.88	47.8	1.15	84.3	1×10^{-10}

Notes: Red values = values outside of the BLM calibration range. The BLM was run with the original measured value as well as the upper or lower bound of the calibration range, as appropriate.

a) The lower bound of the calibration range for temperature is 10°C; therefore, the BLM was also run with the lower bound (10°C) replacing the measured value if the measured value was less than 10°C.

b) Humic acid and sulphide concentrations was assumed as per the BLM user guide (HydroQual 2007a).

c) The upper bound of the calibration range for calcium is 120.24 mg/L; therefore, the BLM was also run with the upper bound (120.24 mg/L) replacing the measured value if the measured value was greater than 120.24 mg/L.

d) The upper bound of the calibration range for sulphate is 278.4 mg/L; therefore, the BLM was also run with the upper bound (278.4 mg/L) replacing the measured value if the measured value was greater than 278.4 mg/L.

e) Zero values replaced with 0.1.

DOC = dissolved organic carbon; BLM = biotic ligand model.

o:\final\2014\1421\1411734\1411734-175-tm-rev0-16000\attachment 1\attachment 1.docx

ATTACHMENT C

Selenium Target Derivation

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-169-TM-Rev0-16000

TO Dale Reimer
Mount Polley Mining Corporation

CC Elaine Irving and Jerry Vandenberg

FROM Jordana Van Geest and Adrian de Bruyn **EMAIL** Jordana_vanGeest@golder.com; Adrian_deBruyn@golder.com

ANALYSIS OF SELENIUM BIOACCUMULATION AND POTENTIAL TOXICITY TO FISH IN HAZELTINE CREEK AT THE MOUNT POLLEY MINE

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) is pleased to provide Mount Polley Mining Corporation (MPMC) with the following analysis of selenium bioaccumulation and toxicity information related to establishing a treatment target for selenium in Hazeltine Creek at the Mount Polley Mine (the Mine) during Closure. This analysis was undertaken to evaluate whether a total selenium concentration in water of 10 µg/L, shown to provide an appropriate level of protection to aquatic life in receiving waters at other mine sites in British Columbia (BC), could be applied to support the management of selenium at the Mount Polley Mine. The following analysis was intended to support Closure planning for the Mine. It is understood that development and approval of a permit limit for selenium will require further consultation with BC Ministry of Environment (MOE), First Nations, and stakeholders prior to Closure.

During Closure, drainage of site contact water may be permitted to return to the natural hydrology of waterbodies and water courses around the Mine site. Contact water may be diverted through treatment systems before being released to natural catchments. Even if Best Available Technologies for passive treatment systems proposed for Closure are applied, selenium concentrations in treated source water may exceed the BC Water Quality Guideline (WQG) of 2 µg/L for the protection of aquatic life. The performance of a closure passive water treatment system is subject to evaluation through piloting. For releases to Hazeltine Creek during Closure, it has been conservatively assumed that there will be no dilution of treated contact water since the dilution capacity of the creek is limited by seasonal flow (Hazeltine Creek is snowmelt driven with the majority of annual runoff occurring during freshet, typically in April and May [KP 2014]). Therefore, selenium concentrations in Hazeltine Creek during Closure may also exceed the BC WQG.

BC WQGs are intended to be conservative environmental quality benchmarks with built-in safety factors, representing concentrations at which there is confidence that designated uses will not be adversely affected. For selenium in particular, the BC WQG was derived to be protective of aquatic life in the most sensitive lentic environments. Site-specific studies at other mines in BC have supported the derivation of protective water quality targets higher than the BC WQG where lentic environments are limited or absent.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

The following sections of this technical memorandum provide an overview of a technical approach to developing a treatment target for selenium (Section 2.0), an analysis of relevant published and site-specific data to compare receiving environment characteristics at the Mount Polley Mine to other mines in BC (Section 3.0), and a conclusion regarding a potential treatment target for discharge to Hazeltine Creek (Section 4.0).

2.0 DERIVATION OF PROTECTIVE SELENIUM TARGETS

Site-specific studies have been used to support protective selenium targets of 10 µg/L or higher at a number of coal and metal mines in BC, recognizing the importance of site-specific conditions to selenium management.

The approach taken to derive target values for the other sites was a back-calculation from tissue-based effects benchmarks for reproductive effects on sensitive resident fish species, using bioaccumulation relationships reflecting selenium uptake into fish eggs. Supporting analyses confirmed that fish reproduction was the most sensitive endpoint and that the derived targets would also be protective of other potentially sensitive taxa and endpoints, including: growth, reproduction, and survival of aquatic invertebrates; growth and survival of juvenile fish; growth and survival of juvenile birds; and reproduction of aquatic-feeding birds and amphibians. This approach was consistent with that taken by the US Environmental Protection Agency (US EPA 2015[1]) and MOE (2014), which determined that reproductive effects through maternal transfer provide the most reliable basis for the establishment of protective ecological benchmarks.

3.0 COMPARISON OF MOUNT POLLEY DATA TO OTHER DATA

The following subsections summarize selenium bioaccumulation and toxicity information relevant to the Mount Polley Mine. The objective of this summary is to compare conditions in Hazeltine Creek to those in receiving waters at other mines, where protective selenium concentrations have been proposed or approved. This comparison will inform the potential application of a protective selenium concentration as a treatment target for Closure planning for the Mine.

3.1 Bioaccumulation Data

Selenium bioaccumulation is a stepwise process, with an initial uptake step from water into algae and other micro-organisms, followed by a series of trophic transfer steps from algae to invertebrates, invertebrates to fish, and so on. The initial uptake step is the largest and most variable part of this stepwise process, in which selenium concentrations increase on the order of 100× to 10,000× from parts per billion (µg/L) in water to parts per million (mg/kg dry weight [dw]) in algae. The magnitude of increase in the initial uptake step depends on aqueous selenium concentration and other site-specific factors such as sulphate concentration and biogeochemical conditions (Williams et al. 1994; Stewart et al. 2010; Lo et al. 2015). The subsequent trophic transfer steps are much smaller and less variable than the initial uptake step: selenium concentration ratios between adjacent trophic levels (sometimes called “trophic transfer factors”) tend to be on the order of 2 to 3 for invertebrates, approximately 1 for fish muscle or whole body concentrations, and typically between 1 and 3 for fish egg concentrations (Presser and Luoma 2010). Thus, selenium concentrations at all levels in the food web are correlated and proportional to site-specific uptake at the base of the food web.

[1] US EPA released a draft document entitled “*Draft Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2015*”. The draft US EPA document is not currently intended for distribution, quotation, or citation.

Given the above, it is possible to determine whether selenium bioaccumulation is similar among sites by comparing patterns of bioaccumulation in lower trophic level organisms. If the pattern of bioaccumulation from water to algae or invertebrates is similar among locations, then bioaccumulation in fish is also expected to be similar.

Previous monitoring of tissue selenium concentrations at the Mine was undertaken because of selenium inputs to the receiving environment from the North Dump Creek and the NEZ Dump. These inputs were mitigated in late 2009 by construction of a seepage collection system. Monitoring was conducted in 2009, 2010, and 2012 to characterize conditions, document temporal trends, and evaluate the potential for effects on aquatic life due to the bioaccumulation of selenium through the food web (Minnow 2013). Previous monitoring included periphyton, benthic invertebrate, and fish tissue sampling in various waterbodies on or adjacent to the Mine site.

The breach of the Tailings Storage Facility dam at the Mount Polley Mine in August 2014 and subsequent debris flow resulted in damage to aquatic habitat along Hazeltine Creek. The channel invert is now considerably lower and, while the alignment of the creek is approximately similar, the creek is now different (e.g., riparian vegetation coverage). Therefore, the degree to which pre-breach data reflect current conditions in the creek is unknown. Reconstruction of the creek channel was completed in May 2015 as part of the rehabilitation of Hazeltine Creek. There has been some recolonization of the benthic invertebrate community within the creek, and monitoring of selenium in benthic invertebrates tissue was undertaken in August 2015 to evaluate post-breach conditions in the creek. In addition, the benthic invertebrates that have recolonized the system will be disturbed again when the fish habitat features are installed in the reconstructed creek channel.

Pre-breach invertebrate selenium data from locations in upper and lower Hazeltine Creek represent a total of 28 samples collected in 2009 (n = 5), 2010 (n = 10), and 2012 (n = 13) (Minnow 2013). Post-breach data collected in 2015 (n = 10; MPMC unpublished data) were from similar areas of upper and lower Hazeltine Creek; however, the same pre-breach locations could not be sampled because of the physical changes that occurred to the creek channel. Geometric mean benthic invertebrate selenium concentrations from Hazeltine Creek were paired with aqueous selenium concentrations (annual geometric mean concentration for pre-breach monitoring; monthly sampling concentration for post-breach monitoring) and plotted in Figure 1.

For comparison, invertebrate selenium data from other systems are also plotted in Figure 1. These data represent a total of 58 samples collected in 2012 (n = 13), 2013 (n = 21), and 2014 (n = 24), predominantly from Quarry Creek, Quarry Creek wetlands, and Trail Creek. The general range of values observed in these systems is shaded for visual comparison.

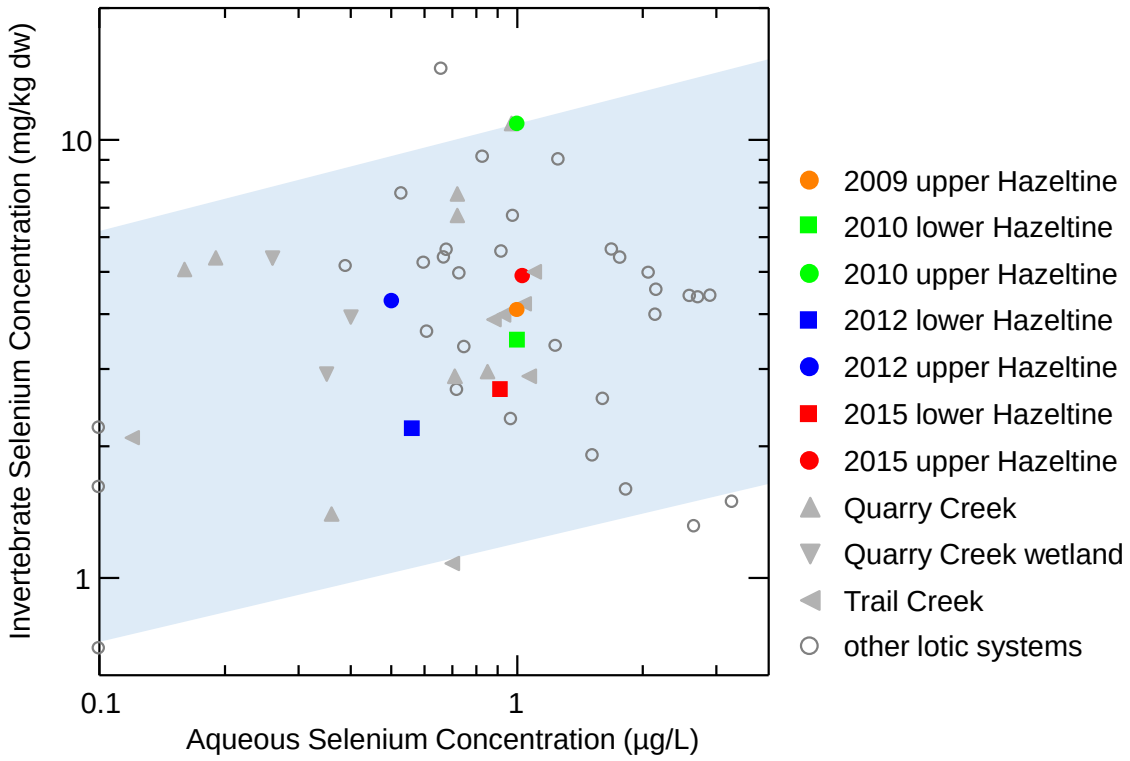


Figure 1: Patterns of Selenium Bioaccumulation in Invertebrates from Upper and Lower Hazeltine Creek (coloured symbols) Compared to Data from Other Systems

Note: Samples collected in August 2015 represent post-breach conditions in Hazeltine Creek.
dw = dry weight.

Invertebrate selenium data from Hazeltine Creek were not sufficient to describe a site-specific bioaccumulation relationship due to the narrow range of aqueous selenium concentrations. However, Hazeltine Creek data were generally near the middle of the pattern observed at other systems. One pre-breach sampling event (2010 upper Hazeltine) was higher than other observations, but still within the range observed at other systems. All post-breach data from Hazeltine Creek were consistent with the pattern observed at other systems. This consistency indicates that Hazeltine Creek exhibits invertebrate selenium concentrations typical of other lotic environments.

3.2 Toxicity Data

Prior to the breach, rainbow trout appeared to be the only species inhabiting upper Hazeltine Creek (Minnow 2014). Other fish species found in lower Hazeltine Creek near its mouth in Quesnel Lake included sockeye salmon (*Oncorhynchus nerka*), chinook salmon (*O. kisutch*), coho salmon (*O. tshawytscha*), kokanee (*O. nerka*), rainbow trout (*O. mykiss*), mountain whitefish (*Prosopium williamsoni*), burbot (*Lota lota*), largescale sucker (*Catostomus macrocheilus*), longnose sucker (*C. catostomus*), longnose dace (*Rhinichthys cataractae*), peamouth chub (*Mylocheilus caurinus*), and redside shiner (*Richardsonius balteatus*), with rainbow trout and burbot being the most abundant (SNC-Lavalin 2015).

The published threshold for reproductive effects of selenium on rainbow trout, expressed as a 10% effects concentration (EC_{10}), is approximately 22 mg/kg dw in eggs (data from Holm et al. 2005; EC_{10} estimated by DeForest et al. 2012 and US EPA 2014). This value is slightly higher (less sensitive) than effects benchmarks used to derive protective selenium concentrations at other sites in BC, which ranged from a published threshold of 18 mg/kg dw for brown trout (*Salmo trutta*; Formation Environmental LLC 2009) applied in southeast BC to 20 mg/kg dw for sensitive coldwater fish species from a species sensitivity distribution analysis (DeForest et al. 2012), applied in northeast BC. Brown trout is the most sensitive species that was tested in the aforementioned studies that are relevant to receiving waters at the Mine. Thus, a selenium target derived to be protective of sensitive species at other sites would be expected to be protective of rainbow trout and other fish species potentially present in Hazeltine Creek.

4.0 CONCLUSION AND RECOMMENDATIONS

The information presented above supports the application of an aqueous selenium concentration of 10 µg/L as a treatment target for planning for Closure for Hazeltine Creek. Receiving waters at the Mount Polley Mine do not exhibit distinct patterns of selenium bioaccumulation compared to receiving waters at other mines (Section 3.1) and rainbow trout as the most abundant fish species in Hazeltine Creek are not expected to be more sensitive to selenium compared to benchmarks adopted elsewhere in BC (Section 3.2). Therefore, a total selenium concentration of 10 µg/L, if met in Hazeltine Creek, would not be expected to cause adverse effects to resident aquatic life.

Residual uncertainty in the protectiveness of 10 µg/L as a treatment target for Hazeltine Creek relates to the relatively limited data available on selenium bioaccumulation under post-breach conditions. It is recommended that further studies be undertaken to characterize selenium bioaccumulation in biota both upstream and downstream of the current treated effluent discharge in Hazeltine Creek to address this residual uncertainty, in particular temporal uncertainty associated with recovery of the system over time. Monitoring in Hazeltine Creek while it receives effluent (i.e., before November 2017; planned as part of MPMC's Comprehensive Environmental Monitoring Program) would provide an opportunity to assess bioaccumulation at selenium concentrations above the BC WQG for aquatic life and would improve confidence in long-term selenium targets derived for the Mine. It is expected that this information will form part of a program developed in consultation with MOE to develop a long-term protective target for selenium in Hazeltine Creek.

Fish are presently excluded from Hazeltine Creek by physical barriers in place during the creek rehabilitation and the approved short-term discharge of treated effluent; therefore, monitoring of fish is not possible at this time. Under future conditions of water management at the Mine, when fish habitat and access in Hazeltine Creek are restored, it would be prudent to undertake limited (i.e., being cognizant of the impacts of sacrificing fish) sampling of fish, both to monitor fish exposure to selenium and to support bioaccumulation modelling.

5.0 CLOSURE

We trust that the information provided in this technical memorandum is sufficient for your present needs. If you have any questions, please do not hesitate to contact the undersigned at (604) 296-4200.

GOLDER ASSOCIATES LTD.

Jordana Van Geest, PhD, RPBio
Environmental Scientist

Adrian de Bruyn, PhD, RPBio
Associate, Senior Environmental Scientist

JVG/AMD/pn/bb/it/kp

Attachment: Study Limitations

o:\final\2014\1421\1411734\1411734-169-tm-rev0-16000\1411734-169-tm-rev0-16000-selenium target 17oct_16.docx

REFERENCES

DeForest, D.K., G. Gilron, S.A. Armstrong and E.L. Robertson. 2012. Species Sensitivity Distribution (SSD) evaluation for selenium in fish eggs: Considerations for development of a Canadian tissue-based guideline. Integrated Environmental Assessment and Management 8: 6-12.

Formation Environmental LLC (formerly Newfields). 2009. Brown Trout Laboratory Reproduction Studies Conducted in Support of Development of a Site-Specific Selenium Criterion. Draft Final. Prepared for JR Simplot Company. June 2009.

Holm, J., V. Palace, P. Siwik, G. Sterling, R. Evans, C. Baron, J. Werner and K. Wautier. 2005. Developmental effects of bioaccumulated selenium in eggs and larvae of two salmonid species. Environmental Toxicology and Chemistry 24:2373-2381.

KP (Knight-Piésold Ltd.). 2014. Hazeltine Creek Hydrologic Analysis. Prepared for Mount Polley Mining Corporation. VA101-1/32-1. May 14, 2014.

Lo, B.P., J.R. Elphick, H.C. Bailey, J.A. Baker and C.J. Kennedy. 2015. The effect of sulphate on selenate bioaccumulation in two freshwater primary producers: a duckweed (Lemna minor) and a green alga (Pseudokirchneriella subcapitata). Environmental Toxicology and Chemistry 34(12): 2841-2845.

Minnow (Minnow Environmental Inc.). 2013. Mount Polley Mine Selenium Monitoring 2012. Prepared for Mount Polley Mining Corporation. March 2013.

Minnow. 2014. Aquatic Environmental Description Report: Mount Polley Mine Discharge of Treated Water to Polley Lake. Prepared for Mount Polley Mining Corporation. July 2014.

MOE (British Columbia Ministry of Environment). 2014. Ambient Water Quality Guidelines for Selenium. Technical Report Update. Prepared by J.M. Beatty and G.A. Russo. April 2014. Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division, BC MOE.

Presser, T.S. and S.N. Luoma. 2010. A methodology for ecosystem-scale modeling of selenium. Integrated Environmental Assessment and Management 6: 685-710.

SNC-Lavalin (SNC-Lavalin Inc.). 2015. Mount Polley Tailings Storage Facility Breach - Fisheries Impact Assessment. Draft Report. Prepared for Mount Polley Mining Corporation. April 2015.

Stewart, R., M. Grosell, D. Buchwalter, N. Fisher, S. Luoma, T. Mathews, P. Orr and W. Wen-Xiong. 2010. Bioaccumulation and trophic transfer of selenium. In Chapman, P.M., W.J. Adams, M.L. Brooks, C.G. Delos, S.N. Luoma, W.A. Maher, H.M. Ohlendorf, T.S. Presser and D.P. Shaw, (Eds.), Ecological Assessment of Selenium in the Aquatic Environment, CRC Press, Boca Raton, FL, USA. P93-139.

Williams, M., R. Ogle, A. Knight and R. Burau. 1994. Effects of sulfate on selenate uptake and toxicity in the green algae Selenastrum capricornutum. Archives of Environmental Contamination and Toxicology 27: 449-453.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates

APPENDIX G

Options Analysis for Long-Term Water Management Plan

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-164-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

FROM Janis Drozdiak and Jerry Vandenberg **EMAIL** Janis_Drozdiak@golder.com; Jerry_Vandenberg@golder.com

OPTIONS ANALYSIS FOR MOUNT POLLEY MINE LONG-TERM WATER MANAGEMENT PLAN

1.0 INTRODUCTION

Mount Polley Mining Corporation (MPMC) has developed a Long-Term Water Management Plan per Section 2.9 of British Columbia *Environmental Management Act* Permit 11678. One component of the Long-Term Water Management Plan is an options analysis, which considered potential discharge locations for treated effluent. The primary goal of the options analysis was to identify discharge options for the long-term water management strategy, which will be suitable for the remainder of Mount Polley Mine operations, closure, and post-closure. This document presents an introduction to the process that was used to screen, evaluate, and select options. It includes a list of options for discharge locations, as well as the weighting and ranking of these options.

2.0 OPTION EVALUATION METHOD

The Kepner-Tregoe (K-T) process was used to evaluate the discharge location for the long-term water management strategy. This method comprises the following steps:

1) **Identify and define potential options**—For the discharge location, a number of options are available. At this stage, all potentially viable options are included in a list, without assigning any preference or likelihood to any given option. A "do nothing" option is included for comparative purposes. A description is included for each option.

2) **Identify and define primary screening criteria**—Primary criteria, also called non-compensatory criteria, are those that have pass/fail or absolute minimum or maximum requirements. Primary criteria are intended to screen an initial list, which may include many options, down to a few options that can be evaluated in more detail.

3) **Identify and define the secondary criteria**—Secondary criteria are those that need to be weighed and evaluated against each other. They are often competing or conflicting demands that make a decision more difficult and less obvious to parties with different priorities. Secondary criteria are often categorized according to the "triple bottom line": environmental, social, and economic factors; a fourth factor, technical feasibility, is sometimes also included as a separate category, as was done in this case. A description of what constitutes a better or worse option should be included so that options can be objectively ranked against each other. Only criteria that can differentiate options should be included.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way, Vancouver, BC, V5M 0C4
Tel: +1 (604) 296 4200 Fax: +1 (604) 298 5253 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

4) **Agree on the rules for weighting and ranking**—Certain rules must be followed to make an objective and transparent decision. The following rules were applied in this options analysis:

   - Total weighting must equal 100.
   - Major categories (e.g., social, environmental, economic, technical) are assigned equal weighting.
   - Rankings are from one to five; the lowest score (i.e., least preferable) must be one and the highest must be five; intermediate ranks need not be evenly or linearly spaced.
   - Two options may tie on a given criterion, but all options may not tie evenly.
   - Final scores are non-binding because the options analysis is completed in advance of detailed engineering and scientific evaluation. The options analysis supports, but does not bind, a decision. If a leading option is later rejected, justification will be provided for its rejection.

5) **Arrange options and criteria**—In a spreadsheet, a matrix is arranged with options in a row at the top and criteria down a column on the left.

6) **Assign weightings to each criterion**—The weightings reflect the importance or priority of each criterion, with the most important criteria having higher weight. These weightings should be somewhat linear (i.e., a criterion that is twice as important as another criterion should be weighted approximately twice as heavily) because, upon completion of the process, they will directly affect a numerical score that indicates the optimal option.

7) **Apply the primary criteria**—Potential options are screened and options to be subjected to detailed evaluation are shortlisted. Options that fail primary criteria are not considered or evaluated further.

8) **Rank each option**—Moving through one criterion at a time, each option is ranked.

9) **Score each option**—Scores are calculated by multiplying each weighting by each ranking, and summing the products. The preferred option(s) are selected based on overall rankings.

10) **Conduct a sensitivity analysis**—In the case of either lack of consensus, or uncertainty regarding weightings or rankings, individual weightings and rankings can be adjusted to see if it would change the highest ranked option. A sensitivity analysis can also be done to explore “what if” scenarios to evaluate changing conditions.

Input for the each of the steps listed above was gained from previous options analyses (listed in the following section) as well as Water Workshops held by MPMC in Likely, BC and the MPMC Public Liaison Committee meeting at the Mine on 12 May 2016. Electronic copies of the options analysis (a blank version and a completed version) were distributed to MPMC’s Public Liaison Committee for input in advance of a public meeting in Likely on 25 May 2016, during which additional feedback was gathered.

3.0 OPTIONS ANALYSIS – DISCHARGE LOCATION

3.1 Previous Analyses

Previous options analyses have been completed as part of the short-term *Technical Assessment Report in Support of an Effluent Permit Amendment* (Golder 2015) and the *Alternative Discharge Design and Construction Plan* (Golder 2016). Through these analyses, ten options were originally screened, feedback was obtained from interested parties, and five options were shortlisted as the most viable or popular options for the detailed analysis described herein.

3.2 Option Description

Five potential discharge locations and a “status quo” option have been identified, as described in Table 1.

Table 1: Description of Potential Discharge Location Options

Option	Title	Description
1	Pipeline to Quesnel Lake	Using pipeline to convey discharge to Quesnel Lake.
2	Relocating Hazeltine Creek discharge	Locating the point of discharge further downstream to allow rehabilitation of fish habitat in the upper reach of Hazeltine Creek and connection to Polley Lake.
3	Pipeline to Quesnel River	Using pipeline to convey discharge to Quesnel River.
4	Distributed to Bootjack Lake, Polley Lake, Hazeltine Creek	Distributing flows to multiple waterbodies, preferably in proportion to pre-development flows.
5	Science-based environmental benchmarks	Developing science-based environmental benchmarks, in accordance with provincial guidance, and discharging to the assimilative capacity of Hazeltine Creek while rehabilitating the creek to fish habitat.
6	Status quo	“Do nothing” option, evaluated for comparative purposes only. Not considered as a viable option beyond permitted date of November 2017.

3.3 Option Comparison

The major advantages and disadvantages of the potential discharge location options are listed in Table 2.

Table 2: Advantages and Disadvantages of Potential Discharge Location Options

Option	Title	Advantages	Disadvantages
1	Pipeline to Quesnel Lake	■ High predicted and measured dilution ■ Deep diffuser in low traffic area ■ Allows complete rehabilitation of Hazeltine Creek	■ High cost of pipeline installation
2	Relocating Hazeltine Creek discharge	■ Minimal pipeline along disturbed corridor ■ Short pipeline required	■ Low dilution at point of discharge ■ Risk of uncontrolled release to Quesnel Lake ■ Requires highly managed flows
3	Pipeline to Quesnel River	■ Stated preference of many Likely residents ■ Allows complete rehabilitation of Hazeltine Creek	■ Additional linear disturbance and diffuser construction ■ Large initial dilution zone required that may impinge fish spawning areas ■ Dilution variable with flow ■ Higher cost of pipeline installation due to distance

Option	Title	Advantages	Disadvantages
4	Distributed flows to Bootjack Lake, Polley Lake, Hazeltine Creek	■ Viable permanent solution that restores pre-mining flows ■ Stated preference of some stakeholders and First Nations	■ Most complex drainage and discharge systems ■ Long-term monitoring at multiple locations
5	Science-based environmental benchmarks	■ Minimal pipeline and infrastructure requirements ■ Low technological complexity	■ Difficult to scale flows ■ Anticipated low public acceptance ■ Long-term monitoring
6	Status quo	*Not evaluated*	*Not evaluated*

3.4 Primary Option Screening

A primary screening of discharge location options was carried out with the criteria listed below:

- **Environmental**—does not cause adverse impacts to aquatic, terrestrial, or human receptors
- **Legal**—complies with all applicable provincial and federal policy and law

The primary screening did not remove any options, but the criteria were maintained as requirements so that if any options were subsequently modified during detailed studies, they must adhere to these criteria.

3.5 Detailed Evaluation

Secondary criteria were applied to differentiate options, as presented in Table 3.

Table 3: Evaluation Criteria for Discharge Locations

Environmental	
Assimilative capacity	Minimum of 10× dilution; >100× dilution preferred
Aquatic effects	Minimize effects on receiving environment
Terrestrial effects	Minimize disturbance (land clearing, construction area, linear disturbance)
Long-term sustainability	Location should be viable for long term, preferably for the remainder of operations and through to post-closure
Technological	
Risk and consequence of failure	Minimize likelihood of failure and potential effect of failure
Complexity	Prefer lower complexity
Flexible design	Prefer adaptable and scalable
Risk of non-compliance	Prefer higher reliability
Social	
Restoration of fish habitat	Preference to rehabilitate more habitat in Hazeltine Creek sooner
Acceptance of option	Stated preference of stakeholders
Economic	
Capital cost	Prefer lower capital cost
Operating cost	Prefer lower operating cost

3.6 Option Weighting and Ranking

The evaluation criteria described in Table 3 were used in the K-T analysis of discharge location options. Weights were assigned to the criteria based on the relative importance of each specific criterion. Quantitative ratings were assigned to each option using the numeric values 1 to 5 (5 being the most preferable, 1 the least preferable). Rankings for each option were multiplied by the relative weighting for each criterion. These weighted scores were summed to determine the total score for each option.

Where possible, quantitative analyses were completed to rank the proposed discharge options.

3.6.1 Noted Considerations for Assimilative Capacity

The assimilative capacity of the discharge location was assessed to determine the following:

- The minimum dilution factors as outlined in Table 3.
- The length of the mixing zone required to achieve the target dilution range.
- Likelihood that the proposed dilution zone impinges on fish spawning habitat.

Calculations of the dilution factors for discharges to Quesnel Lake (Appendix H of the TAR), Quesnel River (Attachment 1 of this Appendix) and Hazeltine Creek (Golder 2015) indicated the following:

- A greater than 40 times dilution can be achieved in Quesnel Lake at the edge of a 100 metre initial dilution zone – for most modelled scenarios a greater than 100 times dilution was achieved.
- For a centreline discharge to the Quesnel River, a 91x dilution factor can be achieved during the 7Q2 low flow and the site generally provides sufficient dilution to achieve equal to or greater than 100x dilution at the edge of a 100 metre mixing zone (see Attachment 1).
- There are periods when the minimum dilution of 10x will not be achievable in Hazeltine Creek.

The Quesnel Lake discharge was ranked over the Quesnel River option since the modelling work considered a centreline discharge. In reality, the discharge from the Mine would be at the edge of the river, which would reduce the modelled dilution by half or, the mixing zone length would have to be doubled to 200 metres to achieve the same dilution. The Hazeltine Creek option was given the lowest ranking due to the lack of dilution.

3.6.2 Noted Considerations for Aquatic Effects

As noted above, the quantitative analysis was also completed to determine if the mixing zone length would impinge on fish spawning habitat. The Quesnel Lake option is considered favorable to both the Quesnel River and Hazeltine Creek discharge options in this context, since the diffusers could be located at depth and away from the shore allowing the discharge to be designed in a manner that would not impinge on fish spawning habitat (in this instance, in the lake). A description of habitat considerations for Quesnel River is included below.

The upper mainstem of the Quesnel River provides valuable spawning habitat for numerous fish species (Pederson 1998). Kokanee salmon utilize the Narrows of Quesnel River near the town of Likely for spawning (Pederson 1998). A large portion of the Interior Fraser coho salmon population spawns in Quesnel River between Quesnel Lake and the UNBC Quesnel River Research Centre (Pederson 1998). Chinook salmon spawn in the Narrows and at the bridge near Likely (Pederson 1998). Dolly Varden spawn in Quesnel River from the Likely Bridge downstream to the UNBC Quesnel River Research Centre (Pederson 1998). The Quesnel River has also been identified as critical habitat for Quesnel Lake rainbow trout, which are believed to spawn in the river. The spawning habitat in the upper mainstem is not continuous but it is widely distributed and it will be determined by the presence of suitable depth, velocity and substrate conditions that are appropriate for the needs of each individual species.

As noted above, the Quesnel River would require a mixing zone of approximately 200 metres to achieve a similar dilution to the achievable dilution in Quesnel Lake. Although, fish spawning habitat is discontinuous in Quesnel River, discharge to this waterbody was given a lower ranking in comparison to Quesnel Lake due to the increased likelihood of the long mixing zone (e.g., 200 metres long and one-quarter river width) coming into contact with fish habitat.

4.0 RESULTS

A populated matrix is included as Attachment 2, and Table 4 shows the total final score for each option. The results indicate that, to balance environmental, technological, social, and economic criteria, the pipeline to Quesnel Lake is the best overall option for the Long-Term Water Management Plan.

Table 4: Options Analysis Final Results

Option	Title	Score	Overall Rank[(a)]
1	Pipeline to Quesnel Lake	393.75	1
2	Relocating Hazeltine Creek discharge	180	5
3	Pipeline to Quesnel River	315	4
4	Distributed to Bootjack Lake, Polley Lake, Hazeltine Creek	321.25	3
5	Science-based environmental benchmarks	332.5	2
6	Status quo	182.5	-

[(a)] For the overall rank, the lowest number indicates the most preferred overall option

Science-based environmental benchmarks (SBEBs) were ranked as the second most viable option based on the criteria employed in the current options analysis. After the options analysis was completed, MPMC discussed SBEBs with the MoE, and based on the outcomes of these discussions, MPMC will not be considering SBEBs at this time in the proposal of the Long-Term Water Management Plan. SBEBs are, however, left in this options analysis to maintain the information that has been presented to community members and to provide a comprehensive overview of the options that have been considered in the development of the Long-Term Water Management plan.

With the exclusion of SBEBs from this analysis, the option of distributed flows becomes the second most preferable option. MPMC continues to pursue this option in the context of closure and post-closure water management.

4.1 Sensitivity Analysis

As part of the analysis, a number of perspectives were sought to evaluate whether the analysis is sensitive to a particular discipline or lens through which it is viewed. The analysis was first completed by an environmental scientist for an environmental perspective, second by a design engineer for a technical perspective, and third by MPMC for an operator perspective. Each of these perspectives came to the same conclusion on the overall rankings, with little variation in numerical scores. Finally, the options analysis was distributed to MPMC's Public Liaison Committee and other interested members of the public in May 2016 for the social perspective. The feedback received indicated that, if environmental, technological, social, and economic factors are weighted evenly, the overall rankings are not sensitive to any particular lens or perspective.

5.0 CLOSURE

We trust this memorandum meets your current requirements. If you have any questions or require additional details, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Janis Drozdiak, PEng
Associate, Senior Pipeline Engineer

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

Attachments: Study Limitations
Attachment 1: Preliminary Analysis of Hydrological Capacity and Initial Dilution Zone Mixing for the Quesnel River Discharge Option
Attachment 2: Options Analysis Matrix

o:\final\2014\1421\1411734\1411734-164-tm-rev0-16000\1411734-164-tm-rev0-16000-mt polley options analysis 17oct_16.docx

REFERENCES

Golder (Golder Associates Ltd.). 2015. Technical Assessment Report in Support of an Effluent Permit Amendment. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-030. May 29, 2015.

Golder. 2016. Alternative Discharge Design and Construction Plan. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-115. January 27, 2016.

Pedersen. R., 1998. Overview Report. Quesnel River Study Area. Fish Habitat Assessment Procedure. Prepared for Weldwood of Canada Ltd. March 1998.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

ATTACHMENT 1
Preliminary Analysis of Hydrological Capacity and Initial Dilution Zone Mixing for the Quesnel River Discharge Option

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-201-TM-Rev0-16000

TO Luke Moger
Mount Polley Mining Corporation

FROM Shouhong Wu, Robert Millar and Jerry Vandenberg **EMAIL** Shouhong_Wu@golder.com; Robert_Millar@golder.com; Jerry_Vandenberg@golder.com

PRELIMINARY ANALYSIS OF HYDROLOGICAL CAPACITY AND INITIAL DILUTION ZONE MIXING FOR THE QUESNEL RIVER DISCHARGE OPTION

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Mount Polley Mining Corporation (MPMC) to undertake a preliminary analysis of the hydrologic capacity and initial dilution zone (IDZ) of the Quesnel River Discharge Option. This location is being considered as a potential long-term option for discharge of treated mine water from the Mount Polley Mine (the Mine). The approximate location of the proposed discharge site (the site), as considered in the Quesnel River Discharge Option, is 4.2 km downstream of the Likely Bridge (Figure 1).

MPMC is applying for an amendment of *Environmental Management Act* (EMA) Permit 11678 for a maximum annual discharge rate of 10 million metric metres (Mm^3). A discharge rate of 0.33 cubic metres per second (m^3/s) reflects the constant rate required to discharge the maximum annual volume of 10 Mm^3, which would be sufficient to manage water under the 99.5 percentile wet-year scenario (i.e., 199 years out of 200) based on hydrologic analysis found in Appendix B of this Technical Assessment Report. However, to balance larger flows during freshet, MPMC is also applying for a maximum instantaneous discharge rate of 0.6 m^3/s. This would allow for increased operational capability to manage water levels in the Springer Pit and peak flows during freshet: minimizing the volume of surplus water required to be stored on site.

The approach presented below represents a desktop analysis using general equations and parameter values from the literature. Additional field measurements would be required to refine or confirm the results.

2.0 HYDROLOGICAL CAPACITY AND FAR FIELD DILUTION RATIOS

The average far-field hydrologic capacity at the site can be determined by the ratio of the mean annual discharge (MAD) at the site divided by the effluent discharge rate. This provides the average dilution ratio. The hydrology in the Quesnel River is well established, with an Environment Canada flow gauge (08KH001) installed near the Likely Bridge. The flow gauge has been in operation since 1924, with continuous data since 1948.

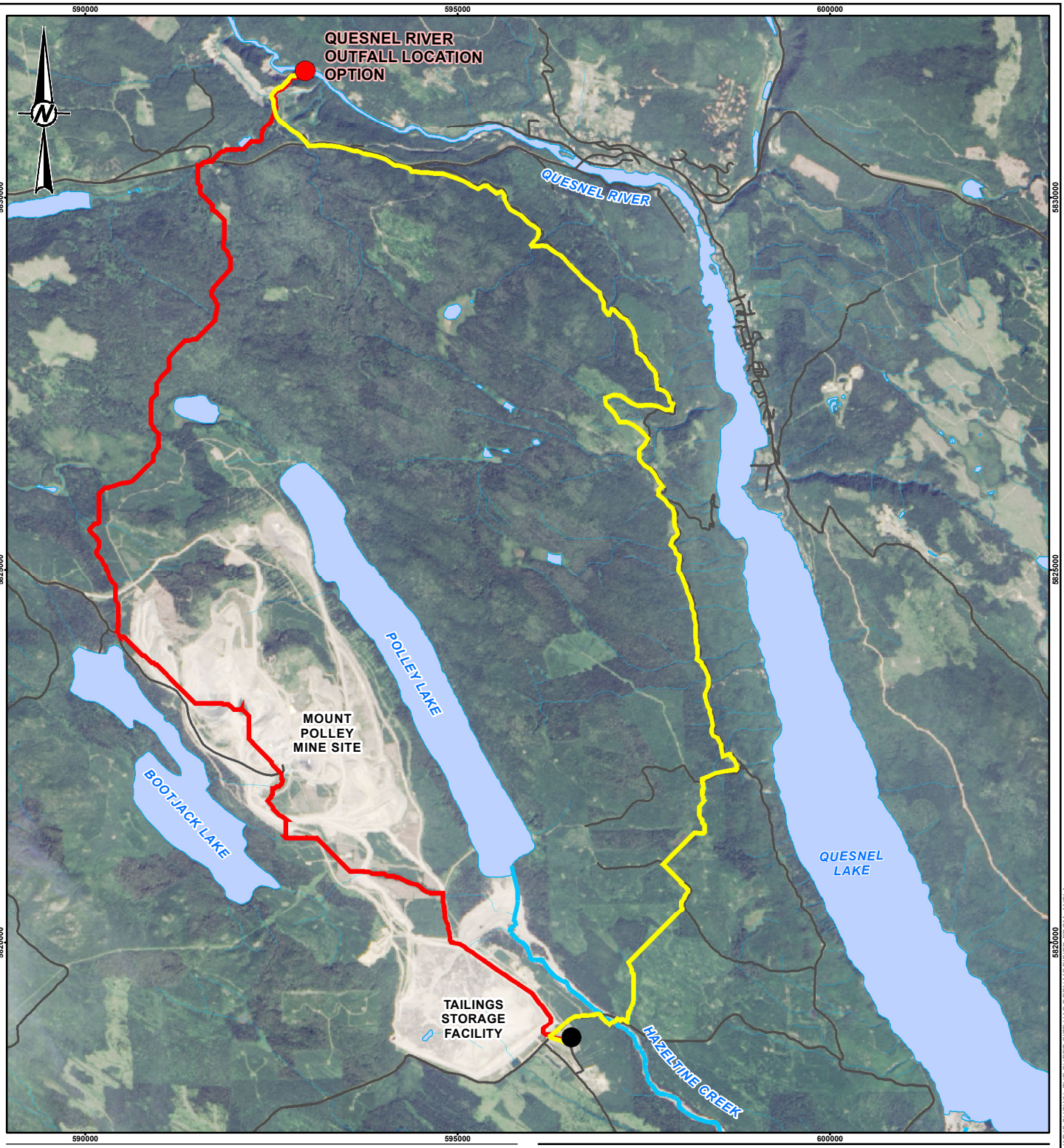
CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

The 2010 annual hydrograph for Quesnel River near the Likely Bridge, together with the mean, minimum, and maximum recorded flows for the period of record, are shown in Figure 2. The MAD is 130 m^3/s; the mean seven-day low water flow (7Q2) is 30 m^3/s; and the mean annual peak flow (mean annual flood) is 394 m^3/s.

In general, a dilution ratio greater than 100:1 is desired under the EMA regulations. Dilution ratios as low as 10:1 may be acceptable with additional assessment, but are likely not acceptable. The average dilution ratio for the design effluent discharge is 394:1 (130/0.33). For the mean seven-day mean low water (7Q2), the dilution ratio is 91:1 (30/0.33).

Based on the hydrology, after complete mixing, the Quesnel River discharge site would generally provide sufficient far-field dilution (greater than 100:1) for all flows, although the minimum dilution for the 7Q2 low flow (91:1) is slightly less than the desired 100:1. However, these dilution ratios are based on complete mixing in the Quesnel River flow. Additional analysis is required for the near-field, or IDZ, which is discussed below.



LEGEND

- SOURCE LOCATION
- LONG-TERM OUTFALL LOCATION

LONG-TERM QUESNEL RIVER PIPELINE ROUTE OPTIONS

- OPTION QR-C
- OPTION QR-D
- ROAD
- WATERCOURSE
- WATERBODY

0 1.5 3

1:75,000 KILOMETRES

REFERENCE(S)

1. WATERCOURSE AND LAKE DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. ORTHOPHOTO OBTAINED FROM NASA 20140217
3. PROJECTION: UTM ZONE 10; DATUM: NAD 1983

CLIENT
IMPERIAL METALS
MOUNT POLLEY MINING CORPORATION

PROJECT
MOUNT POLLEY MINE
TECHNICAL ASSESSMENT REPORT

TITLE
QUESNEL RIVER OUTFALL LOCATION OPTION

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-09-19
DESIGNED	RM
PREPARED	CD
REVIEWED	RM
APPROVED	JV

PROJECT NO.	CONTROL	REV.	FIGURE
1411734	16000	0	1

PATH: \\golder.gds\kal\burnaby\CAD-GIS\Client\1413803\141734\PRODUCTION\16000\MXD\Report\1411734_16000_FIG1_QUESNEL_RIVER_OUTFALL_OPTION.mxd PRINTED ON: 2016-10-17 AT: 2:06:42 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

1 in
0

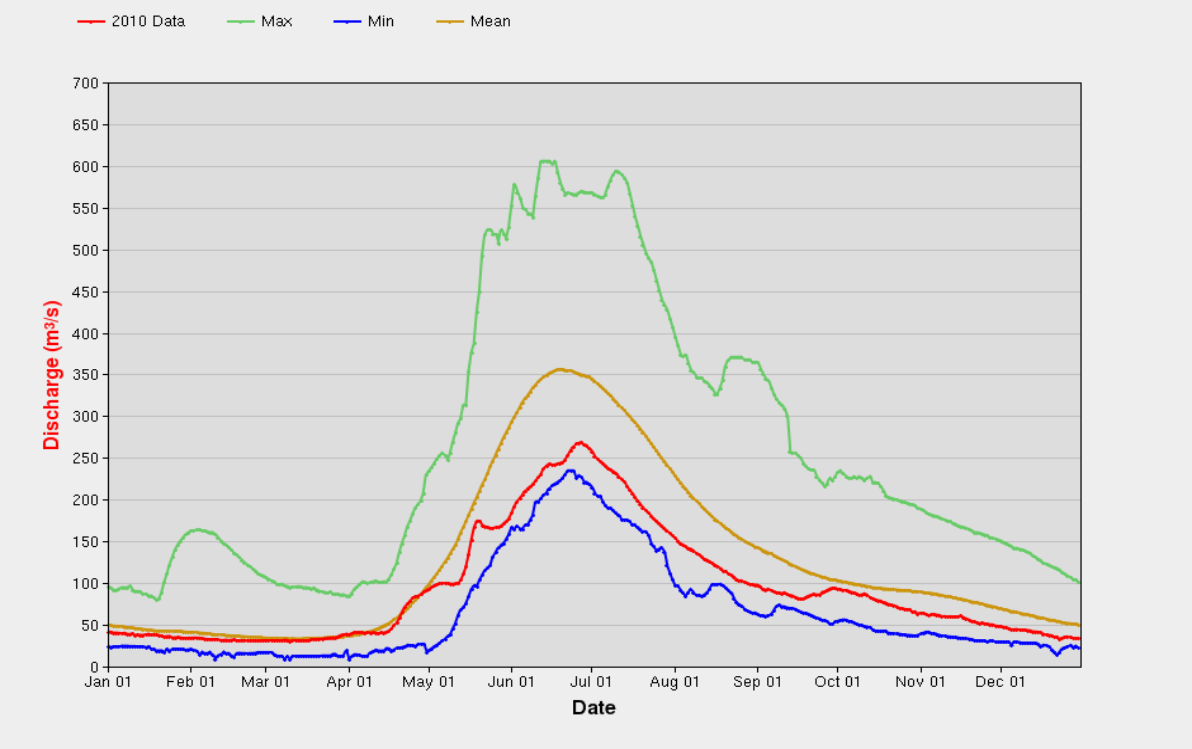


Figure 2: Annual Hydrograph for the Quesnel River at Likely (1924-2010)

3.0 INITIAL DILUTION ZONE

Under the *BC EMA, Municipal Wastewater Regulation* (Government of British Columbia, 2012), the length and width of the IDZ for streams and rivers are defined from mean low water (7Q2):

1) The width, perpendicular to the path of the stream, is the lesser of:

    a. 100 m

    b. 25% of the width of the stream

2) The length, parallel to the path of the stream, is the distance between a point 100-m upstream and a point that is the lesser of:

    c. 100 m downstream

    d. a distance downstream at which the width of the effluent plume equals the width determined under paragraph (1)

For mean low water, the width of the flow is estimated to be approximately 33.3 m (which is approximately half the bankfull width of 65.1 m), and therefore the width of the plume must be less than 8.3 m.

Based on the above, the IDZ for the Quesnel River site is defined as a zone that is 8.3 m wide, and within 100 m downstream of the discharge location (Figure 3). The desired minimum dilution at the boundary of the IDZ is 100:1.

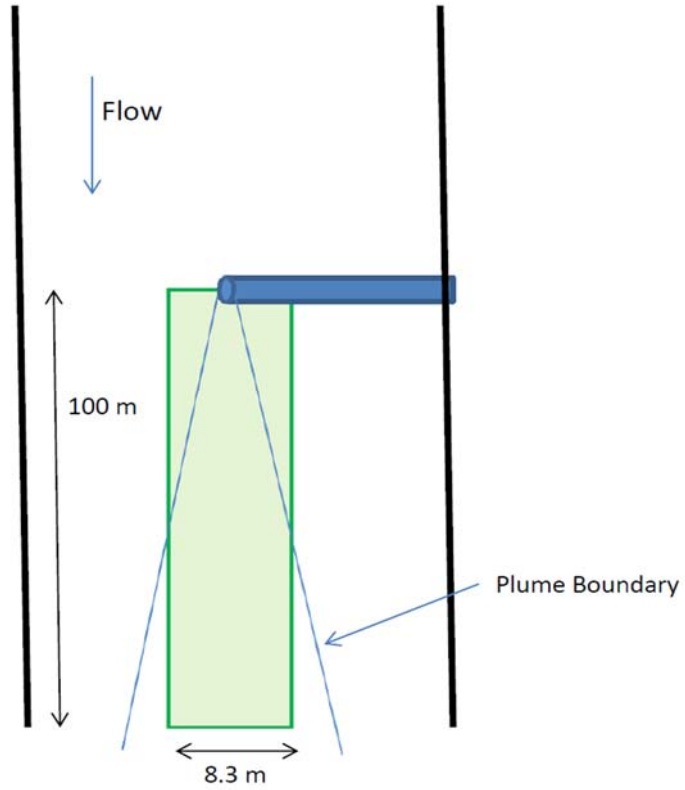


Figure 3: Definition Sketch for the IDZ for a Centreline Discharge

3.1 IDZ Dimensions for Quesnel River

The estimated IDZ for the site has been estimated through a two-dimensional advection-dispersion mixing analysis (see Attachment 1). The mixing parameter values have been assumed from literature values (Fischer et al. 1979). The variation in width, depth, and velocity with discharge have been estimated using hydraulic geometry relations (Leopold and Maddock, 1953). Details of the analysis are provided in Attachment 1.

3.1.1 Results

The key results for a single-point, centreline discharge with no diffuser are summarized in Table 1.

The minimum dilution ratios at the boundary of the IDZ for the design effluent discharge of 0.33 m^3/s under a range of Quesnel River flows are provided in column 5. For the design effluent discharge of 0.33 m^3/s, the minimum dilution rate of 100:1 at the boundary of the IDZ could only be achieved when flow in the Quesnel River was 119 m^3/s or greater. At mean low water (30 m^3/s), a minimum dilution ratio of 30:1 was estimated.

For each Quesnel River flow assessed (column 1) the corresponding maximum effluent discharge that would achieve a minimum dilution ratio of 100:1 at the boundary of the IDZ was also estimated (column 6). For the 7Q2 mean low flow (30 m^3/s), an effluent discharge of 0.1 m^3/s or less would achieve a minimum dilution ratio of 100:1 at the boundary of the IDZ. For flows in Quesnel River greater than 237 m^3/s, the minimum dilution of 100:1 would be achieved for the discharge of 0.6 m^3/s (column 6).

Table 1: Summary of IDZ Results for a Single-point, Centreline Discharge

Quesnel River Flow (m^3/s)	River Top Width (m)	Water Depth (m)	Flow Velocity (m/s)	Minimum Dilution Ratio ([a])	Maximum Effluent Discharge to Meet 100:1 Dilution (m^3/s)
[1]	[2]	[3]	[4]	[5]	[6]
30	33.3	0.78	1.16	30	0.10
50	37.9	0.96	1.38	47	0.16
119	**47.5**	**1.35**	**1.85**	**100**	**0.33**
150	50.4	1.48	2.01	122	0.40
237	56.7	1.78	2.34	182	0.60
264	58.4	1.86	2.43	200	0.66
400	65.1	2.20	2.80	287	0.95

Note: (a) At the boundary of the IDZ for the design effluent discharge of 0.33 m^3/s.

A single bank discharge point and multiple point discharges were also assessed (see Attachment 1). The single bank discharge resulted in lower dilution ratios (0.5 times those in Column [5]). The diffuser length was constrained by the plume width, and a two-port diffuser at the channel centreline provided a modest (+5%) increase in the maximum effluent discharge values (Column [6]).

4.0 ANNUAL EFFLUENT DISCHARGE

Based on the maximum effluent discharges that achieved a minimum dilution ratio of 100:1 at the boundary of the IDZ (Table 1 Column [6]), it is possible to determine the annual discharge volume that satisfies the near-field dilution requirements. To do so, discharge of treated effluent from the Mine was adjusted daily up to the maximum rate of 0.6 m^3/s based on real-time water levels recorded by Environment Canada at flow gauge 08KH001 near the Likely Bridge[1].

Annual discharge capacity estimates are provided based on historical Quesnel River daily flows (1948 through 2010) for maximum discharge rates of 0.33 m^3/s and 0.6 m^3/s (Table 2). For a maximum discharge rate of 0.33 m^3/s, the average annual discharge capacity is 7.5 Mm^3 (0.24 m^3/s). For a maximum instantaneous discharge rate of 0.6 m^3/s, the average annual discharge capacity is 9.8 Mm^3 (0.31 m^3/s). To achieve a discharge of 10 Mm^3 under 1:200-yer wet conditions, the maximum instantaneous discharge of 0.6 m^3/s would be required.

Table 2: Annual Effluent Discharge Capacity

Scenario	Maximum Discharge 0.33 m^3/s		Maximum Discharge 0.6 m^3/s	
	Mm^3	m^3/s	Mm^3	m^3/s
99.5% (Wet)	8.9	0.28	11.6	0.37
Average	7.5	0.24	9.8	0.31
0.05% (Dry)	6.1	0.19	7.7	0.24

[1] https://wateroffice.ec.gc.ca/report/report_e.html?type=realTime&stn=08KH001

5.0 CONCLUSIONS

The following conclusions are based on the above analysis (for a single-point centreline discharge port):

1) For an effluent discharge rate of 0.33 m^3/s the Quesnel River site generally provides adequate capacity to provide far-field dilution ratio of greater than, or equal to 100:1; although for mean 7Q2 low flow the dilution is 91:1.

2) The near-field dilution in the IDZ is limiting when flow in the Quesnel River is less than 119 m^3/s, which occurs on about 227 days per year (62%), on average.

3) To achieve a dilution ratio of greater than or equal to 100:1 at the boundary of the IDZ, the effluent discharge rate would need to be reduced below 0.33 m^3/s when the flow in the Quesnel River is less than 119 m^3/s.

4) A diffuser length would be limited by the mixing zone width, and would increase centreline dilution by approximately 5%.

5) Subject to a minimum dilution ratio of 100:1 at the boundary of the IDZ, the maximum instantaneous discharge rate of 0.6 m^3, requested by MPMC in the EMA Permit 11678 amendment application, would be required to provide 10 Mm^3 annual discharge capacity for 99.5% (1:200-year) wet conditions. Under this scenario, effluent flow rates would need to be continuously managed such that effluent flow is reduced or curtailed in response to changing river discharge rates.

6.0 CLOSURE

We trust that the information presented in this memo is sufficient for your present requirements. If you have any questions or concerns, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Shouhong Wu, PhD, PEng
Senior Water Resources Engineer

Robert Millar, PhD, PEng
Associate, Senior Hydrotechnical/Water Resources Engineer

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

SW/RGM/JV/kp

Attachment : Mixing Calculations

o:\final\2014\1421\1411734\1411734-201-tm-rev0-16000\1411734-201-tm-rev0-16000-quesnel river mixing 17oct_16.docx

REFERENCES

Fischer HB, EJ List, RCY Koh,J Imberger, NH Brooks. 1979. "Mixing in Inland and Coastal Waters", Academic Press, Inc., San Diego, California, 92101.

Government of British Columbia. 2012. *Environmental Management Act*, Municipal Wastewater Regulation, B.C. Reg. 87/2012. Queen's Printer, Victoria, British Columbia, Canada.

Leopold LB, T Maddock. 1953. "The Hydraulic Geometry of Stream Channels and Some Physiographic Implications", U.S. Geological Survey Professional Paper 252, United States Government Printing Office.

ATTACHMENT 1
Mixing Calculations

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-204-TM-Rev0-16000

TO Luke Moger
Mount Polley Mining Corporation

FROM Shouhong Wu and Robert Millar **EMAIL** Shouhong_Wu@golder.com; Robert_Millar@golder.com

MIXING CALCULATIONS

1.0 INTRODUCTION

The two-dimensional advection-dispersion analysis is based on the following assumptions.

- The 7Q2 (mean annual low flow) of the Quesnel River is 30.3 m³/s.
- River bankfull width is 65 m.
- Bankfull flow is 400 m³/s.
- The maximum, average, and minimum effluent discharge are, respectively, 0.3, 0.2, and 0.1 m³/s.
- River bed slope S_o = 0.0075.

2.0 CALCULATION OF TOP WIDTH AND WATER DEPTH FOR DIFFERENT RIVER FLOW RATES

The river top width and water depth for different flow rates were estimated by the regime equations from Leopold and Maddock (1953):

$$\begin{cases} W = aQ^{0.26} \\ H = bQ^{0.40} \end{cases} \quad [1]$$

where Q is river flow; W and H are, respectively, top width and water depth (m); and a and b are coefficients to be calibrated. The coefficient a has a value of 13.7 that is obtained using the provided bankfull top width and flow rate. A value of 0.2 was used for b that resulted in reasonable values for Manning's roughness n.

The estimated W, H and n values corresponding to different flow rates are listed in columns 2, 3 and 5 of Table A1 respectively.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder Associates Ltd.
500 - 4260 Still Creek Drive, Burnaby, British Columbia, Canada V5C 6C6
Tel: +1 (604) 296 4200 Fax: +1 (604) 298 5253 www.golder.com

Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

3.0 CALCULATION OF TURBULENT MIXING COEFFICIENT

The turbulent mixing coefficient ε_t was calculated based on the equation by Fischer et al. (1979):

$$\varepsilon_t = 0.6Hu^* \quad [2]$$

where 0.6 is assumed for irregular natural rivers, and *u** is shear velocity:

$$u^* = \sqrt{g * H * S_0} \quad [3]$$

and g is gravitational acceleration. The calculated *u** and ε_t values corresponding to different discharges are listed in columns 6 and 7 of Table A1, respectively.

4.0 FULL DEPTH MIXING ASSUMPTION

Table A1 indicates that the water depth ranges from 0.78 m to 2.2 m for discharges ranging from 30 m³/s to 400 m³/s, and the mean velocity (listed in column 4 of Table A1) varies from 1.2 m/s to 2.8 m/s. A full depth mixing was assumed because of the shallow river depth and high velocity.

Table A1: Lowest Dilution Factor at Edge of IDZ for Maximum Effluent Discharge (Centreline or Bank)

River Flow	Width	Water Depth	Flow Velocity	Manning's Roughness	Shear Velocity	Mixing Coefficient	Froude Number	Minimum Dilution [(a)]		Maximum Effluent Discharge [(b)]		
								Single-point Discharge at Centreline	Single Bank Discharge Point	Single-point Discharge at Centerline	Single Bank Discharge Point	Maximum IDZ Width for q_{m1}
Q (m^3/s)	W (m)	H (m)	V (m/s)	n	u* (m/s)	ε_t (m^2/s)	Fr	S_{m1}	S_{m2}	q_{m1}(m^3/s)	q_{m2} m^3/s)	L (m)
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
30.3	33.3	0.78	1.16	0.063	0.240	0.113	0.420	30	15	0.100	0.050	5.4
50.0	37.9	0.96	1.38	0.061	0.265	0.152	0.451	47	24	0.155	0.078	5.7
119	47.5	1.35	1.85	0.057	0.315	0.256	0.509	100	50	**0.330**	0.165	6.4
150.0	50.4	1.48	2.01	0.056	0.330	0.294	0.526	122	61	0.404	0.202	6.6
236.5	56.7	1.78	2.34	0.054	0.362	0.386	0.560	182	91	0.600	**0.300**	7.0
264	58.4	1.86	2.43	0.052	0.372	0.413	0.569	200	100	0.661	0.330	7.1
400.0	65.1	2.20	2.80	0.052	0.402	0.530	0.603	287	144	0.948	0.474	7.5

Notes

(a) At the boundary of the IDZ for the design effluent discharge of 0.33 m^3/s.

(b) To have dilution factor of 100 at edge of the IDZ.

5.0 CALCULATION OF THE LOWEST DILUTION FACTOR S_M AT THE EDGE OF INITIAL DILUTION ZONE FOR CENTRELINE EFFLUENT DISCHARGE

Let us first assume that the effluent is discharged into the river by a single point directly at the river centreline. At any cross section downstream of the discharge point, a constituent concentration is calculated by the equation from Fischer et al. (1979):

$$C = \frac{qC_0}{VH\sqrt{\frac{4\pi\varepsilon_t x}{V}}}\exp\left(-\frac{Vy^2}{4\varepsilon_t x}\right) \quad [4]$$

where x and y are the longitudinal and lateral distances from the effluent, q is effluent discharge (m^3/s), C_0 is effluent's initial constituent concentration (mg/L). Eqn. [4] is valid for x in a range where the plume edge will not reach the river bank. By Eqn. [4], at any cross section downstream of the centreline discharge point, the highest concentration occurs at the river centreline (y=0). Because dilution factor $S=C_0/C$ we can evaluate the lowest dilution factor S_m at any downstream cross section by:

$$S_m = \frac{HV}{q}\sqrt{4\pi\varepsilon_t x/V} \quad [5]$$

Eqn. [5] was used to evaluate the lowest dilution factor corresponding to the maximum effluent discharge of 0.3 m^3/s and at the edge of initial dilution zone (IDZ), which has a length of x=100 m (Government of British Columbia 2012), and the results are listed in column 9 of Table A1. This column indicates that for 7Q2 in the Quesnel River, the dilution factor at the edge of the IDZ is as low as 30:1 (Column 9).

For effluent discharge at bank, the lowest dilution factor at any downstream cross section occurs at bank, and its value equals to half of the value calculated by Eqn. [5]. Column 10 of Table A1 lists the lowest dilution factor corresponding q = 0.33 m^3/s and at the edge of IDZ. This column indicates that for 7Q2 on the Quesnel River, the dilution factor at the edge of IDZ is as low as 15. Table A1 also indicates that the allowable effluent discharge at bank is 0.474 m^3/s when river discharge equals bankfull discharge of 400 m^3/s.

6.0 CALCULATION OF THE ALLOWABLE MAXIMUM EFFLUENT DISCHARGE

Under the *Environmental Management Act, Municipal Wastewater Regulation* of BC (2012) at the edge of IDZ, the dilution ratio ≥ 100:1 is preferred. This dilution ratio can be achieved by controlling the effluent discharge. In Eqn. [5] when H, V and ε_t are known, if given x and S_m values, a corresponding q value can be calculated. In Table A1, column 11 shows the calculated q values for centreline discharge by setting x =100 m and S_m = 100 in Eqn. [5]. This column indicates that when the river flow is less than approximately 119 m^3/s, the allowable effluent discharge is less than 0.33 m^3/s. The maximum allowable discharge (to meet the criterion of S>=100) at the bank are listed in column 12 of Table A1. This column indicates that when the river flow is less than about 264 m^3/s the allowable effluent discharge is less than 0.33 m^3/s. The variations of the allowable maximum allowable discharge, centreline and at the bank, with river flow are shown in Figure A1.

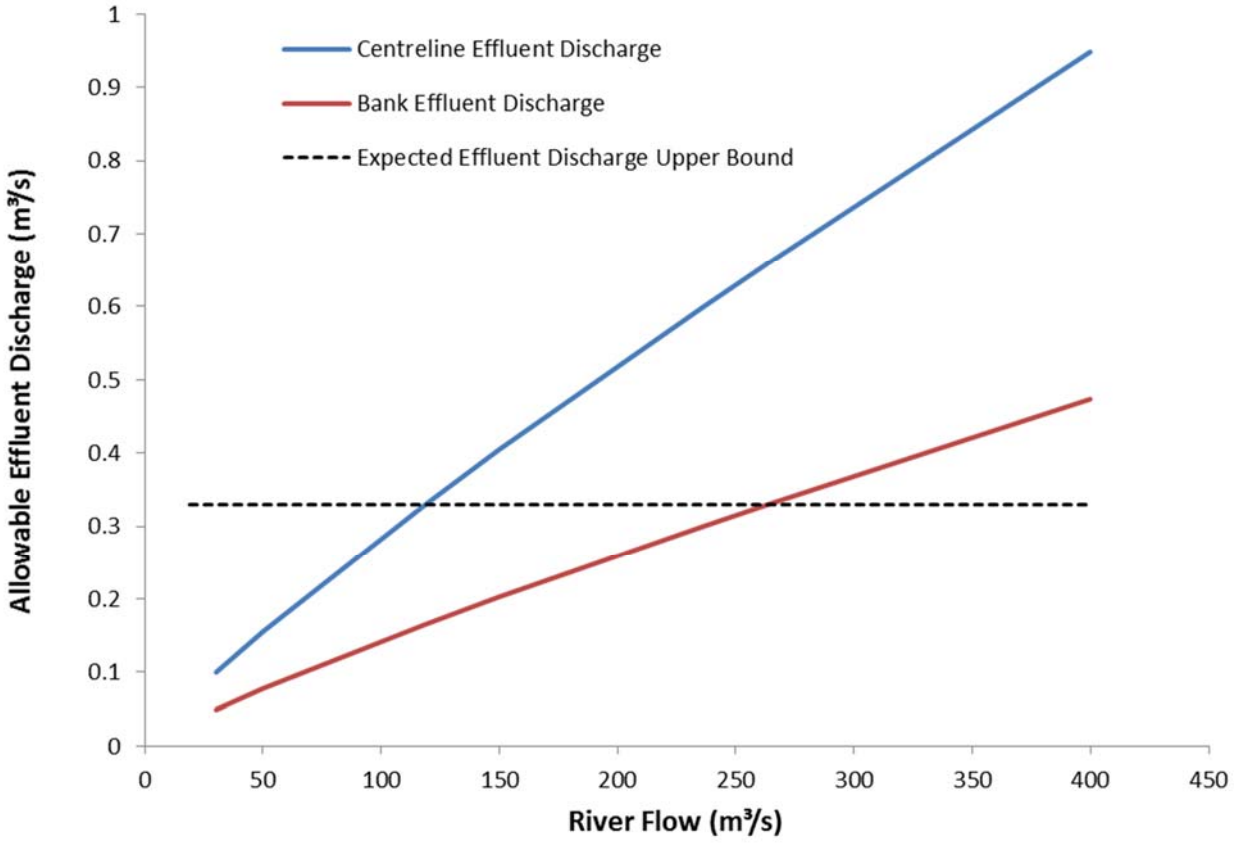


Figure A1: Variation of Allowable Effluent Discharge with River Flow to Meet Dilution Factor no less than 100 at Edge of IDZ

7.0 MAXIMUM WIDTH OF IDZ

To solve y² as a function of x from Eqn. [4]:

$$y^2 = \frac{Bx}{2} ln(\frac{A^2}{x}) \quad [6]$$

where

$$A = \frac{qC_0/C}{H\sqrt{4\pi\varepsilon_t V}} \quad \text{and} \quad [7]$$

$$B = \frac{4\varepsilon_t}{V} \quad [8]$$

Eqn. [6] can be used to plot the contour for a given dilution factor S and Figure A2 shows an example.

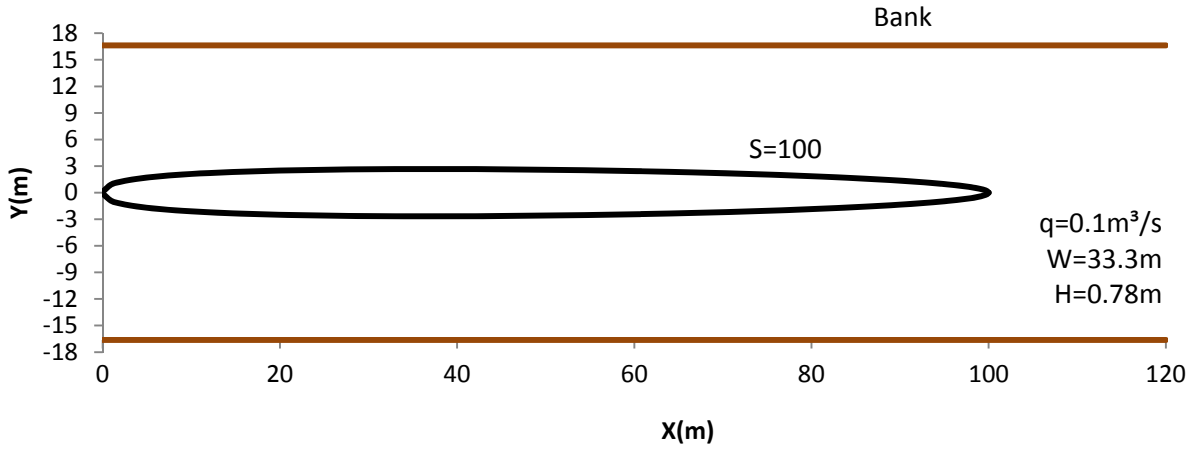


Figure A2: IDZ Boundary Contour for q=0.1 m³/s

It can be proved that y² has maximum value at x= A²/e (where *e* is natural log constant [2.7183]) and the maximum width L for a constant C contour is:

$$L = 2y = A\sqrt{2B/e} \qquad [9]$$

In Table A1, column 13 lists the *L* values for the different controlled *q* values listed in column 11. Column 13 indicates that for 7Q2 river flow, the maximum IDZ width is 5.4 m for controlled effluent discharge, which is about 16% of the river width of 33.3 m, and that for a bank discharge, the maximum IDZ width is 7.5 m, which is about 12% of the river width of 65.1 m.

8.0 DIFFUSER WITH MULTIPLE PORTS

If a diffuser with multiple ports is used, the discharge will be fully mixed across the diffuser length in a short downstream distance from the diffuser, and this will improve dilution. For a diffuser across the river and positioned at the river centerline, Eqn. [10] is used to estimate the constituent concentration at the center of a cross section *x* metres downstream of the diffuser:

$$C = \frac{\frac{q}{n} * C_0}{VH\sqrt{\frac{4\pi\varepsilon_t x}{V}}} \sum_{i=1}^{N} \exp\left(-\frac{V y_i^2}{4\varepsilon_t x}\right) \qquad [10]$$

where N is number of diffuser ports and y_i is the distance between port i centreline and the river centerline. The concentration calculated by Eqn. [10] will be lower than actual concentrations because Eqn. [10] is the result of superimposing the constituent concentration profiles of N independent plumes.

The Government of British Columbia (2012) specifies that the width of IDZ at its downstream extent is less than 25% of the river width, which is approximately 8.0 m wide for 7Q2 river flow. The maximum IDZ width is 5.4 m for single-point centreline discharge, and therefore the diffuser length should be less than approximately 2.6 m.

If a 2.6-m diffuser with two ports is used, for 7Q2 flow of 30.3 m³/s, the allowable effluent discharge via the river centreline can be increased by approximately 5% from 0.1 m³/s to 0.105 m³/s.

9.0 CLOSURE

We trust that the information presented in this memo is sufficient for your present requirements. If you have any questions or concerns, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

Shouhong Wu, PhD, PEng
Senior Water Resources Engineer

Robert Millar, PhD, PEng
Associate, Senior Hydrotechnical/Water Resources Engineer

SW/RGM/kp

o:\final\2014\1421\1411734\1411734-204-tm-rev0-16000\1411734-204-tm-rev0-16000-mixings calculations 17oct_16.docx

ATTACHMENT 2
Options Analysis Matrix

Primary Criteria																							
Criteria		Description	Status Quo (for comparison only)			Option 1 - Pipeline to Quesnel Lake			Option 2 - Re-locating Hazeltine Creek Discharge			Option 3 - Pipeline to Quesnel River			Option 4 - Distributed to Bootjack Lake, Polley Lake, Hazeltine Creek			Option 5 - Science based environmental benchmarks		
Environmental		Does not cause adverse impacts to aquatic, terrestrial or human	✓			✓			✓			✓			✓			✓		
Legal		Complies with all applicable provincial and federal policy and law	✓			✓			✓			✓			✓			✓		
Secondary Criteria																							
Criteria		**Description**	**Weighting**	**Status Quo (for comparison only)**			**Option 1 - Pipeline to Quesnel Lake**			**Option 2 - Re-locating Hazeltine Creek Discharge**			**Option 3 - Pipeline to Quesnel River**			**Option 4 - Distributed to Bootjack Lake, Polley Lake, Hazeltine Creek**			**Option 5 - Science based environmental benchmarks**		
				Rank	**Score**	**Comments**	**Rank**	**Score**	**Comments**	**Rank**	**Score**	**Comments**	**Rank**	**Score**	**Comments**	**Rank**	**Score**	**Comments**	**Rank**	**Score**	**Comments**
Environmental	Assimilative Capacity	Minimum of 10x dilution, >100x dilution preferred	5	1	5	Low dilution at point of discharge	5	25	High predicted and measured dilution	1	5	Low dilution at point of discharge	3	15	>10x dilution, large IDZ required at low flows	4	20	Effluent distributed to multiple locations	2	10	Benchmarks and treatment tailored to receiving environment
	Aquatic Effects	Minimize receiving effects on receiving environment	10	1	10	Prevents or prolongs rehabilitation	5	50	All WQG met at IDZ	2	20	Incomplete restoration of Hazeltine Creek	3	30	IDZ may impinge on fish spawning habitat	3	30	Discharge distributed but into unimpacted water body	4	40	Benchmarks would be derived to minimize aquatic effects
	Terrestrial Effects	Minimize disturbance (land clearing, construction area, linear disturbance)	5	5	25	Minimal pipeline and infrastructure required	2	10	Use of existing infrastructure; some new linear disturbance	4	20	Minimal pipeline along disturbed corridor	1	5	Additional linear disturbance and diffuser construction	3	15	Low terrestrial disturbance	5	25	Minimal pipeline and infrastructure required
	Long Term Sustainability	Ensure location will be viable for long term	5	1	5	Short-term solution	3	15	Suitable for long term but not permanent	2	10	Allows progressive rehabilitation	3	15	Suitable for long term but not permanent	5	25	Viable permanent solution that restores pre-mining flows	4	20	Viable permanent solution
Technological	Risk and Consequence of Failure	Minimize likelihood of failure and potential effect of failure	6.25	1	6.25	Risk of uncontrolled release to Quesnel Lake	5	31.25	Deep diffuser in low traffic area	1	6.25	Risk of uncontrolled release to Quesnel River	2	12.5	Diffuser located in shallow flow	3	18.75	Distributed flows disperse risk	4	25	Low risk of failure; minimal infrastructure
	Complexity	Prefer lower complexity	6.25	3	18.75	Low complexity of system; high complexity of flow management	4	25	Single pipeline and use of existing diffuser	3	18.75	Low complexity of system; high complexity of flow management	2	12.5	Long pipeline; river diffuser	1	6.25	Most complex drainage and discharge systems	5	31.25	Low complexity
	Flexible Design	Adaptable and scalable	6.25	1	6.25	No flexibility - current system is already limited	5	31.25	Readily adaptable to higher flows	1	6.25	No flexibility - current system is already limited	4	25	Some flexibility but may be limited seasonally	3	18.75	Limited scalability; readily adaptable	2	12.5	Difficult to scale
	Risk of Non-compliance	Prefer higher reliability	6.25	1	6.25	Requires highly managed flows	5	31.25	Lowest variability in receiving environment	1	6.25	Requires highly managed flows	2	12.5	Dilution impacted by variable flow rate in receiving environment	4	25	Lake systems less variable than lotic	3	18.75	Dependent upon derivation
Social	Restoration of Fish Habitat	Preference to restore more habitat in Hazeltine Creek sooner	12.5	1	12.5	Prevents or prolongs rehabilitation	5	62.5	Allows complete restoration	2	25	Partial restoration Short timeline	5	62.5	Allows complete restoration	3	37.5	Allows complete restoration but in longer time frame	3	37.5	Allows complete restoration but in longer time frame
	Acceptance of Option	Stated preference of stakeholders	12.5	1	12.5	Not favoured by any stakeholder	2	25	Allows restoration of Hazeltine Creek but entails discharge upgradient of Likely	1	12.5	Not favoured by any stakeholder	5	62.5	Preferred by Likely residents	4	50	Stated preference of some stakeholders	2	25	Anticipated low acceptance
Economic	Capital Cost	Lower capital cost	12.5	5	62.5	No capital cost	2	25	Higher cost of pipeline installation	3	37.5	Short pipeline required	1	12.5	Higher cost of pipeline installation	4	50	Multiple discharge locations, all nearby	4	50	Low infrastructure cost; additional studies required
	Operating Cost	Lower operating cost	12.5	1	12.5	High management and monitoring effort	5	62.5	Minimize maintenance and monitoring locations	1	12.5	High management and monitoring effort	4	50	Long pipeline and river diffuser to maintain	2	25	Long-term monitoring at multiple locations	3	37.5	Long-term monitoring
Final Scoring																							
Environmental			25	Subtotal	45		Subtotal	100		Subtotal	55		Subtotal	65		Subtotal	90		Subtotal	95	
Technological			25	Subtotal	37.5		Subtotal	118.75		Subtotal	37.5		Subtotal	62.5		Subtotal	68.75		Subtotal	87.5	
Social			25	Subtotal	25		Subtotal	87.5		Subtotal	37.5		Subtotal	125		Subtotal	87.5		Subtotal	62.5	
Economic			25	Subtotal	75		Subtotal	87.5		Subtotal	50		Subtotal	62.5		Subtotal	75		Subtotal	87.5	
TOTAL SCORE			100	**TOTAL**	**182.5**	**not ranked**	**TOTAL**	**393.75**	**Rank: 1**	**TOTAL**	**180**	**Rank: 5**	**TOTAL**	**315**	**Rank: 4**	**TOTAL**	**321.25**	**Rank: 3**	**TOTAL**	**332.5**	**Rank: 2**

APPENDIX H

Dilution Performance Review of As-Built Temporary Diffusers in Quesnel Lake

17 October 2016
Reference No. 1411734-162-R-Rev0-16000

Golder Associates

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-174-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

FROM Shouhong Wu and Dejiang Long **EMAIL** Shouhong_Wu@golder.com; Dejiang_Long@golder.com

MOUNT POLLEY – DILUTION PERFORMANCE REVIEW OF AS-BUILT TEMPORARY DIFFUSERS IN QUESNEL LAKE

1.0 INTRODUCTION

The Mount Polley Mine (the Mine) is a copper and gold mine owned by Imperial Metals Corporation (Imperial) and operated by Mount Polley Mining Corporation (MPMC). The site is located approximately 56 km northeast of Williams Lake, British Columbia (BC). MPMC plans to submit a Technical Assessment Report to amend its Environmental Management Act Permit 11678.

In 2015, MPMC commissioned Golder Associated Ltd (Golder) to conduct a conceptual diffuser design and near field modelling in Quesnel Lake (Golder 2015a). In addition, Golder submitted to MPMC the record drawings showing the detailed design of two temporary diffusers (Golder 2015b). The diffusers were subsequently built based on the record drawings.

The locations of the constructed diffusers are shown in Figure 1 and the diffuser details are provided in Figure 2. These two figures are reproduced from the record drawings.

The dilution performance of the as-built diffusers was analyzed using the Cornell Mixing Zone Expert System (CORMIX) program (Attachment A) to estimate dilution ratios under anticipated discharge rates during Operations. This technical memorandum documents the results of the analysis. This memorandum shall be read in conjunction with the important Information and Limitations which forms an integral part of this memorandum.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

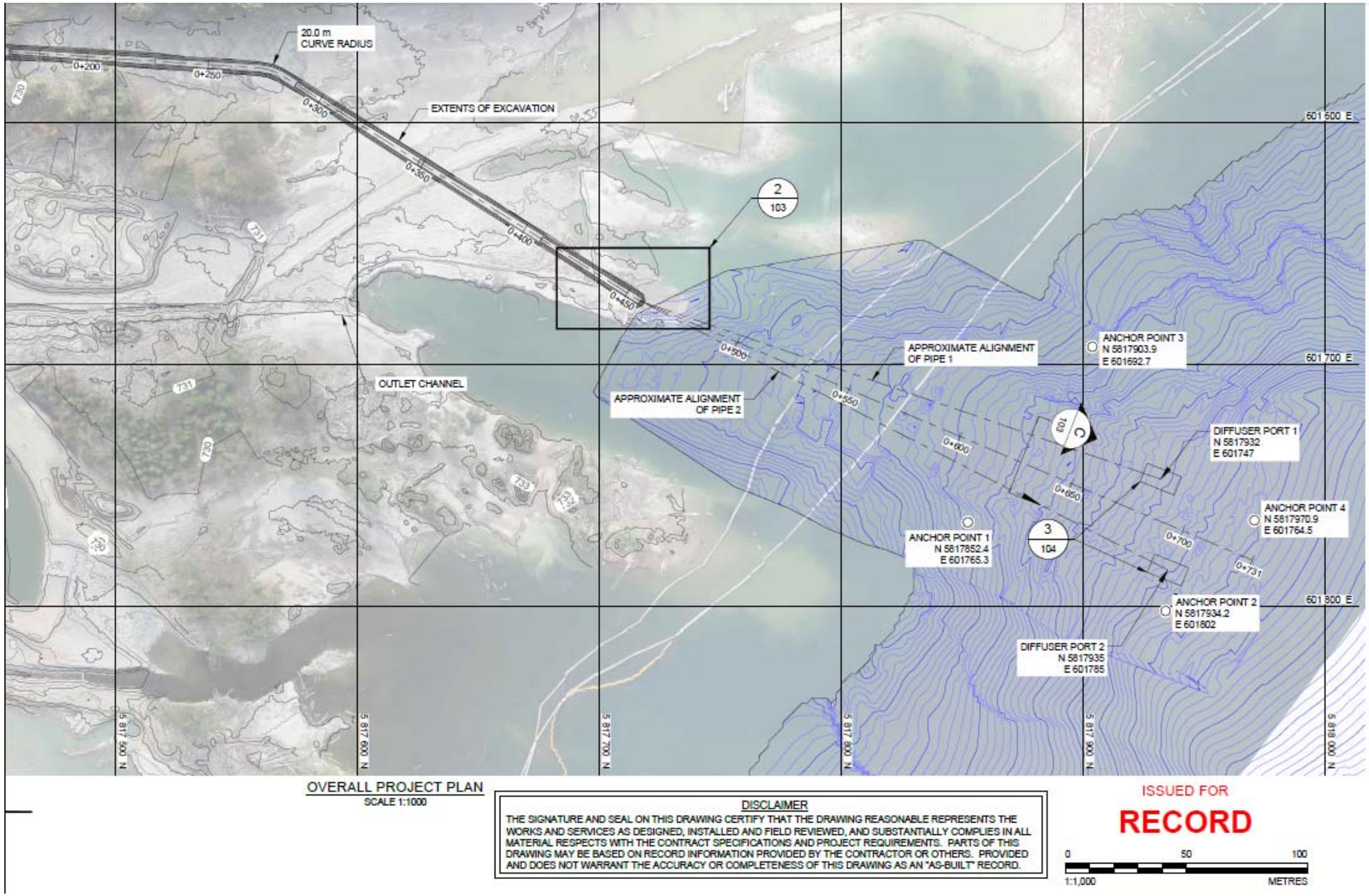


Figure 1: Diffuser Locations

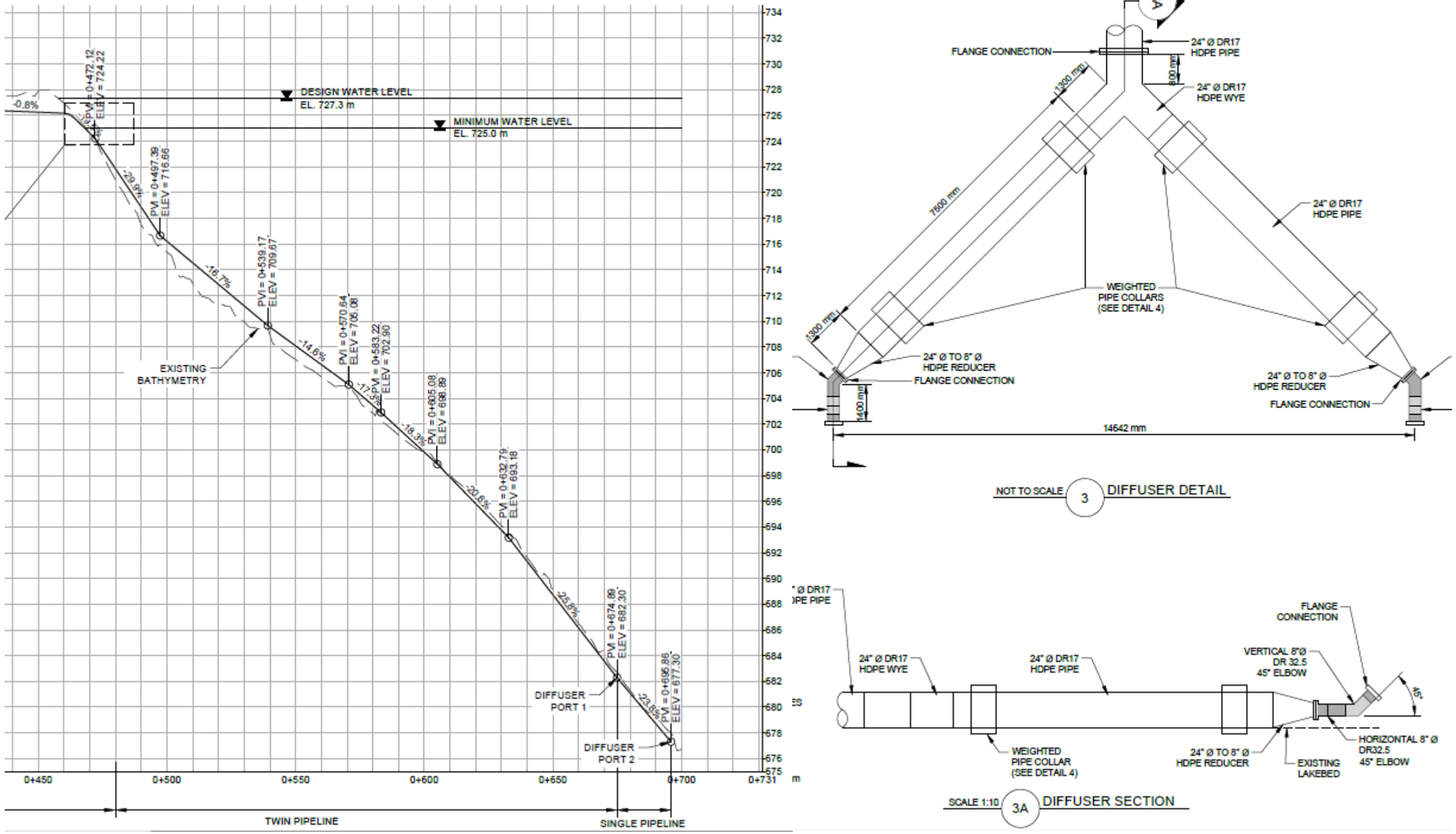


Figure 2: Diffuser Design Details

2.0 GUIDING REGULATION

Although the diffuser discharge is not a municipal wastewater effluent, the definition of the initial dilution zone (IDZ) and other specifications for the diffusers are consistent with the BC Municipal Wastewater Regulation (B.C. Reg. 87/2012; O.C. 230/2012). Specific sections of the regulation that were used as guidance for the diffuser design are listed below:

- Section 58(c): The discharge is diluted such that, at the outside boundary of the IDZ, the dilution factor exceeds 100, which was used as a target in the design but is not expected to be achievable under all operating conditions.
- Section 92: The radius of IDZ for marine waters and lakes is the lesser of 100 m and 25% of the width of water body. In the case of Quesnel Lake, the IDZ is a 100 m radius.
- Section 99(2)(c)(i): Each diffuser will provide at least 10:1 dilution at the boundary of the IDZ.
- Section 100: For additional outfall requirements for lakes, the depth of shallowest diffuser port below mean low water must be at least 10 m. The distance to the closest port of the diffuser from mean low water must be at least 30 m.

Based on the above guidelines, the following criteria were selected for the diffuser design:

- The diffuser port(s) must be at least 10 m below water surface and 30 m from shoreline.
- The dilution factor should not be less than 10 at a distance of 100 m away from the discharge location, and a dilution factor of 100 or greater is preferred.

3.0 INPUT DATA

The input data for the dilution analysis using the CORMIX program include those for the ambient water, the diffusers, and the effluent. Tables 1, 2 and 3 present the input data used for characterizing the ambient water, the diffuser design parameters, and the effluent conditions, respectively.

For the purposes of modelling, the diffusers are assumed to receive inflows from both Perimeter Embankment Till Borrow Pit (PETBP) and Springer Pit. The following should be noted:

- Other flow conditions, such as Hazeltine Creek water with no effluent, may enter the diffusers until the pipeline to Quesnel Lake is constructed by November 2017; however, these conditions are not simulated since the focus of the model was the direct discharge to Quesnel Lake.
- The water from the different sources has different total dissolved solid (TDS) concentrations. Three pairs of TDS concentrations during Operations are considered: the estimated 5th percentile, 50th percentile and 95th percentile concentrations.
- The total suspended solids (TSS) concentration of 15 mg/L is estimated by Golder (2015a).
- Two assumed effluent temperatures are evaluated: 15°C for summer discharge and 2°C for winter discharge.

Table 4 presents the five simulation cases analyzed for each of the effluent discharge conditions listed in Table 3. The simulations are conducted using CORMIX for single port plume with port discharge equal to total discharge divided by the number of ports. When only one diffuser is used, it is assumed that the lower diffuser is used, because it has greater bottom layer depth for mixing if stratification occurs. The simulations are conducted for the worst case of lake stratification condition which has a maximum thermocline depth of 30 m.

Table 1: Ambient Water Parameters

Variable	Unit	Value
Lake bed slope	(°)	13.4
Design water depth [a]	(m)	45.0 (for upper diffuser); 50.0 (for lower diffuser)
Minimum water depth [a]	(m)	42.7 (for upper diffuser); 47.7 (for lower diffuser)
TSS concentration [b]	(mg/L)	67
TDS concentration [b]	(mg/L)	1.5
Lake current velocity [c]	(m/s)	0.001, 0.007, 0.009, 0.011, 0.015, 0.042 corresponding to 95%, 50%, 30%, 20%, 10%, 0% exceedance probabilities
Thermocline depth [b]	(m)	0 to 30 (maximum)
Water temperature [d]	(°C)	Open water:12.7 (top layer); 5.7 (bottom layer); Ice cover: 0 (top layer); 3.2 (bottom layer);
Density	(kg/m³)	Open water: 999.50 (top layer); 1000.03 (bottom layer); Ice cover: 999.93 (top layer); 1000.058 (bottom layer); Model used: 999.50 (top layer); 1000.03 (bottom layer);

[a] Calculated based on the design water level of 727.3 m and minimum water level of 725 m.

[b] Data source: Golder (May 2015).

[c] At water depth of 40 m, and based on the simulation results from Tetra EBA from the 2003 model run.

[d] 12.7°C and 5.7°C are the maximum water temperatures at water depths of 24.5 m and 50 m during open water season simulated by Tetra EBA from the 2003 model run.

Table 2: Diffuser Design Parameters

Parameter	Unit	Value	
		Diffuser 1	Diffuser 2
Number of ports connected to pipe	-	2	2
Pipe inside diameter	(m)	0.535	0.535
Outfall pipe length	(m)	680	701
Port inside diameter	(m)	0.205	0.205
Port vertical angle from the horizontal plane	(°)	31.6	31.6
Port angle from the sloping lake bed	(°)	45	45
Port horizontal angle from the shoreline orientation	(°)	90	90
Port height above ground	(m)	1	1
Port spacing	(m)	14.64	14.64
Port elevation	(m)	682.3	677.3

Note: These values are based on the diffuser design (Golder 2015b).

- = not applicable.

Table 3: Effluent Conditions for a Range of Possible Inflow Combinations

Effluent Condition No.	Inflow Rate Q (m^3/s)			Inflow TDS Concentration C_D (mg/L)			Effluent Temperature	Effluent TSS Concentration	Effluent Density
	Springer Pit	PETBP	Total	Springer Pit	PETBP	Combined	T (°C)	C_S (mg/L)	ρ (kg/m^3)
1	0.12	0.21	0.33	846 (5th percentile)	817 (5th percentile)	828	15	15	999.778
2		0.28	0.4			826		15	999.777
3		0.38	0.5			824		15	999.776
4		0.48	0.6			823		15	999.775
5		0.21	0.33			828	2	15	1000.649
6		0.28	0.4			826		15	1000.648
7		0.38	0.5			824		15	1000.646
8		0.48	0.6			823		15	1000.645
9		0.21	0.33	864 (50th percentile)	905 (50th percentile)	890	15	15	999.827
10		0.28	0.4			893		15	999.829
11		0.38	0.5			895		15	999.831
12		0.48	0.6			897		15	999.832
13		0.21	0.33			890	2	15	1000.700
14		0.28	0.4			893		15	1000.702
15		0.38	0.5			895		15	1000.704
16		0.48	0.6			897		15	1000.705
17		0.21	0.33	1062 (95th percentile)	1005 (95th percentile)	1026	15	15	999.932
18		0.28	0.4			1022		15	999.929
19		0.38	0.5			1019		15	999.926
20		0.48	0.6			1016		15	999.924
21		0.21	0.33			1026	2	15	1000.810
22		0.28	0.4			1022		15	1000.807
23		0.38	0.5			1019		15	1000.804
24		0.48	0.6			1016		15	1000.802
25	0	0.33	0.33	846 (5th percentile)	817 (5th percentile)	817	15	15	999.770
26	0.07		0.4			822		15	999.774
27	0.17		0.5			827		15	999.778
28	0.27		0.6			830		15	999.780
29	0		0.33			817	2	15	1000.641
30	0.07		0.4			822		15	1000.645
31	0.17		0.5			827		15	1000.649
32	0.27		0.6			830		15	1000.651
33	0		0.33	864 (50th percentile)	905 (50th percentile)	905	15	15	999.838
34	0.07		0.4			898		15	999.833
35	0.17		0.5			891		15	999.828
36	0.27		0.6			887		15	999.824
37	0		0.33			905	2	15	1000.712
38	0.07		0.4			898		15	1000.706
39	0.17		0.5			891		15	1000.701
40	0.27		0.6			887		15	1000.697
41	0		0.33	1062 (95th percentile)	1005 (95th percentile)	1005	15	15	999.916
42	0.07		0.4			1015		15	999.923
43	0.17		0.5			1024		15	999.930
44	0.27		0.6			1031		15	999.935
45	0		0.33			1005	2	15	1000.793
46	0.07		0.4			1015		15	1000.801
47	0.17		0.5			1024		15	1000.808
48	0.27		0.6			1031		15	1000.814

TDS = total dissolved solids; TSS = total suspended solids; PETBP = Perimeter Embankment Till Borrow Pond; C_D = inflow concentration; C_S = TSS concentration; ρ =density.

Table 4: Simulation Cases for Each Effluent Condition

Number of Diffusers Used	Single diffuser		Two diffusers		
Ambient Current Speed (m/s)	0.001 (5th percentile)	0.042 (maximum)	0.001 (5th percentile)	0.042 (maximum)	
Assumed Bottom Layer Depth[1] (m)	20	20	15	20	15
Simulation Case No.	1	2	3	4	5

Note: When lake stratification occurs under the design water level of 727.3 m, the maximum thermocline depth of 30 m corresponds to 15 m and 20 m of minimum bottom layer depths for the upper and lower diffusers, respectively.

4.0 SIMULATION RESULTS

The 48 effluent conditions combined with the five simulation cases result in a total of 240 simulation scenarios. The simulated minimum dilution factors at the IDZ boundary for the 240 simulation scenarios are summarized in Table 5.

The simulation results presented in Table 5 are highlighted and discussed below:

- The lowest dilution factors for the five simulation cases range from 37 to 64. There are 14 effluent conditions associated with simulation case 5 which have minimum dilution factor at the IDZ boundary lower than 40. Eight of those 14 scenarios occur in summer and 6 of them can happen in winter.
- The diffuser dilution performance is influenced by the thermocline depth. If the thermocline depth is no more than 29 m associated with the design water level or 26.7 m associated with the minimum lake level, the minimum dilution factor at the IDZ boundary is simulated to be 40 or higher.
- The diffuser dilution performance is influenced by the lake current velocity. Simulation cases 1 and 2 have the same ambient and effluent conditions but not the lake current velocity. The small lake current velocity in simulation case 1 results in the lowest dilution factor of 64. This compares with the large lake current velocity in simulation case 2, which results in the lowest dilution factor of 45. This is because the higher the lake current, the more ambient mixing but the less time or distance for mixing before the plumes reach the IDZ boundary.
- The diffuser dilution performance is influenced by port effluent discharge. If two ports have the same ambient and effluent conditions but different effluent discharges, the plume resulting from the lower discharge generally has better mixing. Although higher discharge plume has higher velocity and entrains more ambient water for mixing, it has less time for mixing before the plume reaches the IDZ boundary. For example, simulation cases 2 and 4 have the same effluent and ambient conditions, but the port effluent discharges in simulation case 2 are twice as large as those in simulation case 4. The dilution factors for simulation case 2 are generally lower than those for simulation case 4.

Table 5: Minimum Dilution Factors at the Initial Dilution Zone Boundary

Effluent Condition No.	Minimum Dilution Factor				
	Simulation Case 1 (Scenario 1 to 48)	Simulation Case 2 (Scenario 49 to 96)	Simulation Case 3 (Scenario 97 to 144)	Simulation Case 4 (Scenario 145 to 192)	Simulation Case 5 (Scenario 193 to 240)
1	78	53	90	84	51
2	75	49	86	72	45
3	64	>100	82	61	40
4	64	>100	79	55	37
5	79	58	>100	>100	>100
6	77	50	81	>100	>100
7	75	47	80	>100	42
8	74	45	79	68	37
9	76	52	87	84	51
10	64	>100	84	72	45
11	64	>100	80	61	39
12	64	>100	77	55	37
13	79	60	>100	>100	>100
14	78	51	81	>100	>100
15	76	47	80	>100	43
16	74	45	80	>100	37
17	64	>100	81	87	52
18	64	>100	78	72	44
19	64	>100	76	60	39
20	64	>100	64	>100	>100
21	80	64	>100	>100	>100
22	78	51	81	>100	>100
23	76	47	80	>100	45
24	75	45	80	>100	37
25	78	52	90	84	51
26	75	49	86	72	45

Effluent Condition No.	Minimum Dilution Factor				
	Simulation Case 1 (Scenario 1 to 48)	Simulation Case 2 (Scenario 49 to 96)	Simulation Case 3 (Scenario 97 to 144)	Simulation Case 4 (Scenario 145 to 192)	Simulation Case 5 (Scenario 193 to 240)
27	64	>100	82	61	40
28	64	>100	79	55	37
29	79	58	>100	>100	>100
30	77	50	81	>100	>100
31	75	47	80	>100	42
32	74	45	79	68	37
33	76	52	87	85	51
34	64	>100	83	72	45
35	64	>100	80	61	39
36	64	>100	78	55	37
37	79	60	>100	>100	>100
38	78	51	81	>100	>100
39	76	47	80	>100	43
40	74	45	80	72	37
41	64	>100	82	86	52
42	64	>100	79	72	44
43	64	>100	76	60	39
44	64	>100	64	>100	>100
45	80	63	>100	>100	>100
46	78	51	81	>100	>100
47	76	47	84	>100	45
48	75	45	80	>100	37

5.0 DIFFUSER HEAD LOSS

The design hydraulic head for the diffuser system of two diffusers is 4 m. The as-built diffuser locations are farther away from the shoreline than the design specification, and the diffuser pipe lengths are greater than the design specification. Therefore, a diffuser head loss analysis was performed to determine the required head for an effluent discharge of 0.6 m^3/s by single diffuser and two diffusers. The results of the analysis are as follows:

- the required head for the two diffusers to convey a total discharge of 0.6 m^3/s is 3.5 m
- the required head for one diffuser to discharge 0.6 m^3/s is 13.2 m

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions are made based on the results of the dilution performance analysis for the 240 scenarios:

- Sixty-one of the 240 simulation scenarios have dilution factors greater than 100 at the IDZ boundary, and 226 simulation scenarios (94%) have dilution factors greater than 40.
- The dilution factors at the IDZ boundary are greater than 40 if thermocline depth is not greater than 29 m associated with design lake water level, or not greater than 27 m associated with minimum lake water level.
- Under the conditions of the design lake water level, only 8 of the 240 simulation scenarios have the lowest dilution factor of 37.
- The estimated hydraulic head required to operate the as-built diffuser system to discharge 0.6 m^3/s is 3.5 m for two diffusers and 13.2 m for one diffuser.

6.2 Recommendations

The following recommendations are made based on the results of the dilution analysis performed in this study:

- use only one diffuser if the total effluent discharge is 0.3 m^3/s or less
- use the lower diffuser if only one diffuser is used
- use two diffusers if the effluent discharge is in the range of 0.33 to 0.6 m^3/s and if the thermocline depth is less than 27 m

7.0 CLOSURE

We trust that the above provides the information that you require at this time. Please do not hesitate to contact the undersigned if you have any questions or need clarification. Golder appreciates the opportunity to be of service on this project.

GOLDER ASSOCIATES LTD.

Shouhong Wu, PhD, PEng
Senior Water Resources Engineer

Dejiang Long, PhD, PEng
Principal, Senior Water Resources Engineer

SW/DL/sb/mkh/cf/pn/kp

Attachments: Study Limitations
Attachment A: Summary Description of the CORMIX Model System

o:\final\2014\1421\1411734\1411734-174-tm-rev0-16000\1411734-174-tm-rev0-16000-dilution performance review 17oct_16.docx

REFERENCES

Golder (Golder Associates Ltd.) 2015a. Conceptual Diffuser Design and Near-Field Modelling in Quesnel Lake. Report submitted to Mount Polley Mining Corporation, May 2015

Golder 2015b. Submission of Record Drawings (Rev. 2) for HDPE Pipeline – Temporary Discharge to Quesnel Lake. Reference No. 1411734-069-L-Rev2-12000. November 16, 2015.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

ATTACHMENT A
Summary Description of the CORMIX Model System

1.0 MODEL CAPABILITIES AND ASSUMPTIONS

The Cornell Mixing Zone Expert System (CORMIX) was developed under several cooperative funding agreements between the United States Environmental Protection Agency and Cornell University during the period of 1985 to 1995. The CORMIX model system uses a rule-based system approach to data input and processing. The model system consists of three subsystems as described below:

- The CORMIX1 sub-system was designed for analyzing plume or jet geometry and dilution characteristics of positive, neutral or negative buoyant effluent from a single port diffuser, into a stagnant or flowing ambient waterbody that is uniform or stratified.
- The CORMIX2 sub-system was designed for analyzing submerged multi-port diffuser discharges under similar effluent and ambient conditions as CORMIX1. It can be used for unidirectional, staged and alternating designs of multi-port diffusers.
- The CORMIX3 sub-system was designed for analyzing positively or neutrally buoyant surface lateral discharges into a waterbody through a canal or near-surface pipe.

In addition, the CORMIX model system provides several post-processing programs to assist in analysis of the model output. These programs include the following:

- CORJET program for a detailed analysis of the near-field behaviour of buoyant jets.
- FFLOCATR program for the far-field delineation of discharge plumes in non-uniform river or estuary environments.
- CMXGRAPH graphic package used for plotting plume profiles.

The major assumptions and simplifications made in the development of the CORMIX model system include the following:

- The cross sectional profile of the waterbody is assumed to be a rectangular straight uniform channel that may be bounded laterally or unbounded. The ambient water velocity is assumed to be uniform within the cross section.
- In addition to a uniform ambient density profile, the model system allows three generic types of ambient density stratification profiles to be used for the approximation of any measured ambient density stratification profile.
- The model system assumes steady state. However, the system allows for analysis of unsteady mixing in tidal environments.
- The model system can be used to predict mixing for both conservative and first-order decay processes, and to simulate heat transfer from thermal plumes.
- The model system can be used to predict mixing for most stable processes. For unstable processes, predictions are made only for the relatively stable zone near the discharge point.

2.0 MODELLING METHODOLOGY

The prediction of plume and jet geometry and dilution characteristics by the CORMIX model system is typically based on the solutions of several simple flow patterns to obtain a complete analysis from the discharge point into the far field. The CORMIX model system is based on a flow classification system.

The flow classification system provides a complete and robust expert knowledge base that carefully distinguishes among the many hydrodynamic flow patterns that a discharge may exhibit. The classification system is based on length scales, which represent the influence of different hydrodynamic processes present in a particular situation. In addition, empirical knowledge and laboratory and field data were used in developing the flow classification system. The model system developers have verified the flow classification system through repeated testing and data comparison. For the three sub-systems, a total of 80 generic flow configurations or classes were identified.

Once a flow class has been selected based on the input data, the CORMIX model system executes a sequence of appropriate hydrodynamic simulation modules for the flow processes in the flow class without exceeding their associated spatial regions. The simulation modules are based on buoyant jet similarity theory, buoyant jet integral models, ambient diffusion theory, stratified flow theory and simple dimensional analysis. Each of the simulation modules uses the final values of the previous module as the “initial conditions”. The simulation modules, upon execution, jointly predict the trajectory and dilution characteristics of a complex discharge condition.

3.0 MODEL INPUT

The version of the CORMIX model used in this study is V8.0 which is a Windows version with seven input pages, including Project, Effluent, Ambient, Discharge, Mixing Zone, Output, and Processing. Input data to the CORMIX model system are entered to the input cells in these input pages. The required model input data are summarized below:

- The Project page has the site/case identifier data. The model system requests information on the name of the site and the file name for the case to be simulated.
- The Effluent page has discharge characteristic data. The amount of input data requested by the model system depends on the following four types of effluents: conservative effluent, non-conservative effluent, heated discharge, and brine discharge. The requested inputs are discharge rate, discharge density, and discharge concentration or temperature. For heated discharge, the surface heat exchange coefficient is required. For diffusers under deep water, the surface heat exchange can be neglected. For non-conservative effluent, the decay rate is required.
- The Ambient page has the ambient condition data. The model system requests all ambient data including water density (stratification), water current, waterbody depth and width, wind speed, channel roughness coefficient and tidal conditions.

- The Discharge page has the diffuser layout data including the following:
  - i) The geometry of the effluent at the point of discharge.
  - ii) The location and orientation of the discharge port(s) with respect to the nearest bank and the direction of the water.
- The Mixing Zone page has the data for spatial region of interest. The model system requests information on the spatial region of interest, ambient water quality standard and the definitions of the toxic dilution zone and the regulatory mixing zone.
- The Output page has various options for outputs and displays.
- The Processing page has buttons for running step simulations (validate inputs; calculate parameters; and classify flows) or running an entire simulation.

4.0 MODEL OUTPUT

The CORMIX model system output is presented by qualitative descriptions, detailed quantitative numerical predictions, and graphical output showing the predicted effluent jets or plumes.

Qualitative descriptions provided by the output file include descriptive messages addressing the case study and the logic employed by the model system. In addition, the length scales, which represent the influence of different hydrodynamic processes in the simulation run, are computed and compared to determine the dominant hydrodynamic process. These length scales are subsequently used to determine the flow class for the simulation run.

Detailed quantitative predictions of the jet or plume geometry and dilution characteristics are provided in the output file presenting the coordinates of the jet or plume centreline, the bulk or the centreline dilution and concentration, and the jet or plume width. In addition, information is provided on the different types of simulation modules used and the reasons for using them, the cumulative travel time at the end of each simulation module, location of plume attachment to the bed and bank and possible model limitations.

The graphics package can be used to show the plan and side views of the predicted plume geometry. In addition, the graphics package can generate plots of the jet or plume centreline concentration against downstream distance and distance along the jet or plume trajectory.

APPENDIX I

Bootjack Lake Hydrodynamic Modelling

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-171-TM-Rev0-16000

TO Colleen Hughes and Luke Moger
Mount Polley Mining Corporation

FROM Shadi Dayyani and Jerry Vandenberg **EMAIL** Shadi_Dayyani@golder.com; Jerry_Vandenberg@golder.com

MOUNT POLLEY MINE – BOOTJACK LAKE HYDRODYNAMIC MODELLING – ASSESSMENT OF EFFECTS OF SEEPAGE FROM THE SPRINGER PIT ON BOOTJACK LAKE

1.0 INTRODUCTION

The Mount Polley Mine (the Mine) is a copper-gold mine owned and operated by Mount Polley Mining Corporation (MPMC), and is located 56 km northeast of Williams Lake, British Columbia. Since 4 August 2014, all mine contact water has been conveyed to and stored in the Springer Pit. A short-term water management plan that included a discharge of treated effluent, was approved on 29 November 2015, and discharge commenced on 1 December 2015. A Technical Assessment Report (TAR) has been developed for the Long-term Water Management Plan, and the modelling described herein was completed in support of that TAR.

Hydrogeological modelling (Appendix B of TAR) indicated there will be seepage from the Springer Pit to Bootjack Lake, which is located immediately west of the mine, as the pit lake elevation rises above 1,030 metres above sea level [masl]. To evaluate the influence of Springer Pit seepage within Bootjack Lake, a hydrodynamic model was developed that simulates the three-dimensional transport of seepage once it reaches the lake.

This memorandum summarizes the development and results of the Bootjack Lake hydrodynamic model. The objective of the hydrodynamic modelling was to evaluate the influence of seepage from the Springer Pit on Bootjack Lake water quality at the edge of an initial dilution zone (IDZ) in the event that the Springer Pit is used as a contingency to store Mine contact water for an extended period. A secondary objective was to evaluate the influence of a potential mine closure treated effluent on the lake. Using the dilution rates presented in this memo, a full suite of water quality constituent concentrations in Bootjack Lake at the IDZ was predicted based on modelled Springer Pit seepage water quality (Appendix D of the TAR).

Model predictions were also generated for six model sensitivity scenarios to assess changes in dilution rates at the IDZ as a result of:

- changes in the Springer Pit seepage rate
- shoreline length that seepage enters the lake
- inclusion of treated mine effluent discharge at closure

The model development, calibration, simulations, and predictions are described in the following sections.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

2.0 METHODS

2.1 Model Description

The Bootjack Lake model was developed in the Generalized Environmental Modeling System for Surface waters (GEMSS). GEMSS is an integrated system of three-dimensional (3-D) hydrodynamic and transport modules embedded in a geographic information and environmental data system. GEMSS is in the public domain and has been used for similar studies throughout North America and worldwide. GEMSS was developed in the mid-1980s as a hydrodynamic platform for transport and fate modelling. The hydrodynamic platform ("kernel") provides 3-D flow fields from which the distribution of various constituents can be computed. The constituent transport and fate computations are grouped into modules. The modules used for Bootjack Lake simulations were the hydrodynamic and transport module and the user-defined constituent module.

The theoretical basis of the hydrodynamic kernel of the GEMSS is the 3-D generalized, longitudinal-lateral-vertical hydrodynamic and transport model (Edinger and Buchak 1980, 1985). This computation has been peer reviewed and published (Edinger and Buchak 1995; Edinger and Kolluru 1999; Edinger et al. 1994, 1997). The kernel is an extension of the longitudinal-vertical transport model written by Buchak and Edinger (1984) that forms the hydrodynamic and transport basis of the water quality model CE-QUAL-W2 (US Army Engineer Waterways Experiment Station 1986). Improvements to the transport scheme, construction of the constituent modules, incorporation of supporting software tools, geographic information system (GIS) interoperability, visualization tools, graphical user interface, and post-processors have been developed by Kolluru et al. (1998, 1999, 2003) and Kolluru and Fichera (2003).

GEMSS was selected to assess conditions in the mixing zone because the 3-D grid allows for simulation of finer-scale processes within an irregularly shaped lake such as Bootjack Lake. The dilution rates predicted by this model were then used to predict a full suite of constituent concentrations by the mass balance model, which is more computationally efficient in terms of model run and output processing times.

2.2 Model Segmentation

A 3-D grid was developed that covers Bootjack Lake. The grid is illustrated in plan view in Figure 1. A grid spacing of 100 metres [m] horizontally was selected with a vertical resolution of approximately 1 m. The grid included a total of 16 active vertical layers and 293 active cells.

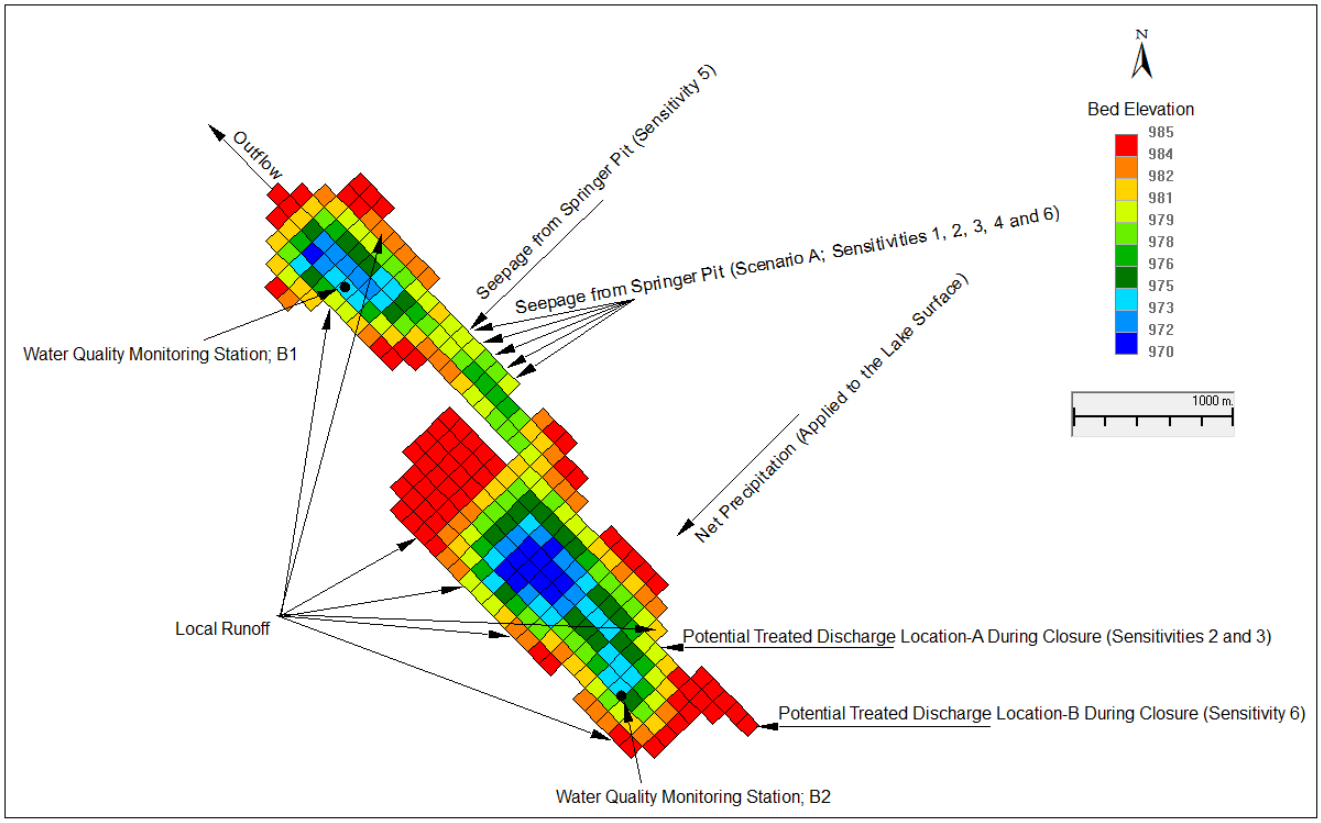


Figure 1: Bootjack Lake Model Grid (Plan View), Inflows, Outflows, and Calibration Stations

2.3 Model Inputs

All known source lake inflows and outflows were included in the model, as shown in Figure 1. Inputs to the model include meteorological, hydrologic, and water quality data, as described in the following sections.

2.3.1 Meteorological Inputs

Meteorological inputs are key drivers of lake circulation and thermal dynamics, which could affect the behaviour of non-point and point sources to the lake. The following meteorological input data were required for this hydrodynamic model: air temperature, dew point temperature, wet bulb temperature, atmospheric pressure, wind direction, wind speed, and solar radiation.

An hourly time-series was constructed for each of these inputs during the calibration time period (i.e., 2012 to 2016) based on observed data from on-site meteorological stations (Weather Stations 1-near the mill and 2-TSF; Litke 2016a, pers. comm.), with the exception of atmospheric pressure. Both weather stations have measured data from 2012 to 2016 for rainfall, temperature, relative humidity, solar radiation, wind speed, and direction. The elevations at Weather Stations 1 and 2 are 1,171 and 964 metres above sea level (masl), respectively (Golder 2015: Section 3, Table 1). Data from Weather Station 2 were used for the hydrodynamic model since the elevation of this station was closer to the elevation of the lake (986 masl). Where gaps existed in the data from Weather Station 2, data from Weather Station 1 were used. Where both stations were missing data, the data gaps were either filled by interpolation (small gaps) or by the annual average value for the specific hour (larger gaps).

An hourly time series of atmospheric pressure was constructed from the Pacific Climate Impacts Consortium Lee's Hill meteorological station (PCIC 2016). Hourly time series of wet bulb temperatures were calculated based on recorded air temperature, relative humidity, and atmospheric pressure. For model predictions, the time series used to calibrate the model was repeated.

2.3.2 Hydrologic Inputs

For the calibration time period (2012 to 2016), the hydrologic inputs to Bootjack Lake were local runoff from the watershed and direct precipitation on the lake. The outflows in the model were discharge at the lake outlet and evaporation.

Based on a catchment delineation completed for Bootjack Lake, it was determined that approximately 14% and 86% of the natural runoff reports to the east and west sides, respectively, of the lake (Appendix B of TAR). These runoff proportions were distributed evenly along the west (five locations) and east (two locations) sides of the lake since the runoff will come from several tributaries (Figure 1).

For the modelling predictions, the hydrologic inputs to Bootjack Lake were the same as those described for the calibration time period, with the addition of Springer Pit seepage. As part of the sensitivity scenarios, a potential mine closure treated effluent discharge to the lake was included. The IDZ was set as the five grid cells along the east shore where seepage is anticipated to reach the lake, and a sensitivity analysis was completed using a single grid cell as the IDZ (see Section 2.8). These flows are shown schematically in Figure 1.

Springer Pit seepage estimates to Bootjack Lake were predicted using a hydrogeological model (Appendix B of TAR) for the future simulations. Hydrogeological modelling indicates that seepage from the Cariboo-Springer Pit to Bootjack Lake will increase to a maximum of 420 m^3/d, under average conditions (base case, Appendix B of TAR) when the pit lake elevation is 1,050 masl.

A treated effluent discharge rate was assumed as an initial estimate of water that might eventually be discharge to Bootjack Lake. The rate is subject to optimization based on the results of a pilot passive water treatment system (Appendix F of the TAR). A discharge rate of treated effluent during Closure was assumed to be 0.008 m^3/s, which is 10% of the Bootjack Lake long-term average outflow (Appendix B of the TAR).

A constructed time-series, with temporal resolution that varied according to the availability of information for each source, formed the basis of the water balance for the hydrodynamic model. Monthly information was available for most of the hydrologic inputs, which were aligned with the Site Wide Water Balance Model (SWWBM; Appendix B of the TAR).

As ice forms on the lake, constituent mass remains in the lake, resulting in increases in lake constituent concentrations during the ice-covered season. The following assumptions, related to ice formation, were included in the model (Litke 2016b, pers. comm.):

- ice formation occurred over a 60-day period from 1 December to 30 January each year
- ice melting occurred over a 60-day period from 1 March to 30 April each year
- an ice thickness of 0.5 m was used each year

2.3.3 Water Quality Inputs

Water quality inputs required for the Bootjack Lake model are temperature and total dissolved solids (TDS) concentrations of the inflows (e.g., natural runoff and seepage from Springer Pit) and in the lake for calibration. Only one water quality monitoring sample was available for the tributaries (local runoff); thus, the tributaries' TDS concentrations were represented by median TDS concentration calculated using Bootjack Lake monitoring results at locations B1 and B2 (Figure 1) collected between 2013 and 2015 for the open-water season (Hughes 2016, pers. comm.).

A local runoff temperature time series was generated using the monthly average of monitored data from monitoring locations B1 and B2. A temperature of 0.5°C was assumed for the months of December, January, and February where the data were missing.

For the model scenarios, a TDS concentration of 1,150 mg/L was applied to seepage from the Springer Pit (Section 5 of the TAR). The temperature of seepage from the Springer Pit was assumed to be 4°C.

2.4 Modelled Constituents

The following constituents were included in the model: TDS, temperature, and a conservative, generic water quality constituent (i.e., a tracer) for evaluating seepage and sensitivity scenarios.

2.5 Quality Assurance

Quality assurance procedures were implemented to check the following items against the objectives of the model:

- **Model framework**— Other modelling software packages were considered, and the GEMSS (a 3-D model) was selected based on its ability to match grid cell size to the IDZ.
- **Model linkages**— Model linkages considered for this study include the flows from the SWWBM, predicted Springer Pit seepage and discharge concentrations from the site water quality model, and seepage rates from the pit from the hydrogeological model.
- **Data used for model inputs**—Time series of raw data were graphed against generated model inputs so that the raw data were represented accurately in the model. The lake volume calculated based on the model grid and bathymetry were plotted to confirm the lake geometry was accurately represented. The meteorological data were plotted and reviewed visually to confirm there were no outliers or anomalies in the dataset.
- **Model set-up**— A grid was set up for the lake's physical domain using the bathymetry file. The model input files were loaded into the model to define boundary conditions, and model parameters were set up.
- **Calibration steps**— Several runs of the model were performed during calibration. Modification of model default parameters did not improve calibration significantly, except for applying a sediment heat exchange function.
- **Model scenarios and sensitivity analysis**— Modelling objectives were reviewed to define model and sensitivity scenarios.

Peer reviews of the model were performed at various stages throughout its development, which was an iterative process whereby issues were identified and addressed.

2.6 Model Calibration

The Bootjack Lake model was calibrated for temperature and TDS to observed data from September 2012 to April 2016 at monitoring locations B1 and B2. Time series and vertical profile figures were created to compare model results to measured data at both locations. The lake's initial conditions were obtained from monitored water quality data at locations B1 and B2.

The first step in the calibration process was to achieve a water balance within the model based on inflows and outflows from the SWWBM (Appendix B of the TAR). Predicted surface water elevations in the lake indicated that the lake volume is balanced over the calibration period.

The hydrodynamic component of the model was calibrated to match measured and modelled thermal and transport behaviour in Bootjack Lake. As the goal of calibration is to apply the formulae and constants that most closely approximate the behaviour of the system under study, adjustment of parameters is standard practice during calibration (Cole and Wells 2008). Default model parameters were used for the thermal variables, with the following exception: to improve thermal profiles, sediment heat exchange was added to the model. The sediment temperature was set at a constant value of 5°C. Additionally, a sediment-water heat exchange coefficient of 6×10^{-7} m/s was added to the model.

Time series plots of surface water temperature at locations B1 and B2 are provided in Attachment A, Figure 1 and show that the model matched the surface water temperatures well. During the open-water season, the modelled thermal profiles fit the measured profiles well on most days (Attachment A, Figures 2 and 3).

At both locations, B1 and B2, modelled temperature profiles were colder than measured data in April (Attachment A, Figures 2 and 3), which may be the result of the assumed duration of the ice-covered season. As discussed in Section 2.3.2, it is assumed in the model that the ice melting period extends until the end of April. The model may underestimate the water temperature in April of 2015 and 2016 since these years were warmer than average and ice may have melted sooner than the end of April based on the measured data. The modelled temperature profiles were also colder than measured data in September and October 2015.

The transport calibration considered the horizontal and vertical distribution of TDS in the lake. For the horizontal transport calibration, the model matched measured TDS concentrations reasonably well at both locations B1 and B2 (Attachment A, Figure 4). Cyclical annual patterns evident in the time series figures are due to salt rejection during ice formation and dilution during ice thawing.

For the vertical transport calibration, default model parameter values were used for hydrodynamic parameters. For the vertical component of the transport calibration, measured specific conductivity profile data were compared to predicted TDS profiles since measured TDS depth profiles were not available (Attachment A, Figures 5 and 6). The calibration was considered adequate if the observed specific conductivity profiles and the predicted TDS profiles followed the same vertical pattern, while recognizing that the absolute values would not be expected to match. Modelled TDS profiles at B1 and B2 locations in the lake matched the observed conductivity profiles reasonably well (Attachment A, Figures 5 and 6). Both the modelled and measured profiles showed minimal vertical TDS gradient on any day.

Overall, the transport calibration indicates that the model is tracking the movement of water and dissolved constituents throughout the vertical and lateral extents of the lake well enough to meet the objective listed in Section 1.

2.7 Model Scenarios

A key objective of the hydrodynamic model was to evaluate the dilution of Springer Pit seepage in the Bootjack Lake IDZ for a contingency scenario, in which all Mine contact water would be conveyed to Springer Pit. This is referred to as a “No Discharge” scenario, and details of this scenario are provided in Section 5.2.1 of the TAR.

The Bootjack Lake hydrodynamic model for this scenario was set up using the calibrated model, assuming seepage from the Springer Pit reaches Bootjack Lake on 31 March 2017, and is evenly distributed over five grid cells in the northeast region of the lake (Figure 1). The seepage was distributed vertically to all grid layers in the cells the seepage reported to, which represents a non-point source along the lake bed and bank. The base case seepage rates were used for this scenario (Appendix B of the TAR).

The model simulation period for this scenario was from 2012 to 2040, which consists of three periods:

- **Period 1 (1 September 2012 to 31 March 2017)**—no seepage; represents the period before seepage from Springer Pit reaches the lake.
- **Period 2 (1 April 2017 to 18 April 2018)**—represents the period of Springer Pit filling (i.e., lake elevation is less than 1,050 masl).
- **Period 3 (19 April 2018 to 31 December 2040)**—represents the period after the water level in the Springer Pit reaches and remains at 1,050 masl.

Seepage rates were calculated for simulation Periods 2 and 3. For Period 2, a time series of seepage rates were generated using the time series of water elevations in the pit (extracted from the SWWBM, Appendix B of the TAR) and seepage rates estimated in the hydrogeological model (Appendix B of the TAR). These rates assume instantaneous groundwater transport from the Springer Pit to the lake starting on 31 March 2017.

For simulation Period 3, the maximum base case seepage rate (corresponding to water level of elevation 1,050 masl in the pit) was applied constantly through the whole period (Appendix B of the TAR).

A tracer was applied to the seepage inflow from Springer Pit to the lake at a constant concentration of 100 mg/L.

2.8 Model Sensitivity Scenarios

The following model sensitivities were performed:

Sensitivity 1— Same as the No Discharge scenario with the following change: upper bound seepage rates from the Springer Pit (Appendix B of the TAR) were applied from 31 March 2017, to 31 December 2040.

Sensitivity 2—For this scenario, it was assumed that treated mine effluent will be discharged to Bootjack Lake at Closure (shown as Location A in Figure 1). Both seepage from the pit and treated effluent are active in this scenario to assess conditions at the IDZ for each loading source. Treated mine effluent was also added as a conservative generic constituent at constant concentration of 100 mg/L to estimate the cumulative effects. A TDS concentration of 1,150 mg/L (similar to the TDS concentrations of seepage from the pit) was applied to the treated mine effluent discharge (Appendix F of the TAR).

The temperature time series constructed for the local runoff was applied to treated effluent. In this scenario, upper bound seepage rates from the Springer Pit were applied from 31 March 2017 to 31 December 2040. This sensitivity scenario was run to evaluate the influence of a potential mine closure treated effluent on the lake.

Sensitivity 3— Same as Sensitivity 2 with following the change: the base case seepage rates from the Springer Pit were applied.

Sensitivity 4— Same as the No Discharge scenario with the following change: constant base case seepage rate from the Springer Pit was applied throughout the whole simulation period. This scenario was run to assess the effects of applying maximum seepage rate through the whole simulation period (assuming that water level in the pit is at its maximum level of 1,050 masl).

Sensitivity 5— Same as the No Discharge scenario with the following change: all Springer Pit seepage is directed to one grid cell (Figure 1). This scenario was run to test the effects of the assumed non-point source input location.

Sensitivity 6— Same as Sensitivity 3 with the following change: treated effluent was discharged to a deeper area to improve near-field dilution (shown as Location B in Figure 1).

3.0 RESULTS

3.1 Model Results

Time series of predicted tracer concentrations for the No Discharge scenario are presented in Figure 2. Results at the cells that directly receive seepage were used to estimate concentrations at the edge of the IDZ. Seepage form the Springer Pit was predicted to increase concentrations in Bootjack Lake until they reach a steady state (with seasonal variation) at around 2036. Cyclical annual patterns occur as a result of salt rejection during ice formation and dilution during ice thawing.

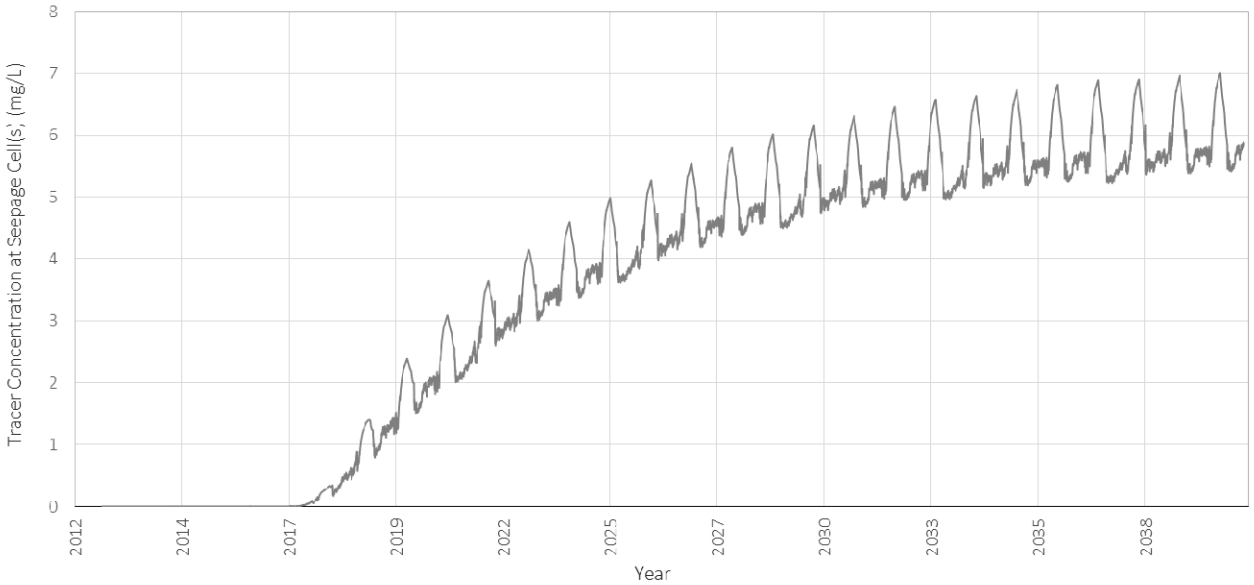


Figure 2: Predicted Tracer Concentrations at the Edge of Mixing Zone around the Seepage from the Springer Pit to Bootjack Lake

3.2 Model Sensitivity Results

Time series of predicted tracer concentrations for Sensitivities 1 to 6 are presented in Figures 3 to 5. Predictions of tracer concentrations from these sensitivities were compared to predictions of tracer concentrations from the No Discharge scenario where applicable.

In general, the Bootjack Lake model was not sensitive to changes made in Sensitivities 4 and 5. The model shows sensitivity to other scenarios (Sensitivities 1, 2, 3, and 6).

In detail, model results for the six model sensitivity scenarios showed the following (Figures 3 to 5):

- Tracer concentrations in the cells receiving pit seepage in Bootjack Lake were predicted to increase as a result of applying upper bound seepage rates (Sensitivity 1) compared to predictions of tracer concentrations from the No Discharge scenario (base case seepage rates).
- Addition of mine closure treated effluent was predicted to increase tracer concentrations at the edge of the IDZ (Sensitivities 2, 3, and 6) compared to the No Discharge scenario and Sensitivity 1.
- Applying a constant seepage rate instead of a time series in Period 2 was predicted not to change tracer concentrations over the long term (Sensitivity 4).
- Tracer concentrations were not sensitive to the shoreline length over which seepage enters the lake (Sensitivity 5). This is because the seepage enters the lake in a well-mixed narrow part of the lake which connects north and south sections (Figure 1).
- Changing the location of mine closure effluent from a shallow cell (Sensitivity 6) to a deeper cell (Sensitivity 3) was predicted to result in lower concentrations at the edge of the IDZ.

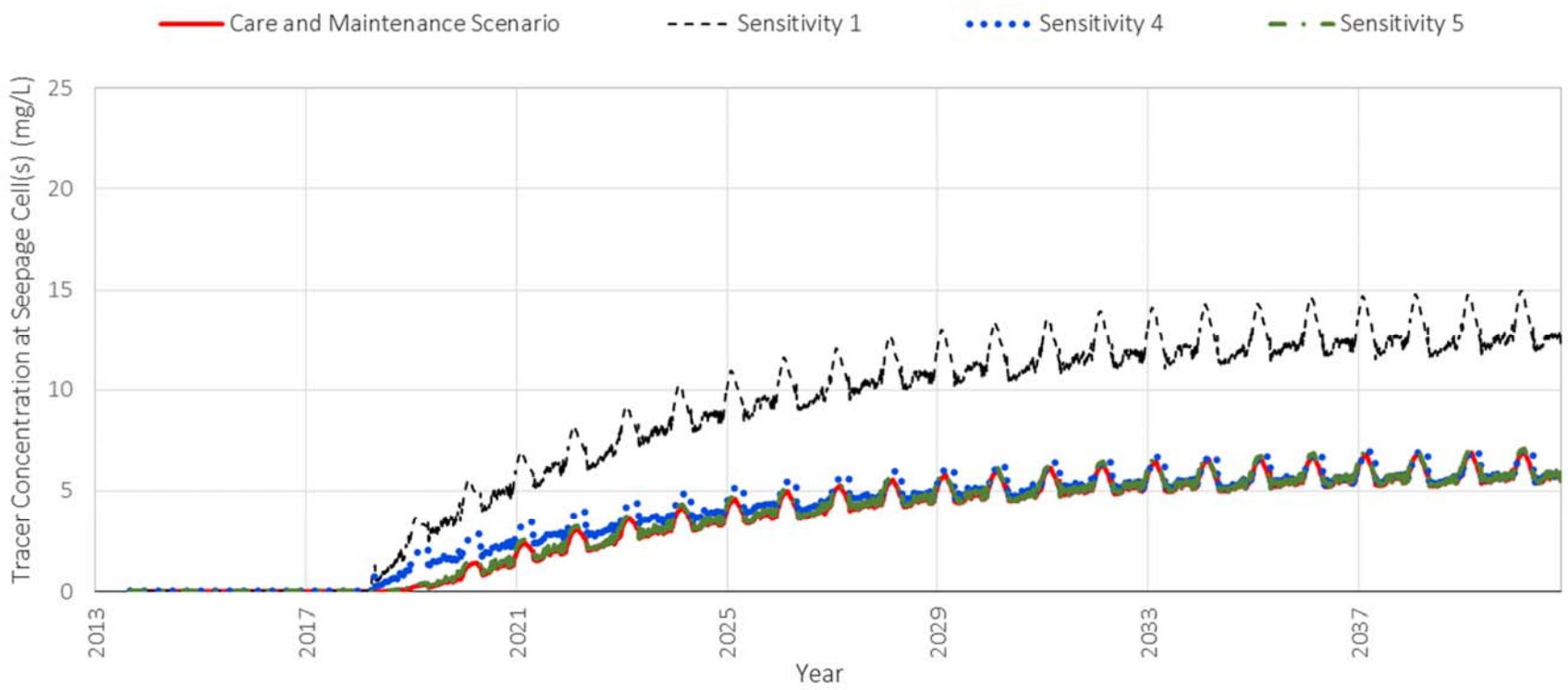


Figure 3: Bootjack Lake Tracer Concentrations at the Seepage Cell(s) (Edge of IDZ) – Sensitivity Analysis (Part 1)

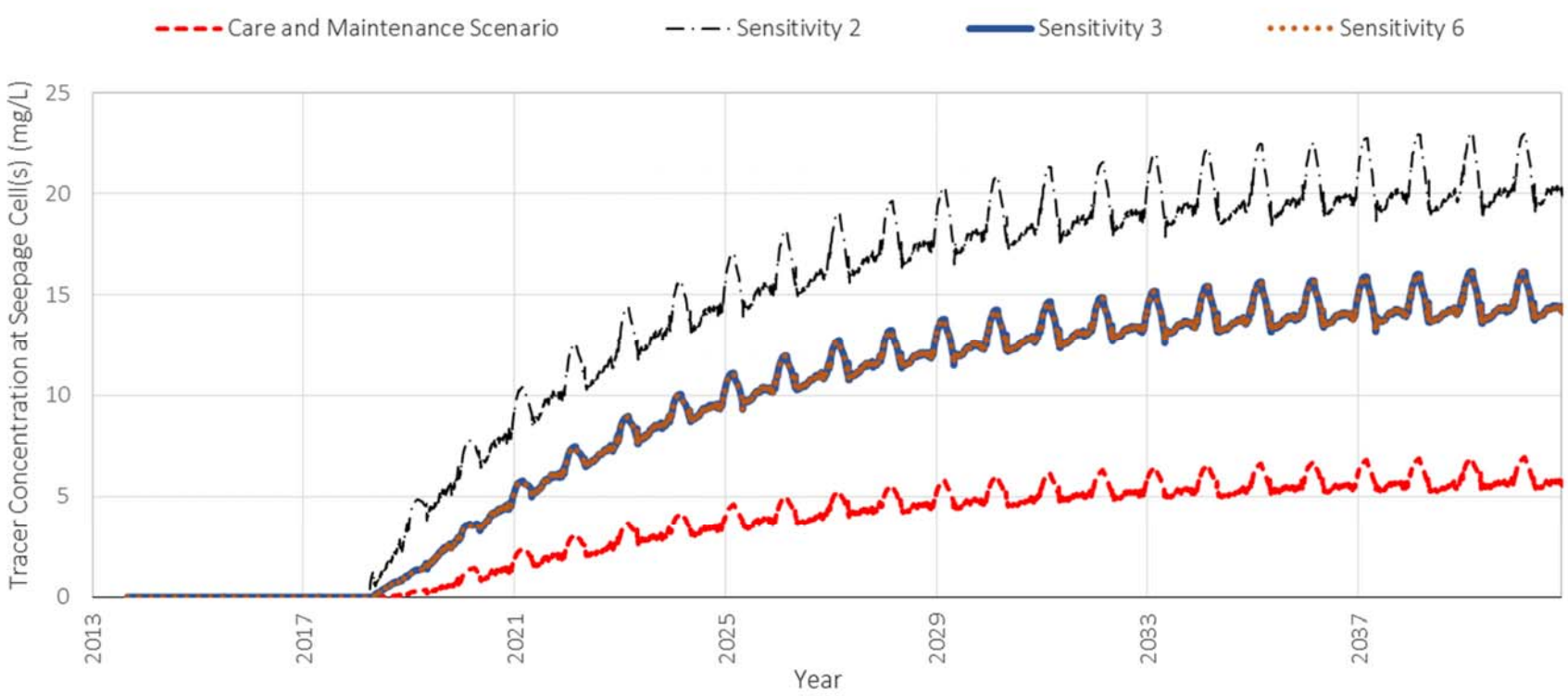


Figure 4: Bootjack Lake Tracer Concentrations at the Seepage Cell(s) (Edge of IDZ) – Sensitivity Analysis (Part 2)

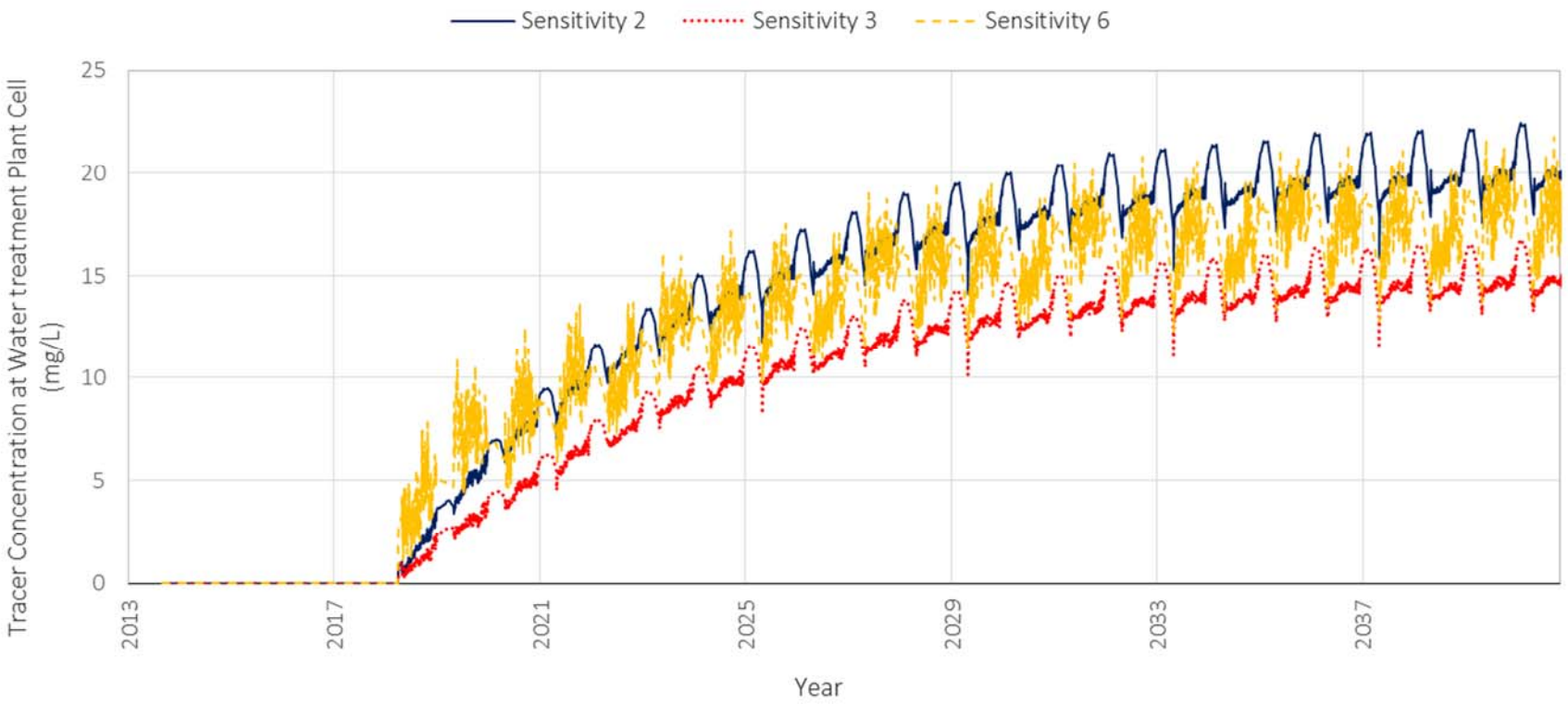


Figure 5: Bootjack Lake Tracer Concentrations at the Mine Effluent Discharge Location (Edge of IDZ) – Sensitivity Analysis

4.0 MODEL LIMITATIONS AND UNCERTAINTY

Modelling requires the use of many assumptions related to determining the physical and chemical characteristics of a system. Predictions are based on several inputs, all of which have inherent uncertainty. Given these inherent uncertainties, the results of a model should be used as a tool in project planning, and to outline potential risks, rather than to indicate absolute concentrations for future scenarios.

The key limitations of the model are as follows:

- **Changes to seepage and treated effluent discharge quantity and quality**—Predicted concentrations only apply to the seepage and effluent discharge rates and water quality concentrations noted in this memorandum. Changes to seepage and effluent discharge water quantity and quality may result in changes to constituent concentrations in the lake outside the range of concentrations predicted herein. Conservative inputs were selected to minimize the likelihood of under-predicting concentrations.
- **Changes to surface water quantity and quality**—Predicted concentrations only apply to the surface water quantities and qualities noted in this memorandum. Changes to surface water quantities or qualities may result in changes to concentrations in the lake outside the range of concentrations predicted herein.
- **Ice thickness**—The model assumes that ice forms on Bootjack Lake at the same rate and at the same thickness each year from 2012 to 2040. The magnitude of the cycle varies and depends on the ice thickness and the depth of the lake. Changes in ice thickness or the depth of the lake from modelled values could affect peak predicted concentrations presented in this memorandum.
- **Calibration data**—The water quality data used for calibration at monitoring locations B1 and B2 were based on data provided by MPMC (Hughes 2016, pers. comm.). Additional calibration data may result in changes to predicted concentrations in the lake outside the range of concentrations predicted in this memorandum.
- It was assumed that water chemistry data used as inputs to the Bootjack Lake model were representative of their respective sources. It is an inherent assumption in modelling that data obtained as part of monitoring programs adequately represent the input sources and will continue to do so in the future.

With the limitations noted above, the model is considered reasonably well calibrated and capable of achieving the objective of evaluating the influence of the seepage and mine closure effluent on Bootjack Lake water quality at the edge of their respective IDZs.

5.0 CONCLUSIONS

A hydrodynamic model of Bootjack Lake was developed using GEMSS to predict the dilution in the IDZ of seepage from the Springer Pit and release of treated effluent at Closure into Bootjack Lake. The model was calibrated using existing field data. Overall, the hydrodynamic calibration indicates that the model is tracking the movement of water and dissolved constituents well vertically and horizontally throughout the lake. Thus, the Bootjack Lake model is considered a reasonable representation of the system.

Sensitivity analyses were developed using different seepage rates and locations. In general, the dilution in the IDZ was not sensitive to the shoreline length over which seepage enters the lake (1 cell – 100 m, or 5 cells – 500 m) or applying a constant seepage rate versus an interpolated time series. It was sensitive to increasing the seepage rate (upper bound versus base case seepage rates) and addition of treated effluent during Closure.

6.0 CLOSURE

We trust that the content of this technical memorandum meets your expectations. Please do not hesitate to contact the undersigned should you have any questions or comments.

GOLDER ASSOCIATES LTD.

Shadi Dayyani, PhD, PEng
Water Quality Modeller

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

SD/JV/bb/ls/kp

Attachments: Study Limitations
Attachment A: Calibration Plots

o:\final\2014\1421\1411734\1411734-171-tm-rev0-16000\1411734-171-tm-rev0-16000-bootjack hydrodynamic model 17oct_16.docx

REFERENCES

Cole TM, Wells S. 2008. CE-QUAL-W2: A Two-Dimensional, Laterally Averaged, Hydrodynamic and Water Quality Model, Version 3.6; User's Manual. Prepared for US Army Corps of Engineers Waterways Experiment Station. Washington, DC, USA.

Buchak EM, Edinger JE. 1984. Generalized, Longitudinal-Vertical Hydrodynamics and Transport: Development, Programming and Applications. Prepared for US Army Corps of Engineers Waterways Experiment Station. Vicksburg, MS, USA.

Edinger JE, Buchak EM. 1980. Numerical hydrodynamics of estuaries. In Hamilton P, Macdonald KB (eds), Estuarine and Wetland Processes with Emphasis on Modelling. Plenum Press, New York, NY, USA. pp 115-146.

Edinger JE, Buchak EM. 1985. Numerical waterbody dynamics and small computers. In Waldrop WR (ed), Proceedings of ASCE 1985 Hydraulic Division Specialty Conference on Hydraulics and Hydrology in the Small Computer Age. American Society of Civil Engineers. Lake Buena Vista, FL, USA. pp 705-710.

Edinger JE, Buchak EM. 1995. Numerical intermediate and far field dilution modelling. Water Air Soil Pollut 83:147-160.

Edinger JE, Buchak EM, McGurk MD. 1994. Analyzing larval distributions using hydrodynamic and transport modelling. In Spaulding ML (ed), Estuarine and Coastal Modelling III: Proceedings of the 3rd International Conference. American Society of Civil Engineers. New York, NY, USA. pp 536-550.

Edinger JE, Kolluru VS. 1999. Implementation of vertical acceleration and dispersion terms in an otherwise hydrostatically approximated three-dimensional model. In Spaulding ML, Butler HL (eds), Proceedings of the 6th International Conference on Estuarine and Coastal Modelling. New Orleans, LA, USA. pp 1019-1034.

Edinger JE, Wu J, Buchak EM. 1997. Hydrodynamic and Hydrothermal Analyses of the Once-through Cooling Water System at Hudson Generating Station. Prepared for Public Service Electric and Gas. Newark, NJ, USA.

Golder (Golder Associates Ltd.). 2015. Cariboo-Springer Pit Phase 4 Water Management Plan (TSF 970 m Design) Report. Submitted to Mount Polley Mining Corporation. Golder Doc. No. 1411734-094-R-Rev0-12000. November 2, 2015.

Kolluru VS, Fichera MJ. 2003. Development and application of combined 1-D and 3-D modelling system for TMDL studies. In Spaulding ML (ed), Proceedings of the 8th International Conference on Estuarine and Coastal Modelling. American Society of Civil Engineers. Monterey, CA, USA. pp 108-127.

Kolluru VS, Buchak EM, Edinger JE. 1998. Integrated model to simulate the transport and fate of mine tailings in deep waters. In Balkema AA (ed), Proceedings of the Tailings and Mine Waste '98 Conference. Fort Collins, CO, USA.

Kolluru VS, Buchak EM, Wu J. 1999. Use of membrane boundaries to simulate fixed and floating structures in GLLVHT. In Spaulding ML, Butler HL (eds), Proceedings of the 6th International Conference on Estuarine and Coastal Modelling. New Orleans, LA, USA. pp 485-500.

Kolluru VS, Edinger JE, Buchak EM, Brinkmann P. 2003. Hydrodynamic modelling of coastal LNG cooling water discharge. J Energy Eng 129:16-31.

PCIC (Pacific Climate Impacts Consortium). 2016. BC Station Data – PCDS. Available at http://tools.pacificclimate.org/dataportal/pcds/map/. Accessed on May 12, 2016. Station #: 47091 (Lee's Hill).

US Army Engineer Waterways Experiment Station. 1986. CE-QUAL-W2: A Numerical Two-Dimensional, Laterally Averaged Model of Hydrodynamics and Water Quality; User's Manual. Defence Technical Information Center. Washington, DC, USA.

PERSONAL COMMUNICATIONS

Hughes, Colleen. 2016. Environmental Coordinator, Mount Polley Mining Corporation. Monitored water quality data. Emails to Jordana van Geest, Environmental Scientist, and Michael Herrell, Senior Geochemist, Golder Associates Ltd. May 5, 2016.

Litke, Shauna. 2016a. Mount Polley Mining Corporation. Meteorological data measured at the mine site. Email to Jerry Vandenberg, Senior Environmental Chemist, Golder Associates Ltd. May 11, 2016.

Litke, Shauna. 2016b. Mount Polley Mining Corporation. Directions on the ice forming/melting assumptions. Email to Jerry Vandenberg, Senior Environmental Chemist, Golder Associates Ltd. Dated May 18, 2016.

STUDY LIMITATIONS

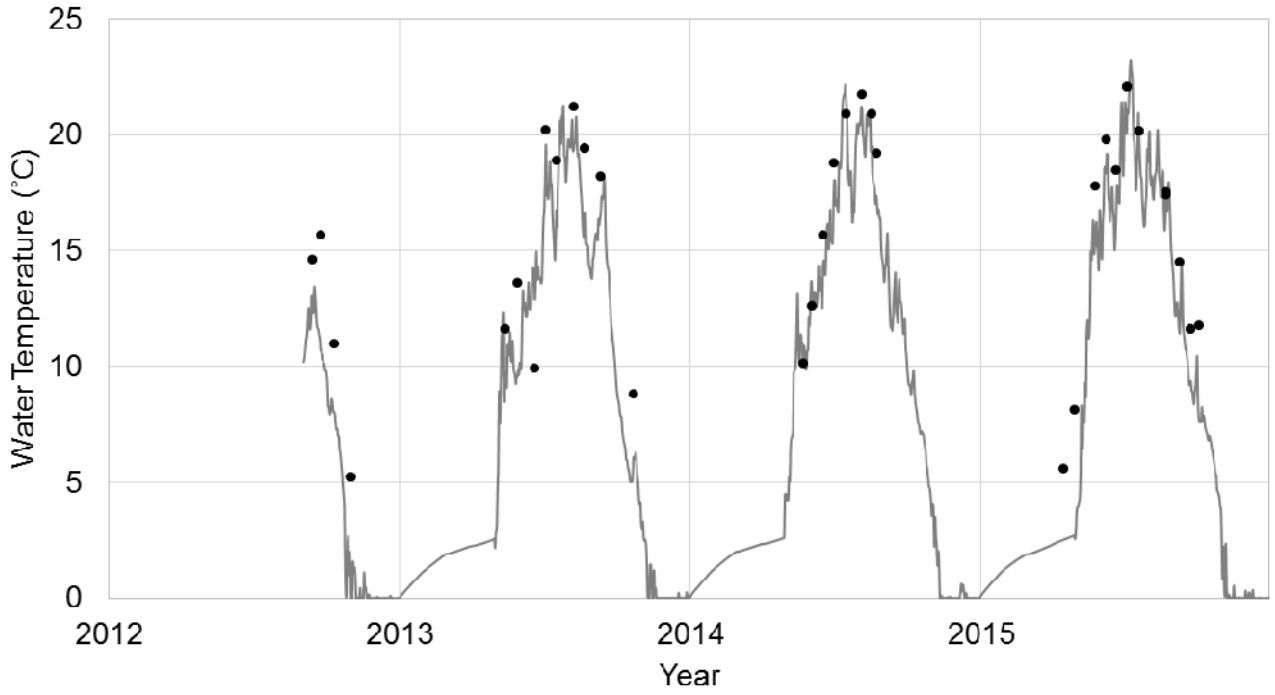
Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

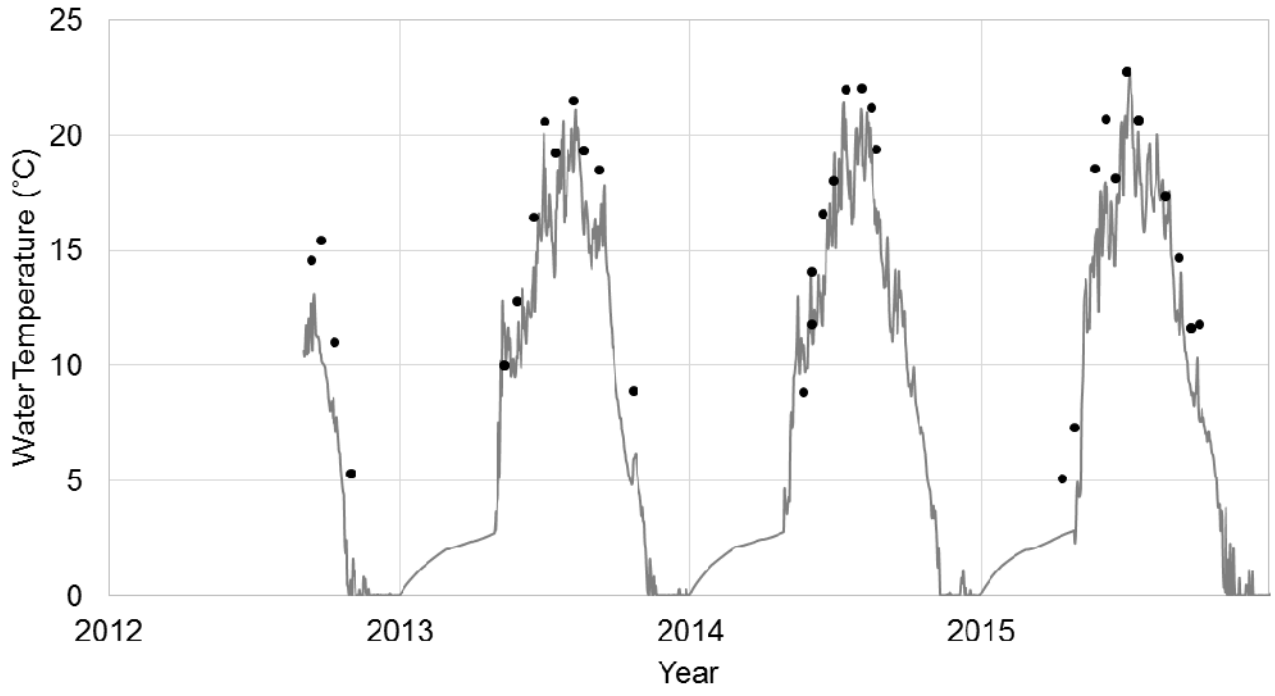
This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

ATTACHMENT A
Calibration Plots



(a) at B1

Figure 1: Bootjack Lake Water Temperature Time Series Calibration Plot at B1 (a) and B2 (b)



(b) at B2

Note: Dots represent measured data; solid lines represent model results; B1 and B2 are calibration locations in Bootjack Lake.

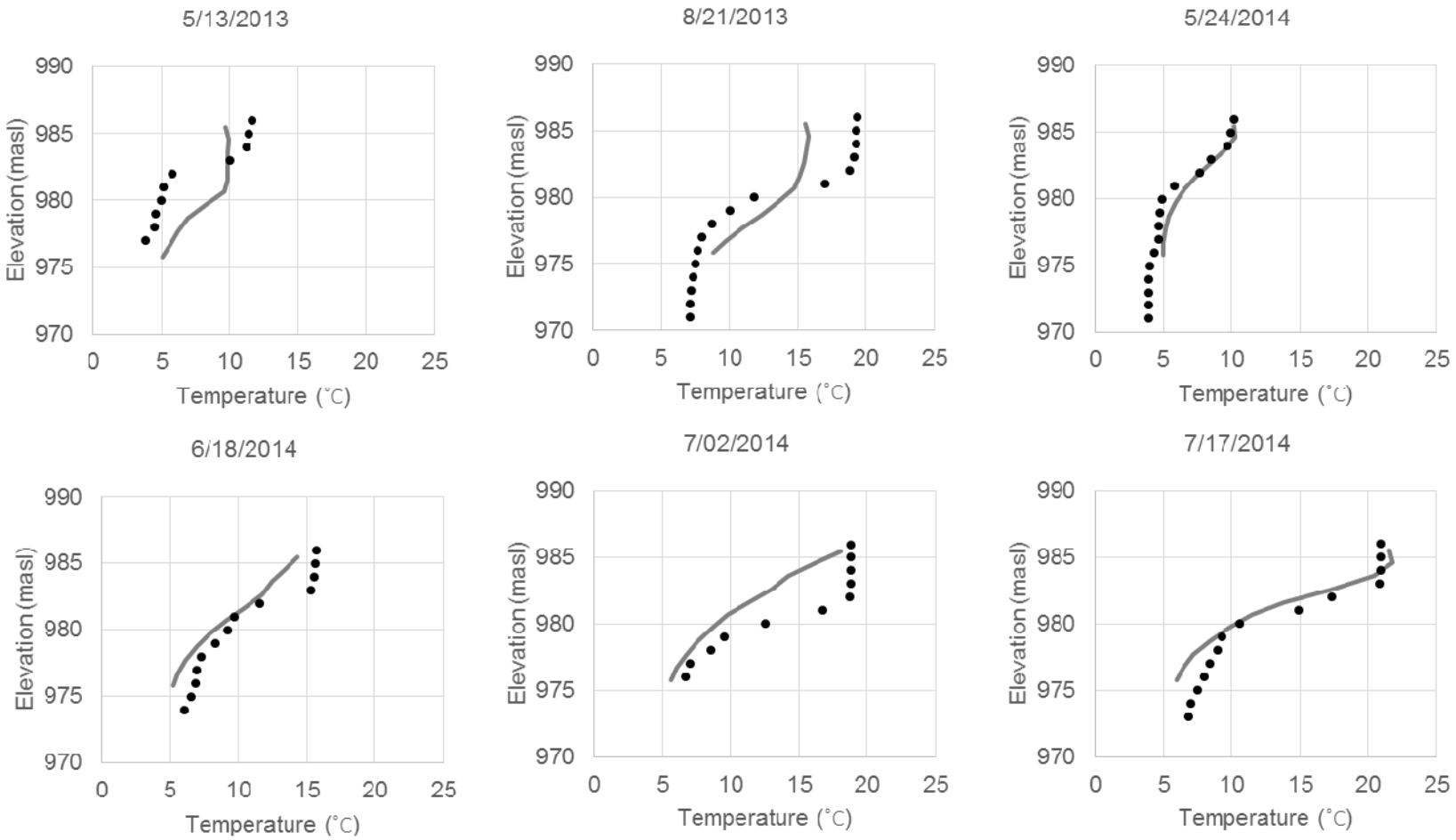


Figure 2: Bootjack Lake Water Temperature Profile Calibration Plots at B1

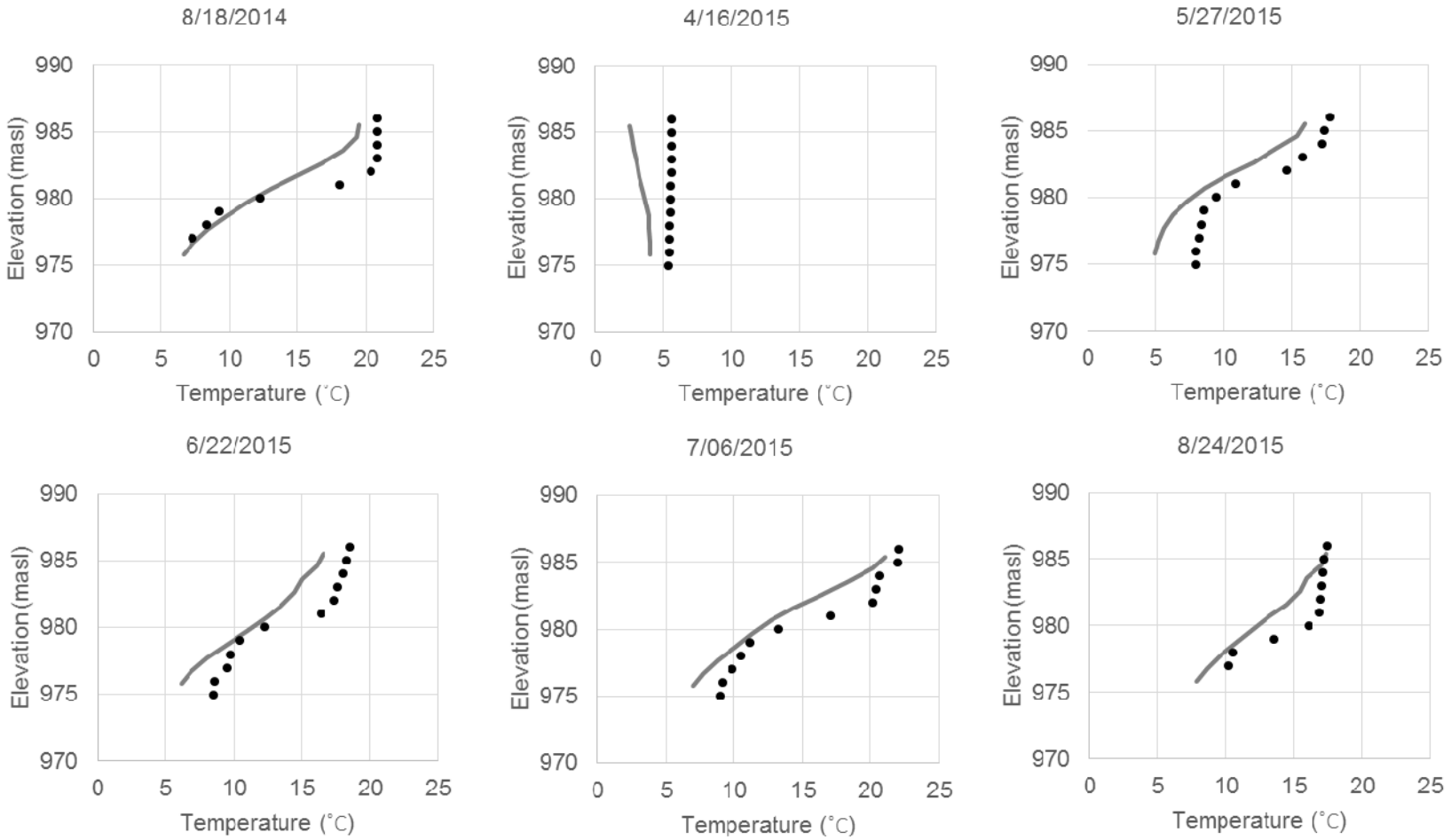


Figure 2: Bootjack Lake Water Temperature Profile Calibration Plots at B1 (continued)

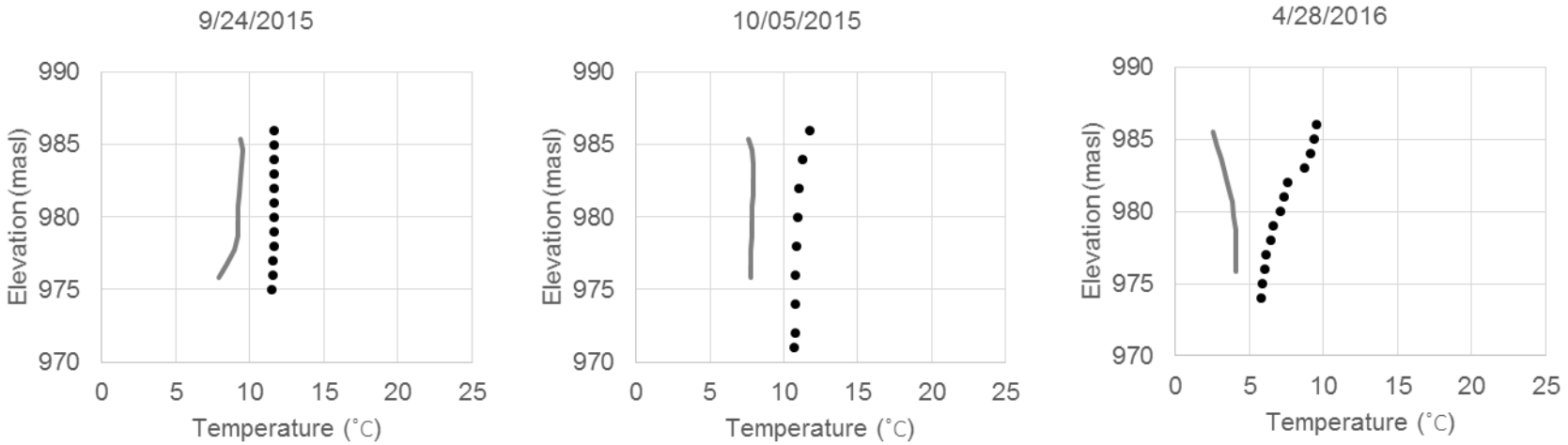


Figure 2: Bootjack Lake Water Temperature Profile Calibration Plots at B1 (continued)

Note: Dots represent measured data; solid lines represent model results; B1 is a calibration location in Bootjack Lake.

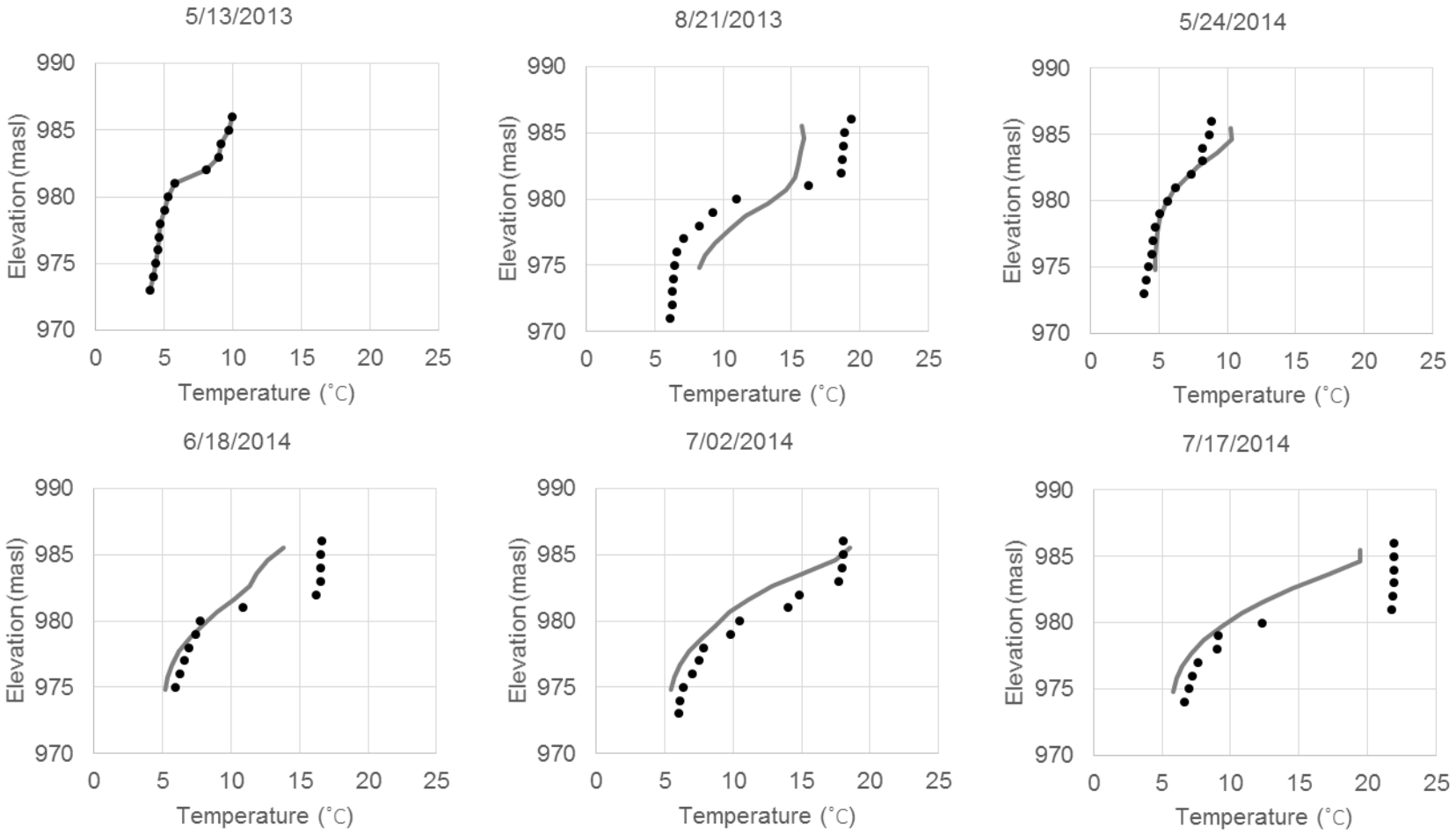


Figure 3: Bootjack Lake Water Temperature Profile Calibration Plots at B2

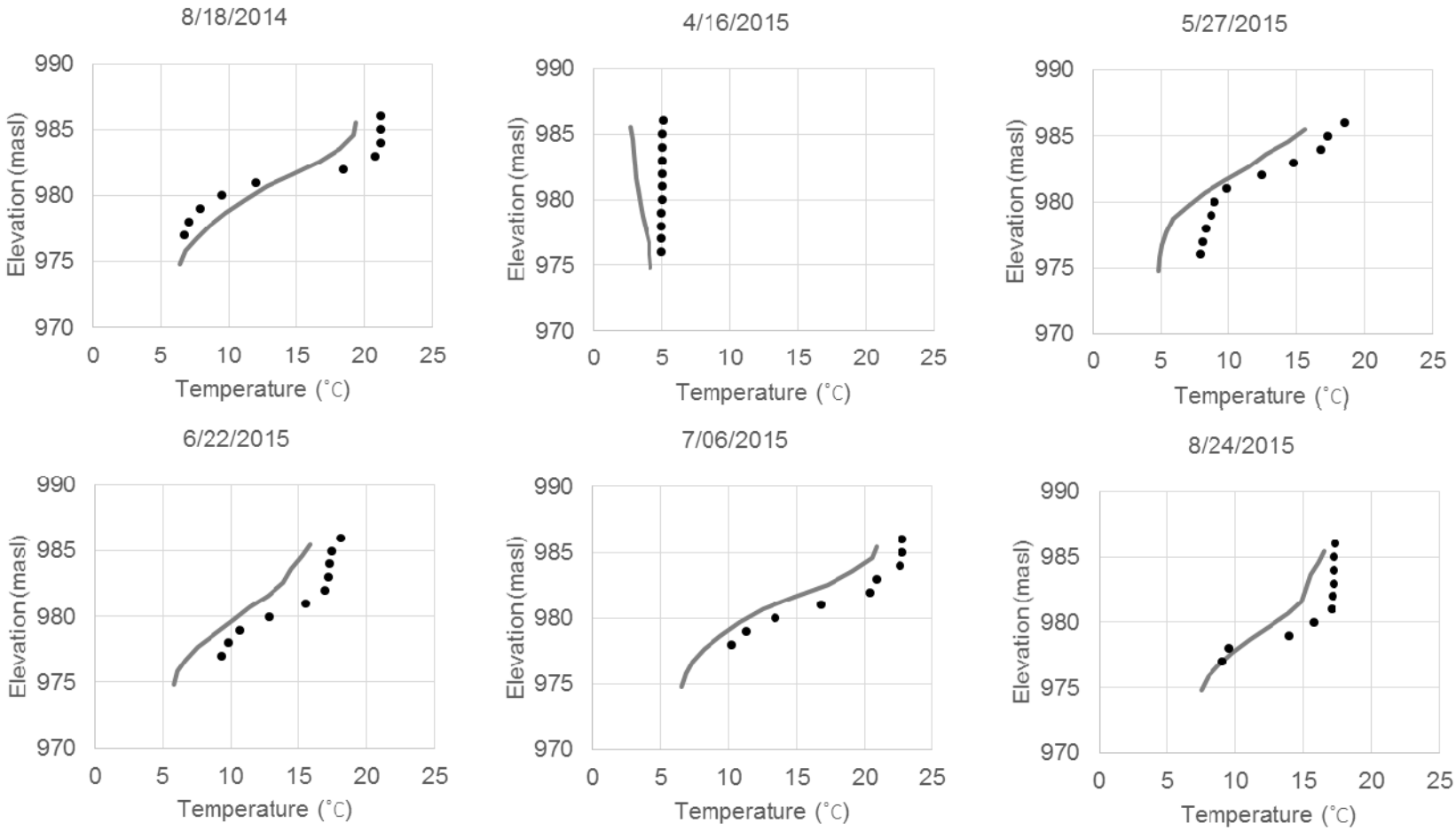


Figure 3: Bootjack Lake Water Temperature Profile Calibration Plots at B2 (continued)

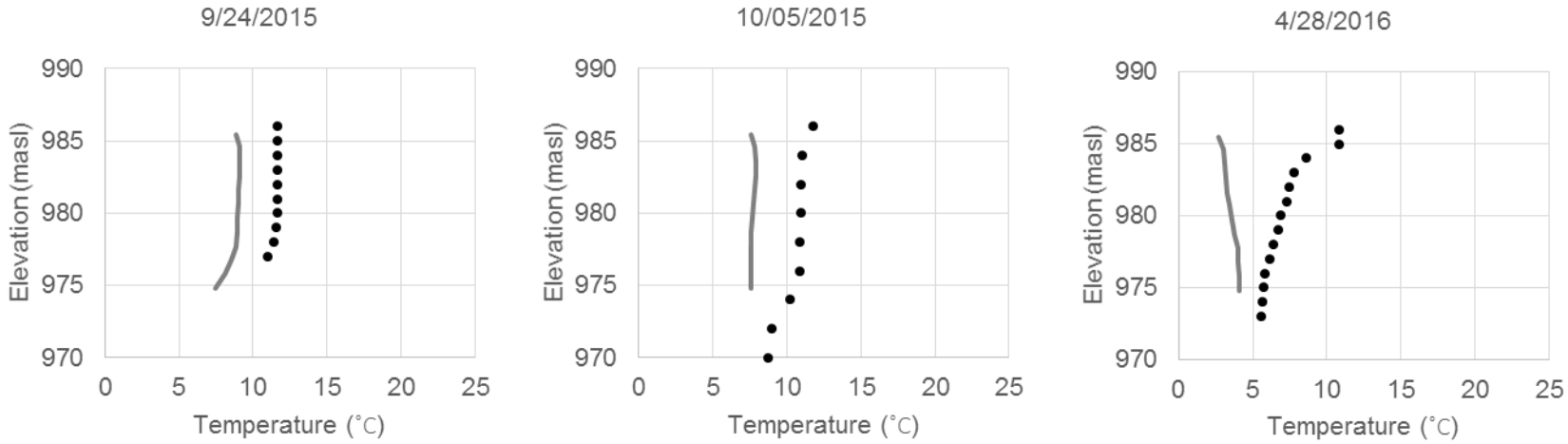
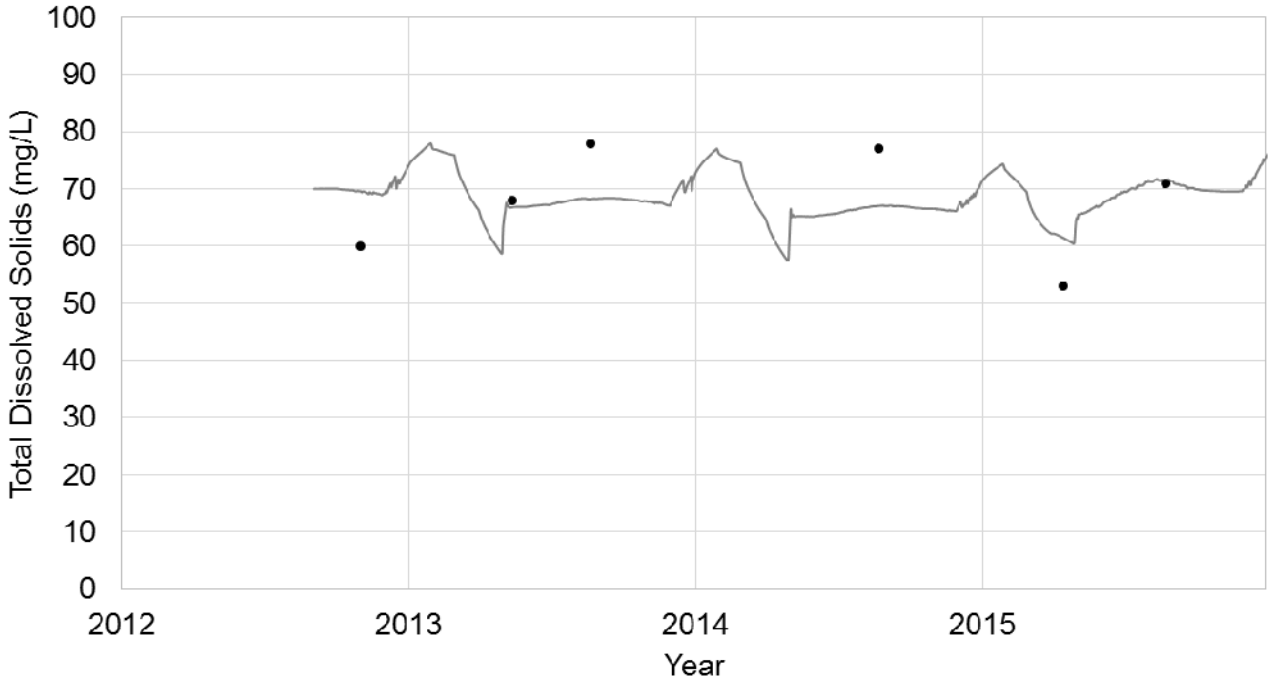
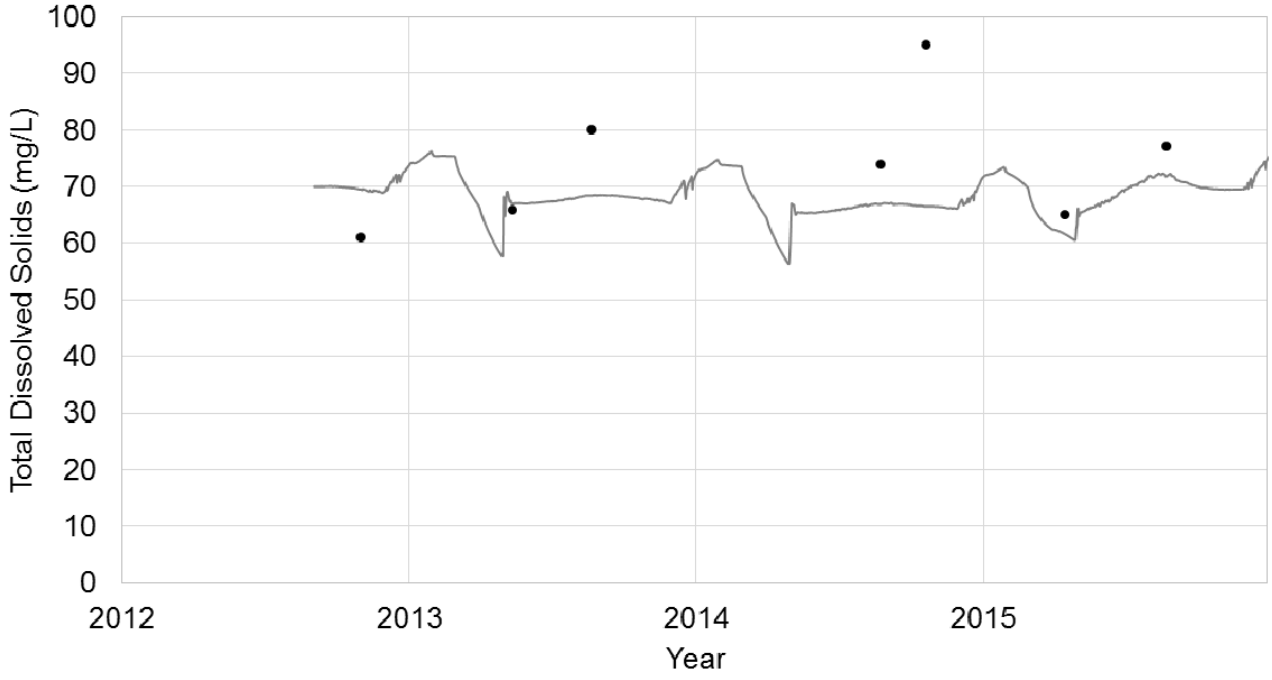


Figure 3: Bootjack Lake Water Temperature Profile Calibration Plots at B2 (continued)

Note: Dots represent measured data; solid lines represent model results; B2 is a calibration location in Bootjack Lake.



(a) at B1



(b) at B2

Figure 4: Bootjack Lake Total Dissolved Solids Time Series Calibration Plots for B1 (a) and B2 (b)

Note: Dots represent measured data; solid lines represent model results; B1 and B2 are calibration locations in Bootjack Lake.

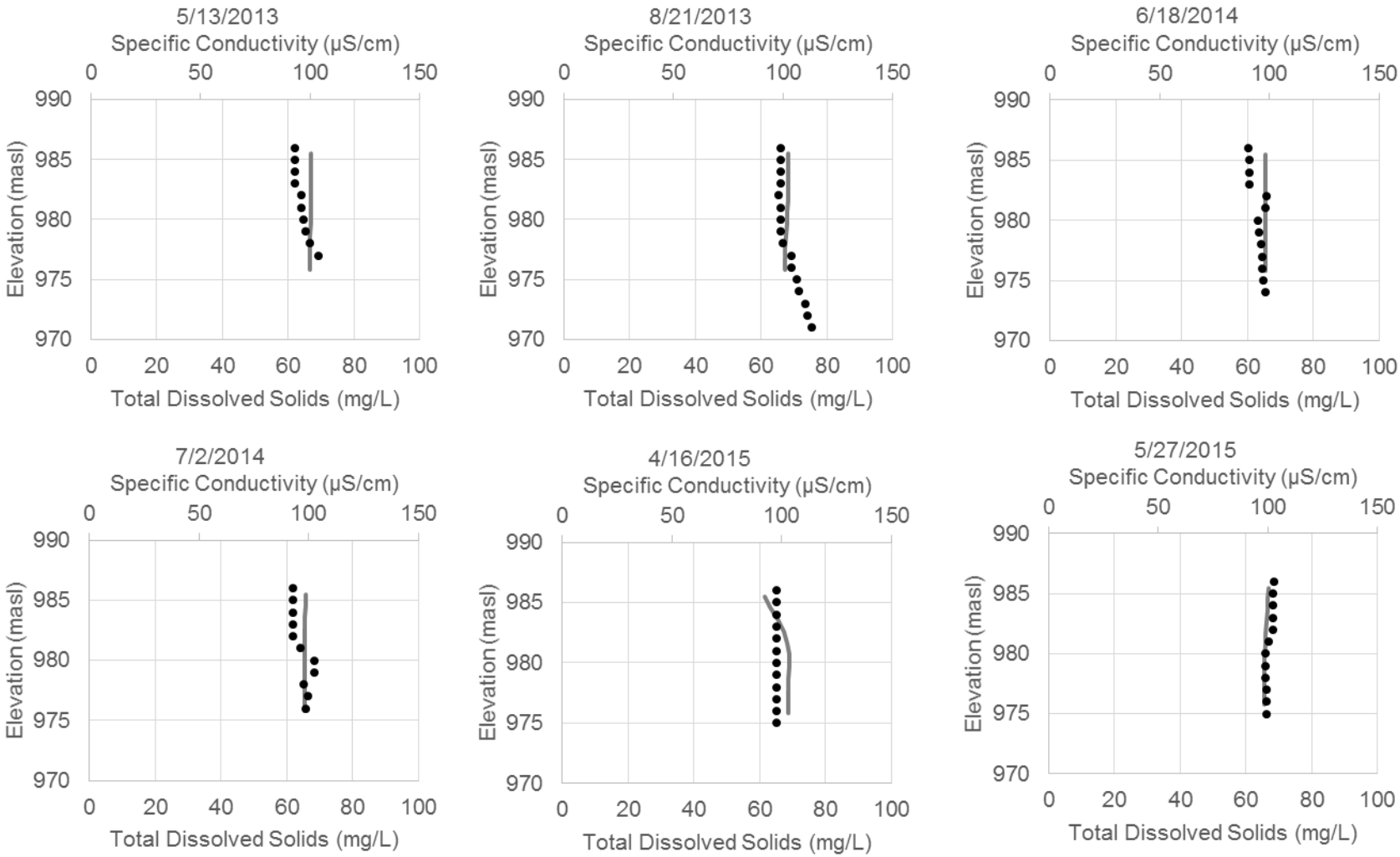


Figure 5: Bootjack Lake Total Dissolved Solids and Specific Conductivity Profile Calibration Plots at B1

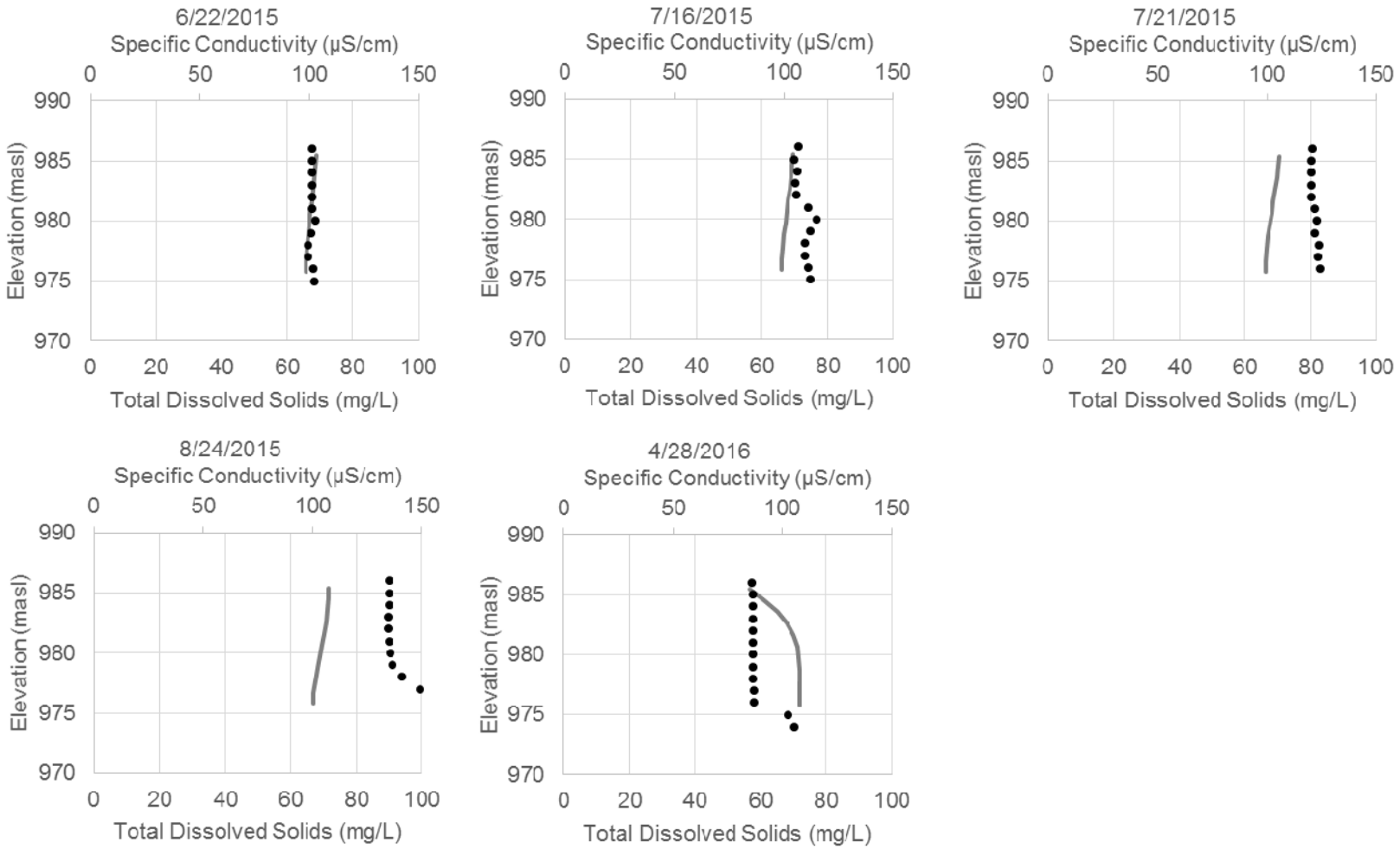


Figure 5: Bootjack Lake Total Dissolved Solids and Specific Conductivity Profile Calibration Plots at B1 (continued)

Note: Dots represent measured specific conductivity data; solid lines represent total dissolved solids model results; B1 is a calibration location in Bootjack Lake.

µS/cm = microsiemens per centimetre.

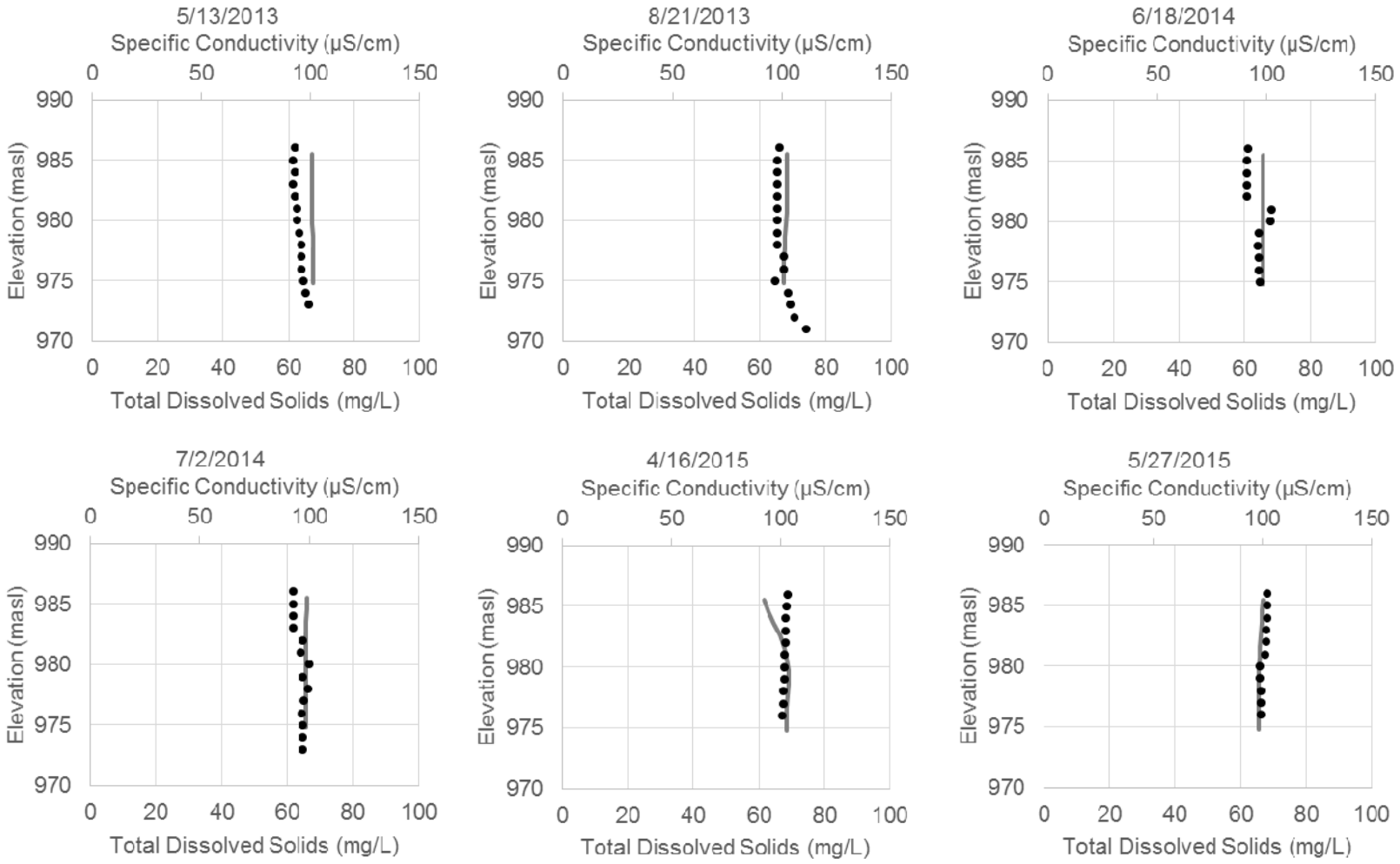


Figure 6: Bootjack Lake Total Dissolved Solids and Specific Conductivity Profile Calibration Plots at B2

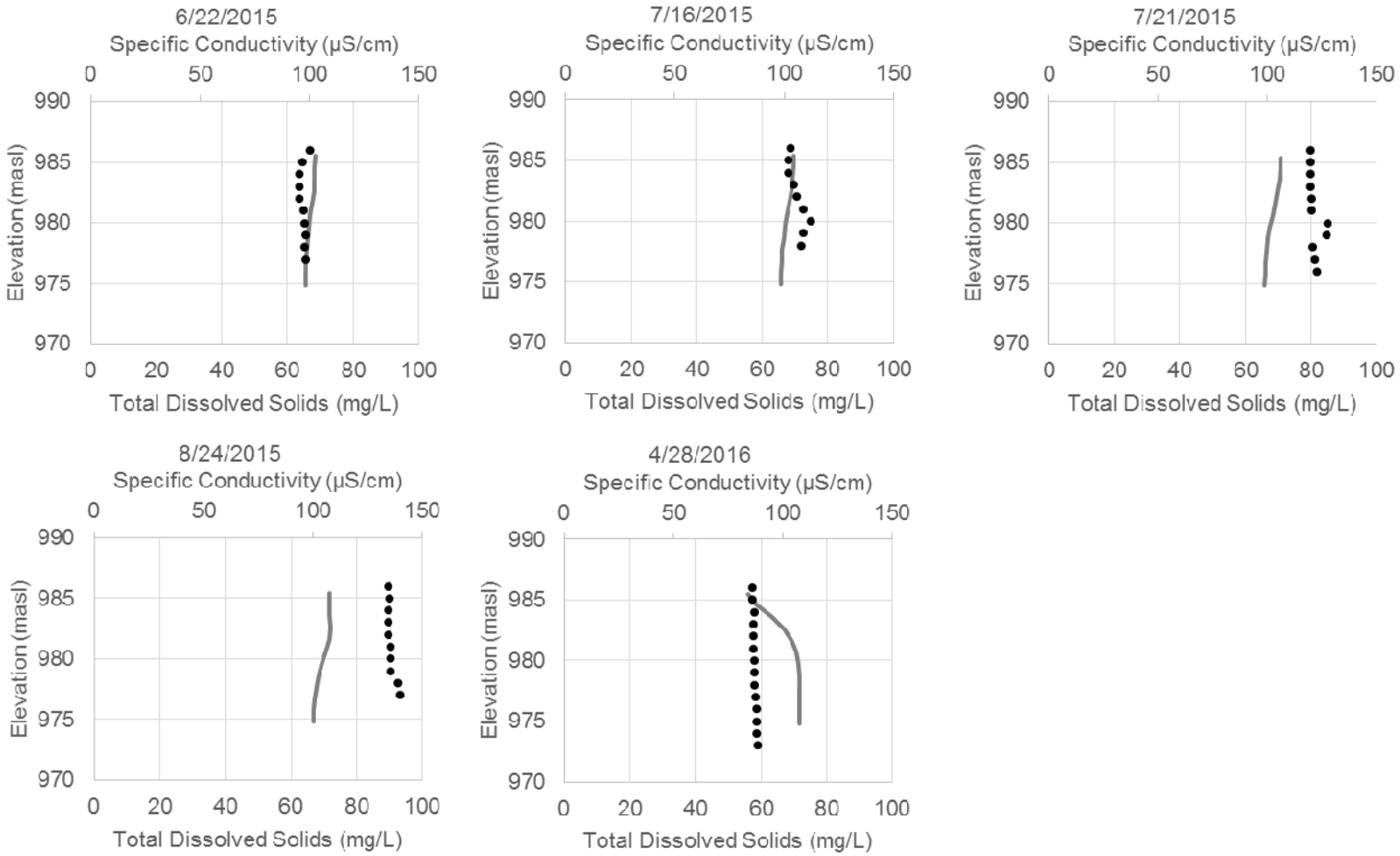


Figure 6: Bootjack Lake Total Dissolved Solids and Specific Conductivity Profile Calibration Plots at B2 (continued)

Note: Dots represent measured specific conductivity data; solid lines represent total dissolved solids model results; B2 is a calibration location in Bootjack Lake.

µS/cm = microsiemens per centimetre.

o:\final\2014\1421\1411734\1411734-171-tm-rev0-16000\attachment a\attachment a - calibration plots.docx

APPENDIX J

Long Term Far Field Diffuser Modelling

TETRA TECH EBA

TECHNICAL MEMO

ISSUED FOR USE

To:	Lyn Anglin, Imperial Metals Colleen Hughes, Mount Polley Mining Corporation	**Date:**	June 27, 2016
c:	Mike Herrell, Golder Associates	**Memo No.:**	001
From:	Daniel Potts, Tetra Tech EBA	**File:**	704-WTR.WTRM03015-01
Subject:	Mt. Polley Long Term Far Field Diffuser Modelling		

1.0 INTRODUCTION

Following the August 4, 2014 failure of its Tailings Storage Facility (TSF), Mount Polley Mine (the Mine) suspended operations. The failure of the TSF necessitated a new water management strategy, and in December 2015 the Mine was approved for short-term discharge of treated effluent into Quesnel Lake through two diffusers at a depth of approximately 50 m. For the present work, Tetra Tech EBA was retained to assess the potential long-term effects of continued discharge through these diffusers, currently installed.

1.1 Previous Related Work

Tetra Tech EBA previously completed several field and modelling studies related to water quality in Quesnel Lake.

- **Quesnel Lake Water Column Observations and Modelling** (Tetra Tech EBA, 2015a): Tetra Tech EBA was retained to perform both field measurements and numerical analyses to develop a predictive model that evaluated the fate of the suspended particulate material in Quesnel Lake and the turbidity resulting from that material.
- **Bathymetry Analysis and Volume Balance** (Tetra Tech EBA, 2015b): Tetra Tech EBA assessed the overall volume balance of the TSF failure event, giving consideration to all available sources of data, both on land and within Quesnel Lake.
- **Dilution Modelling at Potential Outfalls in Quesnel Lake** (Tetra Tech EBA, 2015c): Tetra Tech EBA was retained to assess the performance of proposed outfall designs in Quesnel Lake, particularly the long-term far field performance.

Golder Associates (Golder) conducted near-field modelling using CORMIX and conceptual outfall design (Golder, 2015a).

1.2 Objectives

The present work was undertaken in support of Mount Polley Mining Corporation (MPMC) in its application for a long-term permit for discharge into Quesnel Lake. This memorandum will be incorporated into a long-term Technical Assessment Report (TAR) as an appendix. The objectives of the present work were as follows:

- Assess the potential for dilution in Quesnel Lake under two preliminary “bookend” discharge scenarios, with consideration of long-term buildup over a decade.

Tetra Tech EBA Inc.
Suite 1000 – 10th Floor, 885 Dunsmuir Street
Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241

- Assess the potential for dilution in Quesnel Lake under three "detailed" discharge scenarios, with consideration of long-term buildup during the period of resumed mining operations.

1.3 Limnology Background Discussion

Quesnel Lake is a long, narrow fjord lake reaching from the Cariboo Mountains into the Interior Plateau of BC. Its average and maximum depths are 157 and 511 m, respectively, making it the deepest fjord-type lake in the world (Laval et al, 2008). It has a surface area of about 266 km^2 and a volume of 42 km^3. With a mean annual outflow of 128 m^3/s through the Quesnel River, the lake has an average hydraulic residence time of 10 years. At the west end of the lake, a contraction and sill at Cariboo Island partially separates the main body of the lake from the so-called "West Basin," which represents 8.6% and 2.3% of Quesnel Lake's surface area and volume, respectively. The West Basin's average and maximum depths are 43 and 107 m, respectively.

In temperate lakes, the temperature of the surface water passes through 4°C, the temperature of maximum density, twice annually in a well-understood cycle. Summer warming produces a layer of warm, buoyant water at the surface of a lake. The temperature difference, and thus density difference, between this layer and the cooler water beneath creates a resistance to mixing which stabilizes or stratifies the lake. In the fall, the surface layer cools, reducing the density difference between surface and deeper waters, until the stratification is overcome by wind-induced mixing. This mixing typically involves the entire water column and is commonly referred to as "fall overturn." Under winter conditions, cooling of the entire lake continues until the surface is less than 4°C, at which point a reverse winter stratification appears: a cold, buoyant surface layer overlies a warmer (closer to 4°C) deep layer. In the spring, warming of the surface layer leads up to "spring overturn" when, again, the stratification is overcome by wind-induced mixing. Continued warming of the surface layer re-forms the summer stratification and completes the annual cycle. These mixing episodes have previously been observed in Quesnel Lake in December and April. See, for example, thermistor data presented in Potts (2004) and in Laval et al (2012).

In temperate lakes deeper than about 100-200 m, the seasonal overturn cycle is complicated by high-pressure effects. The temperature of maximum density decreases with pressure, to approximately 3°C at a depth of 500 m. This means that seasonal overturn events can only involve the upper 100-200 m of the water column and deeper water is only renewed or displaced by subtle three-dimensional dynamics. For more discussion and numerous references, refer to Potts (2004) and Laval et al (2012). The main body of Quesnel Lake is subject to these effects. The West Basin of Quesnel Lake, however, with a maximum depth of just over 100 m, follows the normal seasonal overturn cycle for temperate lakes.

The three largest inflows to the lake are east of the sill, whereas Quesnel River flows out of the western tip of the West Basin, meaning that nearly all of the hydraulic throughput of the lake must pass through the West Basin. Based on an average annual outflow of 128 m^3/s, the West Basin's average residence time is about 90 days.

The sill separating the West Basin and the main body of the lake has a maximum depth of 35 m and forks around Cariboo Island. Wind setup and internal waves, or seiches, between the upper and lower layers in the water column cause two-layer exchange flow over the sill following strong wind events. Using temperature measurements, Potts (2004) estimated the rate of exchange flow to be on the order of 1500 m^3/s, which dwarfs the river outflow by an order of magnitude. This exchange is frequent enough and large enough to fully replace the water in the cool, deeper layer in 6-8 weeks (Laval et al, 2008), although the duration of individual exchange events is on the order of hours to a few days.

The key physical drivers of the lake are meteorological fluxes, wind, and rivers. Meteorological fluxes create the seasonal stratification and are dominated by shortwave and longwave radiation and evaporative heat transfer (Potts, 2004; Laval et al, 2012). Wind events are responsible for the seiche activity which can result in upwelling of cold water at the western tip of the lake and exchange flows across the sill (Laval et al, 2008) as well as episodic

deep water renewal (Laval et al, 2012). Rivers also influence circulation and deep water renewal, but to a lesser degree (Laval et al, 2012).

2.0 METHODS

2.1 Model Overview

Tetra Tech EBA used the EPA Visual Plumes UM3 model, embedded in the three-dimensional hydrodynamic model H3D, to evaluate the behaviour of an outfall plume in Quesnel Lake. UM3 is a numerical dilution model for outfall discharge into marine and freshwater environments, and is one of the models included in the Visual Plumes software. The model, developed and distributed by the US Environmental Protection Agency, is an accepted standard for determining environmental impacts from effluent discharge through an outfall. Tetra Tech EBA previously developed a three-dimensional hydrodynamic model of Quesnel Lake in order to describe the behaviour of the suspended material introduced to the lake after the August 4, 2014 TSF failure event. H3D is a three-dimensional hydrodynamic model that has been shown to accurately simulate the effects of tide, wind, river flow, density and time variability in receiving water bodies (Stronach et al., 1993). The Quesnel Lake implementation of the model was developed to simulate the temperature, turbidity, and total dissolved solids regime of the lake. The model is described in the report “Quesnel Lake Water Column Observations and Modelling” (Tetra Tech EBA, 2015a) including validation to historical data and simulation of the lake after the 2014 TSF failure event. The model grid for Quesnel Lake is shown in **Figure 2.1**, with diffuser locations and river inflow and outflow points labelled.

The existing hydrodynamic model of Quesnel Lake does not take into account pressure effects on water’s equation of state. Therefore, it does not reproduce the deep-water renewal processes of the main body of the lake. These processes are, however, inconsequential to the objectives of the present work focused in the West Basin, and generally only affect circulation in water bodies deeper than about 100-200 m.

For outfall assessments, the PLUMES UM3 code was integrated into H3D such that all of the simulated time-varying properties of velocity and density could have the appropriate influence on near-field plume behaviour, and the far-field behaviour could be simulated in a realistic manner. The UM3 model is valid in the near-field when boundary effects do not occur within the near-field, and when the plume dynamics do not cause significant recirculation in the receiving environment. The existing Quesnel Lake model resolution is relatively large (75 x 75 m at the diffuser location) in order to simulate the entire lake. As the point of interest for dilution modelling is 100 m from the outfall, the grid resolution is not suitable for near-field modelling. Near-field dilution is discussed in Golder (2015a) as well as Appendix H of the TAR; Golder used the CORMIX suite of near-field models to design and evaluate diffuser options. The salient difference between the long-term three dimensional approach (H3D-PLUMES) and the near-field approach (CORMIX) is the possibility of building up a background concentration of effluent in the three-dimensional model of the lake, reducing diffuser effectiveness regardless of near-field hydraulic performance.

Warm water is less dense than cool water, so a warm plume encountering the cool bottom waters of a lake is typically buoyant. On the other hand, given similar temperatures, a plume with higher suspended and dissolved solids than the receiving water will sink. The total dissolved solids (TDS) concentrations in the effluent (on the order of 1000 mg/L) are sufficient to overcome approximately 10°C worth of buoyancy. Therefore, the plume may tend either to sink or to rise, depending on its temperature and TDS concentration as well as those of the ambient water. The modelling method chosen is able to respond to these competing processes, including the background buildup of TDS and seasonal changes in effluent and lake temperature.

2.2 Representation of Effluent Characteristics

For modelling purposes, the diffuser effluent and receiving water were represented with the following properties: temperature, total suspended solids (TSS), TDS, and a dye tracer. Density was derived from temperature and TDS

by Chen and Millero's lake-specific equation of state (1986) at zero pressure, and modified for TSS using an assumed solids density of 2650 kg/m^3.

To enable a determination of the degree of effluent dilution achieved at a given point in the lake, the effluent was assigned a dye tracer concentration of 1.0, while the lake's other inflows were assigned a dye concentration of 0.0. The units of measurement for the dye can be interpreted as "m^3 of effluent per m^3 of sample." The dye was modelled as an inert, massless, soluble component. The dilution ratio can be calculated from the dye concentration at a given point; for example, a dye concentration of 0.01 represents 1 part effluent mixed with 99 parts ambient water – a dilution of 99:1.

In the "detailed" scenarios, selenium was added to the list of scalar constituents simulated.

2.3 Initial Conditions

The water temperature profile in the hydrodynamic model was initialized using the 26 November 2015 observation made by the Mine at QUL-66a (see **Figure 2.1**). This conductivity-temperature-depth (CTD) profile showed a nearly-homogeneous water column with temperature ranging from 5.7°C at the surface to 5.0°C at the maximum depth of the cast (90 m). Below 90 m, the initial temperature throughout the lake was assumed as 4.0°C.

For the "bookend" scenarios, the initial concentrations of TSS and TDS were taken as 1.5 and 78 mg/L, respectively, throughout the lake. These values were average measurements from sites near Hazeltine Creek mouth (Golder, 2015a). For the "detailed" scenarios, initial TSS was kept at 1.5 mg/L; however, initial TDS was adjusted to 69 mg/L and the initial selenium concentration was set to 0.00014 mg/L to match measurements east of Cariboo Island (values provided by Golder).

In all scenarios, the initial dye concentration was zero, to represent the absence of effluent.

2.4 Diffuser Discharge Hydrographs and Properties

The purpose of modelling the "bookend" scenarios was to provide preliminary estimates of dilution in Quesnel Lake before input data were available for a more detailed analysis. The defining characteristic of each of the two scenarios is the assumed hydrograph and properties of the discharge through the diffusers. The two "bookend" scenarios, Option 1 and Option 2, are described below.

The purpose of modelling the "detailed" scenarios was to provide best estimates of the resulting water quality in Quesnel Lake under a statistical range of predicted water quality in the discharge, from 5th to 95th percentile concentrations. The discharge characteristics for the "detailed" scenarios are described below.

2.4.1 Option 1 "Bookend" Discharge

Option 1 used a steady simulated flow rate of 0.33 m^3/s (10.4 Mm^3/yr). The steady flow represents discharge through a pipeline, bypassing the sedimentation ponds, and thus excluding any flow contribution from the lower reaches of Hazeltine Creek. Discharge was simulated beginning on 1 December 2005, to match the season that the Mine's discharge began under their short term discharge permit (1 December 2015). **Section 2.6.1** justifies the selection of 2005-2015 as the simulation period. The total simulated volume of effluent discharged from 1 December 2005 to 31 December 2015 was 105 Mm^3.

The temperature of the effluent was based on estimated monthly average temperatures at end of pipe, provided by Golder and consistent with the 2015 TAR (Golder, 2015a), and varied between 0.0 and 17.5°C. The TDS concentration in the effluent was assumed to be 1000 mg/L, based on the 75th percentile concentration in Springer Pit predicted by the Updated TAR Model (Golder, 2015b). Consistent with the Environmental Management Act

permit, the TSS concentration in the effluent was assumed to be 15 mg/L. As there was no mixing with Hazeltine Creek, the dye concentration was a constant 1.0. **Figure 2.2** illustrates the diffuser discharge hydrograph and properties for Options 1 and 2.

2.4.2 Option 2 "Bookend" Discharge

For the Option 2 scenario, the discharge is assumed to pass through the sedimentation ponds, thus mixing with water from Hazeltine Creek. Since the capacity of the diffuser system is 0.60 m^3/s, the treatment plant was assumed to shut down whenever the Hazeltine Creek flow exceeded 0.27 m^3/s. The discharge through the diffusers was therefore defined as indicated in **Table 2.1**, below. The total simulated volume of effluent discharged from 1 December 2005 to 31 December 2015 was 80 Mm^3, which is 76% of the total discharge in Option 1.

Table 2.1: Discharge Definition for Option 2

When Hazeltine Creek Base Flow Was	The Discharge Was
Less than 0.27 m^3/s,	Hazeltine Creek base flow plus 0.33 m^3/s of effluent.
Between 0.27 and 0.60 m^3/s,	Hazeltine Creek base flow only.
Greater than 0.60 m^3/s,	Exactly 0.60 m^3/s of Hazeltine Creek base flow.

The temperature and other properties of the effluent were assumed to be the same as in Option 1. Properties of the combined effluent and Hazeltine Creek discharge were calculated according to the proportion of flow from each source (**see Figure 2.2**). The properties of the Hazeltine Creek base flow are described in **Section 2.7**, below.

2.4.3 "Detailed" Scenario Discharges

The three "detailed" scenarios used discharge flow rates representing average-year hydrology at the mine site. The discharge was a mixture comprised of up to three streams at any given time, coming from the Perimeter Embankment Till Borrow Pond, Springer Pit, and Hazeltine Creek. The flow rates and concentrations of TDS and selenium for each of these streams were provided digitally to Tetra Tech EBA by Golder. Effluent flows are mingled with Hazeltine Creek flows from the simulation start until the end of November 2017, at which time a pipeline is assumed to be commissioned. A bypass conveying flows from Springer Pit is active from May 2016 to May 2017, inclusive, at which time the dewatering of Springer Pit is projected to be completed. For the concentrations of TDS and selenium, three time series were provided, corresponding to 5th-percentile, median, and 95th-percentile predictions of Golder's probabilistic water quality model (see Appendix D of the TAR). In this context, the 95th-percentile water quality predictions are relatively high values which are exceeded in only 5% of the model cases.

The discharge temperatures were estimated from the monthly temperatures of Hazeltine Creek and the effluent, discussed above, and combined in proportion to the respective flow rates. The TSS concentrations in Hazeltine Creek and the effluent were both assumed to be a constant 5.0 mg/L, matching the average concentration observed in Hazeltine Creek (sample location HAC-12) after the water treatment plant became operational (data provided by MPMC). The simulated dye concentration was 1.0 in the effluent streams, and was diluted appropriately when the discharge included water from Hazeltine Creek.

Figure 2.3 shows the discharge characteristics for the 5th-percentile, median, and 95th-percentile water quality "detailed" scenarios. Flow rates are presented as a total for the two diffusers.

2.5 Diffuser Physical Characteristics

The physical characteristics of the diffusers were modelled based on the information shown in drawings 101 through 105 in "HDPE PIPELINE - TEMPORARY DISCHARGE TO QUESNEL LAKE," issued for record and sealed 13 November 2015. There are two diffusers, installed at depths of 45 and 50 m below the water surface. Each diffusers has two ports spaced 15 m apart, each 0.20 m (8 inches) in diameter, which angle up at 45° above the bed slope. The diffuser ports are approximately 1 m above the lake bed.

Although changes to the existing diffuser configuration may be considered for future operations, only the existing configuration was assessed by the modelling described in this memo.

2.6 Meteorological Inputs

One advantage of running a continuous simulation over a decade is the opportunity to see the effects of variable hydrologic and meteorological inputs year by year. Rather than constructing an artificial set of inputs by means of statistics, Tetra Tech EBA chose to use surrogate historical periods to represent the potential future conditions. This approach preserves the linkages between winds, temperatures, and precipitation that would be lost under a stochastic approach.

Meteorological inputs were chosen differently for the "bookend" scenarios than for the "detailed" scenario. The "bookend" runs aimed to make basic assumptions about effluent flow and assess long term buildup under a range of environmental conditions. By contrast, the "detailed" run aimed to make a best estimate of the discharge and assess long term buildup under unfavourable environmental conditions.

2.6.1 Inputs for "Bookend" Scenarios

For the "bookend" scenarios, a surrogate historical decade of hydrologic and meteorological inputs was used to simulate the natural range of environmental conditions, while the effluent flow was held constant. Selection of the most appropriate historical decade was based primarily on winds, which are the strongest driver of mixing in Quesnel Lake, and are therefore the dominant influence over long term buildup. Wind energy is most effective at mixing the lake during the spring and fall overturn processes, which typically happen during the April-May-June and October-November-December periods, respectively.

In keeping with the modelling completed for the short-term discharge permit, wind and other meteorological inputs to the model were derived from the Williams Lake Airport (YWL) records. The period of record at YWL runs from 1961 to present. This period was screened for wind mixing energy by evaluating the root-mean-square (RMS) wind speeds during the two sensitive periods for overturn: April-May-June and October-November-December. The decade with the greatest variation in wind mixing energy was 2006-2015. This decade was therefore selected for the "bookend" models.

Other meteorological parameters of interest are temperature and precipitation, which influence stratification and flow through the lake, respectively. Temperatures were characterized by calculating the average temperature during the expected summer stratification period – May through October. Precipitation was characterized using an annual total. Since river flows are significantly influenced by snow pack, the precipitation for a given year was totaled between September 1st of the preceding year and August 31st to account for winter accumulation.

Table 2.2 below summarizes the variability of wind mixing energy, summer temperatures, and annual precipitation in the decade chosen for the "bookend" simulations. Each parameter is described in terms of its variation from the mean over the period of record at YWL. For example, in 2013 the RMS wind speed in the sensitive periods was 13% lower than average, summer temperatures were 1.1°C warmer than average, and precipitation was 2% less than average.

Table 2.2: Variability in Meteorological Conditions during "Bookend" Decade

Yearly Variation In			
Year	**Windiness**	**Summer T (°C)**	**Precipitation**
2005	0%	-0.2	24%
2006	-1%	0.7	-16%
2007	-7%	-0.1	0%
2008	-6%	-0.1	15%
2009	-2%	0.7	-1%
2010	9%	0.2	-15%
2011	0%	-0.6	24%
2012	1%	0.2	-7%
2013	-13%	1.1	-2%
2014	4%	1.2	18%
2015	2%	1.3	-5%

2.6.2 Inputs for "Detailed" Scenarios

For the "detailed" scenarios, the buildup of effluent in the lake was assessed in relatively unfavourable environmental conditions. Maximum buildup of effluent in the lake would be expected when the least amount of wind energy is available for mixing. The year with the lowest wind energy was 2013, so this year was selected for the "detailed" scenarios. Since the simulations require multi-year duration, the hydrologic and meteorological inputs from 2013 were repeated, or looped, to extend the input period.

Results from the Option 1 "bookend" scenario confirmed that, as expected, the greatest increase in background effluent concentrations in the lake occurred in 2013 (see **Section 3.2**).

2.7 Hydrologic Inputs

The West Basin of Quesnel Lake, into which the diffusers discharge, is at the "downstream" end of the Lake, meaning that the hydraulic throughput of the Lake must all pass through the West Basin. Quesnel River, which flows out of the West Basin, has an annual average flow rate of 128 m^3/s. Based on this flow rate, the average hydraulic residence time of the West Basin is about 90 days.

The major rivers flowing into Quesnel Lake are Horsefly River, Mitchell River, and Niagara Creek. Numerous smaller streams enter the lake as well, including Hazeltine Creek. Inflows to the Quesnel Lake model were represented using the three major rivers, with flows from the lesser streams lumped together with the most appropriate major rivers, following the methods of Potts (2004). Potts's methods predict average monthly inflows to Quesnel Lake, based on historically gauged catchments within and surrounding the Quesnel Lake watershed. To account for yearly differences in precipitation, the average monthly inflows in each year were scaled up or down according to the year's variance in precipitation, as shown in **Table 2.2** above. For example, monthly inflows for 2006 were scaled down from the average by 16%.

For the major rivers, temperatures were taken as the average monthly temperatures measured by Potts (2004). TSS in the Horsefly and Mitchell Rivers was assumed to be 1.5 mg/L, matching the initial condition in the Lake, while TSS in Niagara Creek was taken as 81 mg/L, a value derived from the observations of James (2004). All three major rivers were assumed to have TDS and selenium concentrations matching the initial concentrations in the Lake for the respective runs.

Despite its very small annual average flow rate of approximately 0.24 m^3/s, Hazeltine Creek was included in the "bookend" scenarios as a distinct inflow since estimated flows were available. The flow rate for Hazeltine Creek was derived from synthetic data created by SNC-Lavalin, extrapolated from the gauge location to the creek mouth by a ratio of catchment areas. For simulation years in which the synthetic data had gaps, the gaps were filled by inserting data from other years with similar annual precipitation; for example, gaps in 2014 data were filled with values from the same dates in 1991 (precipitation year totals 516.8 and 518.1 mm, respectively, at YWL). For the "detailed" scenarios, Hazeltine Creek was not included as a distinct inflow to avoid conflict with the monthly flows provided by Golder.

Average monthly temperatures for Hazeltine Creek were taken from MPMC (2009). For the "bookend" scenarios, TSS and TDS were assumed to be 3.3 and 81 mg/L, respectively (Golder, 2015a). For the "detailed" scenarios, TSS was assumed to be 5.0 mg/L, matching the average concentration observed in Hazeltine Creek (sample location HAC-12) after the water treatment plant became operational (data provided by MPMC). TDS and selenium concentrations were assumed to be 247 and 0.001 mg/L, respectively, matching baseline water quality values provided by Golder.

The outflow from the Quesnel Lake model was managed using a weir-type condition to represent Quesnel River's stage-discharge relationship.

Tetra Tech EBA validated the model's hydrology by comparing the simulated lake level against observed lake level at the Water Survey of Canada gauge near Likely from 2006 to 2014. The observed lake level varies 2.4 m in an average year, with a mean lake level of 0.8 m gauge; the simulated lake level varies 2.0 m in an average year with a mean level of 0.9 m gauge. This validation demonstrates that the weir-type outflow condition and the estimated inflows reasonably reproduce the natural rise and fall of the lake level. This degree of agreement is adequate for the present purpose, considering the scarcity of input data and the relatively small influence of hydrology on the model's predictions of long term effluent buildup.

2.8 Sources of Uncertainty

Table 2.3 lists sources of uncertainty in the predictions of water quality in Quesnel Lake stemming from the modelling approach and assumptions described above. Comments are provided describing how the uncertainty is addressed and what bias may be expected in the model's predictions.

Table 2.3: Uncertainty Analysis for Long Term Water Quality Predictions in Quesnel Lake

Source of Uncertainty	How Uncertainty is Addressed in Modelling	Expected Bias to Predicted Water Quality in Quesnel Lake
Future meteorological conditions.	Conditions from past years are used as surrogate data to represent future conditions.	No bias expected; however, random extremes or a changing climate could influence future outcomes.
Wind speed and direction over Quesnel Lake.	Wind speeds are assumed to match those measured at YWL; wind direction is rotated locally so that the dominant wind direction aligns with the lake's axis.	No bias expected; validations done in previous work support these assumptions as making the best use of the available data.
Hydrology in Quesnel Lake catchment area.	Average monthly inflows to the lake are modified by a factor for each year, based on precipitation at YWL.	No bias expected to long-term water quality; short-term variability (days to months) may be underestimated.
Coarseness of hydrodynamic model's horizontal resolution.	Complete mixing implicitly assumed in the model cell where EPA Plumes places the plume; results are reported only outside a 1-cell radius around the diffusers.	Dilution may be overestimated in the few cells closest to the diffusers; no bias expected in the far field.
Effluent flow rates in "bookend" scenarios.	High flow rates assumed, subject to simple rules.	Predictions biased toward worse water quality.
Effluent flow rates in "detailed" scenarios.	Monthly flow rates were provided by Golder as best estimates of average future conditions.	No bias expected to long-term water quality; short-term variability (days to months) may be underestimated.
Effluent temperatures and Hazeltine Creek temperatures, which strongly influence plume density.	Average monthly temperatures were applied in the model.	No bias expected to long-term water quality; short-term variability (days to months) may be underestimated.
Effluent quality in "bookend" scenarios.	Constant concentrations were assumed.	Variability due to effluent quality is not reflected.
Effluent quality in "detailed" scenarios.	Model included daily variation in concentrations, predicted at three probabilistic levels (5th, 50th and 95th percentiles).	The 5th and 95th percentile predictions are expected to bias the predicted lake water quality downwards and upwards, respectively.

In general, the uncertainties described above were addressed in ways that resulted in the best estimate of long-term far field water quality. This was the primary objective of the modelling effort.

The corollary of this approach is that short-term variability and near-field dilution were lower priorities for modelling. For example, short-term variability due to effluent temperatures and flow rates is not reflected in the model due to the use of monthly averages for these parameters. Furthermore, near-field dilution (within a few cells of the diffuser) may be overestimated due to the coarseness of the model's horizontal resolution.

3.0 RESULTS

This section presents the results of the modelling introduced above. First, some example maps and sections are presented to orient the reader to the model's capabilities. Next, the results of the "bookend" scenarios are presented and discussed; and finally the results of the "detailed" scenarios are presented and discussed.

3.1 Example Model Outputs

Figures 3.1 and 3.2 show some examples of model output from the "bookend" scenarios. These examples facilitate discussion of some important model dynamics and set the background for further results presentation.

Figure 3.1 shows a snapshot of the West Basin condition on 12 August 2010 in the Option 1 scenario simulation. The main panel is a plan view or map showing most of the West Basin, with black line contours showing depth at 25-m intervals. The colour scheme represents dilution of the effluent as computed from the dye concentration in the model. The colour shown in each model cell represents the worst (lowest) dilution in the water column at that location and at the snapshot time.

For regulatory purposes, an initial dilution zone (IDZ) is commonly defined as a 100-m radius around the point of discharge. The horizontal resolution of the model is approximately 75 m at the diffuser location. To represent the IDZ, therefore, a 1-cell buffer has been applied around diffuser cells. The buffer was applied as a post-processing step and did not affect model dynamics. In the plan view, dilution within this IDZ has been blanked (light grey). In **Figure 3.1**, the worst dilution outside the IDZ is in the yellow cells southeast of the diffusers, in the range of 20:1 to 30:1.

The inset in **Figure 3.1** shows a cross-section of the West Basin at the diffuser location (see dashed red line on the map), viewed as if looking northwest. The diffusers are marked on the left slope of the lake bottom. The black line contours are temperature, at varying intervals chosen for visual effect. Colours represent dilution again, on the same colour scale as on the map. This section illustrates a strong temperature stratification in the West Basin, typical of summer conditions. The warm effluent discharging into the cool, deep ambient water is buoyant despite its TDS concentration, and the plume rises to approximately 20 m depth (yellow band above diffusers). The IDZ is not blanked on the inset.

Figure 3.2 shows a snapshot of the West Basin condition on 5 November 2014 in the Option 2 scenario simulation. The main panel is identical to **Figure 3.1** in its layout. The worst dilution outside the IDZ is in the yellow cells northeast of the diffusers, again in the range of 20:1 to 30:1.

The inset in **Figure 3.2** shows a longitudinal cross-section of the West Basin along its thalweg (path of greatest depth – see dashed red line on the map), viewed as if looking northeast. The diffusers are marked with dashed circles where the section passes them. At this point in the simulation, the summer temperature stratification has weakened significantly, and wind events can cause internal waves with vertical amplitudes in the tens of metres. These seiches draw the plume back and forth along the long axis of the basin, and can result in "re-dosing," where water carrying moderately-diluted effluent is drawn back past the diffusers to receive a second "dose" of effluent. The highest concentrations of effluent are off the section line and therefore do not appear in the inset.

3.2 Results from "Bookend" Scenarios

The objective of the "bookend" scenarios was to evaluate the capacity for dilution in Quesnel Lake, under a long-term discharge through a range of hydrologic and meteorological conditions. **Figure 3.3** provides time series of dilution for Option 1 (red; steady effluent flows) and Option 2 (black; effluent mixing with Hazeltine Creek). The vertical axis is dilution ratio on a log scale, with smaller numbers (worse water quality) towards the top. The dots

mark the lowest dilution in the model domain, outside the IDZ, from data archived at 24-hour intervals. The bold solid lines are 30-day moving averages of the worst dilution (dots). The fine dotted lines are 30-day moving averages of the worst dilution *at the water surface*. The 30-day moving averages were computed because some constituents, such as selenium, are subject to guidelines defined in those terms.

In Option 1, the worst predicted dilution was 23:1, occurring in summer while the plume was buoyant and subject to trapping under the thermocline. The example model output shown in **Figure 3.1** corresponds to this point in the Option 1 simulation: that is, the red dot at 12 August 2010 in **Figure 3.3** represents the 23:1 dilution in the worst yellow cell in **Figure 3.1**.

In Option 2, the worst predicted dilution was 27:1, occurring in fall with stratification weakening and significant seiche activity leading to local re-dosing. The example model output shown in **Figure 3.2** corresponds to this point in the Option 2 simulation: that is, the black dot at 5 November 2014 in **Figure 3.3** represents the 27:1 dilution in the worst yellow cell in **Figure 3.2**.

Simulated dilution in Option 2 is generally better than in Option 1 for two reasons. First, the Option 2 discharge was only 76% of the Option 1 volume, so there is less total buildup of effluent in the basin. Second, Option 2 involved mixing the effluent with Hazeltine Creek base flow, pre-diluting the effluent as well as affecting density.

To aid understanding of the circulation dynamics, Tetra Tech EBA computed a mass balance of the effluent in the West Basin for the Option 1 simulation. **Figure 3.4** presents a time series of the terms of the mass balance: cumulative effluent discharge, cumulative effluent exited via Quesnel River, cumulative effluent exited over the sill into the main body of the lake, and instantaneous effluent content of the West Basin. At any time, the cumulative effluent discharge must equal the sum of the other three terms. The Option 1 discharge was 0.33 m^3/s, or about 10.4 Mm^3/year. The buildup of effluent in the West Basin reached a quasi-steady state within 2 years. After this time, the West Basin generally contained about 3.5 to 6 Mm^3 of effluent (thick black line), or roughly half a year's worth of discharge. Of the remaining effluent, about 80% was transported out the Quesnel River, and 20% was exchanged over the sill into the main body of the lake. Exchange over the sill was episodic and occurred most often in late fall, whereas transport out Quesnel River was continuous and had its maximum rate during spring overturn (May and June). After steady state was reached, the only differences year-to-year were due to environmental conditions. The year with the greatest buildup of effluent was 2013, measured as the change in West Basin effluent content from 31 December to 31 December. Therefore, 2013 was deemed the worst year of the simulated decade in terms of effluent buildup.

3.3 Results from "Detailed" Scenarios

The objective of the "detailed" scenarios was to evaluate the capacity for dilution in Quesnel Lake, under a long-term discharge of varying properties estimated to represent discharge from the resumed operations of the Mine. **Figure 3.5** provides time series of dilution for discharges with 5th percentile (black), median (blue), and 95th percentile (red) estimated water quality. The layout of the figure is very similar to that of **Figure 3.3**, with dots representing instantaneous values at 24-hour intervals, and lines representing 30-day moving averages. The worst predicted dilutions occur in early summer, when the plume is buoyant, in the years 2018 through 2020. In these years the pipeline is in use, meaning that the effluent is not pre-diluted by Hazeltine Creek.

Examination of model outputs at hourly intervals (not shown) revealed that variations can occur at time scales as short as 3-6 hours. These variations could be due to changes in wind, solar heating, and internal waves in the lake. Instantaneous worst dilutions appearing in the simulations may not reflect daily averages, which are generally used for effects assessment. Therefore, data archived at hourly intervals were combined to produce daily-average worst dilutions during the critical periods of the "detailed" scenarios. **Table 3.1** lists the worst instantaneous dilutions found

at 24-hour intervals (midnights) beside the corresponding worst daily averages and worst 30-day averages, for the three water quality scenarios.

The "detailed" scenarios included selenium as a specific water quality parameter. **Figure 3.6** presents time series of the predicted selenium concentrations. The baseline Quesnel Lake concentration, 0.00014 mg/L, is indicated with a faint grid line, as is the British Columbia Ministry of Environment (MoE) 30-day average guideline of 0.002 mg/L (MoE, 2014). Similar to dilution, the worst selenium concentrations outside the IDZ were archived at 24-hour intervals. The thick lines plotted in **Figure 3.6** represent 30-day moving averages of these concentrations. The fine dotted lines represent 30-day moving averages of worst selenium concentrations *at the water surface*. **Table 3.1** also lists the worst 30-day average selenium concentrations for each scenario.

Table 3.1: Worst Conditions Predicted in "Detailed" Scenarios

Water Quality Scenario	Worst Instantaneous Dilution at Midnight	Worst Daily-Average Dilution	Worst 30-Day Average Dilution	Worst 30-Day Average Selenium Concentration (mg/L)
5th Percentile	24:1	23:1	38:1	0.0009
Median	26:1	28:1	39:1	0.0010
95th Percentile	27:1	28:1	40:1	0.0015

The worst predicted dilutions occur in the 5th-percentile water quality scenario. Worst dilutions generally occurred in summer when the plume was buoyant and was trapped below the thermocline. The 5th-percentile scenario had lesser TDS concentrations, and was therefore more buoyant in summer and more affected by the trapping dynamic, leading to worse predicted dilutions during the summer period. However, the worst predicted selenium concentrations occurred in the 95th-percentile scenario. The higher selenium concentrations in the effluent outweighed the slightly better dilutions generally achieved.

4.0 CONCLUSIONS

Tetra Tech EBA used a hydrodynamic model of Quesnel Lake in combination with the EPA Visual Plumes UM3 model to simulate water quality in Quesnel Lake with long-term discharge of mine water from the existing diffusers near the mouth of Hazeltine Creek.

Two "bookend" scenarios were simulated, with constant discharge characteristics and variable environmental conditions. Results from these scenarios indicated that:

- The worst water quality outside the IDZ typically occurs in summer when the effluent plume is buoyant and gets trapped below the thermocline;
- Buildup of background effluent concentration in the West Basin of Quesnel Lake reaches a quasi-steady state within 2 years, and this state represents approximately half a year's worth of discharge; and
- The strength of the wind during spring and fall overturn periods is the most significant environmental factor for long-term buildup.

Three "detailed" scenarios were simulated, with relatively unfavourable environmental conditions and varying discharge characteristics representative of resumed operations at the Mine. Results from these scenarios indicated that:

- The worst predicted daily-average dilution outside the IDZ would range from 23:1 to 28:1, depending on the concentration of TDS in the effluent;
- The worst predicted 30-day average dilution outside the IDZ would range from 38:1 to 40:1, depending on the concentration of TDS in the effluent;
- The worst predicted selenium concentration outside the IDZ would range from 0.0009 to 0.0015 mg/L, depending on the concentrations of selenium and TDS in the effluent; and
- Higher TDS and selenium concentrations in the effluent led to higher selenium concentrations outside the IDZ, despite an improvement in summer dilution due to reduced buoyancy of the effluent plume.

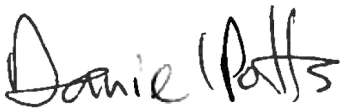
5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Mount Polley Mining Corporation and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Mount Polley Mining Corporation, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are attached to this memo.

6.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.



Prepared by:
Daniel Potts, P.Eng., M.A.Sc.
Hydrotechnical Engineer, Water and Marine
Direct Line: 604.788.0272
Daniel.Potts@tetratech.com

Reviewed by:
Jim Stronach, P.Eng., Ph.D.
Senior Oceanographer, Water and Marine
Direct Line: 778.945.5849
Jim.Stronach@tetratech.com

DJP/JS/TAK

REFERENCES

Chen, C.-T.A. and F.J. Millero, 1986. Precise thermodynamic properties for natural waters covering only the limnological range. Limnol. Oceanogr., 31(3), 1986, 657-662.

Golder (Golder Associates), 2015a. Conceptual Diffuser Design and Near-Field Modelling in Quesnel Lake. Appendix E to TAR submitted to MPMC, May 2015.

Golder, 2015b. Validation of the Springer Pit Lake Model. Memorandum to MPMC, December 18, 2015.

James, C. 2004. Mixing Processes from CTD Profiles Using a Lake-Specific Equation of State: Quesnel Lake. M. A. Sc. thesis, University of British Columbia, BC, Canada.

Laval, B.E., J. Morrison, D. Potts, E.C. Carmack, S. Vagle, C. James, F. A. McLaughlin and M. Foreman. 2008. Wind-driven Summertime Upwelling in a Fjord-type Lake and its Impact on Downstream River Conditions: Quesnel Lake and River, British Columbia, Canada. J. Great Lakes Res. 34:189-203.

Laval, B.E., S. Vagle, D. Potts, J. Morrison, G. Sentlinger, C. James, F. McLaughlin, E.C. Carmack. 2012. The joint effects of riverine, thermal, and wind forcing on a temperate fjord lake: Quesnel Lake, Canada. J. Great Lakes Res. 38:540-549.

MoE (British Columbia Ministry of Environment), 2014c. Ambient Water Quality Guidelines for Selenium. Technical Report Update.

MPMC (Mount Polley Mining Corporation), 2009. Mount Polley Mine Technical Assessment Report for a Proposed Discharge of Mine Effluent. In Support of an Application for the Discharge of Mine Effluent Under the Waste Discharge Regulation of the British Columbia Environmental Management Act.

Potts, D. 2004. The Heat Budget of Quesnel Lake, British Columbia. M. A. Sc. thesis, University of British Columbia, Vancouver, BC, Canada.

Stronach, J.A., J.O. Backhaus, and T.S. Murty. 1993. An update on the numerical simulation of oceanographic processes in the waters between Vancouver Island and the mainland: the GF8 model. Oceanography and Marine Biology Annual Review., Vol. 31, 1–87.

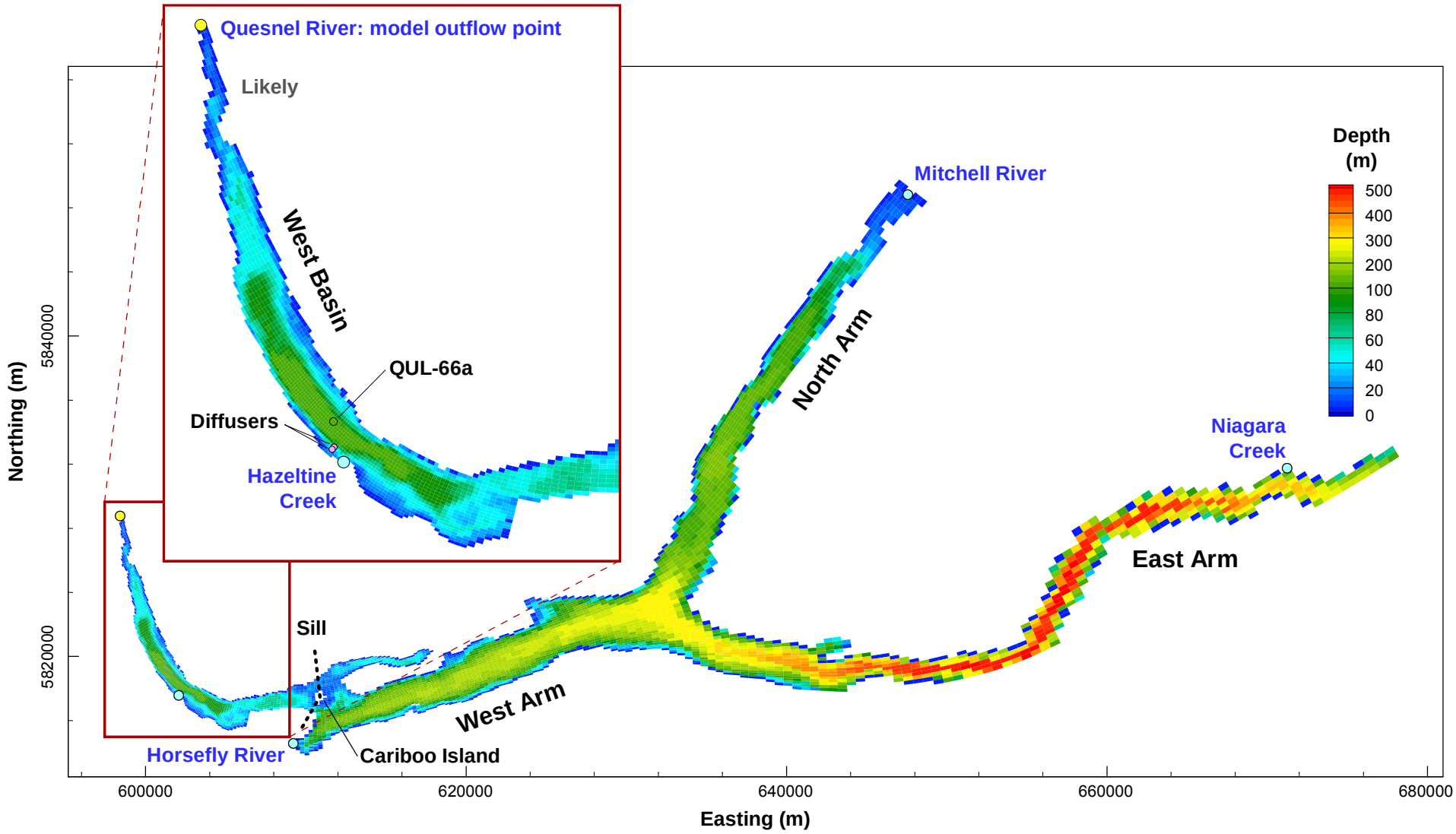
Tetra Tech EBA, 2015a. Quesnel Lake Water Column Observations and Modelling. Prepared for MPMC, May 2015.

Tetra Tech EBA, 2015b. Bathymetry Analysis and Volume Balance. Prepared for MPMC, May 2015.

Tetra Tech EBA, 2015c. Dilution Modelling at Potential Outfalls in Quesnel Lake. Memorandum #005 to MPMC, May 2015. Appendix F to TAR submitted to MPMC, May 2015.

FIGURES

Figure 2.1 Quesnel Lake Hydrodynamic Model Bathymetry
Figure 2.2 Diffuser Discharge Properties for Bookend Scenarios
Figure 2.3 Diffuser Discharge Properties for Detailed Scenarios
Figure 3.1 Option 1 “Bookend” Scenario Example Model Output: Dilution – Plan and Section
Figure 3.2 Option 2 “Bookend” Scenario Example Model Output: Dilution – Plan and Section
Figure 3.3 Simulated Dilution in Quesnel Lake “Bookend” Decadal Runs Options 1 and 2
Figure 3.4 Option 1 “Bookend’ Scenario Effluent Volume Balance
Figure 3.5 Simulated Dilution in Quesnel Lake “Detailed” Scenario Runs
Figure 3.6 Simulated Selenium in Quesnel Lake “Detailed” Scenario Runs



NOTES

Horizontal model resolution varies as shown, with higher resolution in the West Basin and West Arm, and lower resolution in the North and East Arms.

Modelled inflowing and outflowing rivers are labelled. The inset of the West Basin shows the diffuser locations.

STATUS
ISSUED FOR USE

CLIENT
MPMC

QUESNEL LAKE DIFFUSER MODELLING

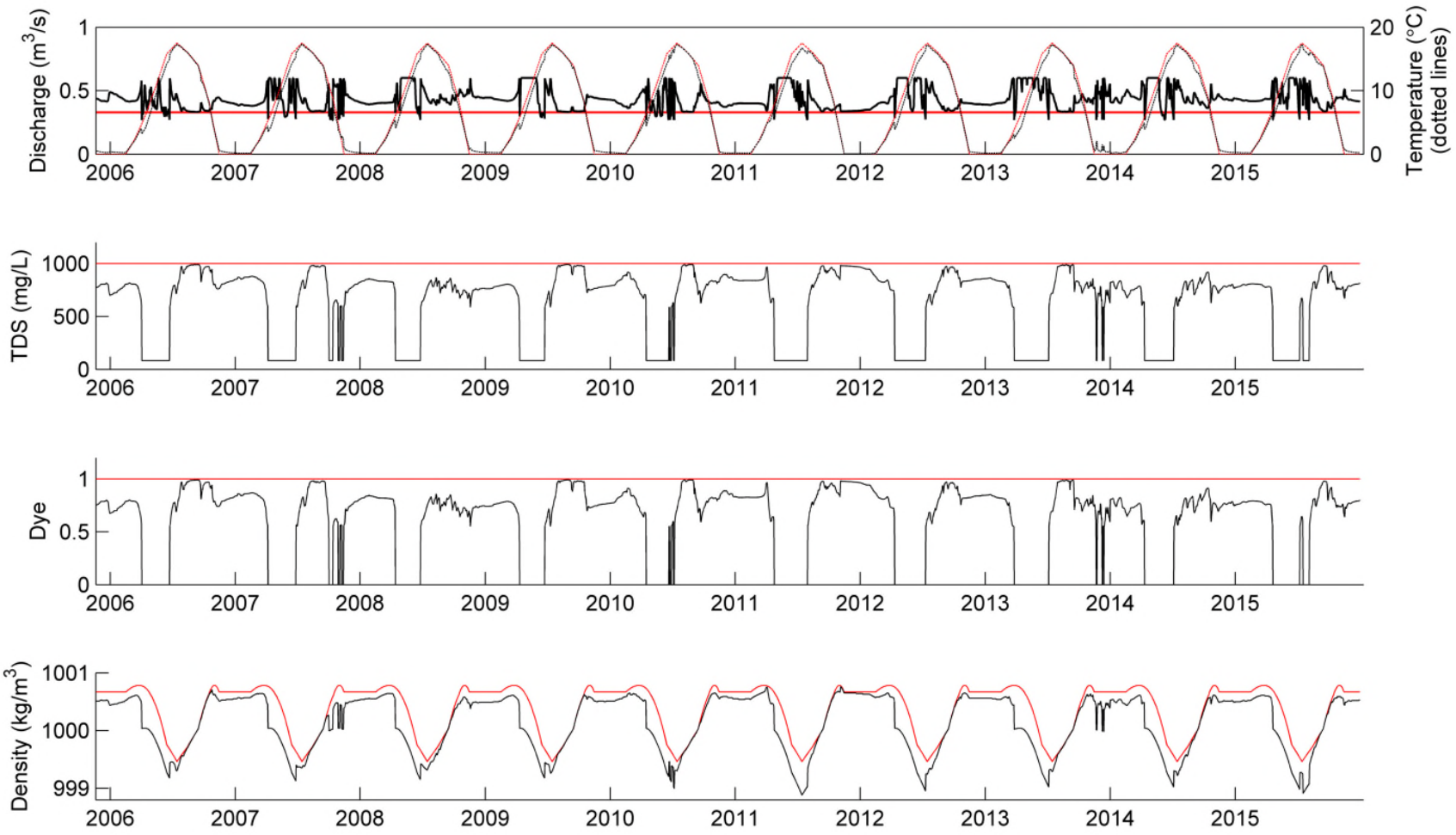
Quesnel Lake Hydrodynamic Model Bathymetry

TETRA TECH EBA

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE: Tetra Tech EBA - VANC
DATE: May 16, 2016

Figure 2.1



NOTES

Legend:

Option 1
Option 2

STATUS
ISSUED FOR USE

CLIENT
MPMC

QUESNEL LAKE DIFFUSER MODELLING

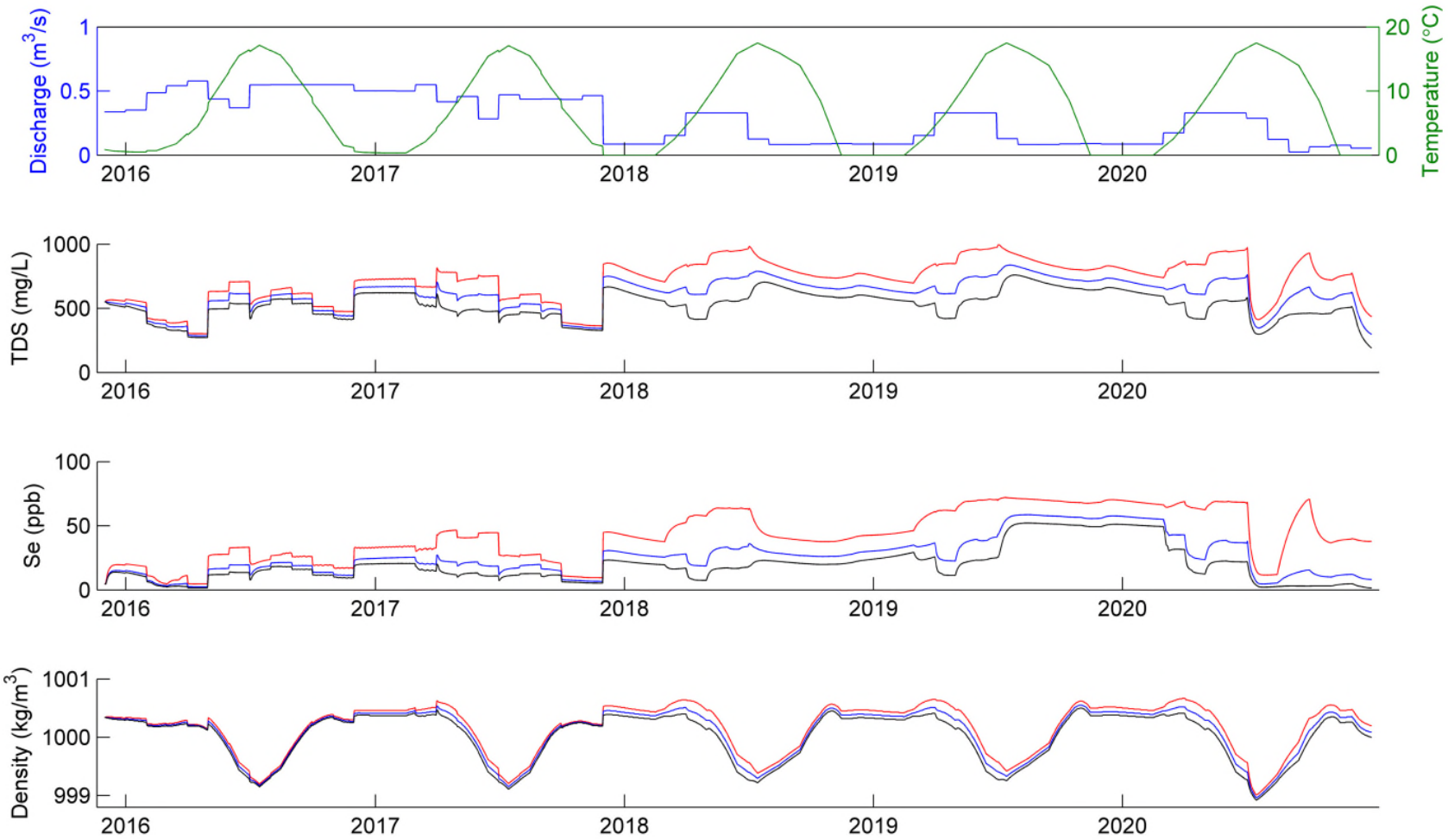
Diffuser Discharge Properties for "Bookend" Scenarios

TETRA TECH EBA

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE	DATE
Tetra Tech EBA - VANC	June 13, 2016

Figure 2.2



NOTES

Legend:

- 95th Percentile WQ
- Median WQ
- 5th Percentile WQ

STATUS
ISSUED FOR USE

CLIENT
MPMC

QUESNEL LAKE DIFFUSER MODELLING

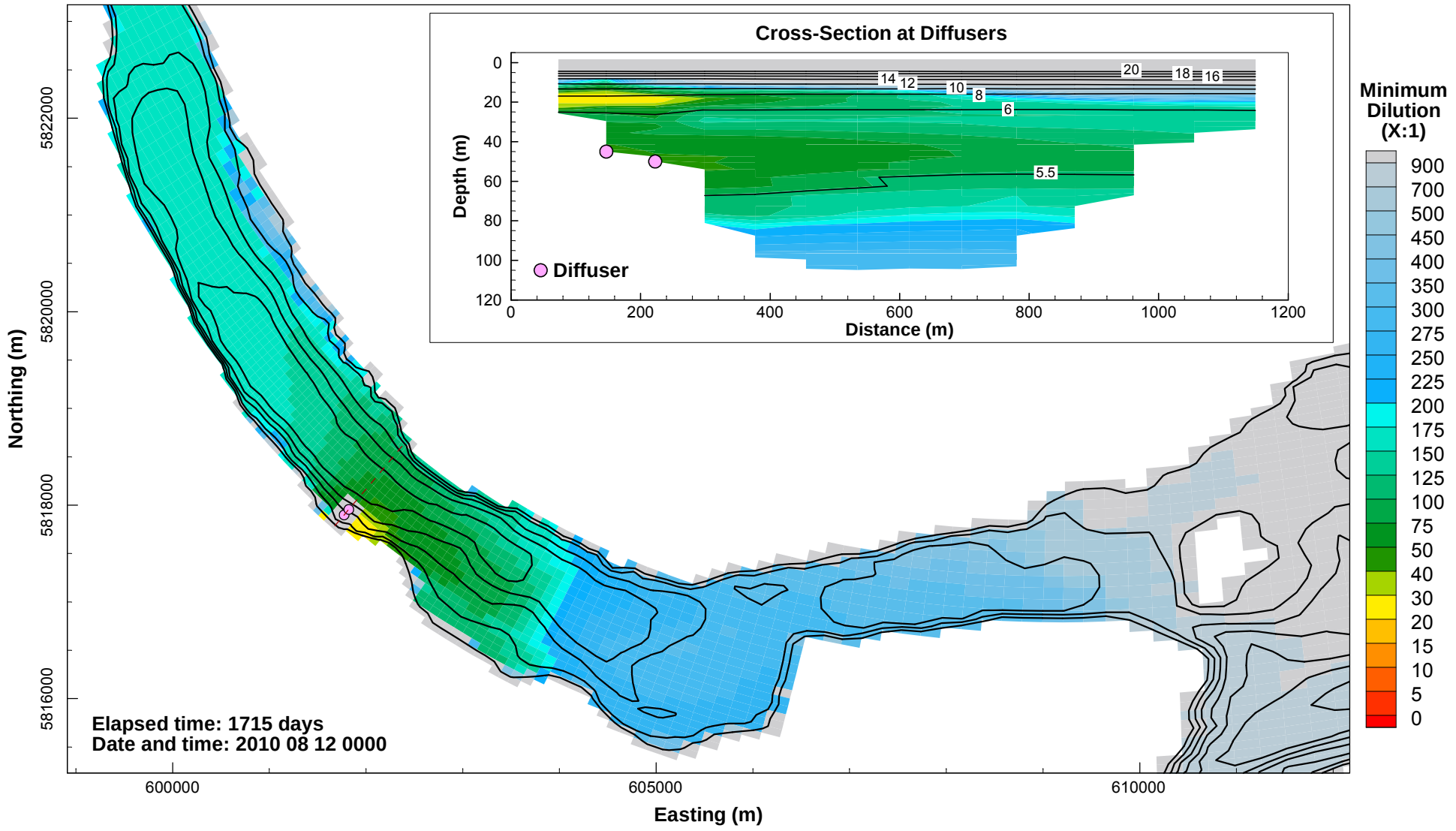
Diffuser Discharge Properties for "Detailed" Scenarios

TETRA TECH EBA

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE: Tetra Tech EBA - VANC
DATE: June 9, 2016

Figure 2.3



NOTES

Effluent flow rate: 0.33 m^3/s.

Plan view shows minimum dilution at any depth, with bathymetric line contours @ 25 m.
Section view shows dilution across West Basin, with temperature line contours.

STATUS
ISSUED FOR USE

CLIENT
MPMC

QUESNEL LAKE DIFFUSER MODELLING

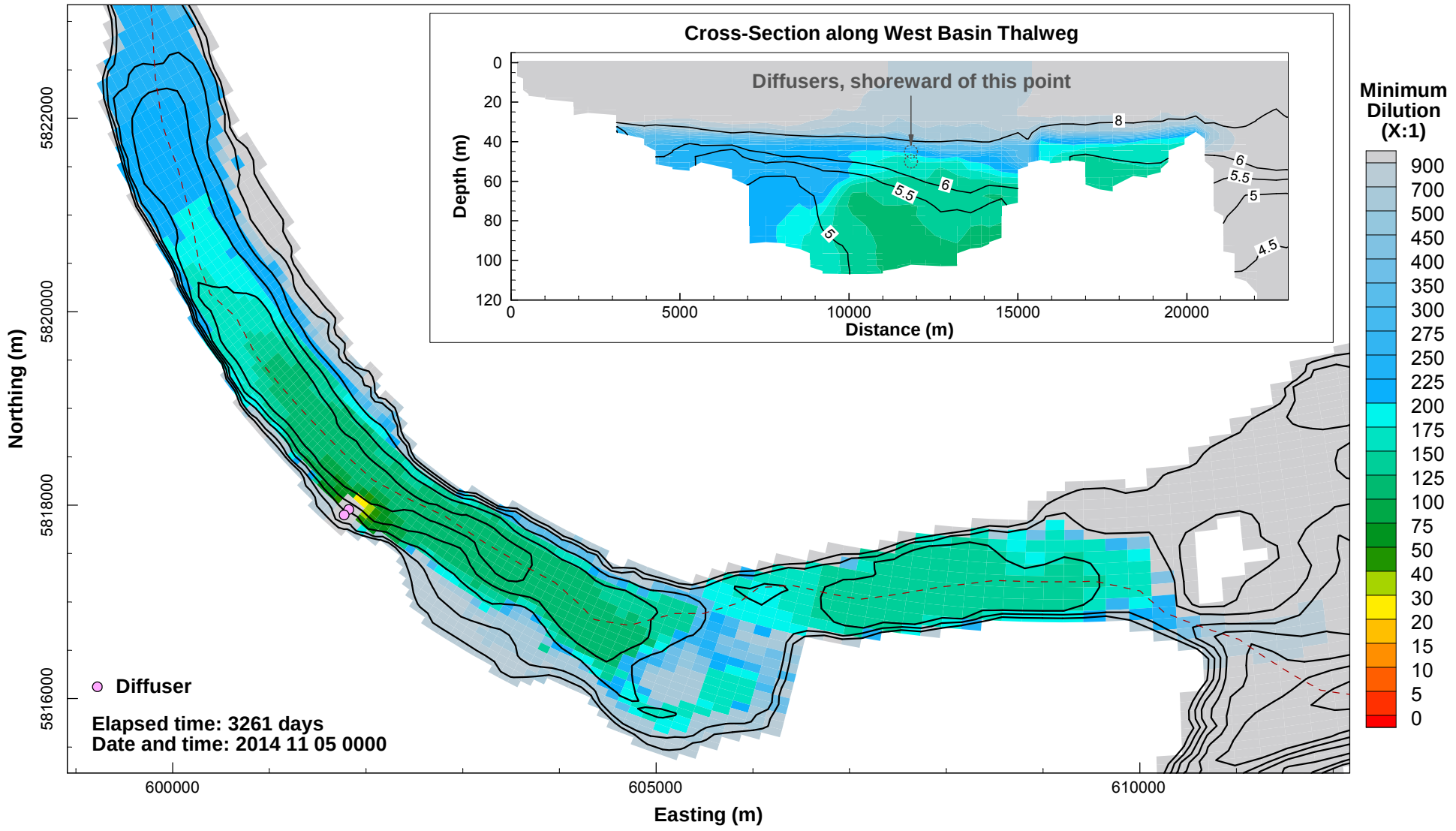
Option 1 "Bookend" Scenario Example Model Output: Dilution - Plan and Section

TETRA TECH EBA

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE: Tetra Tech EBA - VANC
DATE: June 8, 2016

Figure 3.1



NOTES

Effluent flow rate: max 0.33 m^3/s, details per Option 2.

Plan view shows minimum dilution at any depth, with bathymetric line contours @ 25 m.
Section view shows dilution across West Basin, with temperature line contours.

STATUS
ISSUED FOR USE

CLIENT
MPMC

TETRA TECH EBA

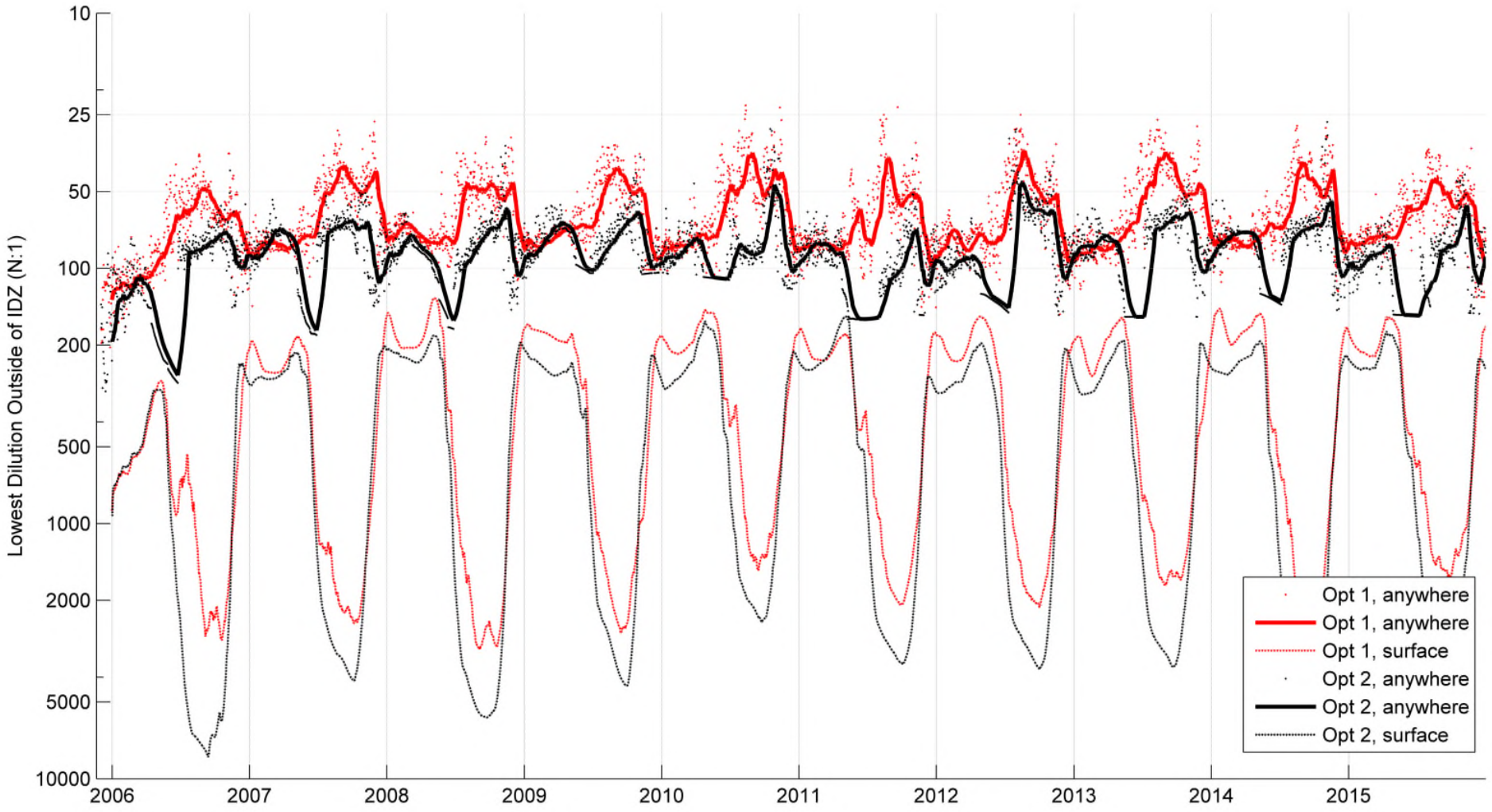
QUESNEL LAKE DIFFUSER MODELLING

Option 2 "Bookend" Scenario Example Model Output: Dilution - Plan and Section

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE	DATE
Tetra Tech EBA - VANC	June 8, 2016

Figure 3.2



NOTES

Dots represent daily snapshot values.
Lines represent 30-day moving average.

Effluent flow rate: 0.33 m^3/s, details per Option.

STATUS
ISSUED FOR USE

CLIENT
MPMC

TETRA TECH EBA

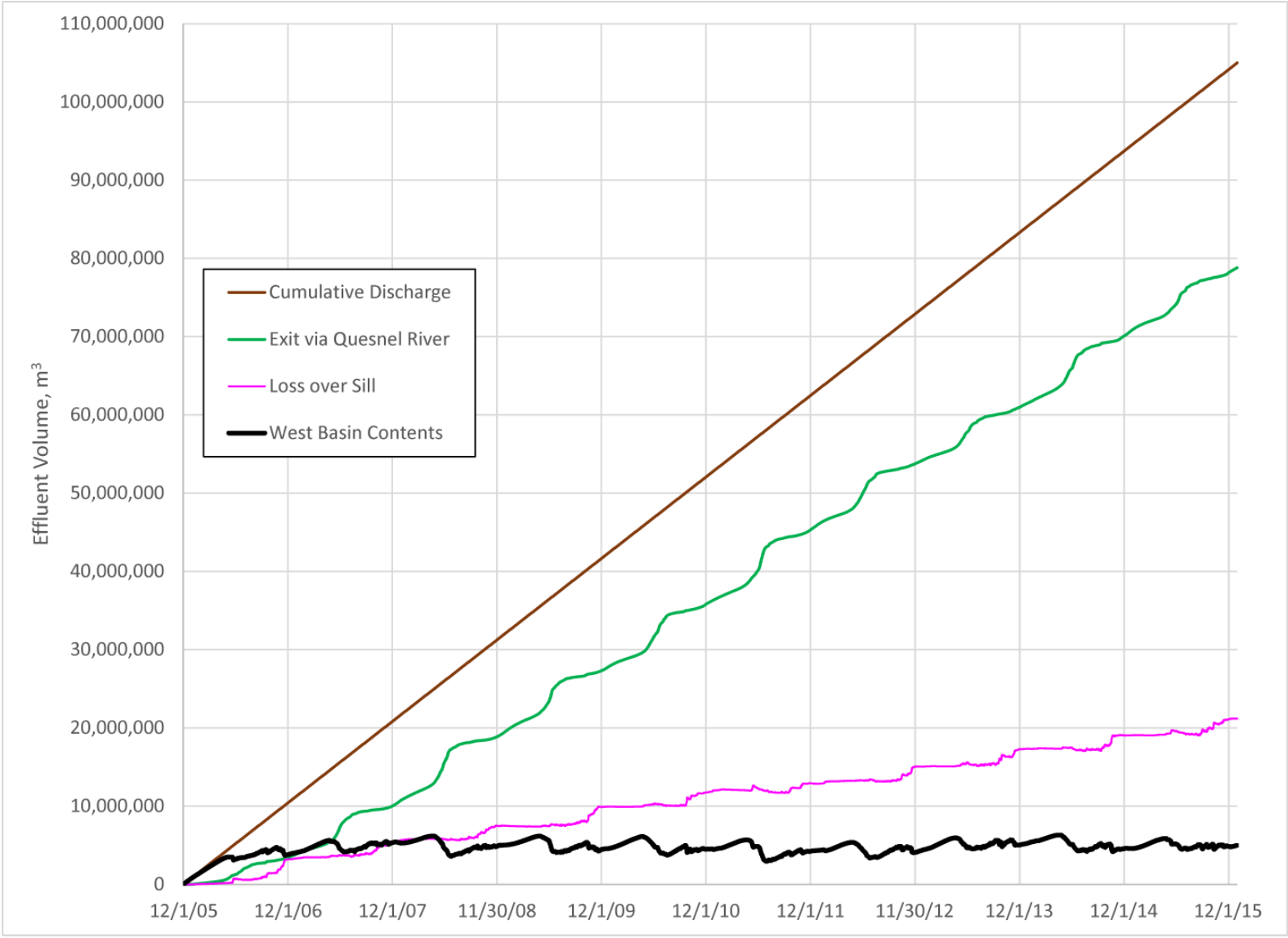
QUESNEL LAKE DIFFUSER MODELLING

Simulated Dilution in Quesnel Lake "Bookend" Decadal Runs Options 1 and 2

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE: Tetra Tech EBA - VANC
DATE: June 8, 2016

Figure 3.3



NOTES

Effluent flow rate: 0.33 m^3/s.
Effluent TDS: assumed 1000 mg/L, constant.

STATUS
ISSUED FOR USE

CLIENT
MPMC

QUESNEL LAKE DIFFUSER MODELLING

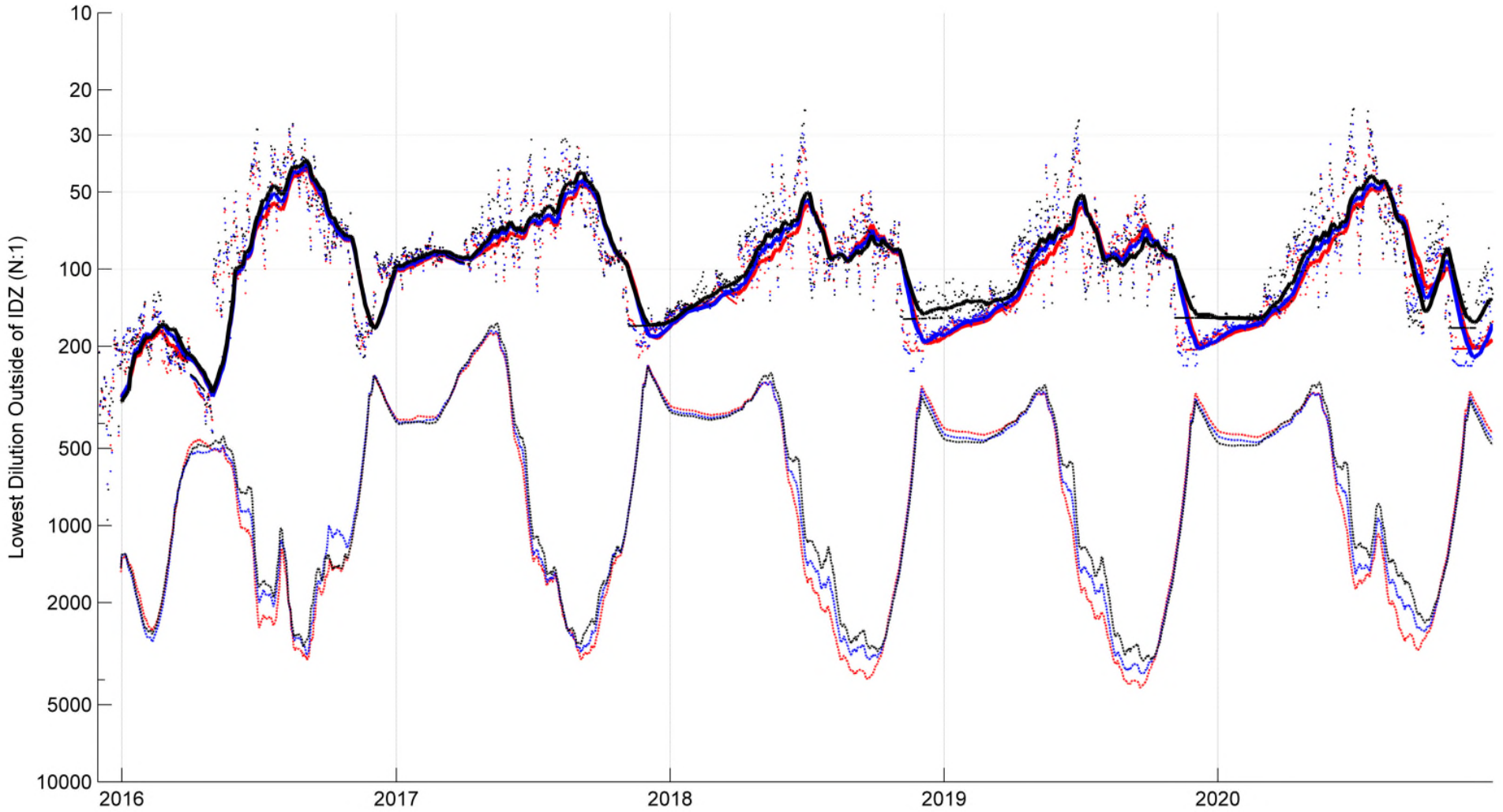
Option 1 "Bookend" Scenario Effluent Volume Balance

TETRA TECH EBA

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE: Tetra Tech EBA - VANC
DATE: June 8, 2016

Figure 3.4



NOTES

Dots represent daily snapshot values.
Lines represent 30-day moving average.

95th Percentile WQ
surface
worst pt
Median WQ
surface
worst pt
5th Percentile WQ
surface
worst pt

STATUS
ISSUED FOR USE

CLIENT
MPMC

QUESNEL LAKE DIFFUSER MODELLING

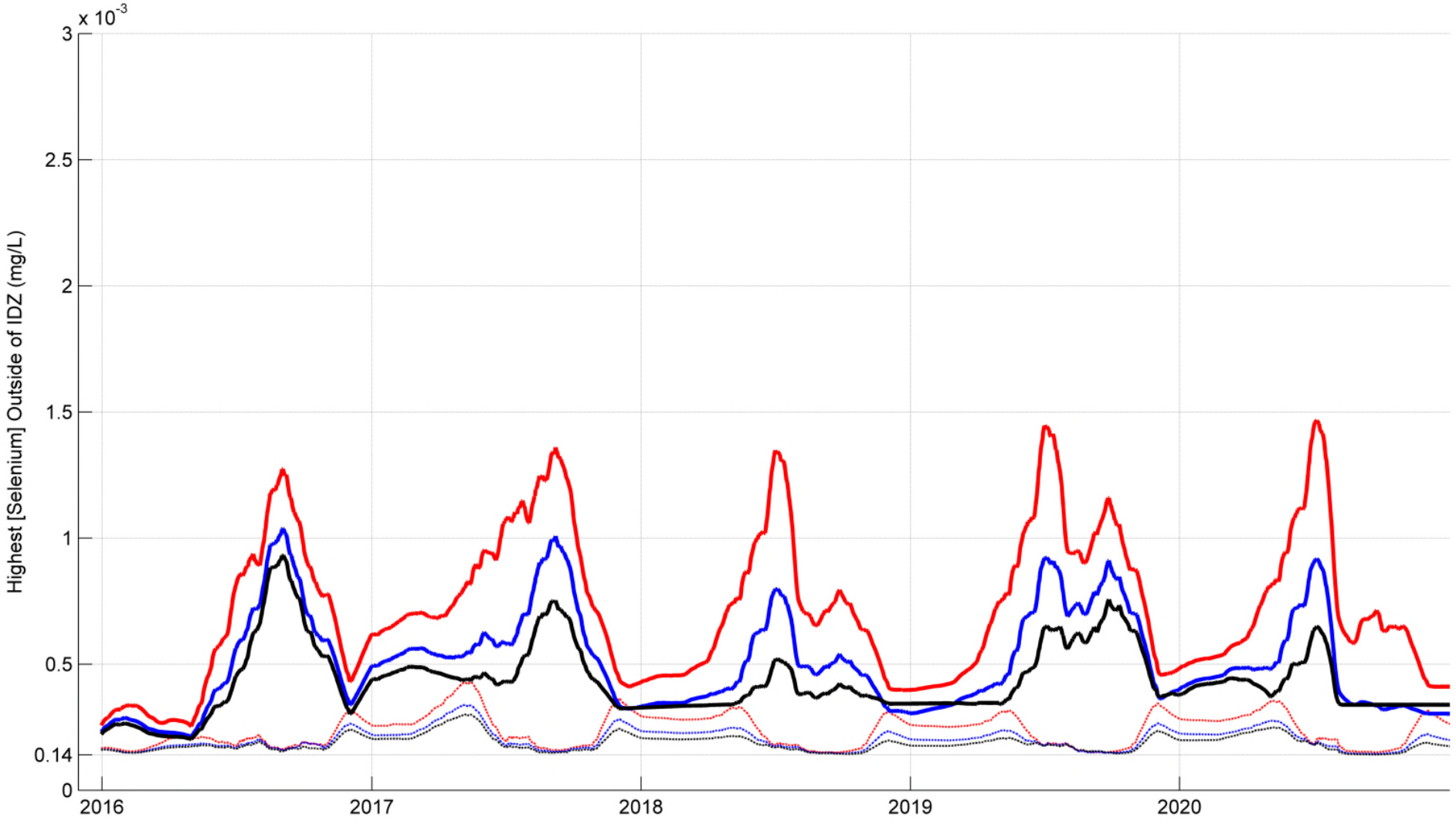
Simulated Dilution in Quesnel Lake "Detailed" Scenario Runs

TETRA TECH EBA

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE	DATE
Tetra Tech EBA - VANC	June 8, 2016

Figure 3.5



NOTES

Lines represent 30-day moving average.

95th Percentile WQ
surface
Median WQ
surface
5th Percentile WQ
surface

STATUS
ISSUED FOR USE

CLIENT
MPMC

TETRA TECH EBA

QUESNEL LAKE DIFFUSER MODELLING

Simulated Selenium in Quesnel Lake "Detailed" Scenario Runs

PROJECT NO.	DWN	CKD	APVD	REV
WTRM03015	DP	JAS	JAS	0

OFFICE: Tetra Tech EBA - VANC
DATE: June 15, 2016

Figure 3.6

APPENDIX A
TETRA TECH EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

HYDROTECHNICAL

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORTS AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. The report may include plans, drawings, profiles and other supporting documents that collectively constitute the report (the "Report").

The Report is intended for the sole use of Tetra Tech EBA's Client (the "Client") as specifically identified in the Tetra Tech EBA Services Agreement or other Contract entered into with the Client (either of which is termed the "Services Agreement" herein). Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Report when it is used or relied upon by any party other than the Client, unless authorized in writing by Tetra Tech EBA.

Any unauthorized use of the Report is at the sole risk of the user. Tetra Tech EBA accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Report.

Where Tetra Tech EBA has expressly authorized the use of the Report by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these General Conditions as well as any limitations on liability contained in the Services Agreement with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these General Conditions and the Services Agreement prior to making any use of the Report. Any use made of the Report by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Report and any other form or type of data or documents generated by Tetra Tech EBA during the performance of the work are Tetra Tech EBA's professional work product and shall remain the copyright property of Tetra Tech EBA.

The Report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Tetra Tech EBA. Additional copies of the Report, if required, may be obtained upon request.

2.0 ALTERNATIVE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of the Report or any drawings or other project-related documents and deliverables (collectively termed Tetra Tech EBA's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original. Tetra Tech EBA will archive the original signed and/or sealed version for a maximum period of 10 years.

Both electronic file and hard copy versions of Tetra Tech EBA's Instruments of Professional Service shall not, under any circumstances, be altered by any party except Tetra Tech EBA. Tetra Tech EBA's Instruments of Professional Service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 STANDARD OF CARE

Services performed by Tetra Tech EBA for the Report have been conducted in accordance with the Services Agreement, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Report.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of Tetra Tech EBA.

4.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless expressly agreed to in the Services Agreement, Tetra Tech EBA was not retained to investigate, address or consider, and has not investigated, addressed or considered any environmental or regulatory issues associated with the project.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with Tetra Tech EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for Tetra Tech EBA to properly provide the services contracted for in the Services Agreement, Tetra Tech EBA has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

6.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of this Report, Tetra Tech EBA may have relied on information provided by persons other than the Client.

While Tetra Tech EBA endeavours to verify the accuracy of such information, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

7.0 GENERAL LIMITATIONS OF REPORT

This Report is based solely on the conditions present and the data available to Tetra Tech EBA at the time the Report was prepared.

The Client, and any Authorized Party, acknowledges that the Report is based on limited data and that the conclusions, opinions, and recommendations contained in the Report are the result of the application of professional judgment to such limited data.

The Report is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present at or the development proposed as of the date of the Report requires a supplementary investigation and assessment.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design, in consideration of the level of the hydrotechnical information that was reasonably acquired to facilitate completion of the design.

The Client acknowledges that Tetra Tech EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

8.0 JOB SITE SAFETY

Tetra Tech EBA is only responsible for the activities of its employees on the job site and was not and will not be responsible for the supervision of any other persons whatsoever. The presence of Tetra Tech EBA personnel on site shall not be construed in any way to relieve the Client or any other persons on site from their responsibility for job site safety.

APPENDIX K

Best Available Technology Assessment of Closure Water Treatment

17 October 2016

REPORT ON:

Mount Polley Mine Closure Water Treatment BAT Assessment

Submitted to:
Mount Polley Mining Corporation
Box 12
Likely, BC
V0L 1N0

Attention: Mr. Luke Moger

REPORT

Reference Number: 1411734-203-R-Rev0-16000

Distribution:

1 Electronic Copy - Mount Polley Mining Corporation
1 Hard Copy - Golder Associates Ltd.

Golder Associates

Glossary of Terms

Abbreviation	Definition
BAT	best available technology
BC	British Columbia
BCR	biochemical reactor
COC	constituent of concern
COPC	constituent of potential concern
HDS	high density sludge
LDS	low density sludge
MPMC	Mount Polley Mining Corporation
TAR	Technical Assessment Report
TMT	trimercaptotriazine
TSS	total suspended solids
%	percent
km	kilometre
m^3/d	cubic metres per day
m^3/s	cubic metres per second
mg/L	milligrams per litre
mg/L (as N)	milligrams per litre as nitrogen
mol/m^3-day	moles per cubic metre per day

Executive Summary

The Mount Polley Mine is predicted to produce a surplus volume of mine contact water for the remainder of operations and into closure. The mine currently treats surplus mine contact water as required, using an Actiflo® water treatment plant (Actiflo Plant)—a high-rate coagulation, flocculation, and sedimentation process. A condition of Permit 11678 (an amended effluent discharge permit issued under the *Environmental Management Act*) is the development and implementation of a Long-Term Water Management Plan for the mine. The Long-Term Water Management Plan provides details of the discharge quantity and quality for the operations phase as its main focus, but also addressed closure and post-closure phases of the mine.

This document, the Mount Polley Mine Closure Best Available Technology Assessment, further supports the Long-Term Water Management Plan by providing a preliminary assessment of best available technology (BAT) for treatment of mine contact water during the closure and post-closure phases (closure BAT). The closure BAT assessment was based on the most recent information available for the predicted water qualities and quantities for various mine contact water sources; however, BAT assessments are intended to be revisited based on changing site conditions, and it is anticipated that such reassessment will be made as the mine's reclamation and closure plan and closure water management plan are updated.

This closure BAT assessment considered a predicted surplus volume of mine contact water of 17,000 m^3/d, which would need to be treated to remove three constituents of concern: total suspended solids, total copper, and total selenium. Recognizing that the water management plan and the water quality predictions will be updated as the closure plan is refined, the closure BAT assessment also considered constituents that are predicted to meet the target discharge water quality but that have the potential to be of concern: sulphate, total metals (other than copper), and nutrients (such as nitrate, ammonia, and phosphate).

The closure BAT assessment considered discharge targets that were set using the case where the assimilative capacity of the receiving environment during closure was assumed to be 40:1, the same value as during the operational phase. During the closure planning, the water management strategies will be refined, and the assimilative capacity for the closure water treatment assessment will be revised if needed.

To meet the discharge targets, a number of potential treatment technologies were screened using technology attributes such as complexity, robustness, ease of site implementation, commercially proven track record, waste management, adaptability, energy consumption and physical footprint. From this analysis, four technologies were shortlisted:

- passive pit lake treatment
- decentralized passive biochemical reactor treatment
- hybrid (semi-passive) treatment using a combination of active and passive components
- active optimized high-rate coagulation/flocculation and sedimentation (Actiflo)

The short-listed technologies were considered individually and in combinations to provide a holistic closure water treatment solution. Mine closure brings new opportunities for passive and hybrid treatment systems not afforded during operations due to the nature of the site and the mine plan. Site-wide water treatment strategies are envisioned to take advantage of opportunities to separate flows, treat individual loading sources, seek candidates for passive treatment, and seek opportunities for distributed discharges to pre-mining watersheds. Mount Polley Mining Corporation and stakeholders have expressed interest in fully evaluating passive and hybrid treatment systems, which would require demonstration of feasibility at the pilot scale on site before optimization and implementation at closure. Using a combination of short-listed technologies, two options were developed for closure/post-closure water treatment:

- Option A – Passive and hybrid treatment systems (applied to selected sources).
- Option B – Pit lake treatment followed by optimized Actiflo Plant.

With Option A there is the possibility to discharge directly to pre-development watersheds and waterways. However, this option is subject to refinement of closure water quality predictions and demonstration of certain innovative technologies, which are yet to be proven for the site conditions at the high flow rates considered. The further development of Option A would be dependent on the closure water management plan, which would define discharge locations. Therefore, Option B, with higher certainty for the site conditions at the high flow rates considered, is assessed to be the most viable option at present.

Table of Contents

GLOSSARY OF TERMS ..... **i**

EXECUTIVE SUMMARY ..... **ii**

1.0 INTRODUCTION **1**

1.1 Background 1

1.2 Supporting Documents 1

1.3 Objectives 2

2.0 DESIGN BASIS **3**

2.1 Flow 3

2.2 Water Quality and Targets 3

2.2.1 Constituents of Concern 3

2.2.2 Constituents of Potential Concern 5

3.0 TREATMENT TECHNOLOGY ALTERNATIVES **6**

3.1 Types of Treatment Systems 6

3.2 Treatment Technologies Matrix 6

3.3 Treatment Technologies Descriptions 8

3.3.1 High-Rate Coagulation/Flocculation and Sedimentation 8

3.3.2 pH Adjustment Metal Removal Processes 8

3.3.3 Sulphide Precipitation 8

3.3.4 Metal Co-precipitation 8

3.3.5 Membrane Processes 9

3.3.6 Selenium Removal Processes 9

3.3.7 Pit Lake Treatment 10

3.3.8 Biochemical Reactor 10

3.3.9 Constructed Aerobic Wetlands 10

3.3.10 Semi-passive (Hybrid) Treatment 11

3.4 Technology Screening 11

4.0 TREATMENT OPTIONS **13**

4.1 Option A – Decentralized Passive and Hybrid Treatment Systems 13

4.2 Option B – Pit Lake Treatment System followed by Actiflo 14

5.0 SELECTED OPTION 15

6.0 CONCLUSION 16

7.0 CLOSURE 17

REFERENCES 18

STUDY LIMITATIONS 19

TABLES

Table 1: Closure/Post-closure Predicted Concentrations and Proposed Limits 4

Table 2: Active and Passive Treatment Technologies Matrix 7

FIGURES

Figure 1: BAT Assessment Process Flow Diagram 2

1.0 INTRODUCTION

1.1 Background

The Mount Polley Mine is a copper-gold mine owned and operated by Mount Polley Mining Corporation (MPMC), a subsidiary of Imperial Metals Corporation. The mine site is located 56 km northeast of Williams Lake, British Columbia. Currently, the mine treats surface water using a high-rate coagulation, flocculation and sedimentation process, referred to as the Actiflo® water treatment plant (Actiflo Plant). An amended effluent discharge permit (Permit 11678) issued under the *Environmental Management Act* (EMA) currently allows discharge from the mine; however, the permitted discharge expires on 30 November 2017.

A condition of EMA Permit 11678 is the development and implementation of a Long-Term Water Management Plan for the mine. This Plan is provided as part of the Long-Term Water Management Technical Assessment Report (Long-Term TAR), to which this document is appended. The proposed Long-Term Water Management Plan provides details of the discharge quantity and quality for the operations phase as its main focus, but also discusses the closure and post-closure phases of the mine. It discusses in detail treatment technologies applicable to operations, but discusses only in conceptual terms treatment options related to closure and post-closure.

To further support the Long-Term Water Management Plan, a preliminary best available technology (closure BAT) assessment was prepared for closure/post-closure based on information available for the predicted site conditions, the details of which are provided in this document.

1.2 Supporting Documents

Below is a summary of water treatment work (presented in chronological order) that is related to the closure phase of the mine. Items referenced below are part of the prior work used to support and inform the closure BAT assessment.

- May 2015: Provided a Short-Term Water Treatment Plan (Golder 2015) for the Mount Polley Mine that was submitted in support of the Short-Term TAR, documenting the development of a water treatment option for excess mine contact water in the short-term. It also defined what BAT is in the context of the Short-Term Water Treatment Plan and described the water treatment options that were considered to support the short-term treatment of mine water.
- March 2016: Conducted a water treatment assessment (Golder 2016) during the development of a water treatment plan for the Long-Term TAR. Using a preliminary basis of design, the assessment included a review of active, passive, and semi-passive systems to aid in the preliminary identification of suitable water treatment systems for different mine-impacted water sources from the Mount Polley Mine.
- June 2016:
  - Developed a conceptual water treatment design as part of the Long-Term TAR (Appendix F of the Long-Term TAR). The intent of the design was to support the stated preference of MPMC and some stakeholders for the use of a passive water treatment system with return of water to pre-development watersheds.

- Prepared an operations water treatment plan to support the Long-Term TAR application (Appendix E of the TAR). The operations water treatment plan identified copper as the only parameter predicted to potentially exceed the proposed EMA Permit 11678 water quality limits during the operational phase of the mine. It described bench-scale test work initiated by MPMC to investigate copper removal using different reagents to support optimization of the existing Actiflo Plant to adapt it to seasonally high copper concentrations. The optimization would be achieved by increasing the polyaluminum chloride (PAC) dosages or adding trimercaptotriaine (TMT) reagent in addition to PAC to the feed water. The details of the optimization is described in the plan.
- Prepared the Water Quality Modelling Report to support the Long-Term TAR, from which the water quality data for the closure BAT assessment was extracted (Appendix D of the Long-Term TAR).
- Prepared the Mount Polley Mine Water Balance Report to support the Long-Term TAR, from which the flow rate for the closure BAT assessment was extracted (Appendix B of the Long-Term TAR).

1.3 Objectives

The objective of the closure BAT assessment is to screen technologies to select the best available technologies to apply for closure/post-closure treatment requirements, based on the information available for flow, water quality, and target water quality for discharge.

The assessment was carried out considering the BAT assessment method as outlined in Figure 1 below.

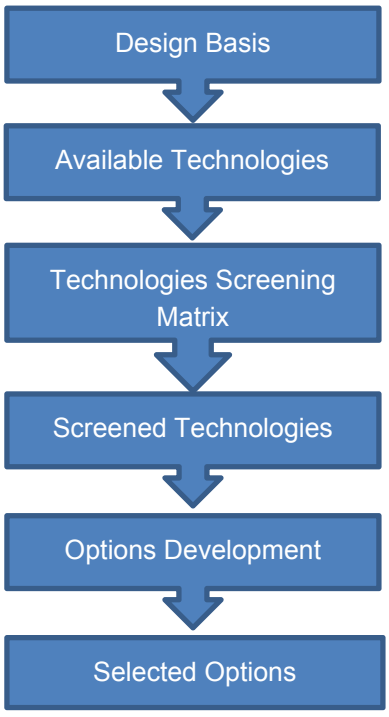


Figure 1: BAT Assessment Process Flow Diagram

2.0 DESIGN BASIS

2.1 Flow

The stochastic site water balance model (Appendix B of the Long-Term TAR) was used to predict post-closure flows for the period of July 2020 to 2100. The maximum of the 90th percentile monthly flows were modelled for closure/post-closure, and the average of these maximum monthly flows (i.e., 17,000 m^3/d) was selected as the design basis.

Typical mine closure activities are designed to reduce the volumes of water that require treatment. For example, waste materials may be covered or moved to mined-out pits, and a greater proportion of non-contact water may be diverted. Reclamation and closure planning research and updates provide an opportunity to revisit the design basis for the closure BAT. The next update to the Reclamation and Closure Plan is required to be submitted to the Ministry of Energy and Mines by 15 January 2017.

During closure, the mine will have the benefit of different water management opportunities such as:

- use of in-pit treatment after the pits are converted to end-pit-lake landforms
- use of decentralized treatment systems
- improved systems (i.e., landform design and covers) to reduce contact of water with mineralized materials, and thus, improved opportunities to divert clean water and provide distributed discharges to pre-mining watersheds

2.2 Water Quality and Targets

2.2.1 Constituents of Concern

As part of the closure/post-closure conceptual water treatment assessment, modelled discharge water qualities (Appendix D of the Long-Term TAR) for the Springer Pit and Perimeter Embankment Till borrow Pond for closure/post-closure were compared to the proposed effluent limits assuming a dilution ratio of 40:1 to identify constituents that may require treatment. The predicted concentrations and targets are presented in Table 1.

Table 1: Closure/Post-closure Predicted Concentrations and Proposed Limits

Parameter	Units	Proposed Effluent Discharge Limit	Closure		Post-closure	
			Springer Pit	Perimeter Embankment Till Borrow Pond	Springer Pit	Perimeter Embankment Till Borrow Pond
Major Ions						
Sulphate	mg/L	1,100	547	906	561	531
Nutrients						
Ammonia	mg/L (as N)	1.3	0.44	0.25	0.55	0.18
Nitrate	mg/L (as N)	34	17	25	17	17
Total phosphorus	mg/L	0.09	0.031	0.037	0.032	0.034
Total Metals						
Arsenic	mg/L	0.028	0.0018	0.0011	0.0021	0.0014
Chromium	mg/L	0.004	0.00092	0.0014	0.001	0.0016
Copper	mg/L	0.033	**0.047**	**0.072**	**0.061**	**0.053**
Iron	mg/L	1	0.71	0.78	0.71	0.77
Lead	mg/L	0.00082	0.00019	0.0002	0.0002	0.00021
Molybdenum	mg/L	0.36	0.16	0.22	0.16	0.12
Nickel	mg/L	0.0051	0.0018	0.0027	0.0019	0.002
Selenium	mg/L	0.075	**0.087**	**0.14**	**0.088**	0.069
Zinc	mg/L	0.059	0.0092	0.017	0.011	0.011

Notes:

Maximum 95th percentile predicted concentrations for Springer Pit and Perimeter Embankment Till Borrow Pond closure/post-closure water quality (refer to the TAR).

Values in red denote concentrations that exceed the proposed effluent discharge limit.

The proposed effluent discharge limits are based on the assimilative capacity of the receiving environment that are demonstrated in the operational phase.

For the closure/post-closure phase, total copper and selenium (in addition to suspended solids) were the only parameters expected to require treatment, and are thus identified as “constituents of concern” (COCs). The modelled values, however, may be conservative; but for the purpose of the closure BAT assessment, both constituents will be considered to require treatment. In making this consideration, is noted that the maximum of the 95th percentile modelled selenium concentration (0.088 mg/L) was only marginally higher than the proposed EMA Permit 11678 effluent limit of 0.075 mg/L.

Typical mine closure activities are designed to reduce the loads of COCs that require treatment. The design basis for the closure BAT is planned to be re-evaluated following the 15 January 2017 Reclamation and Closure Plan update.

2.2.2 Constituents of Potential Concern

During operations, the water quality model will need to be validated, and decentralized treatment options along with flow diversion will need to be assessed. Therefore, there is a potential that treatment for other constituents may be required during closure/post-closure. The following have been identified as being “constituents of potential concern” (COPCs):

- sulphate
- total metals (other than copper)
- nutrients (nitrate, ammonia, phosphate)

3.0 TREATMENT TECHNOLOGY ALTERNATIVES

3.1 Types of Treatment Systems

Water treatment systems can be classified as active or passive, with a combination of these two systems being referred to as semi-passive or hybrid systems.

Conventional active treatment systems require control systems, regular reagent and labour inputs, and typically rely on electrical and mechanical processes for routine operation, all of which contribute to the operating costs. Although not limited by narrow operational parameters (as may be the case of passive systems), sustainability considerations may determine the viability of active treatment systems.

Passive treatment systems harness naturally available means such as microbial activity and topography to treat mine contact water, and may require regular but infrequent maintenance to operate successfully over the system life. Passive systems, by their nature, are more suited to continuous flows and loadings, because they do not feature internal process control mechanisms to react to changes in the feed water. By the same token, passive systems typically operate at a lower treatment efficiency than active systems. Relative to active treatment systems, conventional passive treatment systems often require a large land area for large flows (such as the combined site-wide flow at the mine), making conventional passive treatment impractical for such cases (or more suited to treatment of multiple, smaller, streams of flow).

Hybrid systems have been developed for three major purposes: to mitigate the large land area of passive systems, to provide a basic level of process control and thus improve efficiency, and to introduce active treatment unit processes to the treatment train to allow for the treatment of a wider range of COCs. Hybrid systems, however, have only been demonstrated in selected situations at a small number of commercial installations, and therefore require a higher level of effort, and a longer schedule, to demonstrate and optimize the systems.

3.2 Treatment Technologies Matrix

An assessment was carried to identify technologies capable of removing the COCs and COPCs. The qualified technologies are listed in Table 2. They were compared using the following treatment attributes:

- commercially proven
- system complexity
- system robustness
- ease of site implementation
- waste management requirements
- footprint

Table 2: Active and Passive Treatment Technologies Matrix

Type of Treatment	Technologies	Examples/Processes	Attribute Ratings						Score	COCs			COPCs		
			Commercially Proven	Complexity	Robustness	Ease of Site Implementation	Waste Management	Footprint		TSS	Copper	Selenate	Sulphate	Metals	Nutrients (nitrate, ammonia, phosphate)
Active Treatment	High-rate coagulation/flocculation and sedimentation	Actiflo (including optimization) [a]	3	2	3	3	2	3	16	●	●			●	
	pH adjustment – metal removal processes	HDS, LDS	3	2	3	1	2	2	13	●	●		○	●	
	Sulphide precipitation – metals removal	Sulphide reagents	3	2	3	2	2	3	15	○	●			●	
	Metal co-precipitation processes	Iron/aluminum co-precipitation	3	2	3	2	2	3	15	○	●	○		●	
	Membrane processes	Nano filtration / reverse osmosis (HiPro)	3	1	1	1	1	2	9	●	●	○	●	●	○
	Selenium removal processes	Biological processes: - ABMET (GE) - FBR (Envirogen) - SeHAWK (Frontier)	 3 2 2	 1 1 1	 2 2 2	 1 1 1	 1 1 1	 3 3 3	 11 10 10	●	○	●			●
		Physical/chemical processes: - SeleniumZero® (Veolia) - SelenIX (BioteQ)	 2 1	 1 1	 2 3	 1 1	 1 2	 3 3	 10 11	●	○	●		○	
Passive Treatment	Pit lake treatment	Combination of biochemical, co-precipitation, and/or sedimentation processes. Also applicable to saturated granular fills	2	3	2	3	3	2	15	●	●	●	○	○	○
	Biochemical reactor (BCR)	Metals, selenium removal	1	3	2	1	2	2	11	●	●	●	○	●	●
	Aerobic wetlands	Free water surface constructed wetlands	2	3	2	1	2	1	11	○	○			○	●
	Hybrid treatment	A hybrid or semi-passive treatment technology that combines active and passive components	1	3	3	2	2	2	13	●	●	●	○	●	○

Notes:

Rating scores of 1, 2, and 3 denotes the relative performance scores of a specific technology based on certain water treatment attributes, with “3” being most favourable and “1” least favourable.

● Denotes technologies that will certainly remove the constituents of concern.

○ Denotes technologies that may remove the constituents of concern.

a) A high rate coagulation/flocculation and sedimentation process optimized to allow further removal of copper concentrations through the addition of a trimercaptotriazine (TMT) dosing system or higher PAC dosages.

COCs = constituents of concern; COPCs = constituents of potential concern; TSS = total suspended solids; HDS = high density sludge process; LDS = low density sludge process.

3.3 Treatment Technologies Descriptions

3.3.1 High-Rate Coagulation/Flocculation and Sedimentation

Veolia's Actiflo clarifier model ACP-650 is currently in operation at the mine. The Actiflo clarifier system consists of a high-rate coagulation, flocculation, and sedimentation process that uses microsand as ballast during floc formation to accelerate settling. The process can be optimized to remove metal constituents.

The system installed at the mine has a design treatment capacity rate of 0.23 m^3/s, and it currently removes a portion of the total suspended solids and metal constituents. Extending the operation of the existing unit can be considered for closure and post-closure scenarios, taking advantage of the optimizations that will be made during operations to allow further removal of trace copper through the addition of organosulphides such as TMT or higher dosages of PAC. For more information on the optimized Actiflo Plant, refer to Appendix E of the Long-Term TAR. The Actiflo system, optimized to remove metals using organosulphides, is referred to as the "optimized Actiflo" system.

3.3.2 pH Adjustment Metal Removal Processes

The low density sludge (LDS) process is one of the most commonly used active treatment processes for mine water treatment. Through the addition of a neutralizing reagent (usually lime), the pH is increased to facilitate metal hydroxide precipitation. The system consists of a reagent mixing and dosing stage, a reaction stage with mechanical mixing and aeration if necessary, followed by a flocculation and clarification stage. Low density, high volume sludge is produced, which is usually disposed of on site.

The high density sludge (HDS) process employs the same treatment principles and components as the LDS process, but has the added feature that a portion of the sludge is recycled back to the first stage of neutralization. The recycled sludge is mixed with the added lime to increase the sludge density (hence the name of the process). This feature allows more efficient reagent use, as well as progressively increasing the sludge density to limit the volume and cost of sludge handling required.

3.3.3 Sulphide Precipitation

Dissolved metals can be treated through sulphide precipitation, where the precipitate can either form as a metal sulphide or as an organosulphide complex, depending on the added reagent. In some cases, the feed metals can be recovered in a saleable form to help offset the costs of the reagent. Depending on the target metal, the pH is adjusted and sulphide reagent dosed as a solution (as sodium hydrosulphide or organic sulphide) with or without iron or aluminum salts. The system consists of reagent dosing stage, followed by a flocculation and clarification stage. More complete removal of some metals can be achieved than through the conventional lime-based LDS or HDS processes due to the low solubility of many metal sulphide precipitates.

3.3.4 Metal Co-precipitation

Due to their capacity to adsorb some metals as well as oxyanions (e.g., arsenic and molybdenum), iron oxyhydroxides can be used to co-precipitate with dissolved metals. Fine or colloidal solids are also efficiently removed. The process uses pH adjustment and specific iron dosages to achieve metal removal through process units similar to those used in lime and sulphide removal processes.

3.3.5 Membrane Processes

The membrane provides an electro-physical barrier and allows the separation of ionic species from a fluid. In a membrane process, feed water is separated into a product water stream and a concentrate or brine stream. The selected species are removed from the feed and concentrated in the brine stream. The process recovery, defined as the ratio of product water flow to brine flow, varies depending on the water chemistry, subject to constraints of scaling and the osmotic gradient across the membrane. Membrane processes are limited by colloidal, organic, or biological fouling of membranes, as well as chemical precipitation (scaling). To prevent fouling, the feed to reverse osmosis membrane systems usually requires pre-treatment in the form of chemical addition and filtration. Although recoveries of up to 99% can be achieved in multi-stage reverse osmosis systems with inter-stage precipitation (e.g., the HiPRO process), the brine retentate and sludge produced require appropriate disposal.

3.3.6 Selenium Removal Processes

The soluble oxyanions selenate and selenite are the most common forms of selenium in mine waters. These more soluble selenium forms have high mobility rates. Because selenite is more reactive than selenate, some treatment processes involve the reduction of selenate to selenite as part of the treatment process.

Biological treatment technology relies on biological reduction of the dissolved form (selenate/selenite) to the stable particulate elemental selenium form, which can be removed through a filtration step. This can be achieved in a fixed bed bioreactor (ABMet by GE), a fluidized bed (FBR by Envirogen), or a combination of the two (SeHAWK by Frontier).

Chemical/physical treatment approaches include making use of an ion exchange process with electrochemical reduction and precipitation (used in the SelenIX process by BioteQ), or using zero valent iron to enable sorption/co-precipitation of dissolved selenium (SeleniumZero by Veolia). Reduced iron salts (ferrous chloride or sulphate) have also been shown to reduce selenate to selenite and coprecipitate selenite.

More information on these selenium removal processes can be obtained directly from the vendors' websites:

- ABMet (GE): http://www.gewater.com/products/abmet-selenium-removal.html
- FBR (Envirogen): http://www.envirogen.com/pages/contaminants/selenium-2/
- SeHAWK (Frontier): http://frontierwater.com/
- Selen-IX (BioteQ): http://www.bioteq.ca/technology-solutions/selenium/
- SeleniumZero (Veolia): http://www.veoliawatertech.com/news-resources/datasheets/selenium-removal-veolia.htm

3.3.7 Pit Lake Treatment

In situ pit lake treatment is a process that promotes water treatment through biological and sedimentation processes. The biological treatment process involves amending surface water with the required nutrients, including organic carbon and phosphorus, to promote anaerobic treatment. The goal of in situ treatment is to create and maintain reducing conditions in the deeper portions of the water column to sequester constituents of concern, such as selenium and metals, within the lake sediments. The sedimentation process allows constituents associated with settleable solids to be removed by gravity.

The biological process relies on the same anaerobic microbial selenate and selenite-reduction processes as active and passive biological treatment. Nitrate is removed by the process of denitrification, wherein microbes facilitate the reduction of nitrate to nitrogen gas. The nitrate is reduced prior to selenium reduction due to the thermodynamics of the reactions. Therefore, the effectiveness and cost of selenium treatment depends on the presence of nitrate. Similarly, sulphate reduction also occurs with pit lake treatment which leads to dissolved metal removal via metal sulphide precipitation. Divalent metals including copper can be removed via this mechanism.

A similar anaerobic process has been postulated for saturated granular fills. Such zones are made up of pits and other mine cavities that are backfilled with waste rock material and allowed to be saturated with water, where anaerobic conditions may be encouraged, and where the mine water may be allowed to pass through.

3.3.8 Biochemical Reactor

A biochemical reactor (BCR) is an engineered passive treatment system that uses an organic substrate to optimize microbial and chemical reactions, thus removing metals and sulphate and increasing the pH of the water. The organic substrate is made up of wood chips, manure, and straw, and is normally mixed in varying ratios with limestone sand.

A BCR can be effective in removing copper, selenium, and sulphate from water. Metals precipitate as metal-sulphide or carbonates. In cold climates, the BCR could be covered with an insulating layer. The design (and footprint) of the BCR is driven by the loading rates of the targeted constituents: nitrate, selenium, metals, and sulphate.

A BCR can introduce new contaminants, such as increased sulphide concentrations, nutrients, and biochemical oxygen demand. Therefore, downstream polishing is normally required, which can consist of sulphide removal, aerobic ponds and wetlands, or sedimentation.

3.3.9 Constructed Aerobic Wetlands

Constructed aerobic wetlands are manmade structures designed to mimic processes occurring in natural wetlands in removing pollutants from the water. In wetlands, there are high degrees of interaction between soil chemistry, nutrient cycles, and habitat, among others. An aerobic constructed wetland consists of a shallow, lined basin filled with substrate, covered by open water, and often with aquatic plants. Although both anaerobic and aerobic bacteria can exist in aerobic wetlands, aerobic conditions tend to prevail because of the open water surface. An aerobic constructed wetland is typically provided as a polishing step following biological treatment of wastewater, such as a BCR or a hybrid system.

3.3.10 Semi-passive (Hybrid) Treatment

Active and passive systems may be used in conjunction to improve treatment efficiency and minimize footprint and costs, while giving flexibility to treat a variety of flows and loads. Under these conditions, they are called “hybrid” or “semi-passive” treatment systems. For instance, in a semi-passive treatment system, nutrients or chemicals may be added using metered pumps (active components) upstream of passive components (e.g., pit lake, BCR, or wetland), or active treatment technologies (e.g., Actiflo or active selenium treatment) may be used as a polishing process or ”fail-safe” system downstream of a passive system to comply with receiving environment water quality limits.

3.4 Technology Screening

When comparing the different treatment technologies provided in Table 2, key water treatment attributes and the effectiveness of treatment (i.e., removal efficiency) were considered. Based on the attribute ratings scores, the top three active and passive technologies were shortlisted as closure BAT:

- high-rate coagulation/flocculation and sedimentation (optimized Actiflo Plant)
- sulphide precipitation – metals removal
- metal co-precipitation processes
- pit lake treatment
- BCR
- hybrid (semi-passive) treatment

While some technologies score high on key attributes, they do not provide adequate COC removal. Others (e.g., membrane processes) provide adequate COC and COPC removal, but score low on key attributes, such as system complexity. Similarly, even though aerobic wetlands has the same attributes score as BCR, it is not shortlisted as it does not provide adequate COC removal.

Selenium removal technologies are distinct; therefore, selenium removal was a key determinant in the selection of technology. The active biological or physical/chemical selenium removal processes are capable of meeting selenium targets, but the technologies typically rated lower than passive or hybrid systems on complexity, ease of implementation and/or waste management. Currently, during the operations phase, selenium removal is not required and not practised. Planned work to update the reclamation and closure plan and closure water management plan will elucidate the issue of future selenium management requirements.

Several other active treatment technologies were considered, but these rated lower from the point of view of complexity, ease of implementation, sustainability, and waste management. Conventional active treatment technologies such as lime treatment do not meet the requirements to remove all the anticipated COCs. When considering the COPCs, the complexity of the active systems becomes even greater.

The passive and hybrid systems rated well for simplicity and sustainability, but the performance of the systems needs to be verified through further work on site. The passive and hybrid systems under consideration include a biological treatment element, which is well suited to the list of COCs and COPCs.

Most of the technologies shortlisted above likely cannot be implemented as standalone solutions, but require further optimization and site integration to meet the discharge criteria. These modified concepts are presented as treatment options in the next section.

4.0 TREATMENT OPTIONS

Based on the shortlisted closure BAT treatment technologies identified above, treatment options that would be suited for closure/post-closure water treatment were developed. The holistic or site-wide water treatment BAT assessment needs to take advantage of opportunities to separate flows, treat individual loading sources, seek candidates for passive treatment, and seek opportunities for distributed discharges to pre-mining watersheds, through the closure planning process.

Two options were selected for further consideration and are listed below and followed by more detailed descriptions:

- Option A – Decentralized passive and hybrid treatment systems (applied to selected sources).
- Option B – Passive or hybrid pit lake treatment followed by optimized Actiflo Plant.

In Option A, a set of decentralized treatment systems is expected to be built upon closure. The closure BAT is designed to take advantages of the features, such as the pit lake treatment, that are not possible during operations.

In Option B, the passive and hybrid systems would act as pre-treatment, then the effluent and diversions would be combined or centralized and passed through the Actiflo Plant in the current location.

A conventional centralized passive system, for which a conceptual design was developed, was seriously considered as an option. However, upon further review, which included a benchmarking analysis where the conceptual design was compared with projects of similar design basis and scale, it was deemed to be impractical at the mine site and was dismissed. One of the determining factors in the dismissal was that the land area (i.e., footprint) would have been prohibitively large for the given (centralized) flows and loads. Another factor is the performance limitations, and in particular the treatment efficiency, of such systems as demonstrated in benchmark cases for the flows and corresponding configurations considered. Elements of this option have been retained as an alternative passive approach, tailored to the most suitable flows and loads. Updates to the closure water management plan would feed into the selection of specific streams suitable for passive treatment. A hybrid passive system also has potential for application in this system, although it is not commercially proven.

4.1 Option A – Decentralized Passive and Hybrid Treatment Systems

Decentralized passive or hybrid treatment systems utilize the main strengths of passive systems, while avoiding some weaknesses through selective application of the technologies. A system could be tailored as modular units at specific water sources. The net effect is intended to reduce the loadings of the COCs in the overall water management systems. The pit lake treatment system could become a part of the decentralized treatment system, designed to handle some of the highly variable flows.

The concept of decentralized passive or hybrid systems is therefore dependent on the updates to the closure water management plan and the updates to the closure water quality plan. The application of the technology will necessarily be developed in conjunction with water management systems in order to predict the assimilative capacity of the combined flows and the receiving bodies. The concept also depends on planned pilot work specific to the Mount Polley mine site to demonstrate some of the innovative, but not commercially proven, concepts.

4.2 Option B – Pit Lake Treatment System followed by Actiflo

This option would use the existing active treatment system in conjunction with the passive treatment capabilities of pit lake treatment. Currently, sedimentation is taking place in Springer Pit. The Springer Pit and Wight Pit have potential for in situ pit lake treatment for passive selenium removal, and could also serve as sedimentation basins with partial solids and metals removal in closure.

In the current water management infrastructure arrangement, water from the Springer Pit is conveyed to the optimized Actiflo Plant. The Actiflo Plant uses chemical addition to achieve further metal precipitation and solids removal. Since both the Springer Pit and the optimized Actiflo Plant would be existing features at closure, a limited amount of new operational components is required to implement this portion of the semi-passive treatment system.

One of the disadvantages of this option is that it is tied to a central treatment facility that relies on sufficient dilution in the receiving waterbody. Due to the sulphate concentration in the mine water, this treatment system is likely not suitable for direct discharge to all receiving waterbodies without dilution. Another constraint is that this system, under the current water management infrastructure arrangement, requires site water with elevated selenium to be routed via Springer Pit, which implies a central collection system. Incorporation of the Wight Pit as another location for in situ pit treatment and piloting of pit lake treatment on site is required.

5.0 SELECTED OPTION

As previously identified by MPMC, Option A would be, if practical, preferred for its advantages, including the possibility to discharge directly to pre-development watersheds and waterways. Option A, however, is subject to important constraints, including the performance limits of such systems, and the available land area. Therefore, the preference for Option A is subject to updates to closure water management systems, and subject to further work to refine the performance criteria at the bench and pilot scale. The system also has the advantage of requiring low long-term maintenance.

A conceptual design for a pilot passive and semi-passive treatment systems is provided in Appendix F of the Long-Term TAR. As part of future studies, MPMC may also consider other types of active systems if use of hybrid or passive treatment systems are not proven to be feasible through future research or piloting studies.

Due to the uncertainties associated with Option A, Option B is selected as the most viable option at present, and is considered BAT for the Mount Polley Mine at closure.

6.0 CONCLUSION

Mine closure brings new opportunities for passive and hybrid treatment systems not afforded during operations due to the nature of the site and the mine plan. To meet the treatment requirements for the predicted surplus volume of mine contact water at closure, a number of potential treatment technologies were screened and evaluated. From these, four technologies were shortlisted as closure BAT:

- pit lake treatment
- decentralized BCR
- hybrid (semi-passive) treatment
- high rate coagulation/flocculation and sedimentation (optimized Actiflo Plant)

Several active treatment technologies were considered, but these rated lower from the point of view of complexity, ease of implementation, sustainability, and waste management. Conventional active treatment technologies such as lime treatment do not meet the requirements to remove all the anticipated COCs.

The technologies shortlisted above likely cannot be implemented as standalone solutions, but require further optimization (or combination) and site integration to meet discharge criteria. Using these BAT, two treatment options were developed that would be best suited for closure/post-closure water treatment:

- Option A – Decentralized passive and hybrid treatment systems (applied to selected sources).
- Option B – Passive or hybrid pit lake treatment followed by optimized Actiflo Plant.

Although Option A is preferred, the uncertainties that remain around this passive treatment option need to be addressed and the system needs to be optimized through pilot testing, which makes Option B the most viable option at this stage, and is currently considered BAT for the Mount Polley Mine at closure.

The closure BAT assessment was based on the most recent information available for the predicted water qualities and quantities for various mine contact water sources; however, BAT assessments are intended to be revisited based on changing site conditions, and it is anticipated that such reassessment will be made as the mine's reclamation and closure plan and closure water management plan are updated. The next update to the Reclamation and Closure Plan is required to be submitted to the Ministry of Energy and Mines by 15 January 2017.

7.0 CLOSURE

We trust the above meets your present requirements. If you have questions or additional requirements, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Thalita da Silva Sympovsky, MEng, PEng
Environmental/Process Engineer

Henlo du Preez, BEng
Water Treatment Specialist

Michael Bratty, MSc, PEng
Associate, Senior Water Treatment Engineer

TdSS/HDP/MB/cf/it/kp

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

o:\final\2014\1421\1411734\1411734-203-r-rev0-16000\1411734-203-r-rev0-16000-closure bat assessment 17oct_16.docx

REFERENCES

Golder (Golder Associates Ltd.) 2015. *Proposed Water Treatment System for Short-Term Water Treatment*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-033-TM-Rev0-12000. 29 May 2015.

Golder. 2016. *Mount Polley Long-Term Water Management – Identification of Feasible Water Treatment Systems*. Prepared for Mount Polley Mining Corporation. Golder Doc. No. 1411734-130-TM-Rev0-16000. 1 June 2016.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation (MPMC). It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by MPMC, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. MPMC may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates

APPENDIX L

Development of a Molybdenum Screening Value for the Impact Assessment

TECHNICAL MEMORANDUM

DATE 17 October 2016 **REFERENCE No.** 1411734-173-TM-Rev0-16000

TO Dale Reimer, General Manager
Mount Polley Mining Corporation

CC Elaine Irving and Jerry Vandenberg

FROM Lilly Cesh and Trish Miller **EMAIL** Lilly_Cesh@golder.com;
Trish_Miller@golder.com

DEVELOPMENT OF A MOLYBDENUM SCREENING VALUE FOR THE IMPACT ASSESSMENT

Golder Associates Ltd. is pleased to provide Mount Polley Mining Corporation with the following technical memorandum describing the approach adopted to develop a screening value for molybdenum as a component of the impact assessment in support of the permit amendment application for a long-term water discharge system under the *Environmental Management Act* for Permit 11678 for the Mount Polley Mine (the Mine). The following analysis is intended to support Operations and Closure planning for the Mine.

1.0 INTRODUCTION

Molybdenum is an essential trace metal required for adequate mammalian nutrition; however, high concentrations in diet or drinking water can result in molybdenosis (Eisler 1989). Molybdenosis is a copper-deficiency disease, which is caused by the depressing effect of molybdenum on the physiological availability of copper (Erdmen et al. 1978). Ruminants, in particular cattle, have been shown to be the most sensitive mammals to molybdenosis (Erdman et al. 1978; Ward 1978; Swain 1986; Eisler 1989). Symptoms of molybdenosis in cattle are diarrhea, weight loss, depigmentation, reproductive impairment, alteration of endocrine and pituitary systems, impaired immune function, fragile bones, and occasionally death (Anke et al. 2010; Swain 1986; Telfer et al. 2004). Molybdenum related toxicity is more frequently observed in animals when the copper to molybdenum ratio in their diet is low (Swain 1986).

The BC water quality criteria for molybdenum protective of livestock and wildlife water supply derived according to rationale provided in Swain (1986) is not based on toxicological effects. Therefore, it is not a useful screening value for evaluating the potential for effects on these receptors due to predicted changes in water quality. To support the impact assessment, a screening value was developed based on a literature review of the toxicity of molybdenum to livestock and wildlife focusing on exposure from drinking water. A summary of the results is presented below.

CANADA'S BEST MANAGED COMPANIES Platinum member

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

2.0 TOXICITY OF MOLYBDENUM IN DRINKING WATER TO LIVESTOCK AND MAMMALIAN WILDLIFE

Available molybdenum toxicity data have been summarized by the US Fish and Wildlife Service (Eisler 1989). The majority of the studies on effects of molybdenum to mammals have been conducted on livestock (primarily cattle and sheep), and only one livestock study (Kincaid 1980) exposed the study animals to molybdenum via drinking water. Kincaid (1980) exposed calves to 0, 1, 10, and 50 mg/L ammonium molybdenum (less than 1, 1, 8, and 53 mg/L molybdenum) in drinking water for 21 days. Calves were fed a diet containing 0.29% sulfur, 13 mg/L copper, and less than 1 mg/L molybdenum. The study showed no effect on liver and plasma copper levels, growth, or food and water consumption up to 10 mg/L ammonium molybdenum (Kincaid 1980). Calves exposed to the highest dose (50 mg/L ammonium molybdenum) showed a shift in the copper distribution in blood and copper bioavailability. The study concluded that toxic effects of molybdenum to calves exposed via drinking water was at a concentration between 10 and 50 mg/L ammonium molybdenum (Kincaid 1980). The US Fish and Wildlife Service proposed a molybdenum criteria for the protection of cattle (the most sensitive mammal) exposed via drinking water of less than 10 mg/L based on the minimum toxic concentration between 10 and 50 mg/L for calves from the Kincaid (1980) study (Eisler 1989).

Toxicity data on molybdenum effects to mammalian wildlife is limited, although the available data suggest that domestic livestock are at greater risk (Swain 1986; Eisler 1989). In addition, Swain (1986) suggested that wildlife would be less susceptible to molybdenosis than livestock because wildlife are not confined to one area and will forage from a variety of food sources. The most relevant exposure route for molybdenum uptake by wildlife ruminants, such as deer and moose, is through their plant-based diet rather than directly via drinking water (Swain 1986).

A mule deer (*Odocoileus hemionus*) study showed that this species was at least 10 times more tolerant to high levels of dietary molybdenum than domestic ruminants (Nagy et al. 1975). Female mule deer showed no apparent effects after 33 days on diets containing up to 200 mg Mo/day, or after 8 days at 1,000 mg Mo/day. Only slight effects such as a reduction in food intake and some animals with diarrhea were observed at diets of 2,500 mg Mo/day for 25 days (Nagy et al. 1975). Dietary concentrations of 5,000 and 7,500 mg Mo/day resulted in a reduction in food intake; however, recovery began almost immediately once the animals were switched back to an uncontaminated diet (Nagy et al. 1975).

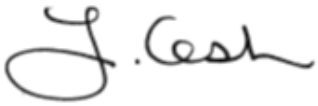
3.0 PROPOSED SCREENING VALUE FOR MOLYBDENUM

Based on the available toxicity data for molybdenum discussed above, effects to livestock occur between 10 and 50 mg/L and effects to wildlife are at even higher molybdenum concentrations. As a result of this literature review, the aquatic life 30-day guideline of 1 mg/L was compared to predicted concentrations at the initial dilution zone of Quesnel and Bootjack Lakes. Based on the available information, this guideline was considered protective of other receiving environment uses including potential effects on livestock and wildlife.

4.0 CLOSURE

We trust that the information provided in this technical memorandum is sufficient for your present needs. If you have any questions, please do not hesitate to contact the undersigned at (604) 296-4200.

GOLDER ASSOCIATES LTD.



Lilly Cesh, MET, RPBio
Environmental Scientist

Trish Miller, MSc, RPBio
Associate, Senior Environmental Scientist

LC/TM/pn/kp

Attachment: Study Limitations

o:\final\2014\1421\1411734\1411734-173-tm-rev0-16000\1411734-173-tm-rev0-16000-molybdenum screening value 17oct_16.docx

REFERENCES

Anke M, Seifert M, Arnhold W, Anke S, and Schafer U. 2010. The Biological and Toxicological Importance of Molybdenum in the Environment and in the Nutrition of Plants, Animals, and Man. Acta Alimentaria 39(1):12–26.

Eisler R. 1989. Molybdenum Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review. Contaminant Hazard Reviews, Report No. 19, Biological Report 85(1.19), US Fish and Wildlife Service, Patuxent Wildlife Research Centre, Laurel, MD. August 1989.

Erdmen JA, Ebens RJ, Case AA. 1978. Molybdenosis: A Potential Problem in Ruminants Grazing on Coal Mine Spoils. Journal of Range Management 31(1):34-36.

Kincaid RL. 1980. Toxicity of Ammonium Molybdate Added to Drinking Water of Calves. Journal of Dairy Science 63:608-610.

Nagy JG, Chappell W, and Ward GM. 1975. Effects of high molybdenum intake in mule deer. Journal of Animal Science. 41:412.

Swain LG. 1986. Water Quality Criteria for Molybdenum. Ministry of Environment and Parks, Province of British Columbia, October 1986.

Telfer SB, NR Kendall, DV Illingworth, AM Mackenzie. 2004. Molybdenum Toxicity in Cattle: an Underestimated Problem. Cattle Practice 12:259–263.

Ward G. 1978 Molybdenum Toxicity and Hypocuprosis in Ruminants: A Review. Journal of Animal Science 46:1078-1085.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

APPENDIX M

Selenium Management Plan

17 October 2016

MOUNT POLLEY MINE

Selenium Management Plan

Submitted to:
Mount Polley Mining Corporation
Box 12
Likely, BC
V0L 1N0

Attention: Mr. Dale Reimer

REPORT

Reference Number: 1411734-172-R-Rev0-16000

Distribution:

1 Electronic Copy - Mount Polley Mining Corporation
1 Hard Copy - Golder Associates Ltd.

Golder Associates

Table of Contents

1.0 INTRODUCTION 1

2.0 REGULATORY CONTEXT 2

2.1 Relevant Guidelines for Selenium 2

2.2 Derivation of Site Performance Objectives and Science-Based Environmental Benchmarks 4

3.0 PREDICTED SELENIUM RELEASES 5

4.0 COMPLIANCE AND ENVIRONMENTAL PROTECTION GOALS 6

4.1 Approved Short-Term Discharge 6

4.2 Operations 6

4.3 Closure 7

5.0 MANAGEMENT, MITIGATION, AND CONTINGENCY MEASURES 8

6.0 RECOMMENDED MONITORING 10

6.1 Short-Term Discharge 10

6.2 Operations 10

6.3 Closure 11

7.0 CLOSURE 12

REFERENCES 13

STUDY LIMITATIONS 14

TABLES

Table 1: Relevant Regulatory Guidelines for Selenium: Draft, Interim, and Approved 3

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) is pleased to provide Mount Polley Mining Corporation (MPMC) with the following Selenium Management Plan (SeMP) as a strategic framework for the management of selenium releases from the Mount Polley Mine (the Mine). The overarching goal of the SeMP is to avoid potential adverse environmental effects, using a proactive rather than reactive approach to selenium management.

The framework outlined in this SeMP is based on detailed information provided in the *Mount Polley Mine: Resumed Operations and Closure Water Management Plan. Permit Amendment Application under the Environmental Management Act: Technical Assessment Report* (the TAR). This SeMP is intended to be a living document and will be updated as new information related to site conditions and applied or tested treatment technologies becomes available. The data gathered in monitoring and investigative studies will become part of the information base for further decisions concerning selenium management at the Mine.

The strategy for managing selenium releases at the Mine considers the following phases of effluent discharge and the compliance conditions specific to each (see Section 4.0):

- approved short-term discharge (November 2015 to November 2017, or earlier)
- operations (November 2017 to closure)
- closure (July 2020)

During approved short-term discharge and operations, site water is, or is proposed to be, directed through a water treatment plant engineered to actively remove particulate constituents (as well as copper for the operations period) from the effluent. During closure, passive or semi-passive treatment technologies will be considered, where possible, and an adaptive management approach is expected to be needed to manage treated effluent quality to comply with closure effluent permit limits.

The main objectives of the SeMP are as follows:

- providing a framework to proactively protect ecological receptors from potential adverse environmental effects related to mining-related inputs of selenium from the Mine
- identifying environmental management and protection goals focussed on meeting existing or anticipated permit requirements
- supporting the proactive management of potential selenium-related issues to avoid environmental liabilities

2.0 REGULATORY CONTEXT

Selenium releases are currently a focus area for regulatory bodies as scientific understanding of the interaction of the element with receiving environments increases. British Columbia (BC) ambient Water Quality Guidelines (WQGs) establish objectives for selenium for the protection of aquatic life. The BC WQGs for selenium were updated in 2014 to provide guidelines for aquatic life, wildlife, and health-based tissue guidelines.

2.1 Relevant Guidelines for Selenium

From a regulatory perspective, selenium cannot be adequately assessed using ambient WQGs or objectives alone because the primary route of selenium effects in aquatic ecosystems is via dietary exposure to organo-selenium, rather than inorganic selenium, in the water column. WQGs for most substances are based on toxicity data generated from waterborne exposure. As such, these guidelines do not consider tissue concentrations in exposed biota, the mechanisms of toxicity in aquatic environments, or other site-specific considerations that are relevant to selenium (Chapman et al. 2010). In recognition of this limitation, BC Ministry of Environment (MoE) and the United States Environmental Protection Agency (US EPA) both have regulations for selenium that include water, sediment, and tissue-based values (Table 1). This approach aligns with the general agreement within the scientific community that a tissue-based selenium criterion is the most effective measure to define limits for the protection of aquatic life in aquatic systems (Chapman et al. 2010).

In recognition of recent developments in selenium science, the BC WQGs for selenium were updated in 2014 to include more recent information on the effects of selenium on human health and ecological receptors. The updated BC WQGs for selenium established guideline values for fish and bird eggs, whole body fish tissue, fish muscle tissue, and invertebrate tissues that range from 4 to 11 milligrams per kilograms dry weight (mg/kg dw) (MoE 2014a). US EPA aquatic life water quality criteria for selenium were revised in 2016. The updated US EPA regulatory values provides a two-part criterion that specifies selenium concentrations in fish tissue (eggs or ovaries and whole body or muscle) and waterborne screening values of 1.5 µg/L for lentic systems and 3.1 µg/L for lotic systems (US EPA 2016).

Table 1: Relevant Regulatory Guidelines for Selenium: Interim and Approved

Water Use	Guideline for Total Selenium
Approved and Interim Guidelines and Criteria[a]	
BC Aquatic Life (freshwater)	1 µg/L (alert concentration); 2 µg/L (guideline)
BC Aquatic Life (fish tissue)	11 mg/kg dw (egg/ovary); 4 mg/kg dw (whole body); 4 mg/kg dw (muscle; interim)
BC Aquatic Life (invertebrate tissue)	4 mg/kg dw (interim)
BC Aquatic Life (sediment)	2 mg/kg (dw; alert concentration)
BC Wildlife (freshwater)	2 µg/L
BC Wildlife (bird eggs)	6 mg/kg dw
BC Irrigation Water	10 µg/L
BC Livestock Watering	30 µg/L
BC Drinking Water	10 µg/L
Canadian Drinking Water[b]	50 µg/L
US EPA Drinking Water[c]	50 µg/L
WHO Drinking Water[d]	40 µg/L (20% of safe upper intake)
US EPA (freshwater)[e]	3.1 µg/L (lotic systems); 1.5 µg/L (lentic systems)
US EPA (fish tissue) [e]	15.1 mg/kg dw (egg/ovary); 8.5 mg/kg dw (whole body); 11.3 mg/kg dw (muscle)

a) Ambient Water Quality Guidelines for Selenium Technical Appendix Update (MoE 2014a), unless specified otherwise.

b) Health Canada (2014) Guidelines for Canadian Drinking Water Quality.

c) US EPA (2009) National Primary Drinking Water Regulations.

d) WHO (2011) Selenium in Drinking-water.

e) Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016 (US EPA 2016).

dw = dry weight; BC = British Columbia; US EPA = United States Environmental Protection Agency; WHO = World Health Organization.

BC WQGs also set limits for selenium in drinking water, with a guideline of 10 micrograms per liter (µg/L), based on a previous Health Canada guideline. The current Canadian WQG for selenium in drinking water is 50 µg/L (Health Canada 2014). The World Health Organization (WHO 2011) reports that water is not normally a major source of selenium intake for humans, and at levels below 50 µg/L it would be unusual for drinking water to make a significant contribution to total selenium intake. When setting guideline values for selenium in drinking water, the WHO suggests allocating 20% of the safe upper intake level of 400 µg/day to drinking water, which translates to a value of 40 µg/L, assuming an intake of 2 L/day.

Canadian, BC, US EPA, and WHO drinking water guidelines and BC WQGs are presented in Table 1.

2.2 Derivation of Site Performance Objectives and Science-Based Environmental Benchmarks

It has been recognized by MoE (2014b) that in some cases, WQGs may not be appropriate thresholds to assess environmental effects because WQGs were derived to be protective of all waters of BC and do not take into account site-specific conditions that may modify exposure and toxicity. Under these circumstances, it may be appropriate to develop an alternative threshold, such as a science-based environmental benchmark (SBEB), to account for site-specific conditions, which often forms the basis of an approved site performance objective (SPO). An SBEB is defined as "a quantifiable receiving environment parameter or attribute developed by qualified professionals through a rigorous scientific process with the intent to guide management decisions for a regulated activity at a specific location" (MoE 2014b). An SPO is a quantifiable receiving environment parameter or attribute, set by a statutory decision-maker considering scientific information along with other factors. For selenium in particular, the BC WQG was derived to be protective of aquatic life in the most sensitive lentic environments. Site-specific studies at other mines in BC have supported the derivation of SBEBs and approval of SPOs for selenium higher than the BC WQG where lentic environments are limited or absent. While the updated BC WQGs include guidelines for selenium concentrations in biological tissue, SBEBs and SPOs are defined as aqueous selenium concentrations for the purpose of facilitating selenium management.

The objective of deriving SPOs is twofold. First, these values can be used to evaluate predicted future selenium concentrations in receiving waters. In this context, predicted selenium concentrations exceeding an SPO would trigger investigations to refine the effects assessment or indicate a need for further mitigation. Second, SPOs provide a target to be used in scoping and designing further mitigation to reduce selenium concentrations in Mine wastewater, and to evaluate the success of these mitigation measures in attaining protection of receiving water ecosystems.

3.0 PREDICTED SELENIUM RELEASES

As discussed in the TAR, predicted selenium concentrations in Mine contact water that will be treated and discharged to Quesnel Lake, as well as in Springer Pit water that may migrate as seepage toward Bootjack Lake, were higher than the 30-day BC WQG. There is no aquatic life WQG specific to protection against selenium effects from acute exposures because diet is the primary pathway of selenium exposure to aquatic life. However, for the purposes of this effluent quality assessment, acute toxicity data compiled in the selenium BC WQG technical guidance (MoE 2014a) to support the derivation of the 30-day BC WQG were reviewed. The lowest reported acute toxicity value for rainbow trout (*Oncorhynchus mykiss*) documented was 4,500 µg/L as selenite, which was selected as an acute screening value. The highest predicted 95th percentile concentrations of total selenium in the treated effluent discharge (87 µg/L) and in the Springer Pit seepage (61 µg/L) were less than this acute screening value, as was the proposed treated effluent discharge limit of 75 µg/L for operations. Selenium will be managed as described in this SeMP, such that concentrations of selenium in effluent discharged to Quesnel Lake remain less than 75 µg/L, and the in-lake monthly average concentration, at the edge of the initial dilution zone (IDZ), remains less than 2 µg/L to meet BC WQGs.

As discussed in the TAR, predicted selenium concentrations at the edge of the IDZ in Quesnel Lake and Bootjack Lake are less than the 30-day BC WQG of 2 µg/L for the protection of aquatic life (maximum median concentration of 1.4 µg/L and maximum 95th percentile of 2.0 µg/L for Quesnel Lake and maximum median concentration of 0.96 µg/L and maximum 95th percentile of 1.6 µg/L for Bootjack Lake).

During closure, drainage of Mine contact water may be permitted to return to the natural hydrology of waterbodies and water courses around the Mine. Contact water may be diverted through treatment systems before being released to natural catchments. Depending on the selected closure/post-closure water management approach, if passive treatment systems are implemented, even if best available technologies (BATs) for passive treatment are applied, selenium concentrations in treated source water may exceed the BC WQG of 2 µg/L for the protection of aquatic life.

4.0 COMPLIANCE AND ENVIRONMENTAL PROTECTION GOALS

The strategy for managing selenium releases at the Mine is to achieve compliance and environmental protection goals specified for the following periods of effluent discharge.

4.1 Approved Short-Term Discharge

MPMC is currently permitted to, and proposes to continue to, discharge treated effluent to Quesnel Lake via the Hazeltine Channel until the end of November 2017. As described in the short-term Technical Assessment Report (Golder 2015), Hazeltine Creek presently is not fish habitat because fish access has been restricted with barriers to facilitate the ongoing rehabilitation activities following the 2014 tailings storage facility foundation failure. For the purpose of the short-term discharge of effluent, Hazeltine Creek is not considered a receiving environment and will be considered as a conduit for surface water flow into Quesnel Lake. This is applicable for the short term only because the objectives for Hazeltine Creek rehabilitation include its future use by fish and other aquatic biota.

The selenium management goals for the short-term discharge via Hazeltine Channel (until November 2017) are as follows:

- Attain permit compliance at discharge location HAD-03 by meeting the approved effluent limit for selenium. The effluent limit is presently 60 µg/L, which is higher than the BC WQG for aquatic life and was approved based on rationale that no fish are permitted in Hazeltine Creek during this period of discharge and that WQGs are met at the edge of the IDZ.
- Attain environmental protection at the edge of the IDZ in Quesnel Lake by meeting BC WQGs.

4.2 Operations

After November 2017, the effluent discharge is proposed to be transitioned to a pipeline directly connecting the water treatment plant to Quesnel Lake. This change in discharge method would eliminate effluent discharge to Hazeltine Creek, which will enable the creek to be restored to fish habitat.

The selenium management goals for the discharge during operations (nominally from November 2017 through to closure) are as follows:

- Attain permit compliance at the discharge location (end-of-pipe) by meeting the approved effluent limit for selenium. The effluent limit may need to be re-evaluated with time based on results of effluent and receiving-environment monitoring. The compliance point for selenium will be end-of-pipe because an in-lake compliance point at the edge of the IDZ in Quesnel Lake may present logistical difficulties for frequent monitoring, particularly during the winter months.
- Attain environmental protection at the edge of the IDZ in Quesnel Lake by meeting BC WQGs.

4.3 Closure

During closure, contact water may be diverted through decentralized passive treatment systems before being released to natural catchments of the Mine area, depending on results of pilot-scale testing, ongoing review of emerging BATs and passive treatment alternatives, and refinement of water quality and quantity models for the Mine. Even if BATs for closure are applied, selenium concentrations in treated source water may exceed the BC WQG of 2 µg/L for the protection of aquatic life.

The selenium management goals for discharge during closure are as follows:

- Attain environmental protection in Quesnel, Bootjack, and Polley lakes by meeting BC WQGs at the edge of the IDZ within each lake. These lakes have sufficient dilution that selenium concentrations less than WQGs will be achieved at the edge of the IDZ.
- Attain environmental protection in Hazeltine Creek by meeting an SPO approved by MoE for Hazeltine Creek for closure. An SPO higher than the BC WQG of 2 µg/L that is still considered to be protective of aquatic life will be proposed in consultation with MoE and supported by field studies and data analysis.

For the purpose of closure planning for the Mine, Golder (2016) (Appendix F of the TAR) proposed a treatment target of 10 µg/L for effluent discharged to Hazeltine Creek during closure. This concentration was shown to provide an appropriate level of protection to aquatic life in receiving waters in other mine areas of BC. For releases to Hazeltine Creek during closure, it has been conservatively assumed that there will be no dilution of treated contact water, because the dilution capacity of the creek is limited by seasonal flow. Therefore, a total selenium concentration of 10 µg/L, if met in Hazeltine Creek, would not be expected to cause adverse effects to resident aquatic life.

It is understood that development and approval of a permit limit for selenium or an in-stream SPO for Hazeltine Creek for closure will require further consultation with MoE prior to closure. Planning for monitoring to support this work will be discussed with MoE prior to undertaking the work.

5.0 MANAGEMENT, MITIGATION, AND CONTINGENCY MEASURES

A geochemical characterization of the Mine site has been completed to determine which areas of the Mine have the highest potential for loading of selenium into the environment. These sources have been incorporated into a site water quality model (WQM) to predict Mine effluent quality during operations and into post-closure (Appendix D of the TAR). Two scenarios were evaluated as part of the WQM, Scenario 1 used Mine monitoring data as inputs and Scenario 2 used source terms developed by SRK Consulting (Appendix C of the TAR). Scenario 1 was considered to be more representative of operations water quality than Scenario 2 because the main conditions driving source water chemistry (e.g., water management practices, pH and redox state of Mine materials) are not expected to change for the remainder of operations. Scenario 2 predictions were based on the assumption that Mine drainages are at their solubility limits (i.e., are at the upper end of expected concentrations). The modelling indicates that selenium treatment will not be required during operations if concentrations remain within the ranges currently recorded in the existing environmental monitoring data, but treatment may be required if Mine drainages approach their solubility limits.

Selenium is currently managed through a combination of best applicable practices (BAPs). BAPs currently in place, and those that will be considered for future implementation, include the following:

- **Water management**—The mine plan includes water management structures designed to divert non-contact water away from waste materials.
- **Progressive reclamation**—Waste dumps will be reclaimed once they reach capacity, which for many dumps means they will be fully reclaimed prior to closure.
- **Pit backfill**—The Cariboo-Springer Pit will be used to subaqueously store potentially acid generating waste, which reduces the exposure of potentially acid generating rock and pit walls to oxygen, thereby reducing potential selenium loading from oxidation of these materials.
- **Engineered cover**—The feasibility of engineered cover systems over waste rock piles may be investigated. Engineered cover systems are designed to reduce the infiltration of water into the waste piles or to reduce the ingress of oxygen. The weathering of sulphide minerals that contribute to the loading of selenium and sulphate requires both oxygen and water. If one of these is not present, the weathering reaction will not proceed and selenium and sulphate will not be released to the receiving environment from oxidation of waste rock. The design and site-specific performance of the cover will dictate how effective it is at reducing selenium and sulphate loading.
- **In-pit treatment**—Flooded mined-out pits may be considered as a method to reduce selenium in waters containing elevated concentrations of this parameter, if required during operations and/or for closure.
- **Biological treatment**—passive systems such as the biochemical reactor (Baldwin et al. 2015) that was piloted on site may be employed to mitigate selenium and other constituent concentrations in Mine contact waters.

Management and treatment of selenium is a developing science, with ongoing research into the topic being carried out worldwide. BATs are technologies that have been researched and are considered to be achievable to implement at the Mine. Based on these, a conceptual passive water treatment system has been designed to remove sulphate and selenium during post-closure (Appendix F of the TAR). A pilot system to trial this technology has also been designed, which could be constructed and tested during operations as one possible use of BAT for water (and selenium) management at the Mine during closure.

This conceptual passive water treatment system includes a biochemical reactor to remove selenium, along with other key constituents, to treat effluent to within proposed discharge targets. The bio-chemical reactor consists of a lined pond filled with carbon source substrate and submerged water column, where oxygen is consumed by microorganisms, and anaerobic conditions prevail. The anaerobic conditions are ideal for development of microorganisms that use organic substrate as a nutrient source, such as sulphate and selenium. Further information on these systems is included in Appendix F of the TAR.

6.0 RECOMMENDED MONITORING

Monitoring of selenium in effluent and the receiving environment is necessary to confirm permit compliance and that environmental protection goals are achieved. The following sections provide an overview of recommended monitoring in support of selenium management for the different phases of effluent discharge. Monitoring of aqueous selenium concentrations is typically undertaken as part of routine monitoring for the effluent discharge (MPMC 2016; the TAR). Additional monitoring that could be undertaken in support of a selenium management plan is described below.

6.1 Short-Term Discharge

Recommended monitoring of selenium during the short-term discharge is as follows:

- Per the requirements of amended Permit 11678, monitoring is conducted at discharge location HAD-03 to confirm compliance with the approved effluent permit limit for selenium (60 µg/L). Monitoring is presently conducted at the edge of the IDZ in Quesnel Lake (QUL-58) to confirm that selenium remains below the WQGs and it is recommended that monitoring be continued.
- To take advantage of current conditions of effluent in Hazeltine Creek, it is recommended that monitoring be undertaken to characterize selenium bioaccumulation in biota both upstream and downstream of the effluent discharge location. It is recommended that this monitoring be undertaken in 2016 and/or 2017 in Hazeltine Creek to support the proposed treatment target of 10 µg/L for effluent discharged to Hazeltine Creek during closure.

6.2 Operations

If the pipeline to Quesnel Lake is approved, recommended monitoring of selenium during operations, is as follows:

- Monitoring will be required at the new discharge location (end-of-pipe) to confirm compliance with the effluent permit limit. It is recommended to continue monitoring at the edge of the IDZ in Quesnel Lake (QUL-58) to confirm that WQGs are met.
- After direct discharge to Hazeltine Creek ceases, monitoring in Hazeltine Creek upstream and downstream of the previous discharge location is recommended to confirm that water quality no longer reflects an influence from the treated discharge. Sampling would entail water chemistry and tissue concentrations in biota, with sampling frequency to be informed by preliminary results collected during the short-term discharge.
- Fish are presently excluded from Hazeltine Creek by physical barriers in place during the creek rehabilitation and the approved short-term discharge of treated effluent. Once fish habitat and access in Hazeltine Creek are restored, it would be prudent to undertake limited sampling of resident fish to monitor fish exposure to selenium.

6.3 Closure

Recommended monitoring of selenium during closure is as follows:

- Monitoring will likely be required at the discharge locations (end-of-pipe) during closure to confirm compliance with future, discharge-specific effluent permit limits. Monitoring at the edge of the IDZ in lake receiving environments (i.e., Quesnel, Polley, and Bootjack lakes) should also be undertaken to confirm that WQGs are met.
- Monitoring in Hazeltine Creek near to, or downstream of, the discharge locations will be undertaken (if discharge to Hazeltine Creek is proposed and approved) to confirm that the in-stream SPO (if applicable) is met. Supplemental monitoring of biota in Hazeltine Creek may be recommended in support of the SPO.

7.0 CLOSURE

We trust that the information provided in this technical memorandum is sufficient for your present needs. If you have any questions, please do not hesitate to contact the undersigned at (604) 296-4200.

GOLDER ASSOCIATES LTD.

Jordana Van Geest, PhD, RPBio
Environmental Scientist

Jerry Vandenberg, MSc, PChem
Principal, Senior Environmental Chemist

JVG/JV/pn/kp

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

o:\final\2014\1421\1411734\1411734-172-r-rev0-16000\1411734-172-r-rev0-16000-selenium management plan 17oct_16.docx

REFERENCES

Baldwin S, P Mirjafari M Rezahdebashi, G Subedi, J Taylor, L Moger, K McMahen, A Frye. 2015. *Start-Up of a Passive Remediation Bioreactor for Sulfate and Selenium Removal from Mine Tailings Water*. 10th International Conference on Acid Rock Drainage & IMWA Annual Conference. Santiago, Chile.

Chapman PM, WJ Adams, ML Brooks, CG Delos, SN Luoma, WA Maher, HM Ohlendorf , TS Presser, DP Shaw. 2010. *Ecological assessment of selenium in the aquatic environment*. Pensacola, FL (USA): Society of Environmental Toxicology and Chemistry (SETAC).

Golder (Golder Associates Ltd.). 2015*. Mount Polley Mine: Short Term Effluent Discharge*. Technical Assessment Report in Support of an Effluent Permit Amendment. Submitted to Mount Polley Mining Corporation. Golder Doc No. 1411734-030-R-Rev0-12000. May 2015.

Golder. 2016. *Analysis of Selenium Bioaccumulation and Potential Toxicity in Fish in Hazeltine Creek at the Mount Polley Mine*. Technical memorandum submitted to Mount Polley Mining Corporation. Golder Doc No. 1411734-169-TM-Rev0. June 2016.

Health Canada. 2014. *Guidelines for Canadian Drinking Water Quality: Guideline Technical Document Selenium*. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. Ottawa, Ontario.

MoE (BC Ministry of Environment). 2014a. *Ambient Water Quality Guidelines for Selenium. Technical Report Update*. Prepared by JM Beatty and GA Russo. April 2014. Water Protection and Sustainability Branch, Environmental Sustainability and Strategic Policy Division.

MoE. 2014b. *Technical Guidance 1: Environmental Management Act Applications. Terms of Reference, Environmental Impact Assessment and Technical Assessment Report, Version 1.0*. December 2014. Environmental Protection Division, Regional Operations Branch.

MPMC (Mount Polley Mining Corporation). 2016. *Comprehensive Environmental Monitoring Plan*. Submitted to BC Ministry of Environment. March 2016. 79 pp + appendices.

US EPA (United States Environmental Protection Agency). 2009. *National Primary Drinking Water Regulations*. EPA 816-F-09-004. Accessed on 1 June 2016. Available at: https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf.

US EPA. 2016. *Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016*. EPA 822-R-16-006. June 2016. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology. Washington, D.C. 807 pp.

WHO (World Health Organization). 2011. *Selenium in Drinking-water*. Background document for development of WHO Guidelines for Drinking-water Quality. WHO/HSE/WSH/10.01/14. 22 pp.

STUDY LIMITATIONS

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Mount Polley Mining Corporation. It represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to Golder by Mount Polley Mining Corporation, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Mount Polley Mining Corporation may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit golder.com

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 44 1628 851851
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way
Vancouver, BC, V5M 0C4
Canada
T: +1 (604) 296 4200

Golder Associates