Memorandum

Date: April 8, 2016
To: Dale Reimer, Mount Polley Mining Corporation
From: Pierre Stecko, Minnow Environmental Inc.
Cc: Colleen Hughes, Katie McMahen, Mount Polley Mining Corporation
'Lyn Anglin, Imperial Metals Corporation

Re: Results of Diffusive Gradients in Thin Films Device Deployment – August to October 2015

The ongoing assessment of the impact to aquatic environmental health following the failure of the Mount Polley tailings dam in August 2014 includes monitoring of water and sediment chemistry. A number of evaluations have indicated low mobility of metals in Mount Polley tailings and tailings-influenced sediment (e.g., SRK 2015a,b; Minnow 2015a, 2016) and this has been supported by the results of water quality monitoring (Golder 2015). Water quality monitoring has focused on total and dissolved metals, both of which over-represent the metal fraction that is available for uptake by aquatic organisms in natural surface waters (i.e., free metal ions and weakly complexed metals, often referred to as the "labile" metal fraction).

This memorandum provides a brief summary and interpretation of metal concentration results associated with diffusive gradients in thin films (DGT) passive sampling devices deployed in waterbodies adjacent to the Mount Polley Mine from August to October 2015. The objective of the deployment of DGT devices in waterbodies adjacent to the Mount Polley Mine was to characterize concentrations of DGT-labile metal in water overlying sediments impacted by the Mount Polley Mine tailings dam failure relative to reference areas.

Background

DGT devices are small devices that contain a membrane filter, a gel diffusion layer and a gel binding layer (e.g., Davison and Zhang 1994). The devices are designed to accumulate labile (free and weakly complexed) substances by diffusion in a controlled manner. Labile metals are the fraction of metals that are considered to be potentially bioavailable (i.e., that can be readily transported across biological membranes of aquatic organisms; e.g., Campbell and Tessier 1996; Luoma and Rainbow 2008). DGT devices used in this

evaluation are optimized for metals and include a 0.45 µm Millipore™ cellulose nitrate membrane, a polyacrylamide gel diffusion layer, and a mixed binding layer composed of Chelex-100™ and Metsorb™ binding resins, all housed in a small polypropylene container approximately two inches in diameter (Panther et al. 2014). Only the membrane is exposed to the sampling environment (as a "window" in the DGT device). Labile metals diffuse through the membrane and gel diffusion layer and are captured in the resin. Following deployment for a time period that results in accumulation to detectable concentrations (but not to resin saturation, which can be calculated based on water chemistry data and avoided), the DGT devices are retrieved and the resin removed, digested, and analyzed. Analytical results are expressed as the mass of metal accumulated in the resin, which can also be used to back-calculate average labile metal concentrations during deployment. DGT-measured labile metal concentrations better represent the fraction of metals that are potentially bioavailable than do total or dissolved concentrations (e.g., Tusseau-Vuillemin 2004; Martin 2008; Simpson et al. 2012; Peijnenburg et al. 2014; Greenberg et al. 2014). This is because total metals include metals associated with particulate and dissolved binding materials (ligands), and dissolved metals include metals associated with binding materials (ligands) that are dissolved and those associated with very small particles and colloids (<0.45 µm in diameter).

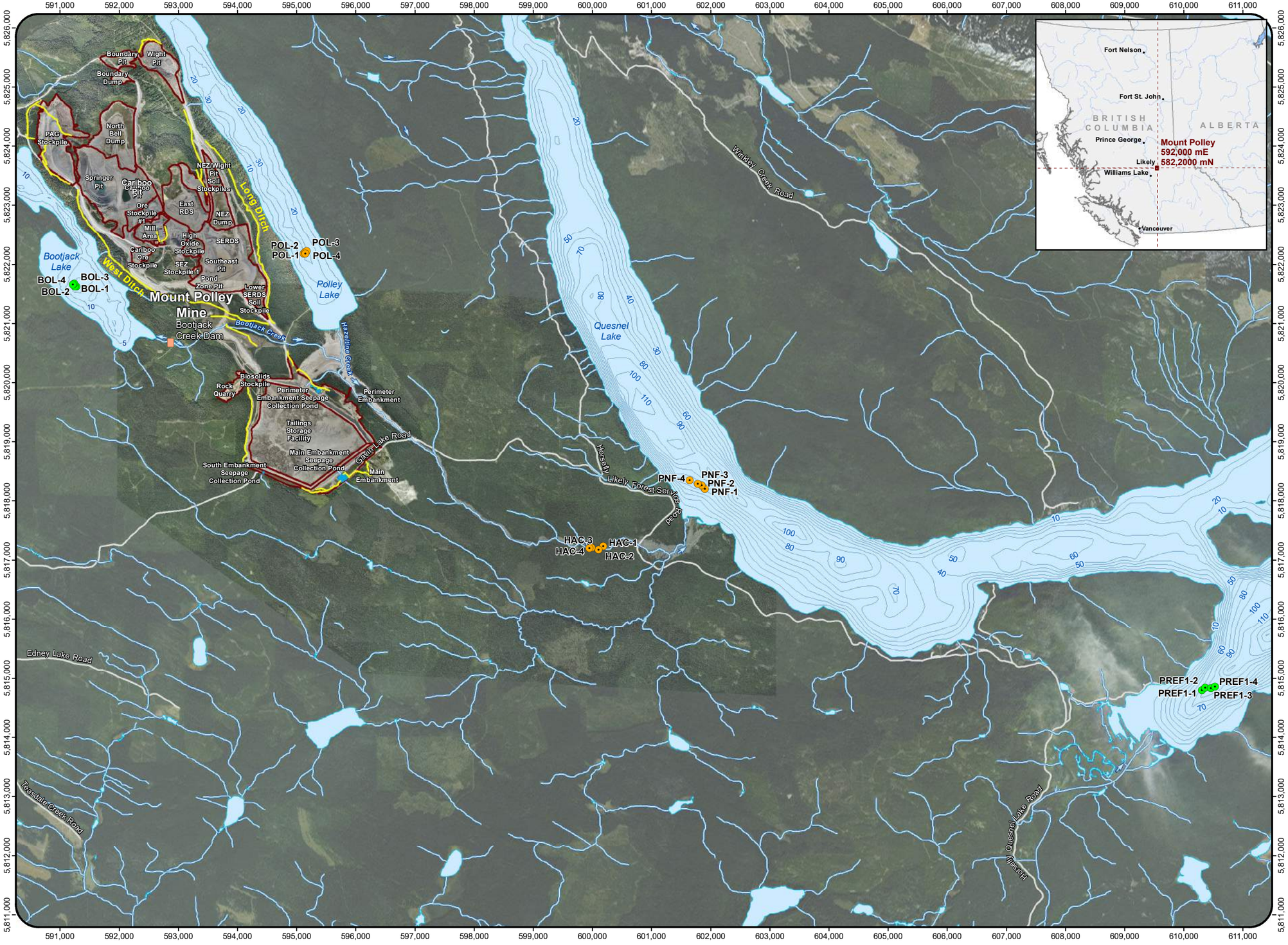
Methods

Study Design

A simple study was undertaken to characterize labile metal concentrations using DGT devices in water overlying sediments at areas impacted by the tailings dam failure, as well as at un-impacted reference areas. DGT devices were deployed at five areas from late August to early October 2015; two lake areas impacted by the tailings dam failure, two reference areas for the impacted lake areas, and Hazeltine Creek (Figure 1; Appendix Table A1). Four replicate DGT devices were deployed at each area.

Deployment and Retrieval

In lakes, DGT devices were installed in the lower water column approximately one meter above the sediment surface. This was achieved by placing a line with anchor and float at each sample location. A flat tray was placed above the anchor to prevent excessive sinking into the sediment. A loop was tied in the rope one meter above the tray and the DGT device was tied to the loop using fishing line. In Hazeltine Creek, DGT devices were placed in small pools within a canyon (Figure 1), where they were tied to a loop of rope, which was then tied to two brick anchors placed in the creek in a manner that kept them approximately 15 centimeters above the creek bottom. At the time of sampling, Hazeltine Creek was not



LEGEND

Passive Sampler Locations

- Exposed
- Reference
- Bootjack Creek Dam
- Seepage Collection Pond
- Mine Infrastructure
- Waterbody
- Water Collection Ditch
- Quesnel Lake Bathymetry (10 m Intervals)
- Bootjack Lake Bathymetry (5 m Intervals)
- Polley Lake Bathymetry (10 m Intervals)
- Watercourse
- Roads
- Water Flow Direction

N
W E
S

0 800 1,600 3,200
Meters

MAP INFORMATION
Datum: NAD 83 Map Projection: UTM Zone 10N
Data Source: Department of Natural Resources Canada. All rights reserved.
Creation Date: February 2016
Project No.: 2574

Figure 1: Polley Lake, Bootjack Lake, Quesnel Lake and Hazeltine Creek Passive Sampler Locations, Mount Polley Mine, 2016.

minnow environmental inc.

considered to be fish habitat as: 1) access to fish was blocked; and 2) it was subject to rehabilitation. During all DGT deployments, exposure to air was kept to a minimum (less than one minute) to avoid desiccation of the DGT devices.

DGT devices were retrieved 34 to 38 days after deployment (Appendix Table A1). DGT devices in Polley Lake, Bootjack Lake and Hazeltine Creek were retrieved by hand hauling, whereas DGT devices in Quesnel Lake (mean depth approximately 100 meters) were retrieved with the assistance of a commercial line hauler (Ace Line Hauler Brutus Plus 40). Upon retrieval, DGT devices were handled with care while wearing metal free disposable nitrile gloves. Particular care was taken not to touch the DGT window. Each DGT device was gently rinsed with metal free water and placed into a labelled glass soil jar with a few drops of metal free water to prevent desiccation. Jars were then placed into clean Ziploc™ bags and then into a dedicated cooler with ice packs, where they were maintained cool prior to transport to the field laboratory. At the field laboratory, the bagged jars were placed in a refrigerator and held until shipment to the analytical laboratory. After collection of all DGT devices, the DGT devices (in bagged jars) were placed in a cooler with frozen ice packs and a chain-of-custody form was prepared and packed with the samples. Coolers were shipped overnight for next day delivery to Maxxam Analytics (Burnaby, BC).

Supporting Measures

Supporting information collected at each deployment location included GPS (Geographic Positioning System) coordinates, sampling depth, Secchi depth (lakes only), field meter measurements of temperature, specific conductance, dissolved oxygen and pH (using a YSI EXO™ handheld portable field meter equipped with YSI EXO2™ Sonde), site photographs (including photographs of the DGT devices), and notes on the presence or absence of any fouling of the DGT devices. Supporting water samples were also collected from each sampling area, including field-filtered samples for dissolved analytes (0.45 µm filter). Water samples were placed into a dedicated cooler with frozen ice packs, where they were maintained cool prior to transport to the field laboratory where they were placed in a refrigerator and held until shipment to the analytical laboratory. At program completion, water samples were placed in a cooler with frozen ice packs and a chain-of-custody form was prepared and packed with the samples. Coolers were shipped overnight for next day delivery to ALS Environmental (Burnaby, BC).

Laboratory Analysis

Upon receipt of the DGT devices, Maxxam opened the coolers, measured temperature to verify the maintenance of cold samples, removed each device from the coolers, logged the sample, and assigned each sample a unique sample identification code. A sample receipt

confirmation was then sent to Minnow for verification. Laboratory analysis of the DGT devices involved dismantling the devices followed by digestion of the resin to provide a determination of total metal in the resin by ICP-MS (Inductively Coupled Plasma – Mass Spectrometry). Free metal ion was subsequently calculated by Maxxam based on total metal in the resin, water temperature during deployment, total deployment time, and manufacturer-supplied peer-reviewed diffusion coefficients, which, in turn, are based on Fick's first law of diffusion (Zhang and Davison 1995; Panther et al. 2014). Upon completion of the analyses, a data report was provided by Maxxam to Minnow electronically in Adobe Acrobat Portable Document Format (PDF; Appendix C) and in MSExcel. Similarly, upon receipt of the water samples, ALS Environmental opened the coolers, measured temperature to verify the maintenance of cold samples, removed each sample from the coolers, logged the sample, and assigned each sample a unique identification code. A sample receipt confirmation was then sent to MPMC and Minnow for verification. Laboratory analyses included all analytes in the Mount Polley routine surface water quality monitoring program, including total and dissolved metals by ICP-MS. Upon completion of the analyses, a data report was provided by ALS to MPMC and Minnow electronically in Adobe Acrobat PDF (Appendix D) and in MSExcel.

Data Analysis

Upon receipt of the analytical data, a Data Quality Assessment (DQA) was completed, including an examination of data completeness, method detection limits achieved, field blank and travel blank results, laboratory precision, laboratory accuracy, and field precision. Following the completion of DQA, in-situ water quality data, DGT mass accumulation data, and DGT-based free metal concentration data were summarized by area, by calculating mean, standard deviation, standard error and 95% confidence limits. In-situ water quality data and DGT-based free metal concentration data were then evaluated by comparing concentrations of detectable analytes in failure-affected areas (Polley Lake and Quesnel Lake exposed area) to reference concentrations. In-situ water quality data and DGT-based free metal concentration data were also compared to British Columbia Water Quality Guidelines (BCWQG) for the protection of aquatic life (BCMOE 2016). Lastly, concentrations of DGT-detectable analytes were compared to total and dissolved concentrations.

Results

Supporting Measures

Supporting meter measurements indicated some differences between Polley Lake (impacted by the 2014 dam failure) and Bootjack Lake (reference), whereas conditions in

the impacted area of Quesnel Lake were very similar to the Quesnel Lake reference (Appendix Table A.2; Appendix Figures A.1 and A.2). Differences between Polley and Bootjack lakes included lower temperature and higher dissolved oxygen at depth in Polley Lake, as well as slightly higher pH and specific conductance throughout the water column of Polley Lake (Appendix Figure A.1). Specific conductance and pH of Hazeltine Creek were notably higher (up to 439 µS/cm and 8.46 pH units; Appendix Table A.2) than at any of the other area evaluated.

Conventional Water Chemistry

Data Quality Assessment indicated good water data quality, meaning that data can be used with a high level of confidence for interpretation and the derivation of conclusions (Appendix B). Copper was the only analyte present at impacted areas at total concentrations greater than BCWQG (Appendix Table C.2). At Hazeltine Creek, which is not currently fish habitat, mean total copper concentration was 0.015 mg/L (compared to an applicable hardness-based 30-day BCWQG of 0.0083 mg/L). At the Quesnel Lake near-field exposed area, mean total copper concentration was 0.0021 mg/L (compared to a mean hardness-based 30-day BCWQG of 0.0023 mg/L), but total concentration at deployment (0.0027 mg/L) was slightly greater than the applicable BCWQG (Appendix Table C.2). Concentrations of total manganese and dissolved iron in water samples from reference Bootjack Lake were elevated relative to BCWQG at DGT deployment and retrieval, but were not similarly elevated at impacted areas (Appendix Table C.2).

DGT Device Results

Data Quality Assessment indicated good DGT data quality with the exception of one trip blank result that suggested contamination but was inconsistent with field blank results and individual sample results (Appendix B). A total of 13 metals accumulated in DGT devices to detectable concentrations (Appendix Table D.1). Four of these (copper, manganese, iron and zinc) were previously identified as Parameters of Interest (POIs) representing the chemical influence of the tailings dam failure on sediment quality (Minnow 2015a) and two more (phosphorus and molybdenum) were previously identified as POIs representing the chemical influence of the tailings dam failure on water quality (Golder 2015).

Examination of total, dissolved, and time-weighted average labile concentrations of the POIs (Appendix Table C.2 and Table 1, respectively) indicated that copper was the only DGT-detectable analyte with some concentrations greater than BCWQG (above) and a spatial pattern consistent with impact from the tailings dam failure (i.e., greater concentrations at the impacted lake areas than at reference lake areas; Figure 2a; Appendix Figures D.1 to D.6). DGT-labile copper concentrations were detectable in Hazeltine Creek

Table 1: Detectable metals in DGT devices and calculated time-weighted free metal concentrations, Mount Polley 2015

A) Metal accumulated in DGT-device resin

Metal Name	Method Detection Limit	Reporting Detection Limit	Units	Hazeltine Creek		Polley Lake (P2)		Bootjack Lake (B2)		Qusenel Lake Profundal - Exposed		Qusenel Lake Profundal - Reference	
				Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Aluminum (Al)	0.59	1.96	µg	3.00	1.67	<0.59	-	<0.59	-	2.31	0.7	2.24	0.56
Barium (Ba)	0.063	0.25	µg	6.57	2.22	1.86	0.10	3.31	0.54	1.75	0.24	1.51	0.07
Calcium (Ca)	20	66	µg	172	26	116	13	<66	-	125	10	117	23
Copper (Cu)	0.025	0.13	µg	2.38	0.19	0.15	0.01	<0.13	-	<0.13	-	<0.13	-
Iron (Fe)	1.25	6.3	µg	<1.25	-	<1.25	-	137	16	<6.3	-	<1.25	-
Magnesium (Mg)	1.25	6.3	µg	7.7	1.2	<6.3	-	<1.25	-	<1.25	-	<1.25	-
Manganese (Mn)	0.05	0.25	µg	0.77	0.19	2.69	0.50	22.5	4.2	1.14	0.12	1.19	0.47
Molybdenum (Mo)	0.044	0.15	µg	<0.15	-	1.23	0.06	0.23	0.01	<0.15	-	<0.15	-
Phosphorus (P)	1.25	6.3	µg	<1.25	-	<1.25	-	15.1	2.9	<1.25	-	<1.25	-
Strontium (Sr)	0.082	0.27	µg	1.94	0.91	0.99	0.12	0.71	0.08	0.84	0.14	0.86	0.12
Uranium (U)	0.0025	0.013	µg	0.020	0.010	0.04	0.00	<0.0025	-	0.03	0.00	0.02	0.00
Vanadium (V)	0.025	0.063	µg	0.33	0.04	0.15	0.01	<0.025	-	<0.063	-	<0.025	-
Zinc (Zn)	0.125	0.63	µg	<0.125	-	<0.125	-	<0.125	-	1.78	3.30	<0.125	-

B) Calculated time-weighted free metal concentrations

Metal Name	Method Detection Limit	Reporting Detection Limit	Units	Hazeltine Creek		Polley Lake (P2)		Bootjack Lake (B2)		Qusenel Lake Profundal - Exposed		Qusenel Lake Profundal - Reference	
				Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Aluminum (Al)	0.0016	0.0054	mg/L	0.0083	0.0045	<0.0016	-	<0.0016	-	0.0071	0.0033	0.0071	0.0033
Barium (Ba)	0.00017	0.00068	mg/L	0.018	0.006	0.006	0.000	0.010	0.002	0.006	0.001	0.006	0.000
Calcium (Ca)	0.033	0.109	mg/L	0.29	0.05	0.23	0.03	<0.011	-	0.28	0.02	0.28	0.05
Copper (Cu)	0.000058	0.00029	mg/L	0.0056	0.0005	0.00039	0.00007	<0.00029	-	<0.00029	-	<0.00029	-
Iron (Fe)	0.0027	0.013	mg/L	<0.0027	-	<0.0027	-	0.32	0.04	<0.013	-	<0.0027	-
Magnesium (Mg)	0.0023	0.012	mg/L	0.015	0.002	<0.012	-	<0.0023	-	<0.0023	-	<0.0023	-
Manganese (Mn)	0.00014	0.0007	mg/L	0.0021	0.0005	0.0090	0.0018	0.0688	0.0127	0.0043	0.0005	0.0048	0.0019
Molybdenum (Mo)	0.000091	0.0003	mg/L	<0.0003	-	0.0030	0.0002	0.0005	0.0000	<0.0003	-	<0.0003	-
Phosphorus (P)	0.0027	0.013	mg/L	<0.0027	-	<0.013	-	0.036	0.007	<0.0027	-	<0.0027	-
Strontium (Sr)	0.00013	0.00045	mg/L	0.0032	0.0015	0.0019	0.0002	0.0013	0.0002	0.0019	0.0003	0.0021	0.0003
Uranium (U)	0.000005	0.000024	mg/L	0.000038	0.000019	0.000091	0.000004	<0.000005	-	0.078	0.006	0.000061	0.000007
Vanadium (V)	0.000059	0.00015	mg/L	0.00077	0.00009	0.00043	0.00003	<0.000059	-	<0.00015	-	<0.000059	-
Zinc (Zn)	0.0002	0.001	mg/L	<0.0002	-	<0.0002	-	<0.0002	-	0.0039	0.0074	<0.0002	-

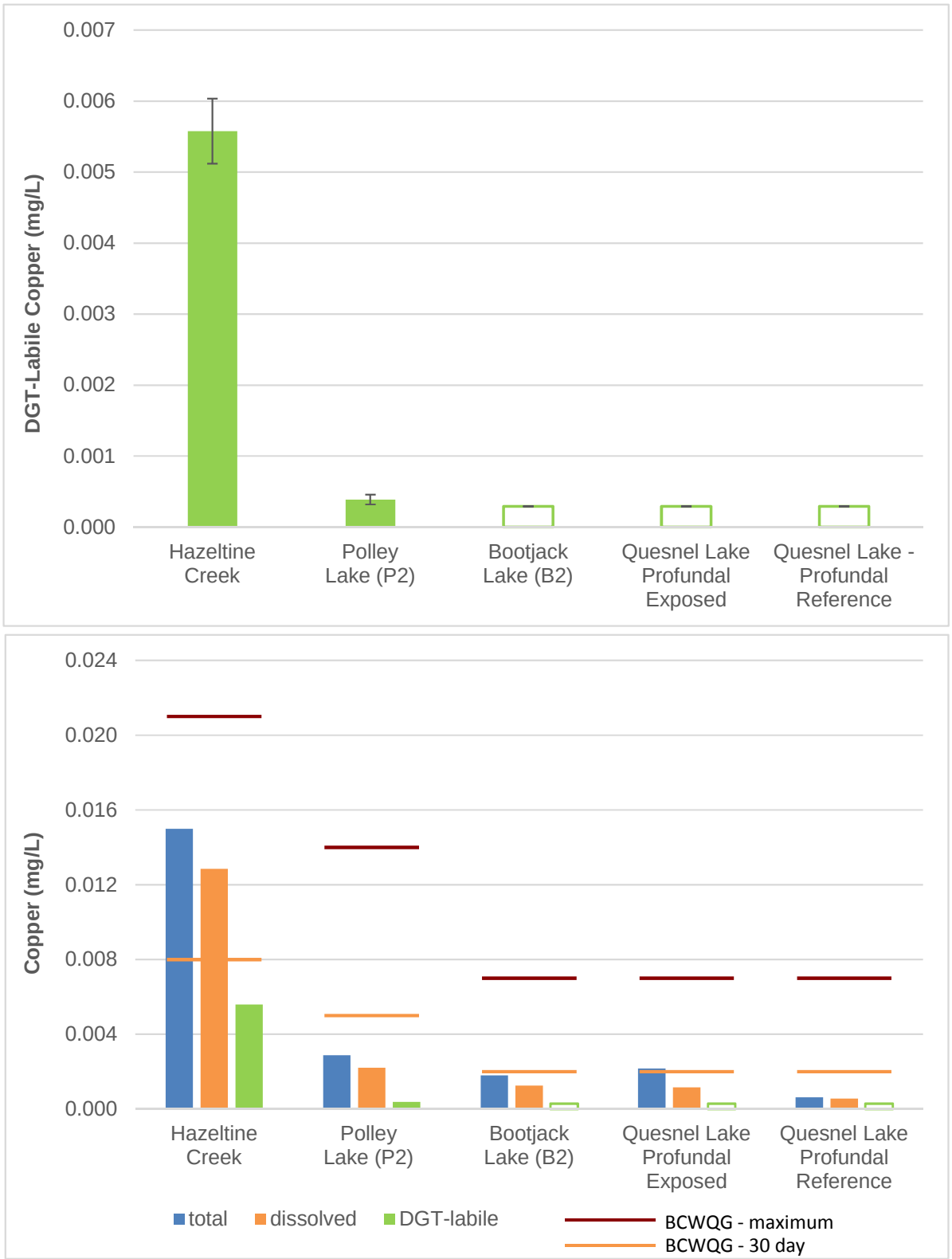


Figure 2: Concentrations of copper in water. A) DGT-labile concentrations (± standard deviation); B) total, dissolved and DGT-labile concentrations [1]

[1] open bars indicate less than detect results

and Polley Lake only (0.0056 ± 0.0005 mg/L and 0.00039 ± 0.00007 mg/L, respectively; Table 1 and Figure 2a). Despite average sediment copper concentrations of 823 mg/kg at Polley Lake versus 382 mg/kg at Bootjack Lake, and despite average sediment copper concentrations of 859 mg/kg at the Quesnel Lake profundal exposed area versus 55.1 mg/kg at the Quesnel Lake profundal reference area (Appendix Table D.3), near-bottom DGT-labile copper concentrations at all of these lake areas were ≤ 0.0004 mg/L (Figure 2a). This suggests limited mobility of the sediment-associated copper, which is consistent with previous observations of limited mobility and bioavailability of metals associated with Mount Polley tailings and tailings-influenced sediments (e.g., SRK 2015a,b; Minnow 2015a, 2016).

Concentrations of total copper greater than the 30-day BCWQG for the protection of aquatic life were observed at Hazeltine Creek and at the Quesnel Lake profundal exposed area (Appendix Table C.2). As previously indicated, Hazeltine Creek is not currently considered fish habitat. At the Quesnel Lake profundal exposed area, concentration of total copper was slightly greater than the 30-day BCWQG at deployment (0.0027 mg/L versus an applicable BCWG of 0.0023 mg/L) but not at retrieval (Appendix Table C.2). Dissolved copper was 54% of total, indicating that approximately half the total copper concentration was particulate (Figure 2b; Appendix Table D.3). DGT-labile copper was a fraction of total and dissolved (<13% and <25%, respectively; Figure 2b; Appendix Table D.3). This indicates that a substantial fraction of copper classified as dissolved after filtration using a 0.45 µm filter is not DGT-labile (i.e., is not in free ion and/or weakly complexed forms) and an even larger fraction of total metal is not DGT-labile.

Although copper was the only POI with a spatial pattern consistent with impact from the tailings dam failure, measurement of DGT-labile metal concentrations provided some perspective on water concentrations of several additional metals. Despite the near-bottom concentrations of total manganese and dissolved iron greater than BCWQG at Bootjack Lake (perhaps related to low near-bottom dissolved oxygen concentrations), DGT-labile concentrations were low and the DGT-labile fraction was 30% for iron and only 6% for manganese (Appendix Table D.3; Appendix Figures D.2 and D.3). This suggests that the majority of total and dissolved iron and manganese was in fine colloidal form unavailable to the DGT-device. Molybdenum was present at total concentrations well below BCWQG, but was highest at Hazeltine Creek and Polley Lake, suggesting some influence of proximity to the Mount Polley Mine (Appendix Figure D.4). The DGT-labile molybdenum fraction was highest at Polley Lake, where it was approximately 30% of total and dissolved concentrations (Appendix Table D.3). Phosphorus concentrations in Polley and Bootjack lakes were greater than the BCWQG range for lakes supporting salmonids, but were only DGT-detectable in Bootjack Lake, with DGT-labile concentrations of 24% and 34% of total

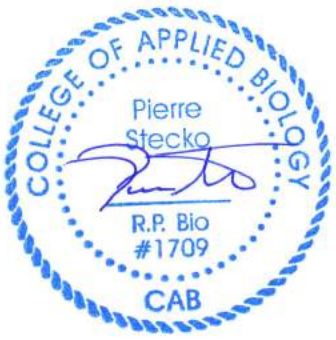
and dissolved phosphorus, respectively (Appendix Figure D.5; Appendix Table D.3). Lastly, one of the four replicate DGT-labile zinc results for Quesnel Lake was elevated (0.015 mg/L; Appendix Table D.1). Although this may represent an anomaly, verification is justified.

Summary

Measurement of DGT-labile metal concentrations (i.e., free metal ions and weakly complexed metals) in water near the bottom of lakes impacted by the Mount Polley Mine tailings dam failure (Polley Lake and Quesnel Lake) indicate DGT-labile metal concentrations that are a fraction of total and dissolved. For copper, the POI of greatest concern and the only DGT-detectable analyte with elevated total concentrations and a spatial pattern consistent with impact from the tailings dam failure, DGT-labile concentrations were less than 13% of total and less than 25% of dissolved concentrations in bottom waters of these lakes. These low concentrations add to the weight-of-evidence of the apparent post-depositional stability of the Mount Polley tailings and tailings-impacted sediment (e.g., SRK 2015a,b; Minnow 2015a, 2016).

Recommendations

DGT-devices provide a promising means of evaluating the mobility of metals associated with tailings-influenced sediments and tracking labile metal concentrations over time. It is therefore recommended that DGT devices are deployed in 2016 in areas impacted by the 2014 tailings dam failure. Lower method detection limits can likely be achieved by extending the deployment period.



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APPENDIX A

SAMPLE LOCATIONS AND SUPPORTING DATA

Table A.1: Sampling locations and dates of passive sampler (DGT) deployment and retrieval, Mount Polley Mine, August 2015

Location	Area Code	Type	Replicate	GPS Coordinates		Deployment		Retrieval		Deployment duration (hours)
				Easting	Northing	Date	Time	Date	Time	
Polley Lake - South Basin	POL-P2	Exposed	1	595122	5822187	28-Aug-15	11:39	5-Oct-15	17:12	917.5
			2	595141	5822212	28-Aug-15	12:02	5-Oct-15	17:03	917.0
			3	595172	5822229	28-Aug-15	12:20	5-Oct-15	16:57	916.6
			4	595150	5822183	28-Aug-15	12:43	5-Oct-15	17:07	916.4
Bootjack Lake - South Basin	BOL-B2	Reference	1	591279	5821629	28-Aug-15	17:06	5-Oct-15	13:57	908.9
			2	591253	5821623	28-Aug-15	17:21	5-Oct-15	13:53	908.5
			3	591241	5821676	28-Aug-15	17:35	5-Oct-15	13:46	908.2
			4	591218	5821665	28-Aug-15	17:53	5-Oct-15	13:49	907.9
Quesnel Lake - Profundal Near-Field	PNF	Exposed	1	601906	5818200	31-Aug-15	17:55	6-Oct-15	8:21	854.4
			2	601849	5818258	31-Aug-15	18:12	6-Oct-15	8:14	854.0
			3	601782	5818289	31-Aug-15	18:33	6-Oct-15	8:33	854.0
			4	601649	5818354	31-Aug-15	18:49	6-Oct-15	8:44	853.9
Quesnel Lake - Profundal Reference	PREF1	Reference	1	610306	5814797	2-Sep-15	14:52	6-Oct-15	11:01	823.2
			2	610362	5814849	2-Sep-15	15:07	6-Oct-15	10:52	822.6
			3	610458	5814834	2-Sep-15	15:26	6-Oct-15	10:43	822.0
			4	610527	5814860	2-Sep-15	15:42	6-Oct-15	10:35	821.5
Hazeltine Creek	HAC	Exposed	1	600184	5817232	29-Aug-15	11:39	6-Oct-15	16:35	916.9
			2	600106	5817179	29-Aug-15	12:02	6-Oct-15	16:11	916.2
			3	599989	5817210	29-Aug-15	12:20	6-Oct-15	16:00	915.7
			4	599951	5817204	29-Aug-15	12:43	6-Oct-15	15:47	915.1

Table A.2: Supporting measures for passive sampler (DGT) deployment and retrieval, Mount Polley Mine, August 2015

A) Surface Water

Location	Area Code	Type	Replicate	Deployment					Retrieval				
				Temp.	DO	DO	SpC	pH	Temp.	DO	DO	SpC	pH
				°C	mg/L	%	µS/cm	pH units	°C	mg/L	%	µS/cm	pH units
Polley Lake	POL-P2	Exposed		18.0	8.49	90	288	8.3	12.1	10.3	96	291	8.12
Bootjack Lake	BOL-B2	Reference		17.9	8.34	88	99	7.92	11.8	10.7	99	100	7.32
Quesnel Lake	PNF	Exposed		17.2	9.01	94	110	7.98	12.6	10.7	101	111	8.26
	PREF1	Reference		17.0	9.00	93	111	7.97	12.6	11.1	105	110	8.24
Hazeltine Creek	HAC	Exposed	1	13.0	9.46	90	402	8.34	8.8	12.1	104	439	8.46
			2	13.2	9.41	90	404	8.39	8.9	12.0	104	436	8.43
			3	13.2	9.41	90	405	8.33	9.1	12.0	104	438	8.46
			4	13.2	9.41	85	402	8.32	9.2	11.7	102	435	8.37

B) Lake Bottom Water

Location	Area Code	Type	Replicate	Deployment					Retrieval				
				Temp.	DO	DO	SpC	pH	Temp.	DO	DO	SpC	pH
				°C	mg/L	%	µS/cm	pH units	°C	mg/L	%	µS/cm	pH units
Polley Lake	POL-P2	Exposed		6.0	2.04	16.4	297	7.02	6.1	1.11	8.9	298	7.26
Bootjack Lake	BOL-B2	Reference		8.9	0.01	0.1	107	6.64	8.72	0.66	5.7	160	6.64
Quesnel Lake	PNF	Exposed		4.5	10.3	80	118	7.38	4.6	12.5	97	116	7.67
	PREF1	Reference		3.9	10.4	79	114	7.44	3.9	13.4	102	113	7.68

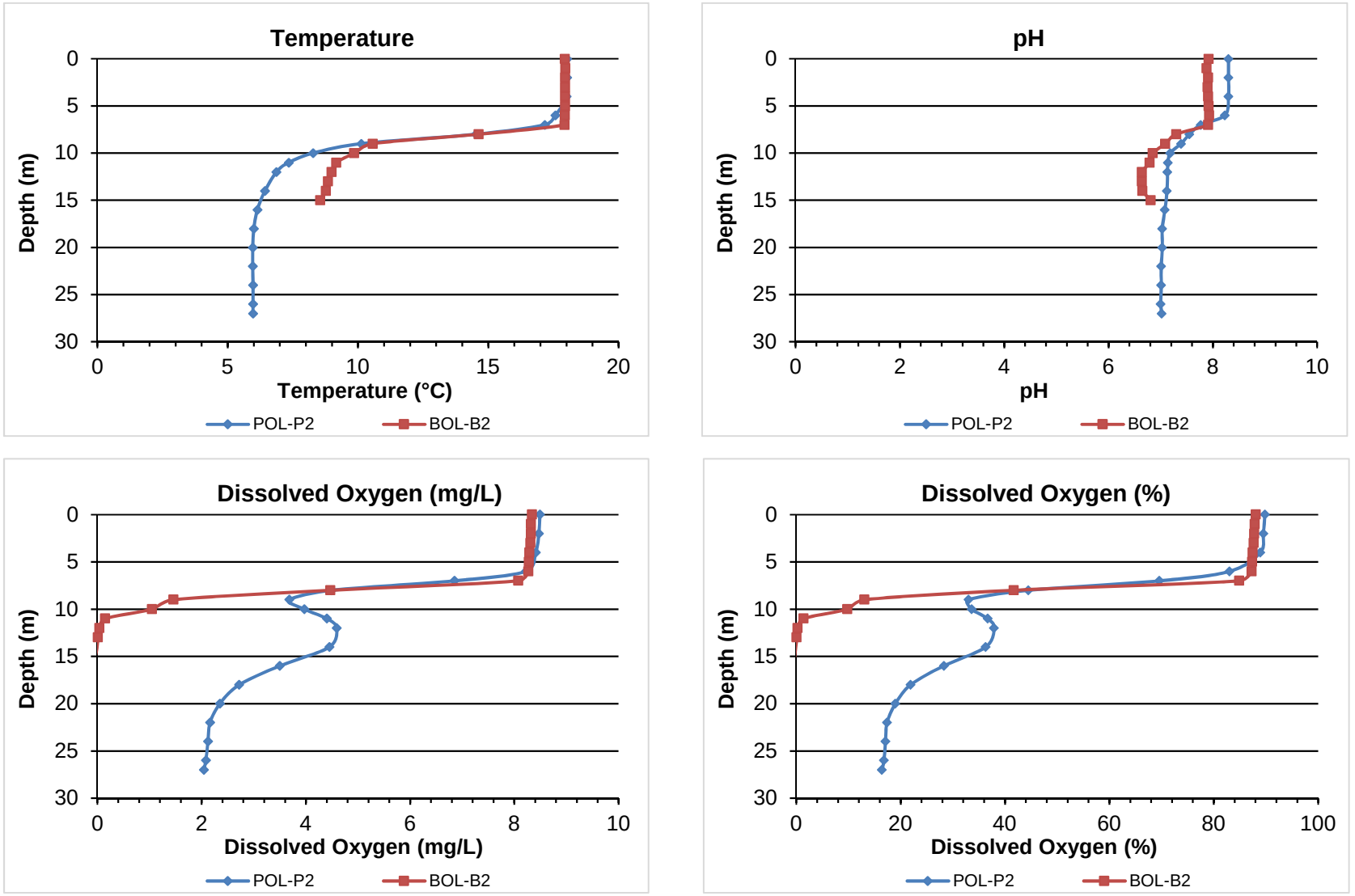

Figure A.1: Vertical profiles of temperature, pH, dissolved oxygen, and specific conductance in Polley Lake and Bootjack Lal during the deployment of Diffusive Gradient in Thin-Film (DGT) passive samplers, Mount Polley Mine, August 20

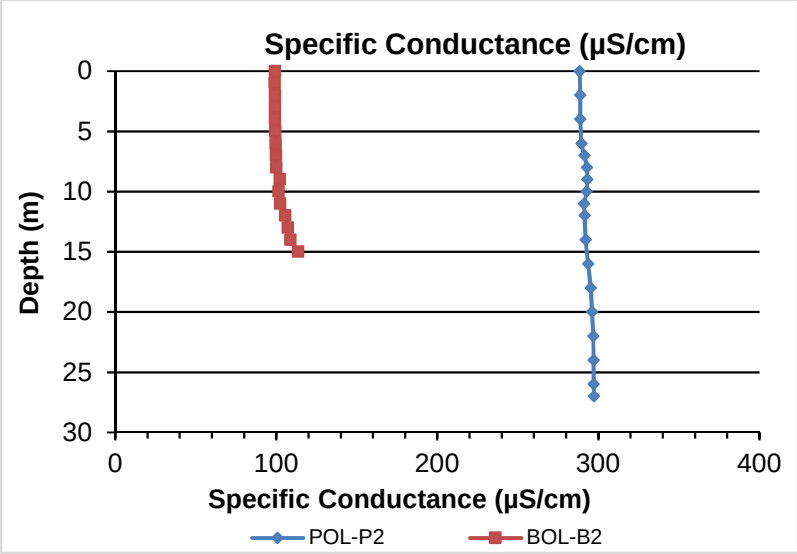

Figure A.1: Vertical profiles of temperature, pH, dissolved oxygen, and specific conductance in Polley Lake and Bootjack La during the deployment of Diffusive Gradient in Thin-Film (DGT) passive samplers, Mount Polley Mine, August 20

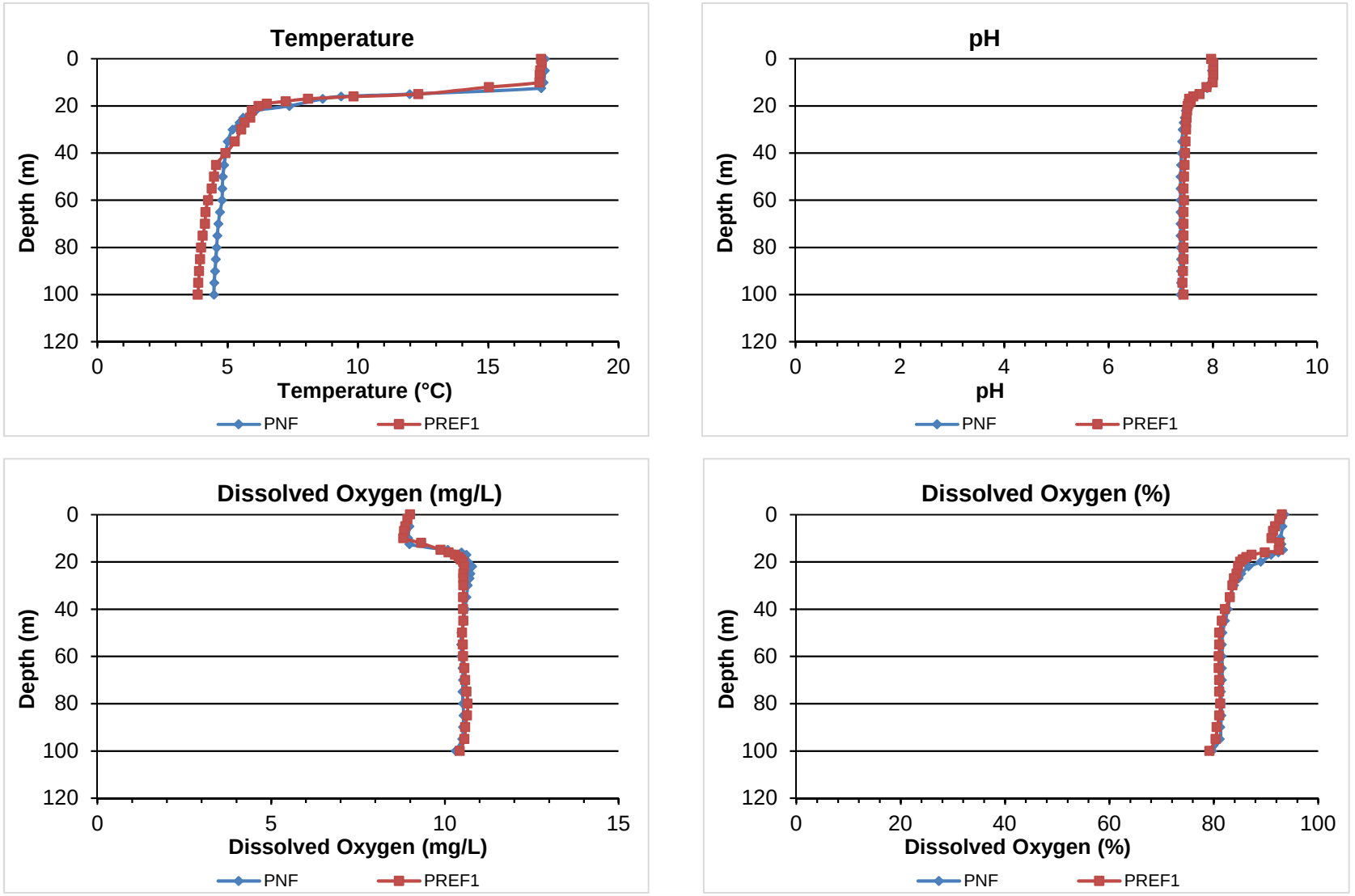

Figure A.2: Vertical profiles of temperature, pH, dissolved oxygen, and specific conductance in Quesnel Lake profundal area during the deployment of Diffusive Gradient in Thin-Film (DGT) passive samplers, Mount Polley Mine, August 20

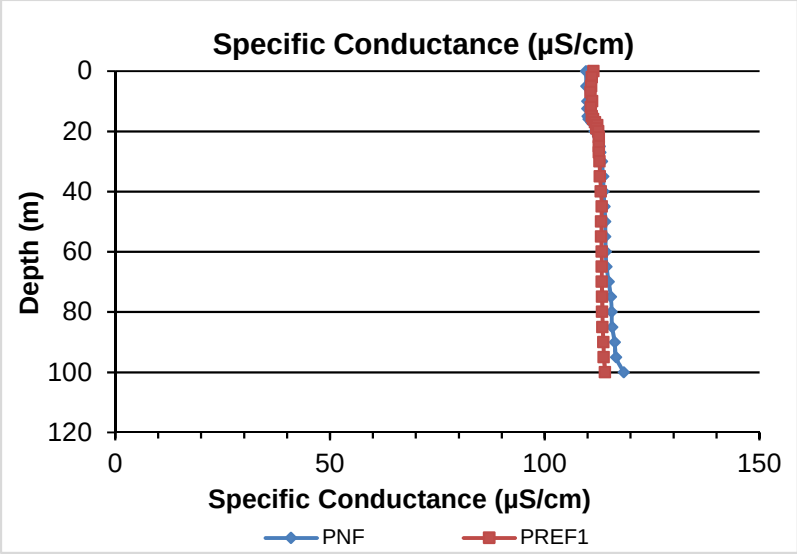

Figure A.2: Vertical profiles of temperature, pH, dissolved oxygen, and specific conductance in Quesnel Lake profundal area during the deployment of Diffusive Gradient in Thin-Film (DGT) passive samplers, Mount Polley Mine, August 20

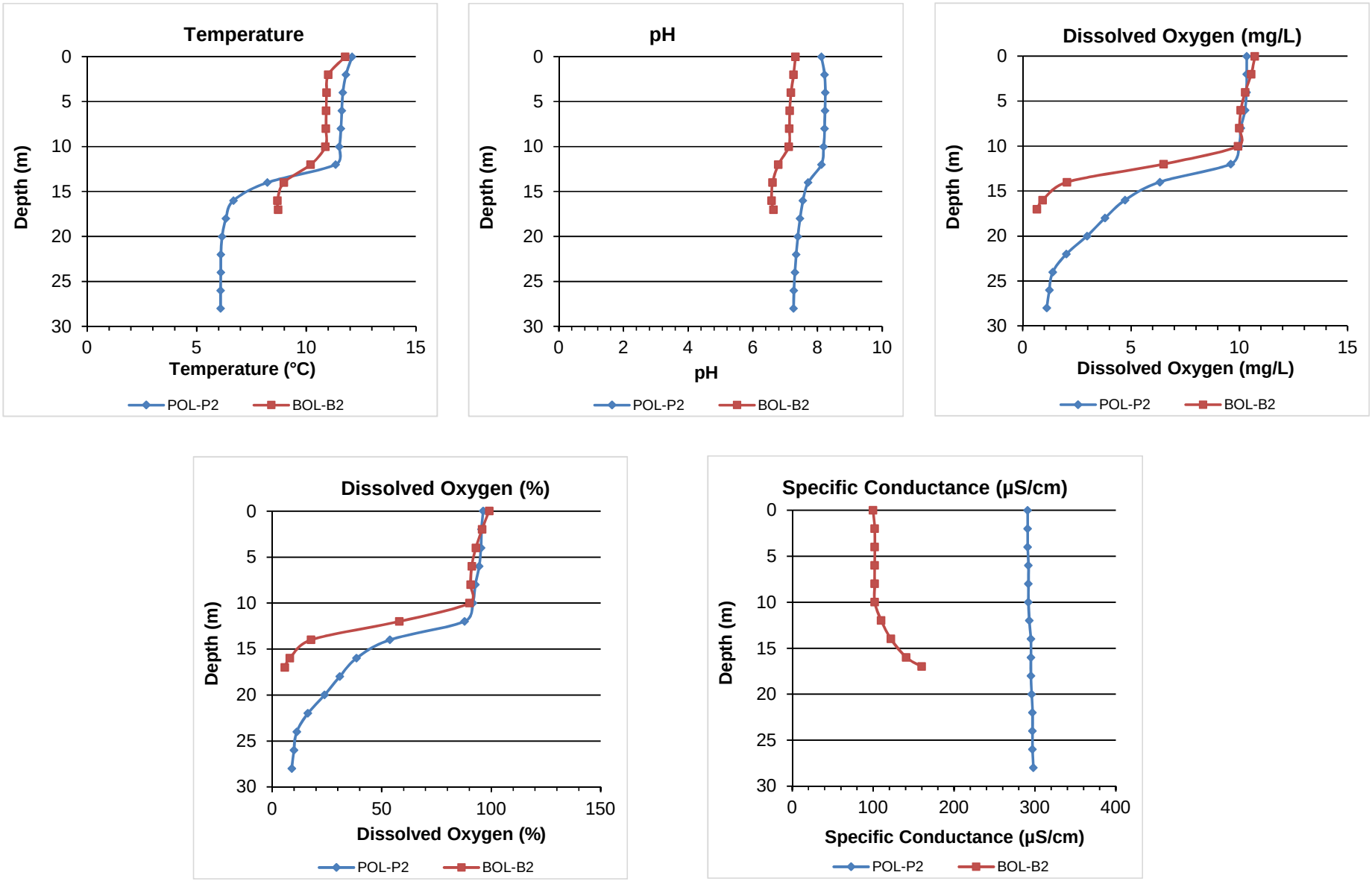

Figure A.3: Vertical profiles of temperature, pH, dissolved oxygen, and specific conductance in Polley Lake and Bootjack Lake during the retrieval of Diffusive Gradient in Thin-Film (DGT) passive samplers, Mount Polley Mine, October 2015

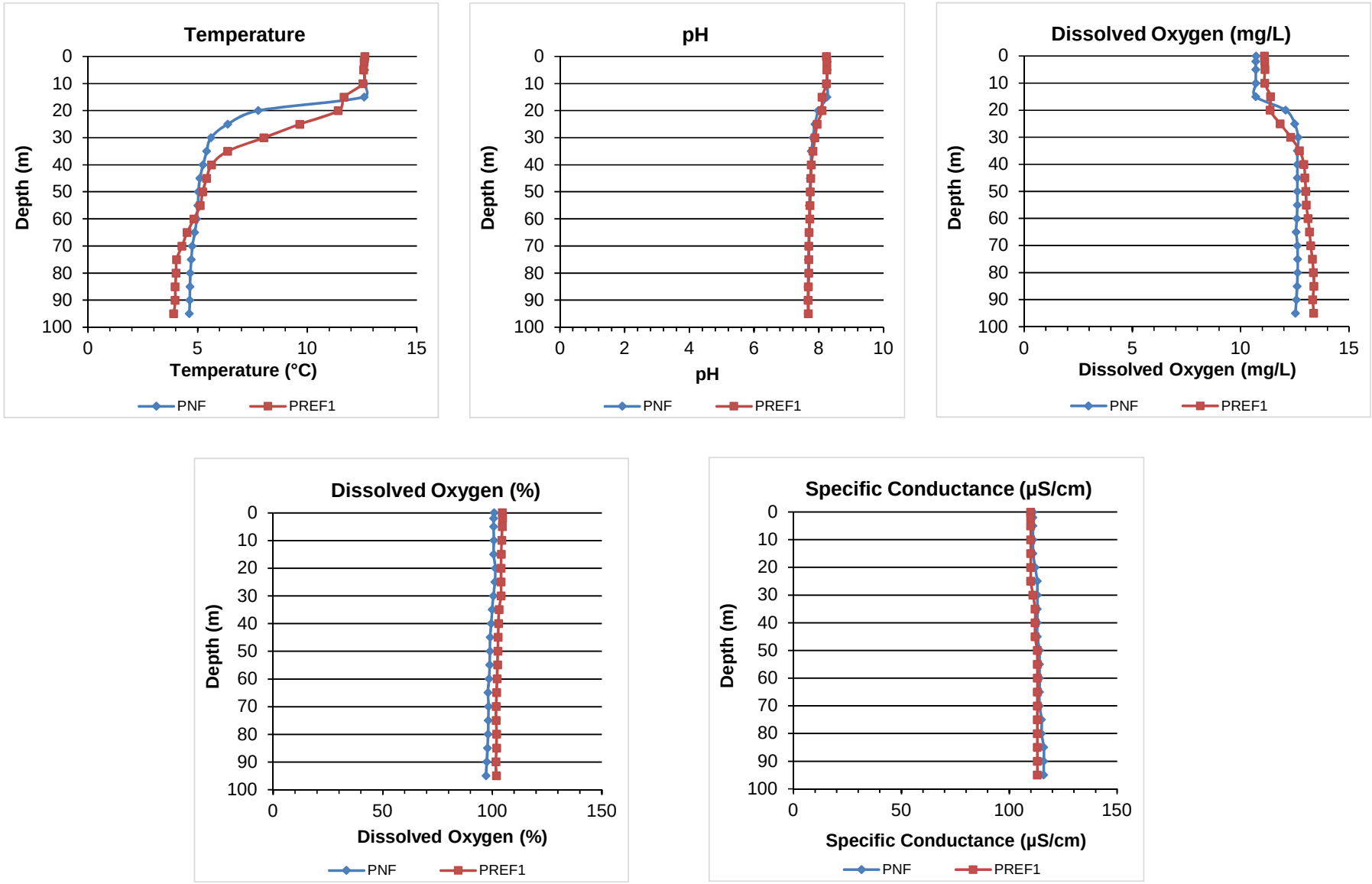

Figure A.4: Vertical profiles of temperature, pH, dissolved oxygen, and specific conductance in Quesnel Lake profundal areas during the retrieval of Diffusive Gradient in Thin-Film (DGT) passive samplers, Mount Polley Mine, October 2015.

APPENDIX B

DATA QUALITY ASSESSMENT

APPENDIX B: DATA QUALITY ASSESSMENT

LIST OF TABLES

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B1.0 INTRODUCTION

Data Quality Assessment (DQA) was conducted on data collected as part of the Mount Polley Mining Corporation 2015 Diffusive Gradients in Thin Films (DGT) Device Deployment. The objective of the DQA is to define the overall quality of the data presented in the report, and, by extension, the confidence with which the data can be used to derive conclusions.

B1.1 Background

A variety of factors can influence the physical, chemical and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Inconsistencies in sampling or laboratory methods, use of instruments that are inadequately calibrated or which cannot measure to the desired level of accuracy or precision, and contamination of samples in the field or laboratory are just some of the potential factors that can lead to the reporting of data that do not accurately reflect actual environmental conditions. Depending on the magnitude of the problem, inaccuracy or imprecision have the potential to affect the reliability of any conclusions made from the data. Therefore, it is important to ensure that programs incorporate appropriate steps to control the non-natural sources of data variability (i.e., minimize the variability that does not reflect natural spatial and temporal variability in the environment) and thus assure the quality of the data.

Data quality as a concept is meaningful only when it relates to the intended use of the data. That is, one must know the context in which the data will be interpreted in order to establish a relevant basis for judging whether or not the data set is adequate. DQA involves comparison of actual field and laboratory measurement performance to data quality objectives (DQOs) established for a particular study, such as evaluation of method detection limits, blank sample data, data precision (based on field and laboratory duplicate samples), and data accuracy (based on matrix spike recoveries and/or analysis of standards or certified reference materials). Only trusted and certified laboratories (e.g., analytical chemistry laboratories certified by Canadian Association for Laboratory Accreditation [CALA]) were involved in the current program and such certified laboratories have rigorous internal quality assurance programs that ensure the highest possible quality.

DQOs were established a-priori at the outset of the program to reflect reasonable and achievable performance expectations. Programs involving a large number of samples and analytes usually yield some results that exceed the DQOs. This is particularly so for multi-element scans since the analytical conditions are not necessarily optimal for every

element included in the scan. Generally, scan results may be considered acceptable if no more than 20% of the parameters fail to meet the DQOs. Overall, the intent of DQA is not to reject any measurement that did not meet a DQO, but to ensure that any questionable data received more scrutiny to determine what effect, if any, this had on interpretation of results within the context of this project.

B1.2 Types of Quality Control Samples

Several types of quality control (QC) samples were assessed based on samples collected (or prepared) in the field and laboratory. These samples include the following:

- **Blanks** are samples of de-ionized water, sampling devices, and/or appropriate reagent(s) that are handled and analyzed the same way as regular samples. These samples will reflect any contamination that occurred in the field (in the case of field or trip blanks) or the laboratory (in the case of laboratory or method blanks). Analyte concentrations should be non-detectable, although a data quality objective of twice the method detection limit allows for slight “noise” around the detection limit.

- **Fabrication Controls** are blank DGT resins that are digested and analyzed in the same manner as regular samples. The fabrication controls account for interferences or contamination from the DGT sampler components, storage and analysis.

- **Field Duplicates** are replicate samples collected from a randomly selected field station using identical collection and handling methods that are then analyzed separately in the laboratory. The duplicate samples are handled and analyzed in an identical manner in the laboratory. The data from field duplicate samples reflect natural variability, as well as the variability associated with sample collection methods, and therefore provide a measure of field precision.

- **Laboratory Duplicates** are replicate sub-samples created in the laboratory from randomly selected field samples which are sub-sampled and then analyzed independently using identical analytical methods. The laboratory duplicate sample results reflect any variability introduced during laboratory sample handling and analysis and thus provide a measure of laboratory precision.

- **Certified Reference Materials and QC Standards** are samples containing known chemical concentrations that are processed and analyzed along with batches of environmental samples. The sample results are then compared to target results

to provide a measure of analytical accuracy. The results are reported as the percent of the known amount that was recovered in the analysis.

B2.0 WATER SAMPLES

B2.1 Detection Limits

Method detection limits (MDLs) achieved by ALS Environmental for the supporting water samples were examined and assessed in all cases where sample results were reported as less than the MDL. For analytes for which a water quality guideline for the protection of aquatic life is available, the MDL should be lower than the guideline value (Table B.1). All reported MDLs were lower than the applicable guideline values (Table B.1), and were therefore of good quality for effective data interpretation.

B2.2 Laboratory Blank Sample Analysis

All laboratory blank results reported for the ALS Environmental laboratory reports L1666722, L1668250, L1684482, L1685536 (a total of 657 results) were non-detectable with the exception of a handful of results (0.6% of results; Appendix C). Detectable laboratory method blank results were reported for alkalinity and conductivity but in all cases the associated sample results were at least five times greater than the blank levels, therefore the sample results were deemed reliable by the laboratory (Appendix C). Overall, this indicates no inadvertent contamination of samples within the laboratory during analysis.

B2.3 Data Precision

Field Duplicate Samples

One duplicate water sample was collected in the field as part of the water sampling conducted to support the evaluation of Diffusive Gradient in Thin-Film (DGT) passive samplers deployed in Hazeltine Creek, Polley Lake, Bootjack Lake and Quesnel Lake. The duplicates showed excellent agreement in concentrations of all analytes except dissolved orthophosphate, dissolved phosphorus, and total silver which had relative percent differences (RPD) among the duplicates of 40.0%, 43.1%, and 57.1%, respectively (Table B.2). Although the data quality objective of a relative percent difference (RPD) of ≤ 25% was not met for these three analytes, each analyte had low reported results, with one detectable and one undetectable result. Consequently, although the absolute difference was small (approximately 0.001 mg/L in the case of dissolved orthophosphate and dissolved phosphorus and < 0.00001 mg/L in the case of silver) the relative percent differences exceeded the DQO (Table B.2). Overall, the field

Table B.1: Laboratory method detection limit (MDL) evaluation for water chemistry analysis relative to guidelines. Highlighting indicate MDLs that did not meet guideline.

Parameter	Units	British Columbia Water Quality Guidelines [a]	Maximum Method Detection Limit Achieved
Physical Tests			
Total Suspended Solids	mg/L	-	3
Anions and Nutrients			
Total Ammonia (as N)	mg/L	0.102 / 0.681 [b]	0.005
Chloride	mg/L	150/600	0.5
Nitrate and Nitrite (as N)	mg/L	-	0.0051
Nitrate (as N)	mg/L	3.0 / 32.8	0.005
Nitrite (as N)	mg/L	0.02 / 0.06 [c]	0.001
Orthophosphate (Dissolved)	mg/L	-	0.001
Phosphorus (Total Dissolved)	mg/L	-	0.002
Phosphorus (Total)	mg/L	-/0.005	0.002
Total Metals			
Antimony	mg/L	0.009/ -	0.0001
Beryllium	mg/L	0.00013 / -	0.0001
Bismuth	mg/L	-	0.00005
Boron	mg/L	- /1.2	0.01
Cadmium	mg/L	-	0.000005
Chromium	mg/L	0.001/- [d]	0.0005
Cobalt	mg/L	0.004/0.11	0.0001
Iron	mg/L	- /1	0.03
Lead	mg/L	0.005/0.033 [e]	0.00005
Lithium	mg/L	-	0.001
Nickel	mg/L	- /0.025 [e]	0.0005
Silver	mg/L	0.00005/0.0001 [e]	0.00001
Thallium	mg/L	0.0008/-	0.00001
Tin	mg/L	-	0.0001
Titanium	mg/L	-	0.01
Vanadium	mg/L	-	0.0005
Zinc	mg/L	0.0075/0.033 [e]	0.003
Dissolved Metals			
Aluminum	mg/L	0.05/0.10	0.003
Antimony	mg/L	-	0.0001
Arsenic	mg/L	-	0.0001
Beryllium	mg/L	-	0.0001
Bismuth	mg/L	-	0.00005
Boron	mg/L	-	0.01
Cadmium	mg/L	0.0001/0.0003 [e]	0.000005
Chromium	mg/L	-	0.0005
Cobalt	mg/L	-	0.0001
Copper	mg/L	-	0.0005
Iron	mg/L	-/0.35	0.03
Lead	mg/L	-	0.00005
Lithium	mg/L	-	0.001
Nickel	mg/L	-	0.0005
Silver	mg/L	-	0.00001
Thallium	mg/L	-	0.00001
Tin	mg/L	-	0.0001
Titanium	mg/L	-	0.01
Vanadium	mg/L	-	0.0005
Zinc	mg/L	-	0.003

[a] British Columbia Water Quality Guidelines (BCMOE 2015a, BCMOE 2015b); Chronic / Acute.

[b] Lowest tabulated chornic and acute ammonia guidelines based on pH and temperature reported in BCMOE (2015a).

[c] For low chloride water (< 2mg/L)

[d] Applies to chromium as Cr (IV); guideline for Cr(III) is 0.0089 mg/L.

[e] Guideline value calculated using the lowest hardness for surface water hardness for applicable water bodies (Quesnel Lake, Bootjack Lake, Polley Lake, and Hazeltine Creek) of 48.8 mg/L.

Table B.2: Field duplicate results for water chemistry analyses. Highlighted values did not meet the data quality objective of ≤ 25% Relative Percent Difference (RPD).

Client Sample ID	Units	Lab report L1684482		
		PNF-DGT	PNF-X	RPD (%) [a]
Date Sampled		6-Oct-15	6-Oct-15	
ALS Sample ID		L1684482-1	L1684482-2	
Physical Tests				
Conductivity	µS/cm	114	115	0.9
Hardness (as CaCO3)	mg/L	57.3	57.4	0.2
pH	pH	7.73	7.73	0.0
Total Suspended Solids	mg/L	<3.0	<3.0	0.0
Total Dissolved Solids	mg/L	72	71	1.4
Turbidity	NTU	0.37	0.47	23.8
Anions and Nutrients				
Alkalinity, Total (as CaCO3)	mg/L	53.2	52.7	0.9
Ammonia, Total (as N)	mg/L	<0.0050	<0.0050	0.0
Chloride (Cl)	mg/L	<0.50	<0.50	0.0
Fluoride (F)	mg/L	0.036	0.036	0.0
Nitrate and Nitrite (as N)	mg/L	0.153	0.151	1.3
Nitrate (as N)	mg/L	0.153	0.151	1.3
Nitrite (as N)	mg/L	<0.0010	<0.0010	0.0
Total Nitrogen	mg/L	0.221	0.220	0.5
Orthophosphate-Dissolved (as P)	mg/L	<0.0010	0.0015	40.0
Phosphorus (P)-Total Dissolved	mg/L	<0.0020	0.0031	43.1
Phosphorus (P)-Total	mg/L	0.0022	0.0028	24.0
Sulfate (SO4)	mg/L	6.90	6.90	0.0
Organic / Inorganic Carbon				
Dissolved Organic Carbon	mg/L	2.00	1.91	4.6
Total Metals				
Aluminum	mg/L	0.0288	0.0247	15.3
Antimony	mg/L	<0.00010	<0.00010	0.0
Arsenic	mg/L	0.00016	0.00015	6.5
Barium	mg/L	0.00663	0.00649	2.1
Beryllium	mg/L	<0.00010	<0.00010	0.0
Bismuth	mg/L	<0.000050	<0.000050	0.0
Boron	mg/L	<0.010	<0.010	0.0
Cadmium	mg/L	0.0000109	0.0000106	2.8
Calcium	mg/L	19.5	18.7	4.2
Chromium	mg/L	<0.00050	<0.00050	0.0
Cobalt	mg/L	<0.00010	<0.00010	0.0
Copper	mg/L	0.00165	0.00161	2.5
Iron	mg/L	<0.030	<0.030	0.0
Lead	mg/L	0.000054	0.000053	1.9
Lithium	mg/L	<0.0010	0.0010	0.0
Magnesium	mg/L	2.21	2.12	4.2
Manganese	mg/L	0.00415	0.00386	7.2
Molybdenum	mg/L	0.000897	0.000858	4.4
Nickel	mg/L	<0.00050	<0.00050	0.0
Potassium	mg/L	0.571	0.546	4.5
Selenium	mg/L	0.000102	0.000108	5.7
Silicon	mg/L	1.96	1.87	4.7
Silver	mg/L	0.000018	<0.000010	57.1
Sodium	mg/L	1.24	1.22	1.6
Strontium	mg/L	0.144	0.143	0.7
Thallium	mg/L	<0.000010	<0.000010	0.0
Tin	mg/L	<0.00010	<0.00010	0.0
Titanium	mg/L	<0.010	<0.010	0.0
Uranium	mg/L	0.000191	0.000185	3.2
Vanadium	mg/L	<0.00050	<0.00050	0.0
Zinc	mg/L	0.0073	0.0073	0.0

[a] The method detection limit (MDL) value was used in instances where values less than the MDL were reported.
RPD calculation: =(Absolute(Replicate 1 - Replicate 2))/Average(Replicate 1, Replicate 2)*100

Table B.2: Field duplicate results for water chemistry analyses. Highlighted values did not meet the data quality objective of ≤ 25% Relative Percent Difference (RPD).

Client Sample ID	Units	Lab report L1684482		
		PNF-DGT	PNF-X	RPD (%) [a]
Date Sampled		6-Oct-15	6-Oct-15	
ALS Sample ID		L1684482-1	L1684482-2	
Dissolved Metals				
Aluminum	mg/L	0.0068	0.0067	1.5
Antimony	mg/L	<0.00010	<0.00010	0.0
Arsenic	mg/L	0.00013	0.00013	0.0
Barium	mg/L	0.00596	0.00599	0.5
Beryllium	mg/L	<0.00010	<0.00010	0.0
Bismuth	mg/L	<0.000050	<0.000050	0.0
Boron	mg/L	<0.010	<0.010	0.0
Cadmium	mg/L	<0.0000050	<0.0000050	0.0
Calcium	mg/L	19.4	19.4	0.0
Chromium	mg/L	<0.00050	<0.00050	0.0
Cobalt	mg/L	<0.00010	<0.00010	0.0
Copper	mg/L	0.00109	0.00108	0.9
Iron	mg/L	<0.030	<0.030	0.0
Lead	mg/L	<0.000050	<0.000050	0.0
Lithium	mg/L	0.0011	0.0011	0.0
Magnesium	mg/L	2.16	2.17	0.5
Manganese	mg/L	0.00107	0.00114	6.3
Molybdenum	mg/L	0.000780	0.000780	0.0
Nickel	mg/L	<0.00050	<0.00050	0.0
Potassium	mg/L	0.548	0.549	0.2
Selenium	mg/L	0.000089	0.000100	11.6
Silicon	mg/L	1.84	1.84	0.0
Silver	mg/L	<0.000010	<0.000010	0.0
Sodium	mg/L	1.19	1.20	0.8
Strontium	mg/L	0.137	0.138	0.7
Thallium	mg/L	<0.000010	<0.000010	0.0
Tin	mg/L	<0.00010	<0.00010	0.0
Titanium	mg/L	<0.010	<0.010	0.0
Uranium	mg/L	0.000167	0.000168	0.6
Vanadium	mg/L	<0.00050	<0.00050	0.0
Zinc	mg/L	<0.0030	<0.0030	0.0

[a] The method detection limit (MDL) value was used in instances where values less than the MDL were reported.
RPD calculation: =(Absolute(Replicate 1 - Replicate 2))/Average(Replicate 1, Replicate 2)*100

duplicate sampling did not indicate any inconsistencies in sampling technique nor issues that could impair data interpretability.

Laboratory Duplicate Samples

All laboratory duplicate results evaluated within laboratory reports L1666722, L1668250, L1684482, L1685536 (1,474 results in total) met ALS Environmental's data quality objectives for the parameters reported (generally < 25% RPD; Appendix C). Among the four laboratory reports, 34 laboratory duplicate samples were evaluated for dissolved metals and alkalinity, 33 for conductivity, 30 for pH, sulphate, and nitrate, and 29 samples were evaluated for nitrite. In addition, 25 laboratory duplicate samples were evaluated for the precision of fluoride, 23 for chloride, 17 for total nitrogen, 15 for ammonia, 13 for dissolved orthophosphate, 12 for total suspended solids and turbidity, and 11 for dissolved organic carbon. Ten laboratory duplicate samples were assessed for precision of total dissolved solids results, five samples for total metals and dissolved phosphorus, and three samples were evaluated for the precision of total phosphorus results. Overall, the laboratory precision achieved in this study is considered good.

B2.4 Data Accuracy

The accuracy of laboratory data from within laboratory reports L1666722, L1668250, L1684482, L1685536 was assessed based on the results of certified reference materials (CRM), laboratory control samples (LCS) and matrix spike samples (MS; Appendix C). Specifically, the following CRM samples were used among the four laboratory reports to assess the accuracy of various analyses; forty one CRM samples were analysed to assess the accuracy of pH and conductivity analyses, forty for alkalinity, twenty five for ammonia, sixteen for turbidity, nine for dissolved orthophosphate, five for dissolved phosphorus, and four CRM samples were used to assess the accuracy of total phosphorus analyses (Appendix C). Sixteen LCS samples were used to evaluate the accuracy of total nitrogen samples, twelve for total suspended solids and dissolved organic carbon analyses, and eleven samples were used to assess chloride, fluoride, nitrate, nitrite, and sulfate analyses accuracy. An additional ten LCS samples were used to assess the accuracy of total dissolved solids analyses, five for total metals, and four LCS samples were analysed to evaluate the accuracy of dissolved metals analyses (Appendix C). Finally, MS samples were also used to assess the accuracy of multiple parameters, with twenty eight MS samples used to evaluate the accuracy of dissolved metals, nitrite, and sulphate analyses, fourteen for ammonia and total nitrogen accuracy, eight for dissolved orthophosphate, eight for dissolved organic carbon, five for total metals and dissolved phosphorus

accuracy, and four MS samples used to assess the accuracy of total phosphorus analyses (Appendix C). All CRM, LCS, and MS results (a total of 1,479 results) met ALS Environmental's data quality objectives for accuracy (Appendix C) and thus laboratory accuracy associated with water samples in this study is considered excellent.

B2.5 Holding Time and General Laboratory Flags

Several hold times were exceeded due to the combination of short optimal hold times and remote sampling (Appendix C). Analytes for which recommended hold times were exceeded included nitrate/nitrite (3-day hold time), pH (15-minute hold time), dissolved phosphorus (3-day hold time), turbidity (3-day hold time), and dissolved orthophosphate (3-day hold time). Results associated with the hold time exceedances appear not to have been affected as they were comparable to those associated with samples where hold times were met, or comparable to field measures in the case of pH. Furthermore, water samples were collected primarily to provide supporting water metals concentration data for the deployed Diffusive Gradient in Thin-Film (DGT) passive samplers and hold time for metals analyses were not exceeded, therefore the observed hold time exceedences will not affect data interpretability. There were no general laboratory flags associated with the water quality data (Appendix C).

B3.0 DGT SAMPLES

B3.1 Detection Limits

Method detection limits (MDLs) and reporting detection limits (RDLs) achieved by Maxxam for the DGT devices were reported for both mass analyses and for estimated average water concentrations (Appendix D). Data quality assessment of MDLs and RDLs is focussed on the average water concentrations as these are ultimately the data of greatest interest, and because water quality guidelines for the protection of aquatic life are available, the MDLs and RDLs should be lower than the guideline value. Of the analytes for which estimated average water concentrations were reported (27 analytes), some less than MDL or RDL results were returned for all but three analytes due to very low concentrations (Appendix D). However, all MDLs were well below water quality guidelines and RDLs for all but one analyte were below water quality guidelines (Table C.3). This exception occurred for chromium, where the RDL (0.0016 mg/L) was slightly greater than the guideline of 0.001 mg/L. Overall, detection limits were good and appropriate for data interpretation. In addition, chromium, the only analyte with a RDL greater than guideline, as not been identified as a parameter of interest within the study area.

B3.2 Laboratory Blank Sample Analysis

Results for the analysis of four blanks were reported in association DGT analyses – two water blanks and two method blanks. All analytes except sodium were reported as below MDL or RDL (Appendix D). This result does not indicate contamination; rather is due to a digestion solution that contains sodium (sodium hydroxide). Furthermore, all DGT data for sodium were reported as less than MDL.

B3.3 Fabrication Controls

Three fabrication control results were reported in association DGT analyses and returned results below MDL or RDL for all analytes except sodium (Appendix D). As noted above, this result does not indicate contamination; rather is due to a digestion solution that contains sodium (sodium hydroxide). Furthermore, all DGT data for sodium were reported as less than MDL.

B3.4 Field Blank Sample Analysis

Two field blanks and one trip blank were included in the program. The two field blanks returned results below MDL or RDL for all analytes (Appendix D). The trip blank returned results below MDL or RDL for all analytes except copper (Appendix D). Based on this

Table B.3: Laboratory method detection limit (MDL) evaluation for DGT-estimated average water concentrations relative to guidelines. Highlighting indicate MDLs that did not meet guideline.

Metal	Units	British Columbia Water Quality Guidelines [1]		Application (d or t)	MDLw	RDLw
		30-day	maximum			
Aluminum	mg/L	0.05	0.10	d	0.0016	0.0054
Antimony	mg/L	0.009	-	t	0.000053	0.00026
Arsenic	mg/L	-	0.005	t	0.000054	0.00027
Barium	mg/L	1.0	-	t	0.00017	0.00068
Beryllium	mg/L	-	-	-	0.000054	0.00027
Cadmium [2]	mg/L	0.00013	0.00029	d	0.0000059	0.000029
Calcium	mg/L	-	-	-	0.033	0.109
Chromium	mg/L	0.001	-	t	0.00032	0.0016
Cobalt	mg/L	0.004	0.11	t	0.000031	0.00015
Copper	mg/L	0.002	0.007	t	0.000058	0.00029
Iron	mg/L	-	0.35	d	0.0027	0.013
Lead [2]	mg/L	0.0046	0.034	t	0.00002	0.0001
Lithium	mg/L	-	-	-	0.00016	0.00079
Magnesium	mg/L	-	-	-	0.0023	0.012
Manganese [2]	mg/L	0.83	1.09	t	0.00014	0.0007
Molybdenum	mg/L	-	0.073	t	0.000091	0.0003
Nickel [2]	mg/L	-	0.06	t	0.00024	0.00081
Phosphorus	mg/L	-	-	-	0.0027	0.013
Potassium	mg/L	-	-	-	0.0033	0.017
Selenium	mg/L	0.002	-	t	0.000073	0.00037
Silver [2]	mg/L	0.00005	0.0001	t	0.0000023	0.000012
Sodium	mg/L	-	-	-	93	310
Strontium	mg/L	-	-	-	0.00013	0.00045
Thallium	mg/L	0.0008	-	t	0.00000081	0.0000041
Uranium	mg/L	-	-	-	0.0000047	0.000024
Vanadium	mg/L	-	-	-	0.000059	0.00015
Zinc [2]	mg/L	0.0075	0.033	t	0.0002	0.001

[1] British Columbia Water Quality Guidelines (BCMOE 2015a,b) except for molybdenum, which is the Canadian Water Quality Guideline (CCME 2015).

[2] at lowest applicable hardness of 50 mg/L

result (1.06 ug in the gel), a request was sent to the analytical laboratory for re-analysis, which confirmed the original result, suggesting contamination. Despite this results, there was no evidence of contamination in the field sample results – all reference results were less than RDL (<0.39 ug) and all results from exposed areas showed good agreement among replicates.

B3.5 Data Accuracy

Spikes of cadmium, thallium and uranium were added to method blanks and DGT resins to evaluate recovery. In all cases, recovery was well within the acceptable range (Appendix D).

B3.6 Holding Time and General Laboratory Flags

There were no hold time exceedences or general laboratory flags associated with the DGT samples (Appendix D).

B4.0 DATA QUALITY STATEMENT

Water quality data collected in support of the Diffusive Gradient in Thin-Film passive sampler deployment at the Mount Polley Mine were of good quality. This was characterized by good detectability, negligible analyte concentrations in method blanks, good field and laboratory precision, and good laboratory accuracy. Therefore, the supporting water quality data can be used with a high level of confidence in the derivation of conclusions. Similarly, the DGT data were characterized by good detectability, as well as negligible analyte concentrations in most blanks and all fabrication controls. Copper was detected in a trip blank, suggesting contamination, but was not supported by results from two field blanks, nor in the field samples themselves, which had low concentrations in reference areas and higher concentrations with good agreement among stations at the exposed areas. Although this data point is considered to most likely represent an anomaly, it does detract from the overall confidence in DGT copper results.

B5.0 REFERENCES

BCMoE (British Columbia Ministry of Environment). 2015a. Working Water Quality Guidelines for British Columbia (2015). Updated April 2015.

BCMoE (British Columbia Ministry of Environment). 2015b. British Columbia Water Quality Guidelines (Criteria) Reports. http://www2.gov.bc.ca/gov/topic.page?id=044DD64C7E24415D83D07430964113C9&title=Approved%20Water%20Quality%20Guidelines. Accessed April 2015.

Minnow (Minnow Environmental Inc.). 2015. Mount Polley Tailings Dam Failure – Sediment Quality Impact Characterization. Prepared for Mount Polley Mining Corporation, May 2015.

APPENDIX C

SUPPORTING WATER CHEMISTRY DATA

Table C.1: British Columbia Water Quality Guidelines for the Protection of Aquatic Life

Analyte		Units	Guidelines for the Protection of Aquatic Life [1]		Guideline Status	Hardness-Dependent Guidelines for the Protection of Aquatic Life applicable at Three Benchmark Hardness Concentrations [2]					
			30-day	Maximum		30-day			Maximum		
						50	130	200	50	130	200
Field	Temperature	C	narrative		approved		0.9			-	
	pH	pH	6.5 - 9.0		approved		-			-	
Lab	Dissolved Oxygen	mg/L	8.0 minimum	5.0 minimum	approved	-	-	-	-	-	-
Aggregate	Alkalinity (total)	mg/L	10 - 20 minimum	-	working	-	-	-	-	-	-
	Total Suspended Solids	mg/L	narrative		approved	-	-	-	-	-	-
Ions	Sulphate (dissolved)	mg/L	218 - 429		approved	-	-	-	218	309	429
	Fluoride (dissolved)	mg/L	-51.73 + 92.57(log(hardness)) x 0.01		approved	-	-	-	1.1	1.4	1.6
Nutrients	Nitrate (as nitrogen)	mg/L	3.0	32.8	approved	-	-	-	-	-	-
	Nitrite (as nitrogen) [3]	mg/L	0.020	0.06	approved	-	-	-	-	-	-
	Ammonia (as nitrogen) [4]	mg/L	0.45	1.9	approved	-	-	-	-	-	-
	Phosphorus (total) [5]	mg/L	0.005 - 0.015 (inclusive)		approved	-	-	-	-	-	-
	Dissolved Organic Carbon	mg/L	narrative		approved	-	-	-	-	-	-
Dissolved Metals	Aluminum	mg/L	0.05	0.10	approved	-	-	-	-	-	-
	Cadmium	mg/L	e^(0.736(ln(hardness))-4.943)	e^(1.03(ln(hardness))-5.274)	approved	0.00013	0.00026	0.00035	0.00029	0.00077	0.0012
	Iron	mg/L	-	0.35	approved	-	-	-	-	-	-
Total Metals	Antimony	mg/L	0.009	-	working	-	-	-	-	-	-
	Arsenic	mg/L	-	0.005	approved	-	-	-	-	-	-
	Barium	mg/L	1.0	-	working	-	-	-	-	-	-
	Beryllium	mg/L	0.00013	-	working	-	-	-	-	-	-
	Boron	mg/L	-	1.2	approved	-	-	-	-	-	-
	Chromium [6]	mg/L	0.001 CrVI; 0.0089 CrIII	-	working	-	-	-	-	-	-
	Cobalt	mg/L	0.004	0.11	approved	-	-	-	-	-	-
	Copper	mg/L	0.04*hardness	0.094*hardness + 2	approved	0.0020	0.0052	0.0080	0.007	0.014	0.021
	Iron	mg/L	-	1.0	approved	-	-	-	-	-	-
	Lead	mg/L	3.31+ e^(1.273(ln(hardness))-4.704)	e^(1.273(ln(hardness))-1.46)	approved	0.0046	0.0078	0.0110	0.034	0.114	0.197
	Manganese	mg/L	0.0044*hardness - 0.605	0.01102*hardness + 0.54	approved	0.83	1.18	1.49	1.09	1.97	2.74
	Mercury	mg/L	0.00001 when meHg = 1%	-	approved	-	-	-	-	-	-
	Molybdenum	mg/L	-	0.073	approved	-	-	-	-	-	-
	Nickel	mg/L	-	e^(0.76(ln(hardness))+1.06)	working	-	-	-	0.06	0.12	0.16
	Selenium	mg/L	0.002	-	approved	-	-	-	-	-	-
	Silver	mg/L	0.0001 when hardness ≤ 100 mg/L	0.0001 when hardness ≤ 100 mg/L	approved	0.00005	0.0015	0.0015	0.0001	0.003	0.003
	Thallium	mg/L	0.0008	-	working	-	-	-	-	-	-
	Zinc [7]	mg/L	0.0075 when hardness < 90	0.033 when hardness < 90	approved	0.0075	0.038	0.090	0.033	0.063	0.12

[1] British Columbia Water Quality Guidelines (BCMOE 2015a,b) except for molybdenum, which is the Canadian Water Quality Guideline (CCME 2015).

[2] Hardness value of 50 mg/L is representive of Quesnel Lake and Bootjack Lake, 130 mg/L is representative of Polley Lake, and 200 mg/L is representative of Hazeltine Creek. However, exact hardness values were used in the data screening presented in Table C.2.

[3] Applicable to low chloride water (<2 mg/L chloride) as observed at all sampling locations.

[4] Ammonia guideline values were selected based on a high pH (8.4) and temperature (15ºC)

[5] Applicable to lakes where salmonids are the predominant fish species

[6] Guideline for Chromium VI (0.001 mg/L) was selected, as this is the principal species found in surface waters.

[7] 30-d guideline when hardness is greater than 90 mg/L is 7.5+0.75(hardness-90) and maximum is 33+0.75(hardness-90)

Table C.2: Supporting water quality data collected at the deployment and retrieval of Diffusive Gradient in Thin-Film (DGT) passive samplers, Mount Polley Mine, August and October 2015.

Analyte	Units	Guidelines for the Protection of Aquatic Life [1]		Bootjack Lake		Polley Lake		Quesnel Lake Profundal				Hazeltine Creek	
				Reference (Bootjack Lake)		Exposed (Polley Lake P2)		Reference (Horsefly Bay)		Exposed (Near-field)			
				BOL-B2		POL-P2		PREF1		PNF		HAC	
Sampling Period:		30-day	Maximum	Deployment	Retrieval	Deployment	Retrieval	Deployment	Retrieval	Deployment	Retrieval	Deployment	Retrieval
Date Sampled:				28-Aug-15	5-Oct-15	28-Aug-15	5-Oct-15	2-Sep-15	6-Oct-15	31-Aug-15	6-Oct-15	29-Aug-15	6-Oct-15
Physical Tests													
Conductivity	uS/cm	-	-	104	107	291	284	108	110	116	114	402	422
Hardness (as CaCO3)	mg/L	-	-	48.8	50.3	134	137	56	55.3	56.9	57.3	199	216
pH	pH	6.5 - 9.0		7.49	7.37	7.86	7.73	7.73	7.75	7.75	7.73	8.41	8.38
Total Suspended Solids	mg/L	narrative		<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	18.2
Total Dissolved Solids	mg/L	-	-	65	83	175	194	80	71	68	72	238	283
Turbidity	NTU	narrative		2.26	4.34	1.79	2.38	0.26	0.15	1.09	0.37	0.49	1.07
Anions and Nutrients													
Alkalinity, Total (as CaCO3)	mg/L	10-20 minimum		46.5	52.7	95.5	100	48.5	50.7	50.6	53.2	158	178
Ammonia, Total (as N) [2]	mg/L	0.45	1.9	0.122	0.253	0.0108	0.0225	<0.0050	<0.0050	<0.0050	<0.0050	0.0115	<0.0050
Chloride (Cl)	mg/L	-	-	1.32	1.32	1.41	1.37	<0.50	<0.50	<0.50	<0.50	1.55	1.56
Fluoride (F) [3]	mg/L	1.1 - 1.6		0.054	0.055	0.084	0.086	0.032	0.033	0.037	0.036	0.149	0.149
Nitrate and Nitrite (as N)	mg/L	-	-	0.0143	<0.0051	0.448	0.445	0.142	0.145	0.147	0.153	0.084	0.010
Nitrate (as N)	mg/L	3.0	32.8	0.0125	<0.0050	0.448	0.444	0.142	0.145	0.147	0.153	0.084	0.010
Nitrite (as N)	mg/L	0.02	0.06	0.0017	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Nitrogen	mg/L	-	-	0.419	0.564	0.691	0.728	0.193	0.199	0.203	0.221	0.244	0.145
Orthophosphate-Dissolved (as P)	mg/L			0.0282	0.196	0.0744	0.0885	<0.0010	<0.0010	<0.0010	<0.0010	0.0074	0.0037
Phosphorus (P)-Total Dissolved	mg/L			0.0337	0.176	0.0819	0.0960	0.0029	<0.0020	0.0032	<0.0020	0.0106	0.0051
Phosphorus (P)-Total [4]	mg/L	- [4]		0.0751	0.231	0.0794	0.0890	0.0024	<0.0020	0.0050	0.0022	0.0122	0.0079
Sulfate (SO4) [3]	mg/L	218 - 429		3.79	3.05	47.8	47.4	6.16	6.30	7.04	6.90	52.6	55.9
Organic / Inorganic Carbon													
Dissolved Organic Carbon	mg/L	narrative		6.94	6.73	6.32	5.85	1.99	1.70	1.95	2.00	4.08	3.66
Total Metals													
Aluminum	mg/L			0.0081	0.0164	0.0264	0.0193	0.0123	0.0098	0.0871	0.0288	0.0485	0.102
Antimony	mg/L	0.009		0.00010	0.00012	0.00014	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	0.00021	0.00018
Arsenic	mg/L	0.005		0.00088	0.00117	0.00105	0.00097	0.00013	0.00011	0.00028	0.00016	0.00153	0.00143
Barium	mg/L	1.0		0.0222	0.0303	0.0125	0.0102	0.00533	0.00514	0.00798	0.00663	0.0355	0.0364
Beryllium	mg/L			<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	mg/L			<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	mg/L	1.2		0.049	0.046	0.029	0.030	<0.010	<0.010	<0.010	<0.010	0.041	0.042
Cadmium	mg/L	-	-	<0.0000050	0.0000691	<0.0000050	0.0000096	<0.0000050	<0.0000050	<0.0000050	0.0000109	0.0000136	0.0000117
Calcium	mg/L			15.3	15.4	43.9	43.3	18.9	18.7	18.7	19.5	57.6	63.1
Chromium	mg/L	0.001 CrVI; 0.0089 CrIII		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	mg/L	0.004	0.011	<0.00010	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper [3]	mg/L	0.002 - 0.008	0.007 - 0.021	0.00167	0.00194	0.00292	0.00286	0.00066	0.00061	0.00270	0.00165	0.0154	0.0146
Iron	mg/L	1.0		0.642	1.76	<0.030	<0.030	<0.030	<0.030	0.075	<0.030	0.034	0.101
Lead [3]	mg/L	0.005 - 0.011	0.034 - 0.197	<0.000050	0.000219	<0.000050	<0.000050	<0.000050	<0.000050	0.000061	0.000054	<0.000050	0.000061
Lithium	mg/L			<0.0010	<0.0010	<0.0010	<0.0010	0.0013	<0.0010	<0.0010	<0.0010	0.0019	0.0024
Magnesium	mg/L			2.44	2.52	5.66	5.93	2.13	2.09	2.07	2.21	11.4	13.8
Manganese [3]	mg/L	0.83 - 1.5	1.1 - 2.7	0.946	1.28	0.202	0.225	0.00639	0.00129	0.0154	0.00415	0.00353	0.00661
Molybdenum	mg/L	0.073		0.00136	0.00130	0.0110	0.0104	0.000379	0.000326	0.00103	0.000897	0.0127	0.0123
Nickel [3]	mg/L	0.06 - 0.16		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Potassium	mg/L			0.573	0.571	1.49	1.48	0.496	0.491	0.626	0.571	1.71	1.72
Selenium	mg/L	0.002		0.000150	0.000128	0.000851	0.000803	0.000093	0.000074	0.000115	0.000102	0.000925	0.000967
Silicon	mg/L			3.42	3.42	4.30	4.47	1.80	1.77	1.97	1.96	5.05	5.89
Silver	mg/L			<0.000010	0.000073	<0.000010	0.000039	<0.000010	<0.000010	<0.000010	0.000018	<0.000010	<0.000010
Sodium	mg/L			2.54	2.41	10.3	10.1	0.956	0.946	1.40	1.24	14.3	15.1
Strontium	mg/L			0.134	0.143	0.318	0.331	0.138	0.143	0.136	0.144	0.488	0.576
Thallium	mg/L			<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Tin	mg/L			<0.00010	0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	mg/L			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	mg/L			0.000042	0.000039	0.000289	0.000257	0.000162	0.000158	0.000220	0.000191	0.00122	0.00140
Vanadium	mg/L			<0.00050	0.00060	0.00090	0.00059	<0.00050	<0.00050	0.00056	<0.00050	0.00146	0.00152
Zinc [3]	mg/L	0.0075 - 0.09	0.033 - 0.12	<0.0030	0.0171	<0.0030	0.0039	<0.0030	<0.0030	<0.0030	0.0073	<0.0030	<0.0030
Dissolved Metals													
Aluminum	mg/L	0.05	0.10	<0.0030	0.0051	<0.0030	<0.0030	0.0048	0.0049	0.0089	0.0068	0.0095	0.0054
Antimony	mg/L	-	-	<0.00010	<0.00010	0.00012	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00018	0.00014
Arsenic	mg/L	-	-	0.00075	0.00114	0.00097	0.00093	0.00011	<0.00010	0.00015	0.00013	0.00149	0.00137
Barium	mg/L	-	-	0.0214	0.0301	0.0107	0.00898	0.00515	0.00504	0.00660	0.00596	0.0356	0.0351
Beryllium	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	mg/L	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	mg/L	-	-	0.043	0.044	0.026	0.027	<0.010	<0.010	<0.010	<0.010	0.036	0.037
Cadmium [3]	mg/L	0.00013 - 0.00035	0.00029 - 0.0012	<0.0000050	0.0000430	<0.0000050	0.0000089	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000102	0.0000055
Calcium	mg/L	-	-	15.4	15.8	44.2	44.9	18.9	18.8	19.3	19.4	60.3	63.6
Chromium	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	mg/L	-	-	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	mg/L	-	-	0.00123	0.00128	0.00223	0.00220	0.00064	<0.00050	0.00125	0.00109	0.0143	0.0114
Iron	mg/L	0.35		0.518	1.70	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead	mg/L	-	-	<0.000050	0.000057	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium	mg/L	-	-	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0011	<0.0010	0.0011	0.0016	0.0019
Magnesium	mg/L	-	-	2.47	2.60	5.65	6.00	2.15	2.06	2.10	2.16	11.8	13.9
Manganese	mg/L	-	-	0.921	1.29	0.00261	0.00661	0.00532	0.00047	0.0117	0.00107	0.00240	0.00348
Molybdenum	mg/L	-	-	0.00130	0.00122	0.0101	0.00930	0.000315	0.000323	0.000957	0.000780	0.0123	0.0112
Nickel	mg/L	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Potassium	mg/L	-	-	0.565	0.595	1.46	1.46	0.478	0.486	0.588	0.548	1.73	1.67
Selenium	mg/L	-	-	0.000159	0.000170	0.000893	0.000790	0.000082	0.000086	0.000098	0.000089	0.00101	0.000910
Silicon	mg/L	-	-	3.38	3.45	4.17	4.43	1.76	1.70	1.85	1.84	5.11	5.71
Silver	mg/L	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium	mg/L	-	-	2.44	2.44	9.99	9.93	0.992	0.927	1.30	1.19	14.4	14.6
Strontium	mg/L	-	-	0.130	0.139	0.311	0.318	0.136	0.135	0.131	0.137	0.485	0.552
Thallium	mg/L	-	-	<0.000010	0.000021	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000012
Tin	mg/L	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	mg/L	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	mg/L	-	-	0.000039	0.000036	0.000269	0.000234	0.000154	0.000141	0.000206	0.000167	0.00119	0.00128
Vanadium	mg/L	-	-	<0.00050	0.00057	0.00051	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00123	0.00099
Zinc	mg/L	-	-	<0.0030	0.0341	<0.0030	0.0061	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030

[1] British Columbia Water Quality Guidelines (BCMOE 2015a,b) except for molybdenum, which is the Canadian Water Quality Guideline (CCME 2015). Guidelines applied as chronic (long term) unless separate 30-day and maximum guidelines are available

[2] Ammonia guideline values were selected based on a high pH (8.4) and temperature (15ºC)

[3] Concurrent hardness values were used for all screening against hardness-based water quality guidelines; see Appendix Table C.1 for applicable equations

[4] Guideline of 0.005 to 0.015 mg/L (inclusive) is not applied as too few samples are available for adequate application

yellow shading indicates a concentration greater than an applicable guideline (long term)

APPENDIX D

DGT (DIFFUSIVE GRADIENTS IN THIN FILMS) DATA

Table D.1: Mass of Metals extracted by Diffusive Gradients in Thin Films (DGT), Mount Polley Mine, August to October, 2015 [a,b,c]

				Hazeltine Creek						Polley Lake						Bootjack Lake					
Client ID				**HAC-1**	**HAC-2**	**HAC-3**	**HAC-4**	**Hazeltine Creek**		**P2-1**	**P2-2**	**P2-3**	**P2-4**	**Polley Lake**		**B2-1**	**B2-2**	**B2-3**	**B2-4**	**Bootjack Lake**	
Deployment time				38.2 days	38.2 days	38.2 days	38.1 days			38.2 days	38.2 days	38.2 days	38.2 days			37.9 days	37.9 days	37.8 days	37.8 days		
Temperature				10.9 °C	11.1 °C	11.2 °C	11.2 °C	**Mean**	**SD**	6.05 °C	6.05 °C	6.05 °C	6.05 °C	**Mean**	**SD**	8.65 °C	8.65 °C	8.65 °C	8.65 °C	**Mean**	**SD**
Metal Name	**MDL**	**RDL**	**Units**	**Mass Extracted by DGT**																	
Aluminum (Al)	0.59	1.96	µg	2.19	5.49	2.35	<RDL	**3.00**	**1.67**	<MDL	<MDL	<MDL	<MDL	<0.59	-	<MDL	<MDL	<MDL	<MDL	<0.59	-
Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	<0.025	-	<MDL	<MDL	<MDL	<MDL	<0.025	-	<MDL	<MDL	<MDL	<MDL	<0.025	-
Arsenic (As)	0.025	0.13	µg	<RDL	<RDL	<RDL	<RDL	<0.13	-	<RDL	<RDL	<RDL	<RDL	<0.13	-	<RDL	<RDL	<RDL	<RDL	<0.13	-
Barium (Ba)	0.063	0.25	µg	6.87	9.60	5.01	4.81	**6.57**	**2.22**	1.76	1.86	1.99	1.84	**1.86**	**0.10**	2.70	3.14	3.43	3.98	**3.31**	**0.54**
Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-
Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	<MDL	<0.077	-	<MDL	<MDL	<MDL	<MDL	<0.077	-	<MDL	<MDL	<MDL	<MDL	<0.077	-
Boron (B)	0.25	1.3	µg	<MDL	<MDL	<MDL	<RDL	<0.25	-	<MDL	<RDL	<RDL	<RDL	<1.3	-	<RDL	<RDL	<MDL	<RDL	<1.3	-
Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<RDL	<0.0025	-	<MDL	<MDL	<MDL	<MDL	<0.0025	-	<MDL	<MDL	<MDL	<MDL	<0.0025	-
Calcium (Ca)	20	66	µg	168	210	152	158	**172**	**26**	112	114	134	103	**116**	**13**	<RDL	<RDL	<RDL	<RDL	<66	-
Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-
Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-	<RDL	<RDL	<RDL	<RDL	<0.013	-
Copper (Cu)	0.025	0.13	µg	2.34	2.64	2.37	2.18	**2.38**	**0.19**	0.15	<RDL	0.14	0.16	**0.15**	**0.01**	<RDL	<RDL	<RDL	<RDL	<0.13	-
Iron (Fe)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	<1.25	-	<MDL	<MDL	<MDL	<MDL	<1.25	-	145	147	113	142	**137**	**16**
Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-
Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-
Magnesium (Mg)	1.25	6.3	µg	7.78	9.3	7.5	<RDL	**7.7**	**1.2**	<MDL	<MDL	<RDL	<MDL	<6.3	-	<MDL	<MDL	<MDL	<MDL	<1.25	-
Manganese (Mn)	0.05	0.25	µg	0.68	1.05	0.68	0.65	**0.77**	**0.19**	3.18	2.71	2.00	2.87	**2.69**	**0.50**	18.41	20.83	22.61	28.22	**22.5**	**4.2**
Molybdenum (Mo)	0.044	0.15	µg	<RDL	<RDL	<RDL	<MDL	<0.15	-	1.16	1.20	1.30	1.24	**1.23**	**0.06**	0.22	0.23	0.23	0.24	**0.23**	**0.01**
Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	<MDL	<0.095	-	<MDL	<MDL	<MDL	<MDL	<0.095	-	<MDL	<MDL	<MDL	<MDL	<0.095	-
Phosphorus (P)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	<1.25	-	<RDL	<RDL	<RDL	<RDL	<1.25	-	11.46	14.73	15.77	18.5	**15.1**	**2.9**
Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	<MDL	<5	-	<MDL	<MDL	<MDL	<MDL	<5	-	<MDL	<MDL	<MDL	<MDL	<5	-
Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	<MDL	<0.05	-	<MDL	<MDL	<MDL	<MDL	<0.05	-	<MDL	<MDL	<MDL	<MDL	<0.05	-
Strontium (Sr)	0.082	0.27	µg	1.97	3.22	1.28	1.28	**1.94**	**0.91**	0.88	0.94	1.15	0.97	**0.99**	**0.12**	0.62	0.70	0.69	0.82	**0.71**	**0.08**
Silver (Ag)	0.0025	0.013	µg	<RDL	<MDL	<MDL	<MDL	<0.0025	-	<MDL	<MDL	<MDL	<MDL	<0.0025	-	<MDL	<MDL	<MDL	<MDL	<0.0025	-
Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	<MDL	<94000	-	<MDL	<MDL	<MDL	<MDL	<94000	-	<MDL	<MDL	<MDL	<MDL	<94000	-
Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	<MDL	<0.0013	-	<MDL	<MDL	<MDL	<MDL	<0.0013	-	<MDL	<MDL	<MDL	<MDL	<0.0013	-
Tin (Sn)	0.092	0.31	µg	<MDL	<MDL	<MDL	<MDL	<0.092	-	<MDL	<MDL	<MDL	<MDL	<0.092	-	<MDL	<MDL	<MDL	<MDL	<0.092	-
Uranium (U)	0.0025	0.013	µg	0.020	0.034	<RDL	<RDL	**0.020**	**0.010**	0.04	0.04	0.04	0.04	**0.04**	**0.00**	<MDL	<MDL	<MDL	<MDL	<0.0025	-
Vanadium (V)	0.025	0.063	µg	0.29	0.36	0.36	0.30	**0.33**	**0.04**	0.15	0.14	0.16	0.16	**0.15**	**0.01**	<MDL	<MDL	<MDL	<MDL	<0.025	-
Zinc (Zn)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-

[a] mean and standard deviation calculated using substitution of the method detection limit (MDL) or reporting detection limit (RDL)

[b] in cases where all replicates were reported as less than MDL or RDL, the mean is reported as the applicable MDL or RDL

[c] in cases where results were a mixture of less than MDL and less than RDL, the mean is reported as less than RDL

Table D.1: Mass of Metals extracted by Diffusive Gradients in Thin Films (DGT), Mount Polley Mine, August to October, 2015 [a,b,c]

				Quesnel Lake Profundal Exposed						Quesnel Lake Profundal Reference					
Client ID				**PNF-1**	**PNF-2**	**PNF-3**	**PNF-4**	**Quesnel Lake Profundal Exposed**		**PRef1-1**	**PRef1-2**	**PRef1-3**	**PRef1-4**	**Quesnel Lake Profundal Reference**	
Deployment time				35.6 days	35.6 days	35.6 days	35.6 days			34.3 days	34.3 days	34.3 days	34.2 days		
Temperature				4.55 °C	4.55 °C	4.55 °C	4.55 °C	**Mean**	**SD**	3.9 °C	3.9 °C	3.9 °C	3.9 °C	**Mean**	**SD**
Metal Name	**MDL**	**RDL**	**Units**	**Mass Extracted by DGT**											
Aluminum (Al)	0.59	1.96	µg	<RDL	3.36	<RDL	<RDL	**2.31**	**0.70**	<RDL	<RDL	3.08	<RDL	**2.24**	**0.56**
Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	<0.025	-	<MDL	<MDL	<MDL	<MDL	<0.025	-
Arsenic (As)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	<0.025	-	<MDL	<MDL	<MDL	<MDL	<0.025	-
Barium (Ba)	0.063	0.25	µg	1.88	1.73	1.42	1.98	**1.75**	**0.24**	1.49	1.44	1.6	1.49	**1.51**	**0.07**
Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-
Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	<MDL	<0.077	-	<MDL	<MDL	<MDL	<MDL	<0.077	-
Boron (B)	0.25	1.3	µg	<MDL	<MDL	<RDL	<RDL	<1.3	-	<RDL	<MDL	<RDL	<MDL	<1.3	-
Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	<0.0025	-	<MDL	<MDL	<MDL	<MDL	<0.0025	-
Calcium (Ca)	20	66	µg	139	125	119	118	**125**	**10**	83	121	131	132	**117**	**23**
Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-
Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-
Copper (Cu)	0.025	0.13	µg	<RDL	<RDL	<RDL	<RDL	<0.13		<RDL	<RDL	<RDL	<MDL	<0.13	-
Iron (Fe)	1.25	6.3	µg	<MDL	<RDL	<MDL	<MDL	<6.3		<MDL	<MDL	<MDL	<MDL	<1.25	-
Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	<0.013	-	<MDL	<MDL	<MDL	<MDL	<0.013	-
Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	<0.125	-	<MDL	<MDL	<MDL	<MDL	<0.125	-
Magnesium (Mg)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	<1.25	-	<MDL	<MDL	<MDL	<MDL	<1.25	-
Manganese (Mn)	0.05	0.25	µg	1.05	1.3	1.03	1.17	**1.14**	**0.12**	1.13	0.60	1.28	1.74	**1.19**	**0.47**
Molybdenum (Mo)	0.044	0.15	µg	<RDL	<RDL	<RDL	<RDL	<0.15		<MDL	<MDL	<MDL	<RDL	<0.15	-
Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	<MDL	<0.095	-	<MDL	<MDL	<MDL	<MDL	<0.095	-
Phosphorus (P)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	<1.25	-	<MDL	<MDL	<MDL	<MDL	<1.25	-
Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	<MDL	<5	-	<MDL	<MDL	<MDL	<MDL	<5	-
Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	<MDL	<0.05	-	<MDL	<MDL	<MDL	<MDL	<0.05	-
Strontium (Sr)	0.082	0.27	µg	0.98	0.83	0.65	0.89	**0.84**	**0.14**	0.68	0.92	0.93	0.92	**0.86**	**0.12**
Silver (Ag)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	<0.0025	-	<MDL	<MDL	<MDL	<MDL	<0.0025	-
Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	<MDL	<94000	-	<MDL	<MDL	<MDL	<MDL	<94000	-
Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	<MDL	<0.0013	-	<MDL	<MDL	<MDL	<MDL	<0.0013	-
Tin (Sn)	0.092	0.31	µg	<MDL	<RDL	<MDL	<MDL	<0.092	-	<MDL	<MDL	<MDL	<MDL	<0.092	-
Uranium (U)	0.0025	0.013	µg	0.03	0.03	0.03	0.03	**0.03**	**0.00**	0.03	0.02	0.02	0.02	**0.02**	**0.00**
Vanadium (V)	0.025	0.063	µg	<RDL	<RDL	<MDL	<RDL	<0.063	-	<MDL	<MDL	<MDL	<MDL	<0.025	-
Zinc (Zn)	0.125	0.63	µg	<MDL	6.73	<MDL	<MDL	**1.78**	**3.30**	<MDL	<MDL	<MDL	<MDL	<0.125	-

[a] mean and standard deviation calculated using substitution of the me

[b] in cases where all replicates were reported as less than MDL or RDL

[c] in cases where results were a mixture of less than MDL and less tha

Table D.2: Calculated labile metal concentrations using Diffusive Gradients in Thin Films (DGT), Mount Polley Mine, August to October 2015 [a,b,c]

				Hazeltine Creek						Polley Lake						Bootjack Lake					
Client ID				**HAC-1**	**HAC-2**	**HAC-3**	**HAC-4**	**Hazeltine Creek**		**P2-1**	**P2-2**	**P2-3**	**P2-4**	**Polley Lake**		**B2-1**	**B2-2**	**B2-3**	**B2-4**	**Bootjack Lake**	
Deployment time				38.2 days	38.2 days	38.2 days	38.1 days			38.2 days	38.2 days	38.2 days	38.2 days			37.9 days	37.9 days	37.8 days	37.8 days		
Temperature				10.9 °C	11.1 °C	11.2 °C	11.2 °C	**Mean**	**SD**	6.0 °C	6.0 °C	6.0 °C	6.0 °C	**Mean**	**SD**	8.6 °C	8.6 °C	8.6 °C	8.6 °C	**Mean**	**SD**
Metal Name	**MDLw**	**RDLw**	**Units**	**Calculated Labile Metals Extracted by DGT**																	
Aluminum (Al)	1.6	5.4	µg/L	6.1	15	6.5	<RDLw	**8.3**	**4.5**	<MDLw	<MDLw	<MDLw	<MDLw	<1.6	-	<MDLw	<MDLw	<MDLw	<MDLw	<1.6	-
Antimony (Sb)	0.053	0.26	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.053	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.053	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.053	-
Arsenic (As)	0.054	0.27	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	<0.27	-	<RDLw	<RDLw	<RDLw	<RDLw	<0.27	-	<RDLw	<RDLw	<RDLw	<RDLw	<0.27	-
Barium (Ba)	0.17	0.68	µg/L	19	26	14	13	**18.0**	**5.9**	5.7	6	6.4	5.9	**6.0**	**0.3**	8.1	9.4	10	12	**9.9**	**1.6**
Beryllium (Be)	0.054	0.27	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.054	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.054	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.054	-
Bismuth (Bi)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Boron (B)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Cadmium (Cd)	0.0059	0.029	µg/L	<MDLw	<MDLw	<MDLw	<RDLw	<0.029	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.0059	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.0059	-
Calcium (Ca)	33	109	µg/L	280	350	250	260	**285**	**45**	220	220	260	200	**225**	**25**	<RDLw	<RDLw	<RDLw	<RDLw	<109	-
Chromium (Cr)	0.32	1.6	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.32	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.32	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.32	-
Cobalt (Co)	0.031	0.15	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.031	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.031	-	<RDLw	<RDLw	<RDLw	<RDLw	<0.15	-
Copper (Cu)	0.058	0.29	µg/L	5.5	6.2	5.5	5.1	**5.6**	**0.5**	0.42	<RDLw	0.39	0.45	**0.39**	**0.07**	<RDLw	<RDLw	<RDLw	<RDLw	<0.29	-
Iron (Fe)	2.7	13	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<2.7	-	<MDLw	<MDLw	<MDLw	<MDLw	<2.7	-	340	350	264	333	**322**	**39**
Lead (Pb)	0.02	0.1	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.02	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.02	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.02	-
Lithium (Li)	0.16	0.79	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.16	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.16	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.16	-
Magnesium (Mg)	2.3	12	µg/L	15	17	14	<RDLw	**14.5**	**2.1**	<MDLw	<MDLw	<RDLw	<MDLw	<12	-	<MDLw	<MDLw	<MDLw	<MDLw	<2.3	
Manganese (Mn)	0.14	0.7	µg/L	1.9	2.9	1.9	1.8	**2.1**	**0.5**	11	9	6.6	9.5	**9.0**	**1.8**	56	64	69	86	**69**	**13**
Molybdenum (Mo)	0.091	0.3	µg/L	<RDLw	<RDLw	<RDLw	<MDLw	<0.3	-	2.8	2.9	3.2	3.0	**3.0**	**0.2**	0.51	0.53	0.52	0.54	**0.53**	**0.01**
Nickel (Ni)	0.24	0.81	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.24	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.24	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.24	-
Phosphorus (P)	2.7	13	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<2.7	-	<RDLw	<RDLw	<RDLw	<RDLw	<13	-	27	35	37	44	**36**	**7**
Potassium (K)	3.3	17	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<3.3	-	<MDLw	<MDLw	<MDLw	<MDLw	<3.3	-	<MDLw	<MDLw	<MDLw	<MDLw	<3.3	-
Selenium (Se)	0.073	0.37	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.073	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.073	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.073	-
Silver (Ag)	0.0023	0.012	µg/L	<RDLw	<MDLw	<MDLw	<MDLw	<0.012	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.0023	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.0023	-
Sodium (Na)	93000	310000	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<93000	-	<MDLw	<MDLw	<MDLw	<MDLw	<93000	-	<MDLw	<MDLw	<MDLw	<MDLw	<93000	-
Strontium (Sr)	0.13	0.45	µg/L	3.3	5.3	2.1	2.1	**3.2**	**1.5**	1.7	1.8	2.2	1.9	**1.9**	**0.2**	1.1	1.3	1.2	1.5	**1.3**	**0.2**
Thallium (Tl)	0.00081	0.0041	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.00081	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.00081	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.00081	-
Tin (Sn)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Titanium (Ti)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Uranium (U)	0.0047	0.024	µg/L	0.041	0.064	<RDLw	<RDLw	**0.038**	**0.019**	0.086	0.093	0.091	0.094	**0.091**	**0.004**	<MDLw	<MDLw	<MDLw	<MDLw	<0.0047	-
Vanadium (V)	0.059	0.15	µg/L	0.7	0.85	0.85	0.69	**0.77**	**0.09**	0.43	0.39	0.46	0.44	**0.43**	**0.03**	<MDLw	<MDLw	<MDLw	<MDLw	<0.059	-
Zinc (Zn)	0.2	1	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.2	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.2	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.2	-

[a] mean and standard deviation calculated using substitution of the method detection limit (MDL) or reporting detection limit (RDL)

[b] in cases where all replicates were reported as less than MDL or RDL, the mean is reported as the applicable MDL or RDL

[c] in cases where results were a mixture of less than MDL and less than RDL, the mean is reported as less than RDL

Table D.2: Calculated labile metal concentrations using Diffusive Gradients in Thin Films (DGT), Mount Polley Mine, August to October 2015 [a,b,c]

				Quesnel Lake Profundal Exposed						Quesnel Lake Profundal Reference					
Client ID				**PNF-1**	**PNF-2**	**PNF-3**	**PNF-4**	**Quesnel Lake Profundal Exposed**		**PRef1-1**	**PRef1-2**	**PRef1-3**	**PRef1-4**	**Quesnel Lake Profundal Reference**	
Deployment time				35.6 days	35.6 days	35.6 days	35.6 days			34.3 days	34.3 days	34.3 days	34.2 days		
Temperature				4.5 °C	4.5 °C	4.5 °C	4.5 °C	**Mean**	**SD**	3.9 °C	3.9 °C	3.9 °C	3.9 °C	**Mean**	**SD**
Metal Name	**MDLw**	**RDLw**	**Units**	**Calculated Labile Metals Extracted by DGT**											
Aluminum (Al)	1.6	5.4	µg/L	<RDLw	12	<RDLw	<RDLw	**7.1**	**3.3**	<RDLw	<RDLw	12	<RDLw	**7.1**	**3.3**
Antimony (Sb)	0.053	0.26	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.053	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.053	-
Arsenic (As)	0.054	0.27	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.054	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.054	-
Barium (Ba)	0.17	0.68	µg/L	6.9	6.3	5.2	7.2	**6.4**	**0.9**	5.8	5.6	6.2	5.8	**5.9**	**0.3**
Beryllium (Be)	0.054	0.27	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.054	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.054	-
Bismuth (Bi)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Boron (B)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Cadmium (Cd)	0.0059	0.029	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.0059	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.0059	-
Calcium (Ca)	33	109	µg/L	310	280	260	260	**278**	**24**	200	290	310	310	**278**	**53**
Chromium (Cr)	0.32	1.6	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.32	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.32	-
Cobalt (Co)	0.031	0.15	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.031	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.031	-
Copper (Cu)	0.058	0.29	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	<0.29	-	<RDLw	<RDLw	<RDLw	<MDLw	<0.29	-
Iron (Fe)	2.7	13	µg/L	<MDLw	<RDLw	<MDLw	<MDLw	<2.7	-	<MDLw	<MDLw	<MDLw	<MDLw	<2.7	-
Lead (Pb)	0.02	0.1	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.02	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.02	-
Lithium (Li)	0.16	0.79	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.16	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.16	-
Magnesium (Mg)	2.3	12	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<2.3		<MDLw	<MDLw	<MDLw	<MDLw	<2.3	
Manganese (Mn)	0.14	0.7	µg/L	3.9	4.9	3.9	4.4	**4.3**	**0.5**	4.5	2.4	5.1	7.0	**4.8**	**1.9**
Molybdenum (Mo)	0.091	0.3	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	<0.3	-	<MDLw	<MDLw	<MDLw	<RDLw	<0.3	-
Nickel (Ni)	0.24	0.81	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.24	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.24	-
Phosphorus (P)	2.7	13	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<2.7	-	<MDLw	<MDLw	<MDLw	<MDLw	<2.7	-
Potassium (K)	3.3	17	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<3.3	-	<MDLw	<MDLw	<MDLw	<MDLw	<3.3	-
Selenium (Se)	0.073	0.37	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.073	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.073	-
Silver (Ag)	0.0023	0.012	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.0023	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.0023	-
Sodium (Na)	93000	310000	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<93000	-	<MDLw	<MDLw	<MDLw	<MDLw	<93000	-
Strontium (Sr)	0.13	0.45	µg/L	2.2	1.8	1.4	2.0	**1.9**	**0.3**	1.6	2.2	2.2	2.2	**2.1**	**0.3**
Thallium (Tl)	0.00081	0.0041	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	<0.00081	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.00081	-
Tin (Sn)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Titanium (Ti)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	-	-	n/a	n/a	n/a	n/a	-	-
Uranium (U)	0.0047	0.024	µg/L	0.072	0.078	0.075	0.086	**0.078**	**0.006**	0.07	0.054	0.061	0.058	**0.061**	**0.007**
Vanadium (V)	0.059	0.15	µg/L	<RDLw	<RDLw	<MDLw	<RDLw	<0.15	-	<MDLw	<MDLw	<MDLw	<MDLw	<0.059	-
Zinc (Zn)	0.2	1	µg/L	<MDLw	15	<MDLw	<MDLw	**3.9**	**7.4**	<MDLw	<MDLw	<MDLw	<MDLw	<0.2	-

[a] mean and standard deviation calculated using substitution of the method detection limit (MDL) or reporting detection limit (RDL)

[b] in cases where all replicates were reported as less than MDL or RDL, the mean is reported as the applicable MDL or RDL

[c] in cases where results were a mixture of less than MDL and less than RDL, the mean is reported as less than RDL

Appendix Table D.3: Comparison of Concentrations of Parameters of Interest in Sediment and Water (Total, Dissolved and DGT-Labile)

Copper in Sediment and Water

	Sediment	Water			RATIOS				
		Total	Dissolved	DGT-Labile					
Sampling Area	mg/kg	mg/L	mg/L	mg/L	T / S [1]	D / S [2]	D / T [3]	DGT / T [4]	DGT / D [5]
Hazeltine Creek	469	0.015	0.013	0.0056	0.0032%	0.0027%	86%	37%	44%
Polley Lake	823	0.0029	0.0022	0.00039	0.0004%	0.0003%	77%	13%	18%
Bootjack Lake	382	0.0018	0.0013	<0.00029	0.0005%	0.0003%	70%	< 16%	< 23%
Quesnel Lake - Exposed	859	0.0022	0.0012	<0.00029	0.0003%	0.0001%	54%	< 13%	< 25%
Quesnel Lake - Reference	55.1	0.00064	0.00057	<0.00029	0.0012%	0.0010%	90%	< 46%	< 51%

Iron in Sediment and Water

	Sediment	Water			RATIOS				
		Total	Dissolved	DGT-Labile					
Sampling Area	mg/kg	mg/L	mg/L	mg/L	T / S [1]	D / S [2]	D / T [3]	DGT / T [4]	DGT / D [5]
Hazeltine Creek	50,580	0.068	<0.030	<0.0027	0.0001%	< 0.0001%	< 44%	< 4%	-
Polley Lake	29,760	<0.030	<0.030	<0.0027	-	-	-	-	-
Bootjack Lake	30,067	1.2	1.1	0.32	0.0040%	0.0037%	92%	27%	29%
Quesnel Lake - Exposed	40,620	<0.030	<0.030	<0.013	-	-	-	-	-
Quesnel Lake - Reference	31,300	<0.030	<0.030	<0.0027	-	-	-	-	-

Manganese in Sediment and Water

	Sediment	Water			RATIOS				
		Total	Dissolved	DGT-Labile					
Sampling Area	mg/kg	mg/L	mg/L	mg/L	T / S [1]	D / S [2]	D / T [3]	DGT / T [4]	DGT / D [5]
Hazeltine Creek	725	0.00507	0.00294	0.0021	0.0007%	0.0004%	58%	41%	71%
Polley Lake	2,574	0.2135	0.0046	0.0090	0.0083%	0.0002%	2%	4%	195%
Bootjack Lake	3,327	1.113	1.106	0.069	0.0335%	0.0332%	99%	6%	6%
Quesnel Lake - Exposed	1,033	0.0098	0.006385	0.0043	0.0009%	0.0006%	65%	44%	67%
Quesnel Lake - Reference	491	0.00384	0.002895	0.0048	0.0008%	0.0006%	75%	125%	166%

Molybdenum in Sediment and Water

	Sediment	Water			RATIOS				
		Total	Dissolved	DGT-Labile					
Sampling Area	mg/kg	mg/L	mg/L	mg/L	T / S [1]	D / S [2]	D / T [3]	DGT / T [4]	DGT / D [5]
Hazeltine Creek	2.47	0.0130	0.0120	<0.0003	0.5263%	0.4858%	92%	< 2%	< 3%
Polley Lake	10.1	0.011	0.010	0.0030	0.1059%	0.0960%	91%	28%	31%
Bootjack Lake	4.32	0.0013	0.0013	0.0005	0.0301%	0.0301%	100%	38%	38%
Quesnel Lake - Exposed	4.05	0.0010	0.0009	<0.0003	0.0237%	0.0215%	91%	< 31%	< 34%
Quesnel Lake - Reference	1.08	0.00035	0.00032	<0.0003	0.0324%	0.0296%	91%	< 86%	< 94%

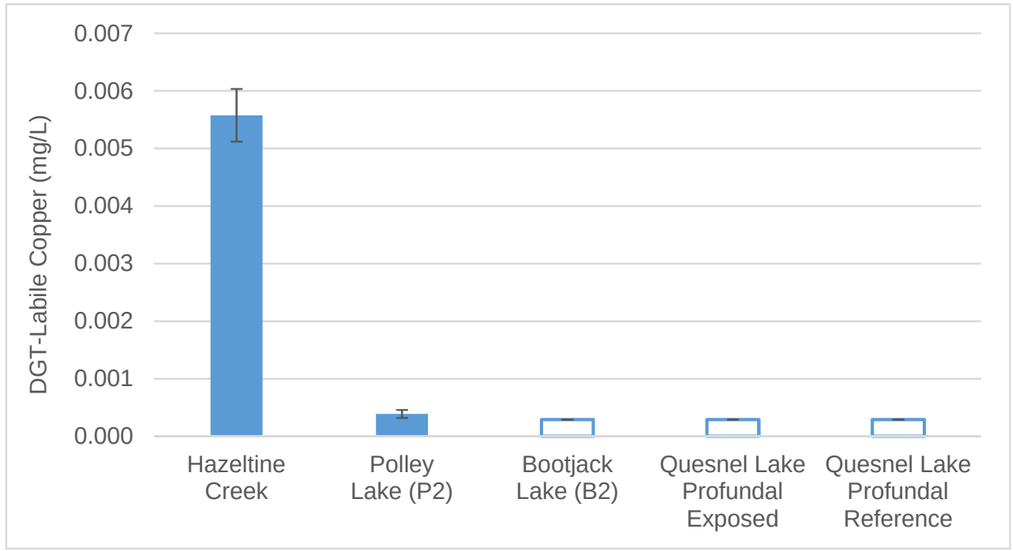
Phosphorus in Sediment and Water

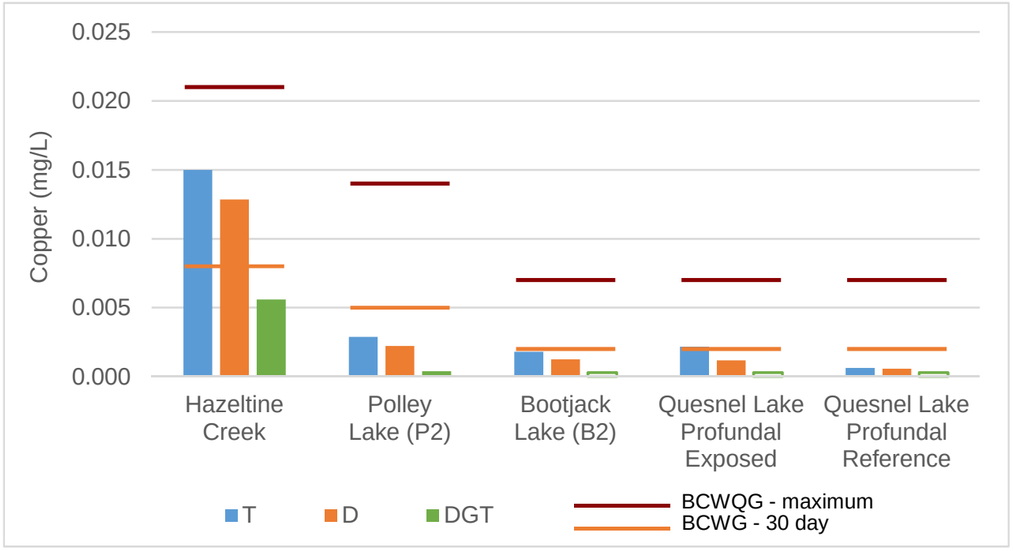
	Sediment	Water			RATIOS				
		Total	Dissolved	DGT-Labile					
Sampling Area	mg/kg	mg/L	mg/L	mg/L	T / S [1]	D / S [2]	D / T [3]	DGT / T [4]	DGT / D [5]
Hazeltine Creek	1,558	0.0101	0.0079	<0.0027	0.0006%	0.0005%	78%	< 27%	< 34%
Polley Lake	1,200	0.0840	0.0890	<0.013	0.0070%	0.0074%	106%	< 15%	< 15%
Bootjack Lake	2,537	0.153	0.105	0.036	0.0060%	0.0041%	69%	24%	34%
Quesnel Lake - Exposed	1,352	0.0036	0.0026	<0.0027	0.0003%	0.0002%	72%	< 75%	< 104%
Quesnel Lake - Reference	1,180	0.0022	0.0025	<0.0027	< 0.0002%	0.0002%	114%	< 123%	< 108%

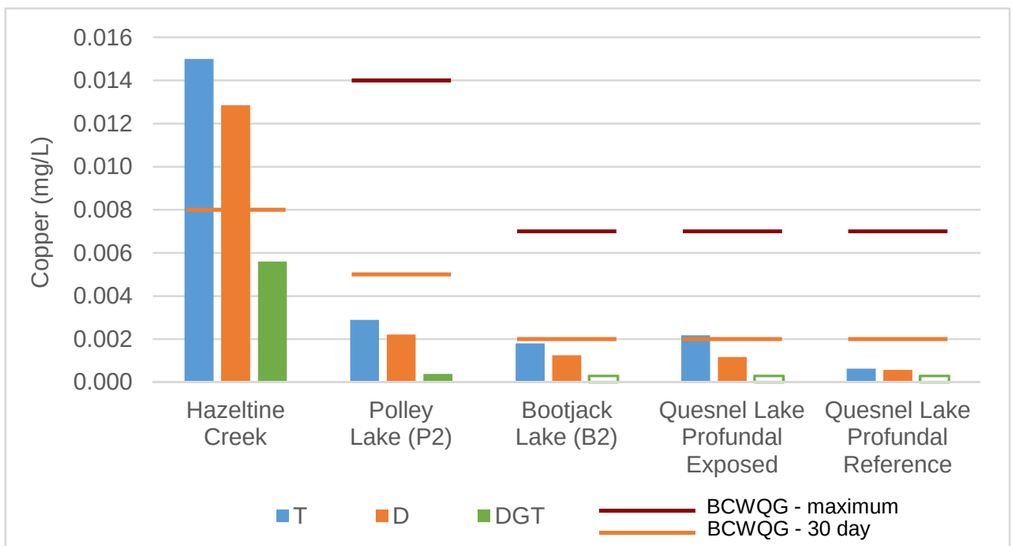
Zinc in Sediment and Water

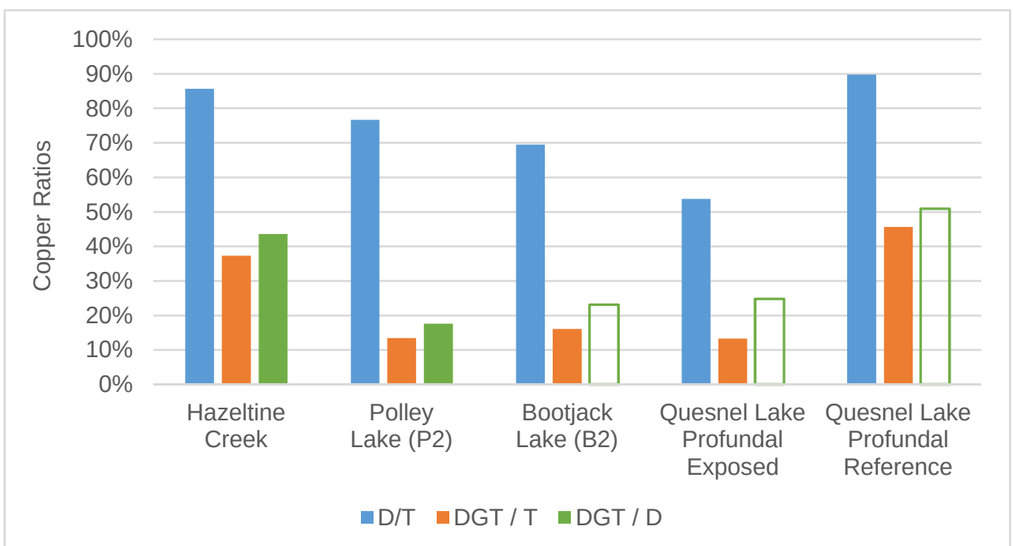
	Sediment	Water			RATIOS				
		Total	Dissolved	DGT-Labile					
Sampling Area	mg/kg	mg/L	mg/L	mg/L	T / S [1]	D / S [2]	D / T [3]	DGT / T [4]	DGT / D [5]
Hazeltine Creek	73.9	<0.0030	<0.0030	<0.0002	-	-	-	-	-
Polley Lake	86.4	0.0035	0.0046	<0.0002	0.0040%	0.0053%	132%	< 6%	< 4%
Bootjack Lake	82.8	0.010	0.019	<0.0002	0.0121%	0.0224%	185%	< 2%	< 1%
Quesnel Lake - Exposed	96.0	0.0052	<0.0030	0.0039	0.0054%	< 0.0031%	< 58%	76%	> 100%
Quesnel Lake - Reference	79.8	<0.0030	<0.0030	<0.0002	< 0.0038%	< 0.0038%	-	-	-

[1] total water / sediment; [2] dissolved water / sediemnt; [3] dissolved water / total water; [4] DGT-labile water / total water; [5] DGT-labile water / dissolved water

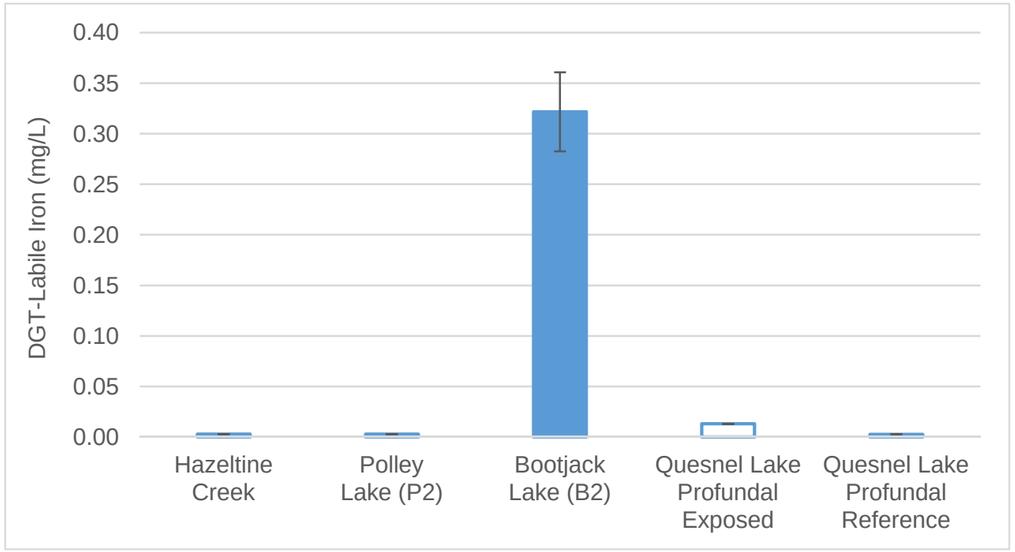


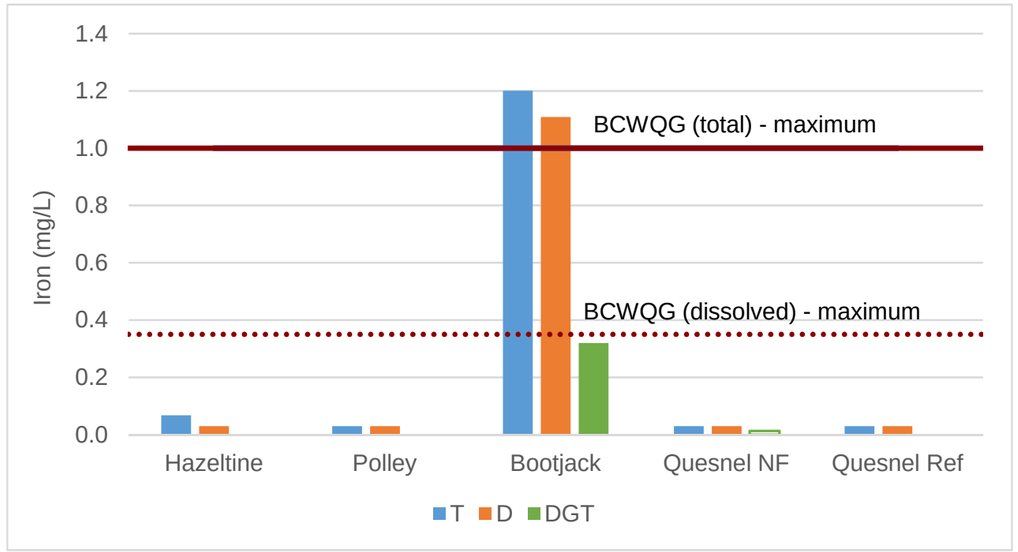


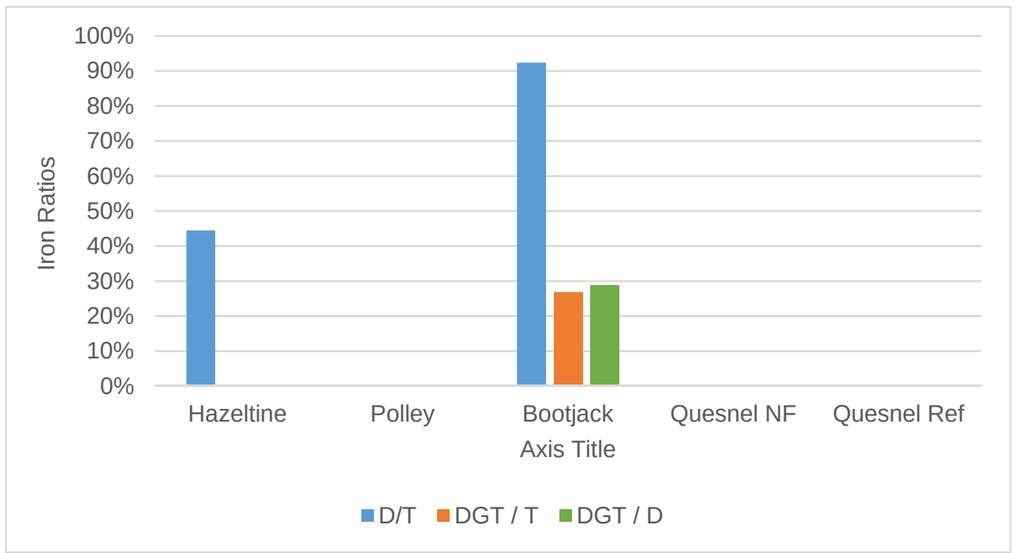




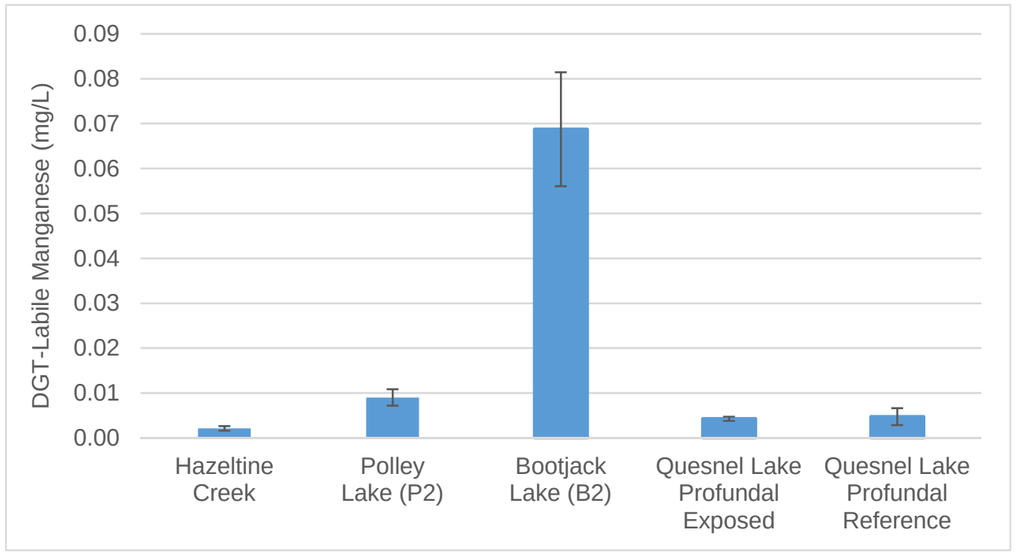
Appendix Figure D.1: Copper concentrations measured in water, Mount Polley 2015. a) DGT-labile; b) total, dissolved and DGT-labile (full y-axis); c) total, dissolved and DGT-labile (truncated y-axis); d) proportions (dissolved/total, DGT-labile/total and DGT-labile/dissolved)

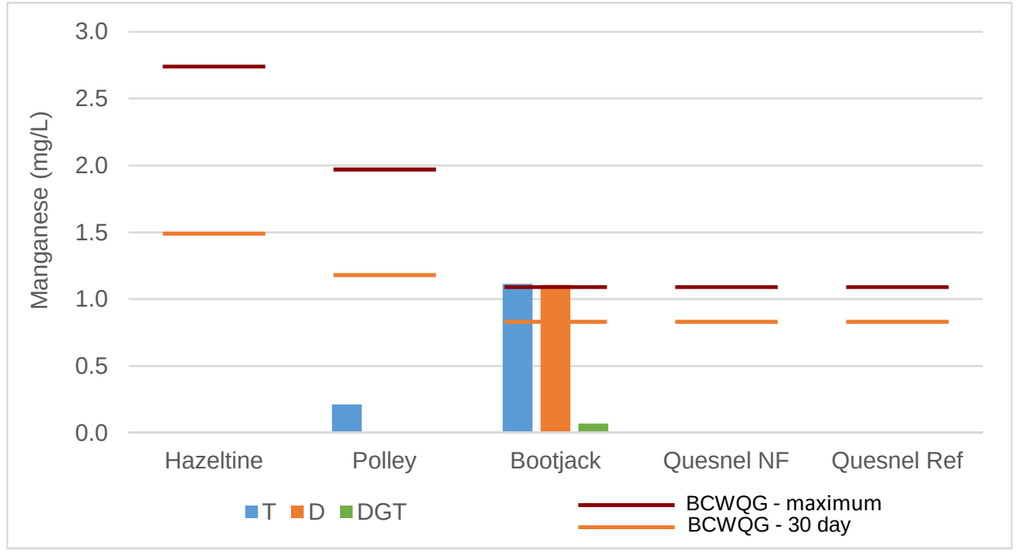


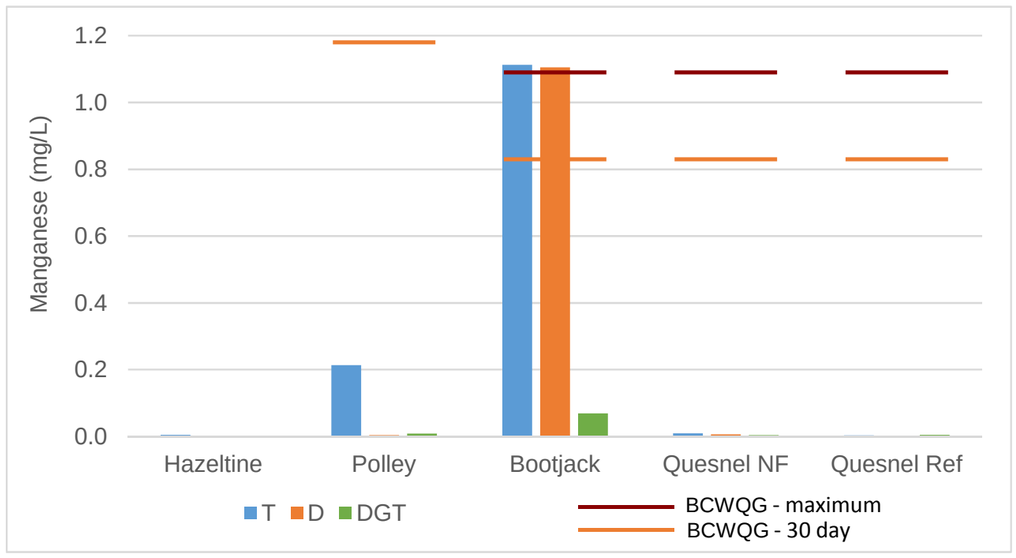


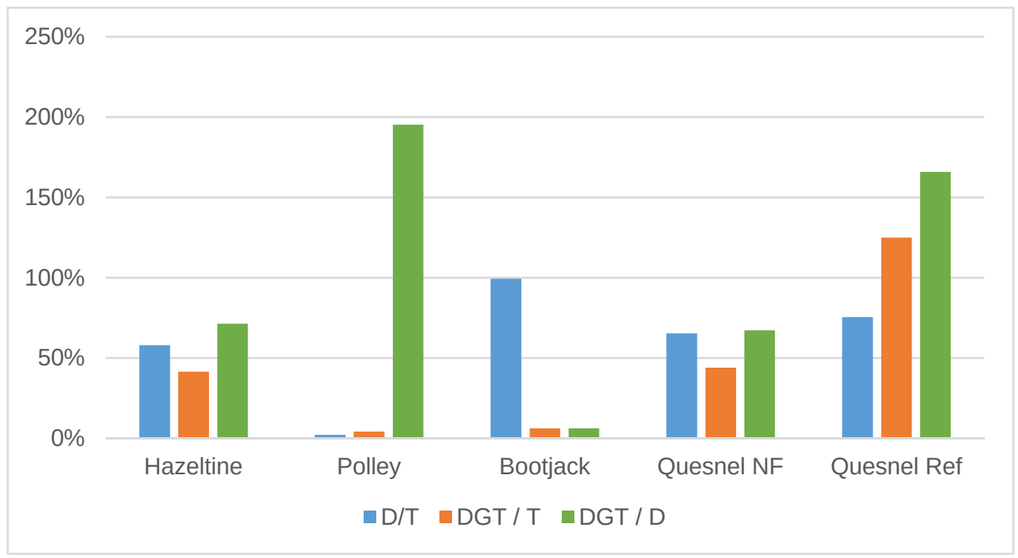


Appendix Figure D.2: Iron concentrations measured in water, Mount Polley 2015. a) DGT-labile; b) total, dissolved and DGT-labile; c) proportions (dissolved/total, DGT-labile/total and DGT-labile/dissolved)

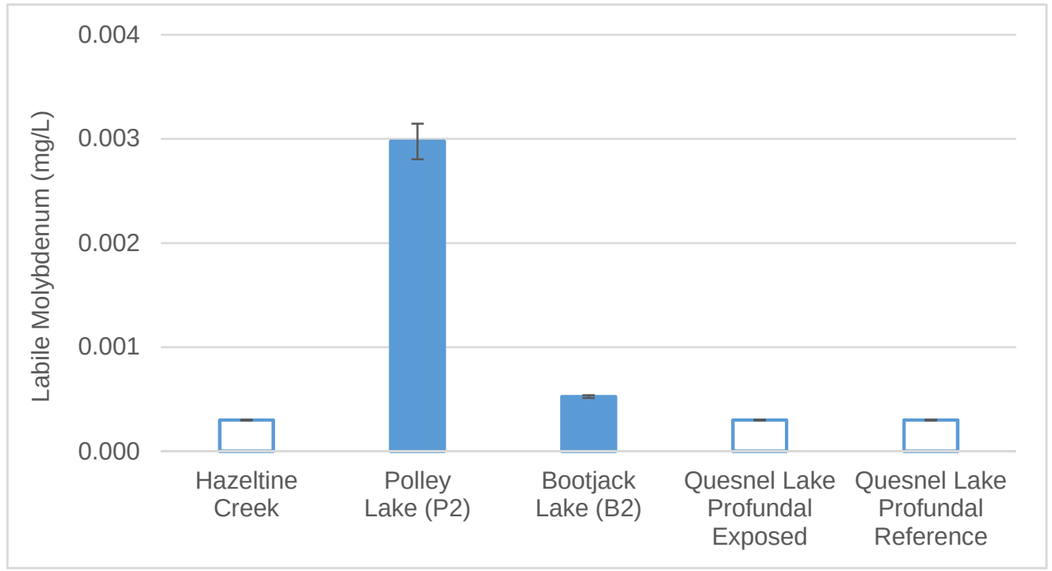


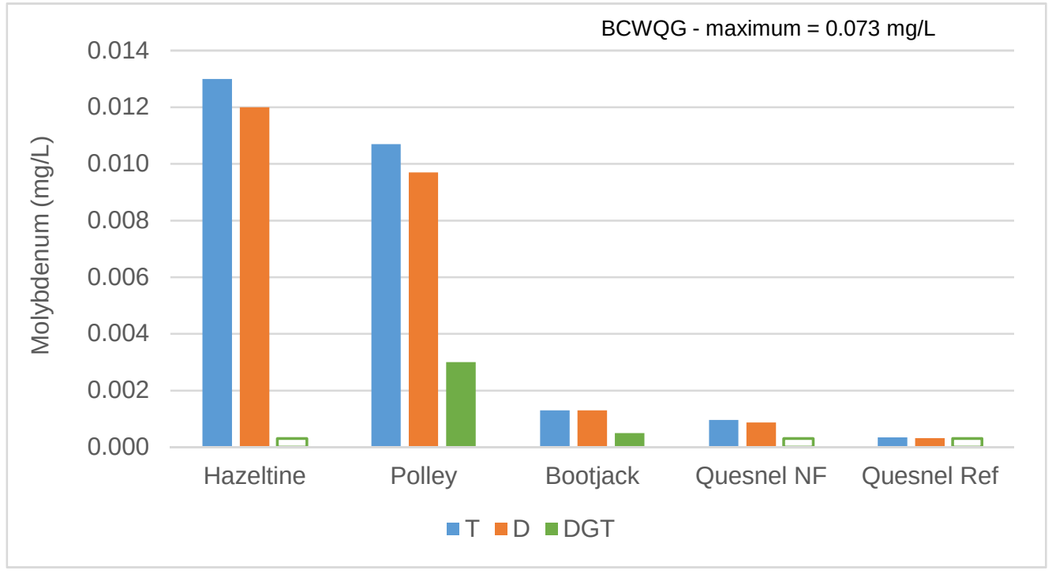


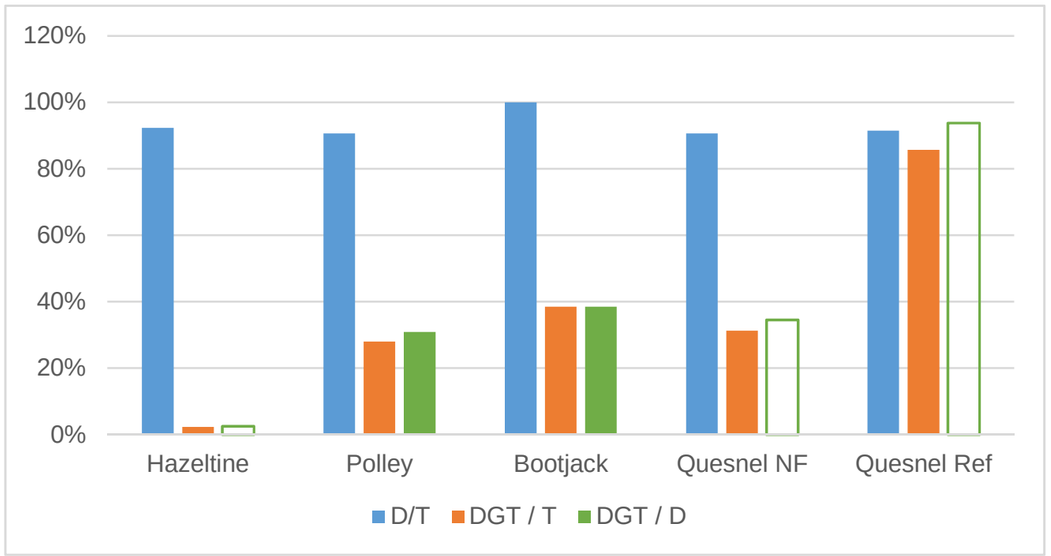




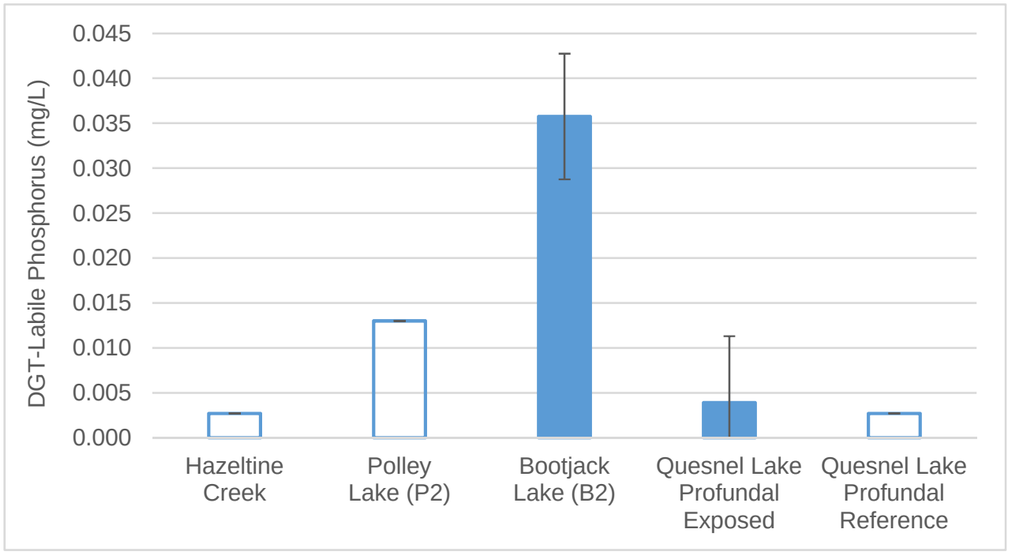
Appendix Figure D.3: Manganese concentrations measured in water, Mount Polley 2015. a) DGT-labile; b) total, dissolved and DGT-labile (full y-axis); c) total, dissolved and DGT-labile (truncated y-axis); d) proportions (dissolved/total, DGT-labile/total and DGT-labile/dissolved)

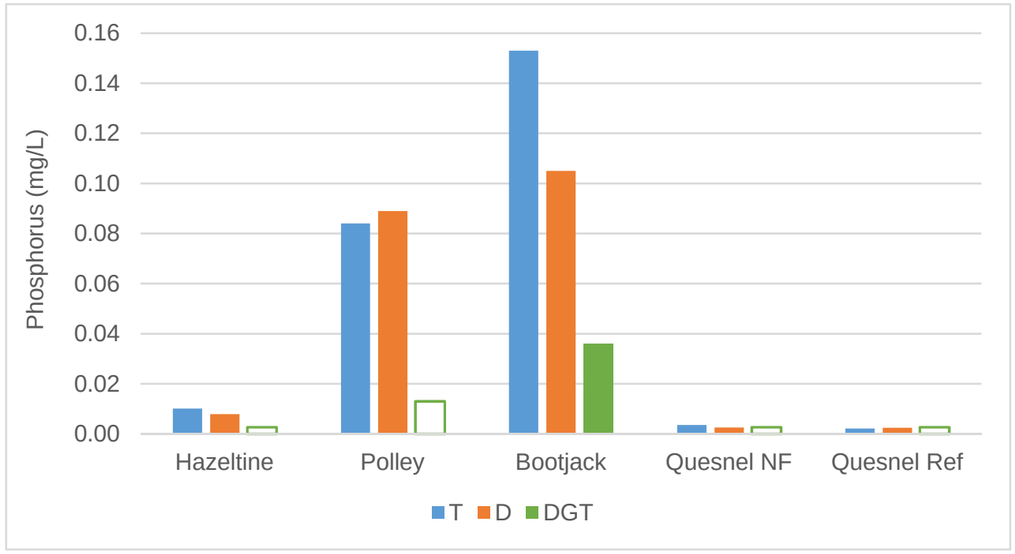


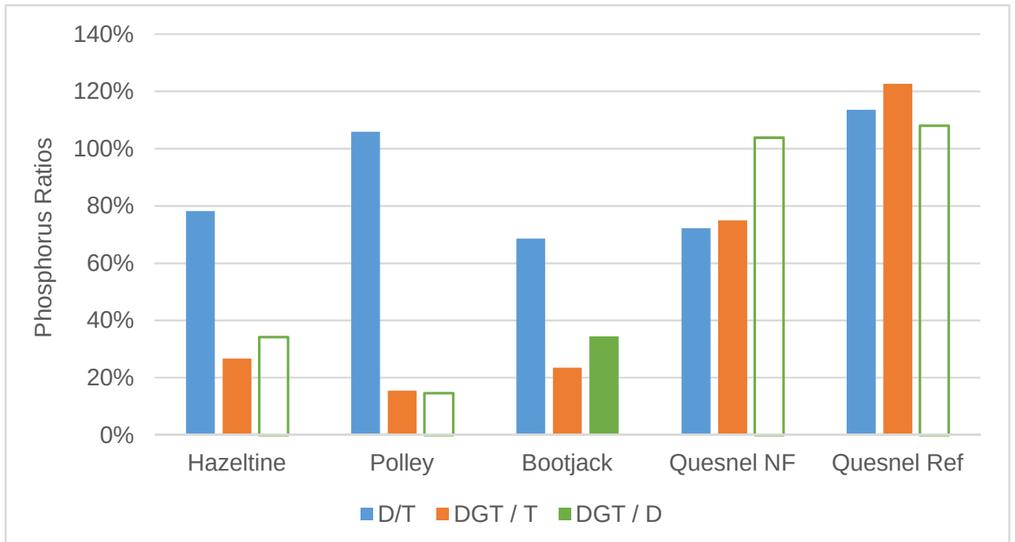




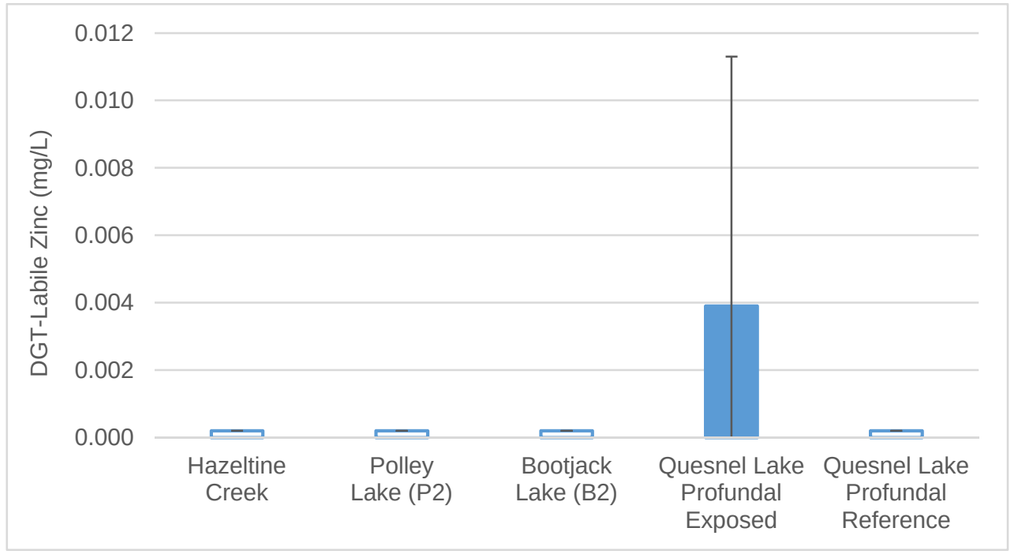
Appendix Figure D.4: Molybdenum concentrations measured in water, Mount Polley 2015. a) DGT-labile; b) total, dissolved and DGT-labile; c) proportions (dissolved/total, DGT-labile/total and DGT-labile/dissolved)

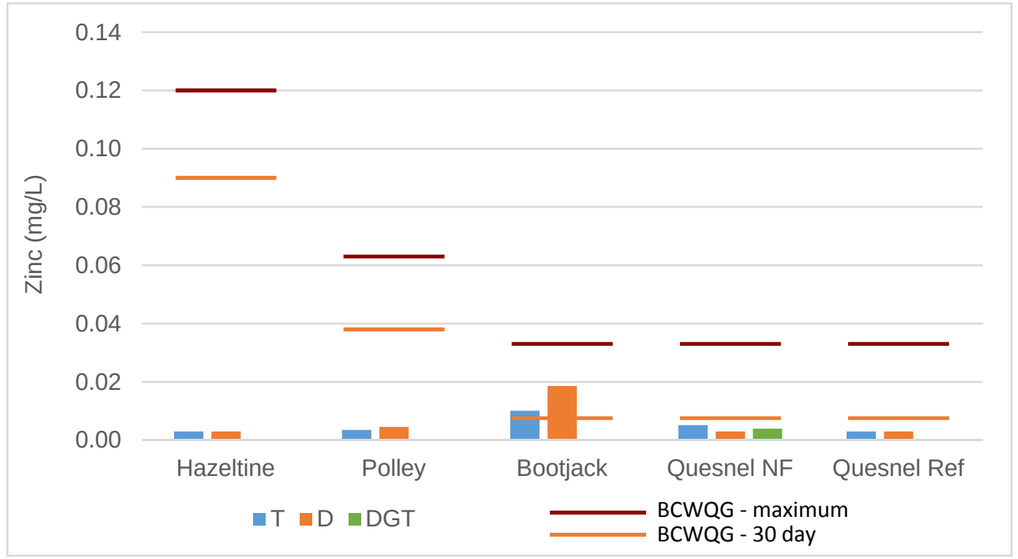


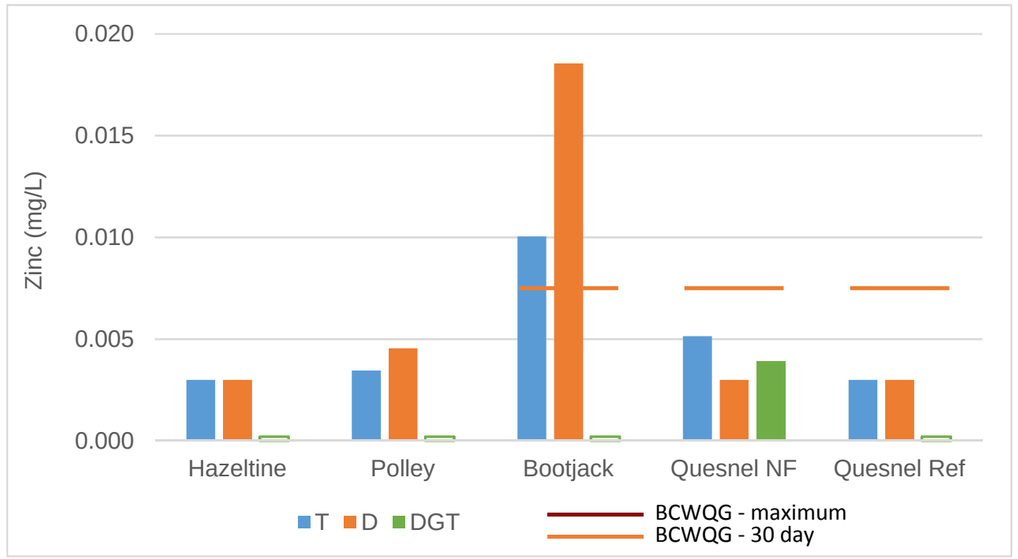


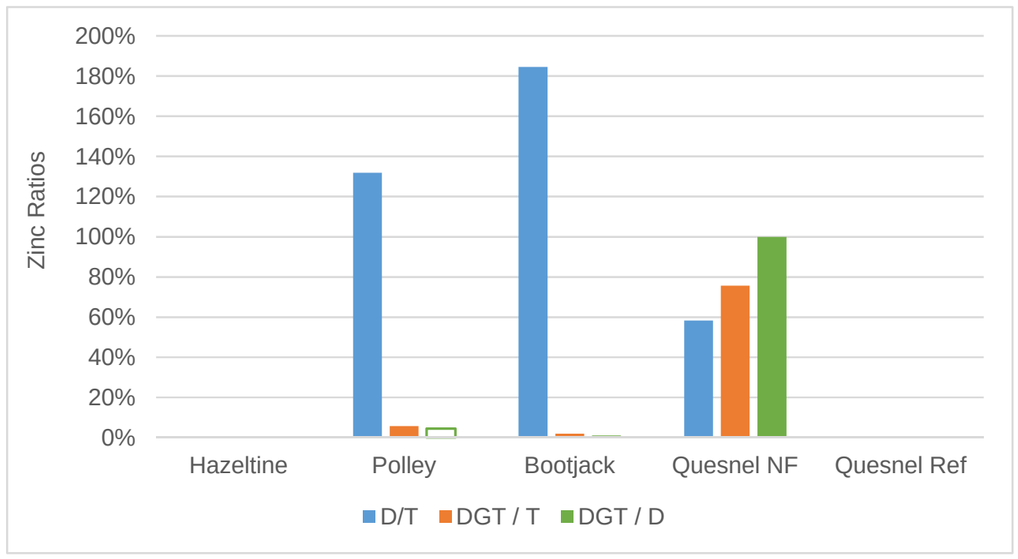


Appendix Figure D.5: Phosphorus concentrations measured in water, Mount Polley 2015. a) DGT-labile (mean ± standard deviation); b) mean total, dissolved and DGT-labile; c) mean proportions (dissolved/total, DGT-labile/total and DGT-labile/dissolved)









Appendix Figure D.6: Zinc concentrations measured in water, Mount Polley 2015. a) DGT-labile; b) total, dissolved and DGT-labile (full y-axis); c) total, dissolved and DGT-labile (truncated y-axis); d) proportions (dissolved/total, DGT-labile/total and DGT-labile/dissolved)

Project #: 2574

Attention: Pierre Stecko
Minnow Environmental
#101 - 1025 Hillside Avenue
Victoria, BC
V8T 2A2

Report Date: 2015/11/13
Revision Date: 2015/11/27

DGT MASS ANALYSIS REPORT

MAXXAM JOB #: B5K6077 (C.O.C. #08412522, #08412523, #08412524)

Maxxam (Burnaby) Job #: B588897

Received: 2015/10/09, 08:30 AM

Sample Matrix: SOLID (DGT)
Samples Received: 23

Analyses	Quantity	Instrumental Analysis	Primary Reference
Free metals in DGT units	23	CAM SOP-00447	DGT Research, Technical Document

Remarks:

DGT water samplers loaded with Chelex-Metsorb resin gel were purchased from Griffith University (Brisbane, Australia). Samplers were received by Maxxam and were shipped to the client as received, on ice.

Upon receipt after deployment, DGTs were digested along with 3 fabrication controls, 4 blanks and 4 spikes for quality control purposes. The procedures for instrumental analyses were based on CAM SOP-00447/16 with some deviations due to the different nature of the matrix. The sample preparation and digestion procedures were in line with the practices recommended by the DGT Supplier[1, 2] and with the additional method optimization by Maxxam.

[1]DGT – for measurements in waters, soils and sediments. Technical Documentation published by DGT Research Ltd. http://www.dgtresearch.com/dgtresearch/dgtresearch.pdf

[2]Panther, J., Bennett, W., Welsh, D. and Teasdale, P. (2014). Simultaneous measurement of trace metals and oxyanion concentrations in water using Diffusive Gradients in Thin Films with a Chelex-Metsorb mixed binding layer. *Analytical Chemistry, 86*, 427-434.

Due to the extent of the deviations taken from the stated SOP, this analysis is not considered as accredited. This analysis has not been fully validated. A detailed description of the DGT preparation, digestion, analysis, and calculation of metal detection limits is available upon request.

The Chelex-Metsorb resin is selective towards di-and tri-valent cationic metal species and oxyanionic species; as a result, monovalent metal species including Lithium (Li), Sodium (Na), Potassium (K), and Silver (Ag) have extremely low affinity and data for these metals should be interpreted with caution. Similarly Calcium (Ca),

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despite being divalent is known to have a low affinity for this resin. Titanium cannot be reported because the Chelex-Metsorb is a titanium-based resin.

We trust this report is sufficient for your purposes. If you have any questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,

Heather Lord, Ph.D.
Manager, Environmental R&D
Maxxam Analytics Corporation

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Metals Extracted by Diffusive Gradient Thin Films (DGT)

	Maxxam ID	BDF184-01	BDF185-01	BDF186-01	BDF187-01	
	Client ID	HAC-1 N14265	HAC-2 N14266	HAC-3 N14267	HAC-4 N14268	
	Deployment time	38.2 days	38.2 days	38.2 days	38.1 days	QC BATCH
	Temperature	10.9 °C	11.1 °C	11.2 °C	11.2 °C	

Note	Metal Name	MDL	RDL	Units	Mass Extracted by DGT				
3	Aluminum (Al)	0.59	1.96	µg	2.19	5.49	2.35	<RDL	4226452
	Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Arsenic (As)	0.025	0.13	µg	<RDL	<RDL	<RDL	<RDL	4226452
	Barium (Ba)	0.063	0.25	µg	6.87	9.60	5.01	4.81	4226452
	Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Boron (B)	0.25	1.3	µg	<MDL	<MDL	<MDL	<RDL	4226452
	Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<RDL	4226452
1, 3	Calcium (Ca)	20	66	µg	167.91	209.62	152.20	157.53	4226452
	Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Copper (Cu)	0.025	0.13	µg	2.34	2.64	2.37	2.18	4226452
	Iron (Fe)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Magnesium (Mg)	1.25	6.3	µg	7.78	9.30	7.50	<RDL	4226452
	Manganese (Mn)	0.05	0.25	µg	0.68	1.05	0.68	0.65	4226452
3	Molybdenum (Mo)	0.044	0.15	µg	<RDL	<RDL	<RDL	<MDL	4226452
3	Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Phosphorus (P)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Strontium (Sr)	0.082	0.27	µg	1.97	3.22	1.28	1.28	4226452
1	Silver (Ag)	0.0025	0.013	µg	<RDL	<MDL	<MDL	<MDL	4226452
1, 3	Sodium (Na)	94000	31000	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Tin (Sn)	0.092	0.31	µg	<MDL	<MDL	<MDL	<MDL	4226452
2	Titanium (Ti)	n/a	n/a	µg	n/a	n/a	n/a	n/a	4226452
	Uranium (U)	0.0025	0.013	µg	0.02	0.034	<RDL	<RDL	4226452
	Vanadium (V)	0.025	0.063	µg	0.29	0.36	0.36	0.30	4226452
	Zinc (Zn)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452

1 – Metal has very low affinity for the resin
2 – Metal cannot be reported when using Chelex-Metsorb resin (titanium based resin)
3 – MDL and RDL were raised due to presence in the fabrication controls and/or blanks (see QA report)

Notes:
a. The data presented here have not been rounded due to the wide range of concentrations reported and to facilitate further data manipulation. In any final data presentation, only two significant figures should be reported.
b. <MDL: Target compound not detected (below Method Detection Limit).
c. <RDL: Target compound detected above MDL but below Reporting Detection Limit.

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Metals Extracted by Diffusive Gradient Thin Films (DGT)

	Maxxam ID	BDF188-01	BDF189-01	BDF190-01	BDF191-01	
	Client ID	P2-1 N14269	P2-2 N14270	P2-3 N14271	P2-4 N14272	
	Deployment time	38.2 days	38.2 days	38.2 days	38.2 days	QC BATCH
	Temperature	6.05 °C	6.05 °C	6.05 °C	6.05 °C	

Note	Metal Name	MDL	RDL	Units	Mass Extracted by DGT				
3	Aluminum (Al)	0.59	1.96	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Arsenic (As)	0.025	0.13	µg	<RDL	<RDL	<RDL	<RDL	4226452
	Barium (Ba)	0.063	0.25	µg	1.76	1.86	1.99	1.84	4226452
	Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Boron (B)	0.25	1.3	µg	<MDL	<RDL	<RDL	<RDL	4226452
	Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Calcium (Ca)	20	66	µg	112.32	113.97	133.52	103.02	4226452
	Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Copper (Cu)	0.025	0.13	µg	0.15	<RDL	0.14	0.16	4226452
	Iron (Fe)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Magnesium (Mg)	1.25	6.3	µg	<MDL	<MDL	<RDL	<MDL	4226452
	Manganese (Mn)	0.05	0.25	µg	3.18	2.71	2.00	2.87	4226452
3	Molybdenum (Mo)	0.044	0.15	µg	1.16	1.20	1.30	1.24	4226452
3	Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Phosphorus (P)	1.25	6.3	µg	<RDL	<RDL	<RDL	<RDL	4226452
1	Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Strontium (Sr)	0.082	0.27	µg	0.88	0.94	1.15	0.97	4226452
1	Silver (Ag)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Tin (Sn)	0.092	0.31	µg	<MDL	<MDL	<MDL	<MDL	4226452
2	Titanium (Ti)	n/a	n/a	µg	n/a	n/a	n/a	n/a	4226452
	Uranium (U)	0.0025	0.013	µg	0.04	0.04	0.04	0.04	4226452
	Vanadium (V)	0.025	0.063	µg	0.15	0.14	0.16	0.16	4226452
	Zinc (Zn)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452

1 – Metal has very low affinity for the resin
2 – Metal cannot be reported when using Chelex-Metsorb resin (titanium based resin)
3 – MDL and RDL were raised due to presence in the fabrication controls and/or blanks (see QA report)

Notes:
a. The data presented here have not been rounded due to the wide range of concentrations reported and to facilitate further data manipulation. In any final data presentation, only two significant figures should be reported.
b. <MDL: Target compound not detected (below Method Detection Limit).
c. <RDL: Target compound detected above MDL but below Reporting Detection Limit.

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Metals Extracted by Diffusive Gradient Thin Films (DGT)

	Maxxam ID	BDF192-01	BDF193-01	BDF194-01	BDF195-01	
	Client ID	B2-1 N14273	B2-2 N14274	B2-3 N14275	B2-4 N14276	
	Deployment time	37.9 days	37.9 days	37.8 days	37.8 days	QC BATCH
	Temperature	8.65 °C	8.65 °C	8.65 °C	8.65 °C	

Note	Metal Name	MDL	RDL	Units	Mass Extracted by DGT				
3	Aluminum (Al)	0.59	1.96	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Arsenic (As)	0.025	0.13	µg	<RDL	<RDL	<RDL	<RDL	4226452
	Barium (Ba)	0.063	0.25	µg	2.70	3.14	3.43	3.98	4226452
	Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Boron (B)	0.25	1.3	µg	<RDL	<RDL	<MDL	<RDL	4226452
	Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Calcium (Ca)	20	66	µg	<RDL	<RDL	<RDL	<RDL	4226452
	Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Cobalt (Co)	0.013	0.063	µg	<RDL	<RDL	<RDL	<RDL	4226452
	Copper (Cu)	0.025	0.13	µg	<RDL	<RDL	<RDL	<RDL	4226452
	Iron (Fe)	1.25	6.3	µg	144.89	147.38	112.57	142.27	4226452
	Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Magnesium (Mg)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Manganese (Mn)	0.05	0.25	µg	18.41	20.83	22.61	28.22	4226452
3	Molybdenum (Mo)	0.044	0.15	µg	0.22	0.23	0.23	0.24	4226452
3	Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Phosphorus (P)	1.25	6.3	µg	11.46	14.73	15.77	18.50	4226452
1	Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Strontium (Sr)	0.082	0.27	µg	0.62	0.70	0.69	0.82	4226452
1	Silver (Ag)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Tin (Sn)	0.092	0.31	µg	<MDL	<MDL	<MDL	<MDL	4226452
2	Titanium (Ti)	n/a	n/a	µg	n/a	n/a	n/a	n/a	4226452
	Uranium (U)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Vanadium (V)	0.025	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Zinc (Zn)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452

1 – Metal has very low affinity for the resin
2 – Metal cannot be reported when using Chelex-Metsorb resin (titanium based resin)
3 – MDL and RDL were raised due to presence in the fabrication controls and/or blanks (see QA report)

Notes:
a. The data presented here have not been rounded due to the wide range of concentrations reported and to facilitate further data manipulation. In any final data presentation, only two significant figures should be reported.
b. <MDL: Target compound not detected (below Method Detection Limit).
c. <RDL: Target compound detected above MDL but below Reporting Detection Limit.

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Metals Extracted by Diffusive Gradient Thin Films (DGT)

	Maxxam ID	BDF196-01	BDF197-01	BDF198-01	BDF199-01	
	Client ID	PNF-1 N14277	PNF-2 N14278	PNF-3 N14279	PNF-4 N14280	
	Deployment time	35.6 days	35.6 days	35.6 days	35.6 days	QC BATCH
	Temperature	4.55 °C	4.55 °C	4.55 °C	4.55 °C	

Note	Metal Name	MDL	RDL	Units	Mass Extracted by DGT				
3	Aluminum (Al)	0.59	1.96	µg	<RDL	3.36	<RDL	<RDL	4226452
	Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Arsenic (As)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Barium (Ba)	0.063	0.25	µg	1.88	1.73	1.42	1.98	4226452
	Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Boron (B)	0.25	1.3	µg	<MDL	<MDL	<RDL	<RDL	4226452
	Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Calcium (Ca)	20	66	µg	138.96	124.76	118.51	118.45	4226452
	Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Copper (Cu)	0.025	0.13	µg	<RDL	<RDL	<RDL	<RDL	4226452
	Iron (Fe)	1.25	6.3	µg	<MDL	<RDL	<MDL	<MDL	4226452
	Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Magnesium (Mg)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Manganese (Mn)	0.05	0.25	µg	1.05	1.30	1.03	1.17	4226452
3	Molybdenum (Mo)	0.044	0.15	µg	<RDL	<RDL	<RDL	<RDL	4226452
3	Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Phosphorus (P)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Strontium (Sr)	0.082	0.27	µg	0.98	0.83	0.65	0.89	4226452
1	Silver (Ag)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Tin (Sn)	0.092	0.31	µg	<MDL	<RDL	<MDL	<MDL	4226452
2	Titanium (Ti)	n/a	n/a	µg	n/a	n/a	n/a	n/a	4226452
	Uranium (U)	0.0025	0.013	µg	0.03	0.03	0.03	0.03	4226452
	Vanadium (V)	0.025	0.063	µg	<RDL	<RDL	<MDL	<RDL	4226452
	Zinc (Zn)	0.125	0.63	µg	<MDL	6.73	<MDL	<MDL	4226452

1 – Metal has very low affinity for the resin
2 – Metal cannot be reported when using Chelex-Metsorb resin (titanium based resin)
3 – MDL and RDL were raised due to presence in the fabrication controls and/or blanks (see QA report)

Notes:
a. The data presented here have not been rounded due to the wide range of concentrations reported and to facilitate further data manipulation. In any final data presentation, only two significant figures should be reported.
b. <MDL: Target compound not detected (below Method Detection Limit).
c. <RDL: Target compound detected above MDL but below Reporting Detection Limit.

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Metals Extracted by Diffusive Gradient Thin Films (DGT)

	Maxxam ID	BDF200-01	BDF201-01	BDF202-01	BDF203-01	
	Client ID	PRef1-1 N14281	PRef1-2 N14282	PRef1-3 N14283	PRef1-4 N14284	
	Deployment time	34.3 days	34.3 days	34.3 days	34.2 days	QC
	Temperature	3.9 °C	3.9 °C	3.9 °C	3.9 °C	BATCH

Note	Metal Name	MDL	RDL	Units	Mass Extracted by DGT				
3	Aluminum (Al)	0.59	1.96	µg	<RDL	<RDL	3.08	<RDL	4226452
	Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Arsenic (As)	0.025	0.13	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Barium (Ba)	0.063	0.25	µg	1.49	1.44	1.60	1.49	4226452
	Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Boron (B)	0.25	1.3	µg	<RDL	<MDL	<RDL	<MDL	4226452
	Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Calcium (Ca)	20	66	µg	83.08	121.31	131.30	132.49	4226452
	Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Copper (Cu)	0.025	0.13	µg	<RDL	<RDL	<RDL	<MDL	4226452
	Iron (Fe)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Magnesium (Mg)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Manganese (Mn)	0.05	0.25	µg	1.13	0.60	1.28	1.74	4226452
3	Molybdenum (Mo)	0.044	0.15	µg	<MDL	<MDL	<MDL	<RDL	4226452
3	Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Phosphorus (P)	1.25	6.3	µg	<MDL	<MDL	<MDL	<MDL	4226452
1	Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Strontium (Sr)	0.082	0.27	µg	0.68	0.92	0.93	0.92	4226452
1	Silver (Ag)	0.0025	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
1, 3	Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	<MDL	4226452
3	Tin (Sn)	0.092	0.31	µg	<MDL	<MDL	<MDL	<MDL	4226452
2	Titanium (Ti)	n/a	n/a	µg	n/a	n/a	n/a	n/a	4226452
	Uranium (U)	0.0025	0.013	µg	0.03	0.02	0.02	0.02	4226452
	Vanadium (V)	0.025	0.063	µg	<MDL	<MDL	<MDL	<MDL	4226452
	Zinc (Zn)	0.125	0.63	µg	<MDL	<MDL	<MDL	<MDL	4226452

1 – Metal has very low affinity for the resin
2 – Metal cannot be reported when using Chelex-Metsorb resin (titanium based resin)
3 – MDL and RDL were raised due to presence in the fabrication controls and/or blanks (see QA report)

Notes:
a. The data presented here have not been rounded due to the wide range of concentrations reported and to facilitate further data manipulation. In any final data presentation, only two significant figures should be reported.
b. <MDL: Target compound not detected (below Method Detection Limit).
c. <RDL: Target compound detected above MDL but below Reporting Detection Limit.

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Metals Extracted by Diffusive Gradient Thin Films (DGT)

	Maxxam ID	BDF204-01	BDF205-01	BDF206-01	
	Client ID	Field Blank 1 N14289	Field Blank 2 N14282	Trip Blank N14283	
	Deployment time	n/a	n/a	n/a	QC BATCH
	Temperature	n/a	n/a	n/a	

Note	Metal Name	MDL	RDL	Units	Mass Extracted by DGT			
3	Aluminum (Al)	0.59	1.96	µg	<MDL	<MDL	<MDL	4226497
	Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	4226497
	Arsenic (As)	0.025	0.13	µg	<MDL	<MDL	<MDL	4226497
	Barium (Ba)	0.063	0.25	µg	<MDL	<MDL	<MDL	4226497
	Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	4226497
3	Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	4226497
	Boron (B)	0.25	1.3	µg	<MDL	<MDL	<MDL	4226497
	Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	4226497
1, 3	Calcium (Ca)	20	66	µg	<MDL	<MDL	<MDL	4226497
	Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	4226497
	Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	4226497
	Copper (Cu)	0.025	0.13	µg	<MDL	<MDL	1.06	4226497
	Iron (Fe)	1.25	6.3	µg	<MDL	<MDL	<MDL	4226497
	Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	4226497
1	Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	4226497
	Magnesium (Mg)	1.25	6.3	µg	<MDL	<MDL	<MDL	4226497
	Manganese (Mn)	0.05	0.25	µg	<MDL	<MDL	<MDL	4226497
3	Molybdenum (Mo)	0.044	0.15	µg	<MDL	<MDL	<MDL	4226497
3	Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	4226497
	Phosphorus (P)	1.25	6.3	µg	<MDL	<MDL	<MDL	4226497
1	Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	4226497
	Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	4226497
3	Strontium (Sr)	0.082	0.27	µg	<MDL	<MDL	<MDL	4226497
1	Silver (Ag)	0.0025	0.013	µg	<MDL	<MDL	<MDL	4226497
1, 3	Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	4226497
	Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	4226497
3	Tin (Sn)	0.092	0.31	µg	<MDL	<MDL	<MDL	4226497
2	Titanium (Ti)	n/a	n/a	µg	n/a	n/a	n/a	4226497
	Uranium (U)	0.0025	0.013	µg	<MDL	<MDL	<MDL	4226497
	Vanadium (V)	0.025	0.063	µg	<MDL	<MDL	<MDL	4226497
	Zinc (Zn)	0.125	0.63	µg	<MDL	<MDL	<MDL	4226497

1 – Metal has very low affinity for the resin
2 – Metal cannot be reported when using Chelex-Metsorb resin (titanium based resin)
3 – MDL and RDL were raised due to presence in the fabrication controls and/or blanks (see QA report)

Notes:
a. The data presented here have not been rounded due to the wide range of concentrations reported and to facilitate further data manipulation. In any final data presentation, only two significant figures should be reported.
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c. <RDL: Target compound detected above MDL but below Reporting Detection Limit.

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Quality Assurance Report
Maxxam Job # B5K6077

Test Summary

Maxxam ID	BDF184-01	**Collected**	2015/10/06
Sample ID	HAC-1 N14265	**Relinquished**	2015/10/07
Matrix	DGT sampler	**Received**	2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID	BDF185-01	**Collected**	2015/10/06
Sample ID	HAC-2 N14266	**Relinquished**	2015/10/07
Matrix	DGT sampler	**Received**	2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID	BDF186-01	**Collected**	2015/10/06
Sample ID	HAC-3 N14267	**Relinquished**	2015/10/07
Matrix	DGT sampler	**Received**	2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID	BDF187-01	**Collected**	2015/10/06
Sample ID	HAC-4 N14268	**Relinquished**	2015/10/07
Matrix	DGT sampler	**Received**	2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID	BDF188-01	**Collected**	2015/10/05
Sample ID	P2-1 N14269	**Relinquished**	2015/10/07
Matrix	DGT sampler	**Received**	2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

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Maxxam ID BDF189-01 **Collected** 2015/10/05
Sample ID P2-2 N14270 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF190-01 **Collected** 2015/10/05
Sample ID P2-3 N14271 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF191-01 **Collected** 2015/10/05
Sample ID P2-4 N14272 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF192-01 **Collected** 2015/10/05
Sample ID B2-1 N14273 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF193-01 **Collected** 2015/10/05
Sample ID B2-2 N14274 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF194-01 **Collected** 2015/10/05
Sample ID B2-3 N14275 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

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Maxxam ID BDF195-01 **Collected** 2015/10/05
Sample ID B2-4 N14276 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF196-01 **Collected** 2015/10/06
Sample ID PNF-1 N14277 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF197-01 **Collected** 2015/10/06
Sample ID PNF-2 N14278 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF198-01 **Collected** 2015/10/06
Sample ID PNF-3 N14279 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF199-01 **Collected** 2015/10/06
Sample ID PNF-4 N14280 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF200-01 **Collected** 2015/10/06
Sample ID PRef1-1 N14281 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

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Maxxam ID BDF201-01 **Collected** 2015/10/06
Sample ID PRef1-2 N14282 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF202-01 **Collected** 2015/10/06
Sample ID PRef1-3 N14283 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF203-01 **Collected** 2015/10/06
Sample ID PRef1-4 N14284 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226452	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF204-01 **Collected** n/a
Sample ID Field Blank 1 N14289 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226497	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF205-01 **Collected** n/a
Sample ID Field Blank 2 N14290 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226497	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Maxxam ID BDF206-01 **Collected** n/a
Sample ID Trip Blank N14291 **Relinquished** 2015/10/07
Matrix DGT sampler **Received** 2015/10/09

Test Description	Instrumentation	Batch	Digested	Analyzed	Analysts
Free Metals in DGT	CAM SOP-00447/16	4226497	2015/10/13-16	2015/10/22	Christopher Atkinson Prempal Bhatti

Quality Assurance Report
Blanks and Fabrication Controls

Maxxam Job # B5K6077 – QC Batch 4226452

		Maxxam ID	BDK223-01	BDK220-01	RDL	MDL
		QC Parameter	Water Blank	Method Blank		
		Matrix	RODI water	Digest		
Note	**Analysis Date**	**Metal name**	(µg)	(µg)	(µg)	(µg)
	2015/10/22	Aluminum (Al)	<RDL	<RDL	0.63	0.13
	2015/10/22	Antimony (Sb)	<MDL	<MDL	0.13	0.025
	2015/10/22	Arsenic (As)	<MDL	<MDL	0.13	0.025
	2015/10/22	Barium (Ba)	<MDL	<MDL	0.25	0.063
	2015/10/22	Beryllium (Be)	<MDL	<MDL	0.063	0.013
	2015/10/22	Bismuth (Bi)	<MDL	<RDL	0.13	0.025
	2015/10/22	Boron (B)	<MDL	<MDL	1.3	0.25
	2015/10/22	Cadmium (Cd)	<MDL	<MDL	0.013	0.003
	2015/10/22	Calcium (Ca)	<MDL	<MDL	25	5.0
	2015/10/22	Chromium (Cr)	<MDL	<MDL	0.63	0.125
	2015/10/22	Cobalt (Co)	<MDL	<MDL	0.063	0.013
	2015/10/22	Copper (Cu)	<MDL	<MDL	0.13	0.025
	2015/10/22	Iron (Fe)	<MDL	<MDL	6.3	1.25
	2015/10/22	Lead (Pb)	<MDL	<MDL	0.06	0.013
	2015/10/22	Lithium (Li)	<MDL	<MDL	0.63	0.13
	2015/10/22	Magnesium (Mg)	<MDL	<MDL	6.3	1.25
	2015/10/22	Manganese (Mn)	<MDL	<MDL	0.25	0.050
	2015/10/22	Molybdenum (Mo)	<MDL	<RDL	0.063	0.0025
	2015/10/22	Nickel (Ni)	<MDL	<MDL	0.13	0.025
	2015/10/22	Phosphorus (P)	<MDL	<MDL	6.3	1.25
	2015/10/22	Potassium (K)	<MDL	<MDL	25	5.0
	2015/10/22	Selenium (Se)	<MDL	<MDL	0.25	0.050
	2015/10/22	Strontium (Sr)	<MDL	<MDL	0.13	0.025
	2015/10/22	Silver (Ag)	<MDL	<MDL	0.013	0.0025
1	2015/10/22	Sodium (Na)	44.94	33152	13	2.5
	2015/10/22	Thallium (Tl)	<MDL	<MDL	0.013	0.0013
	2015/10/22	Tin (Sn)	<MDL	<MDL	0.13	0.025
	2015/10/22	Titanium (Ti)	n/a	n/a	n/a	n/a
	2015/10/22	Uranium (U)	<MDL	<MDL	0.013	0.0025
	2015/10/22	Vanadium (V)	<MDL	<MDL	0.063	0.025
	2015/10/22	Zinc (Zn)	<MDL	<MDL	0.63	0.13

1 – Digestion solution is 1M NaOH

Notes:

Water Blank: RODI water used during sample processing of the samples
Method Blank: Digestion tube, to which no DGT resin is added, digested and analyzed, used to identify lab contamination
Fabrication Control: Blank DGT resin digested and analyzed, accounts for interferences or contamination incurred from the passive sampler components, storage, processing and analysis

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Quality Assurance Report
Blanks and Fabrication Controls

Maxxam Job # B5K6077 – QC Batch 4226497

		Maxxam ID	BDK226-01	BDK227-01	RDL	MDL
		QC Parameter	Water Blank	Method Blank		
		Matrix	RODI water	Digest		
Note	Analysis Date	Metal name	(µg)	(µg)	(µg)	(µg)
	2015/10/22	Aluminum (Al)	<RDL	<RDL	0.63	0.13
	2015/10/22	Antimony (Sb)	<MDL	<MDL	0.13	0.025
	2015/10/22	Arsenic (As)	<MDL	<MDL	0.13	0.025
	2015/10/22	Barium (Ba)	<MDL	<MDL	0.25	0.063
	2015/10/22	Beryllium (Be)	<MDL	<MDL	0.063	0.013
	2015/10/22	Bismuth (Bi)	<MDL	<MDL	0.13	0.025
	2015/10/22	Boron (B)	<MDL	<MDL	1.3	0.25
	2015/10/22	Cadmium (Cd)	<MDL	<MDL	0.013	0.003
	2015/10/22	Calcium (Ca)	<MDL	<MDL	25	5.0
	2015/10/22	Chromium (Cr)	<MDL	<MDL	0.63	0.125
	2015/10/22	Cobalt (Co)	<MDL	<MDL	0.063	0.013
	2015/10/22	Copper (Cu)	<MDL	<MDL	0.13	0.025
	2015/10/22	Iron (Fe)	<MDL	<MDL	6.3	1.25
	2015/10/22	Lead (Pb)	<MDL	<MDL	0.06	0.013
	2015/10/22	Lithium (Li)	<MDL	<MDL	0.63	0.13
	2015/10/22	Magnesium (Mg)	<MDL	<MDL	6.3	1.25
	2015/10/22	Manganese (Mn)	<MDL	<MDL	0.25	0.050
	2015/10/22	Molybdenum (Mo)	<MDL	<MDL	0.063	0.0025
	2015/10/22	Nickel (Ni)	<MDL	<MDL	0.13	0.025
	2015/10/22	Phosphorus (P)	<MDL	<MDL	6.3	1.25
	2015/10/22	Potassium (K)	<MDL	<MDL	25	5.0
	2015/10/22	Selenium (Se)	<MDL	<MDL	0.25	0.050
	2015/10/22	Strontium (Sr)	<MDL	<MDL	0.13	0.025
	2015/10/22	Silver (Ag)	<MDL	<MDL	0.013	0.0025
1	2015/10/22	Sodium (Na)	21.83	31999	13	2.5
	2015/10/22	Thallium (Tl)	<MDL	<MDL	0.013	0.0013
	2015/10/22	Tin (Sn)	<MDL	<MDL	0.13	0.025
	2015/10/22	Titanium (Ti)	n/a	n/a	n/a	n/a
	2015/10/22	Uranium (U)	<MDL	<MDL	0.013	0.0025
	2015/10/22	Vanadium (V)	<MDL	<MDL	0.063	0.025
	2015/10/22	Zinc (Zn)	<MDL	<MDL	0.63	0.13

1 – Digestion solution is 1M NaOH

Notes:

Water Blank: RODI water used during sample processing of the samples
Method Blank: Digestion tube, to which no DGT resin is added, digested and analyzed, used to identify lab contamination
Fabrication Control: Blank DGT resin digested and analyzed, accounts for interferences or contamination incurred from the passive sampler components, storage, processing and analysis

6740 Campobello Road, Mississauga, ON L5N 2L8

Quality Assurance Report
Blanks and Fabrication Controls

Maxxam Job # B5K6077 – QC Batch 4226497

		Maxxam ID	BDK230-01	BDK242-01	BDK243-01	RDL	MDL
		QC Parameter	Fabrication Control 1	Fabrication Control 2	Fabrication Control 3		
		Matrix	DGT	DGT	DGT		
Note	**Analysis Date**	**Metal name**	(µg)	(µg)	(µg)	(µg)	(µg)
	2015/10/22	Aluminum (Al)	<RDL	<RDL	<RDL	0.63	0.13
	2015/10/22	Antimony (Sb)	<MDL	<MDL	<MDL	0.13	0.025
	2015/10/22	Arsenic (As)	<MDL	<MDL	<MDL	0.13	0.025
	2015/10/22	Barium (Ba)	<MDL	<MDL	<MDL	0.25	0.063
	2015/10/22	Beryllium (Be)	<MDL	<MDL	<MDL	0.063	0.013
	2015/10/22	Bismuth (Bi)	<MDL	<MDL	<MDL	0.13	0.025
	2015/10/22	Boron (B)	<MDL	<MDL	<MDL	1.3	0.25
	2015/10/22	Cadmium (Cd)	<MDL	<MDL	<MDL	0.013	0.003
	2015/10/22	Calcium (Ca)	<RDL	<MDL	<MDL	25	5.0
	2015/10/22	Chromium (Cr)	<MDL	<MDL	<MDL	0.63	0.125
	2015/10/22	Cobalt (Co)	<MDL	<MDL	<MDL	0.063	0.013
	2015/10/22	Copper (Cu)	<MDL	<MDL	<MDL	0.13	0.025
	2015/10/22	Iron (Fe)	<MDL	<MDL	<MDL	6.3	1.25
	2015/10/22	Lead (Pb)	<MDL	<MDL	<MDL	0.06	0.013
	2015/10/22	Lithium (Li)	<MDL	<MDL	<MDL	0.63	0.13
	2015/10/22	Magnesium (Mg)	<MDL	<MDL	<MDL	6.3	1.25
	2015/10/22	Manganese (Mn)	<MDL	<MDL	<MDL	0.25	0.050
	2015/10/22	Molybdenum (Mo)	<MDL	<MDL	<MDL	0.063	0.0025
	2015/10/22	Nickel (Ni)	<RDL	<MDL	<MDL	0.13	0.025
	2015/10/22	Phosphorus (P)	<MDL	<MDL	<MDL	6.3	1.25
	2015/10/22	Potassium (K)	<MDL	<MDL	<MDL	25	5.0
	2015/10/22	Selenium (Se)	<MDL	<MDL	<MDL	0.25	0.050
	2015/10/22	Strontium (Sr)	<RDL	<RDL	<MDL	0.13	0.025
	2015/10/22	Silver (Ag)	<MDL	<MDL	<MDL	0.013	0.0025
1	2015/10/22	Sodium (Na)	31617	31154	31398	13	2.5
	2015/10/22	Thallium (Tl)	<MDL	<MDL	<MDL	0.013	0.0013
	2015/10/22	Tin (Sn)	<RDL	<RDL	<MDL	0.13	0.025
	2015/10/22	Titanium (Ti)	n/a	n/a	n/a	n/a	n/a
	2015/10/22	Uranium (U)	<MDL	<MDL	<MDL	0.013	0.0025
	2015/10/22	Vanadium (V)	<MDL	<MDL	<MDL	0.063	0.025
	2015/10/22	Zinc (Zn)	<MDL	<MDL	<MDL	0.63	0.13

1 – Digestion solution is 1M NaOH

Notes:

Water Blank: RODI water used during sample processing of the samples
Method Blank: Digestion tube, to which no DGT resin is added, digested and analyzed, used to identify lab contamination
Fabrication Control: Blank DGT resin digested and analyzed, accounts for interferences or contamination incurred from the passive sampler components, storage, processing and analysis

6740 Campobello Road, Mississauga, ON L5N 2L8

Quality Assurance Report
Spikes

Maxxam Job # B5K6077 – QC Batch 4226452

		Maxxam ID	BDK222-01	BDK221-01	QC Limits	QC Batch
		QC Parameter	Resin Spike	Method Spike		
		Matrix	DGT	Digest		
Note	**Analysis Date**	**Metal**	(% Recovery)	(% Recovery)	%	4226452
	2015/10/22	Cadmium	108	92	70-130	4226452
	2015/10/22	Thallium	83	99	70-130	4226452
	2015/10/22	Uranium	83	102	70-130	4226452

Notes:

Resin Spike: Metal solution spiked directly onto DGT resin and digested, used to evaluate method accuracy
Method Spike: Digestion tube to which the metal solution is spiked without the presence of a DGT resin, sample is digested and analyzed, used to evaluate lab process accuracy

6740 Campobello Road, Mississauga, ON L5N 2L8

Quality Assurance Report
Spikes

Maxxam Job # B5K6077 – QC Batch 4226497

		Maxxam ID	BDK229-01	BDK228-01	QC Limits	QC Batch
		QC Parameter	Resin Spike	Method Spike		
		Matrix	DGT	Digest		
Note	**Analysis Date**	**Metal**	(% Recovery)	(% Recovery)	%	4226497
	2015/10/22	Cadmium	78	103	70-130	4226497
	2015/10/22	Thallium	73	97	70-130	4226497
	2015/10/22	Uranium	74	102	70-130	4226497

Notes:

Resin Spike: Metal solution spiked directly onto DGT resin and digested, used to evaluate method accuracy
Method Spike: Digestion tube to which the metal solution is spiked without the presence of a DGT resin, sample is digested and analyzed, used to evaluate lab process accuracy

6740 Campobello Road, Mississauga, ON L5N 2L8

Validation Signature Page

Maxxam Job #: B5K6077

Maxxam (Burnaby) Job #: B588897

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s):

Angel Rodriguez-Lafuente, Ph.D.
Senior Analyst, Environmental Research and Development
Maxxam Analytics Corporation

Heather Lynn Lord, Ph.D.
Manager, Environmental Research and Development
Maxxam Analytics Corporation

6740 Campobello Road, Mississauga, ON L5N 2L8

Project #: 2574

Attention: Pierre Stecko
Minnow Environmental
#101 - 1025 Hillside Avenue
Victoria, BC
V8T 2A2

Report Date: 2015/11/23

ESTIMATED AVERAGE WATER CONCENTRATION REPORT FROM DGT PASSIVE SAMPLERS

MAXXAM JOB #: B5K6077 (C.O.C. #08412522, #08412523, #08412524)

Maxxam (Burnaby) Job #: B588897

Received: 2015/10/09, 08:30 AM

Sample Matrix: Water Sampling Media (WSM)
Samples Received: 23

Analyses	Quantity	Lab Analyses	Primary Reference
Free metals in water by DGT	23	CAM SOP-00447	DGT Research, Technical Document

Remarks:

This report provides the estimated integrated water concentrations during the DGT sampler deployments. Accumulated masses of free metals in the DGT devices have been reported separately for the above-noted job number.

Water concentrations were estimated based on the masses of free metals accumulated in the DGT devices along with the reported average temperature and deployment time, known diffusion coefficients and physical properties of the DGT devices.

We trust this report is sufficient for your purposes. If you have any questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,

Heather Lord, Ph.D.
Manager, Environmental R&D
Maxxam Analytics Corporation

Angel Rodriguez-Lafuente, Ph.D.
Senior Analyst, Environmental R&D
Maxxam Analytics Corporation

6740 Campobello Road, Mississauga, ON L5N 2L8

Time averaged concentrations of free metal ions in water

	Maxxam ID	BDF184-01	BDF185-01	BDF186-01	BDF187-01	
	Client ID	HAC-1 N14265	HAC-2 N14266	HAC-3 N14267	HAC-4 N14268	
	Deployment time	38.2 days	38.2 days	38.2 days	38.1 days	QC BATCH
	Average temperature	10.9 °C	11.1 °C	11.2 °C	11.2 °C	

Note	Metal Name	MDLw	RDLw	Units	Time-averaged concentration in water, C_w				
1	Aluminum (Al)	1.6	5.4	µg/L	6.1	15	6.5	<RDLw	4226452
	Antimony (Sb)	0.053	0.26	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Arsenic (As)	0.054	0.27	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
	Barium (Ba)	0.17	0.68	µg/L	19	26	14	13	4226452
	Beryllium (Be)	0.054	0.27	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Bismuth (Bi)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
3	Boron (B)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
	Cadmium (Cd)	0.0059	0.029	µg/L	<MDLw	<MDLw	<MDLw	<RDLw	4226452
1, 4	Calcium (Ca)	33	109	µg/L	280	350	250	260	4226452
	Chromium (Cr)	0.32	1.6	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Cobalt (Co)	0.031	0.15	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Copper (Cu)	0.058	0.29	µg/L	5.5	6.2	5.5	5.1	4226452
	Iron (Fe)	2.7	13	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Lead (Pb)	0.020	0.10	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Lithium (Li)	0.16	0.79	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Magnesium (Mg)	2.3	12	µg/L	15	17	14	<RDLw	4226452
	Manganese (Mn)	0.14	0.70	µg/L	1.9	2.9	1.9	1.8	4226452
1, 6	Molybdenum (Mo)	0.091	0.30	µg/L	<RDLw	<RDLw	<RDLw	<MDLw	4226452
1	Nickel (Ni)	0.24	0.81	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Phosphorus (P)	2.7	13	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Potassium (K)	3.3	17	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Selenium (Se)	0.073	0.37	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Silver (Ag)	0.0023	0.012	µg/L	<RDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Sodium (Na)	93000	310000	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1	Strontium (Sr)	0.13	0.45	µg/L	3.3	5.3	2.1	2.1	4226452
	Thallium (Tl)	0.00081	0.0041	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Tin (Sn)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
5	Titanium (Ti)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
6	Uranium (U)	0.0047	0.024	µg/L	0.041	0.064	<RDLw	<RDLw	4226452
6	Vanadium (V)	0.059	0.15	µg/L	0.70	0.85	0.85	0.69	4226452
	Zinc (Zn)	0.20	1.0	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452

1 DLs increased due to presence in the fabrication control or in the method blanks
2 DLs increased due to presence in the trip blank or in the field blanks
3 No gel or water diffusion coefficient reported, water concentrations cannot be calculated
4 Metal has low affinity for the resin; reported values should be interpreted with caution
5 Metal cannot be reported when using a Chelex-Metsorb resin
6 Metal present as oxyanion

MDLw – Method Detection Limit in water
RDLw – Reporting Detection Limit in water
Cw – Estimated concentration in water

Time averaged concentrations of free metal ions in water

	Maxxam ID	BDF188-01	BDF189-01	BDF190-01	BDF191-01	
	Client ID	P2-1 N14269	P2-2 N14270	P2-3 N14271	P2-4 N14272	
	Deployment time	38.2 days	38.2 days	38.2 days	38.2 days	QC BATCH
	Average temperature	6.0 °C	6.0 °C	6.0 °C	6.0 °C	

Note	Metal Name	MDLw	RDLw	Units	Time-averaged concentration in water, C_w				
1	Aluminum (Al)	1.9	6.4	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Antimony (Sb)	0.062	0.31	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Arsenic (As)	0.064	0.32	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
	Barium (Ba)	0.20	0.81	µg/L	5.7	6.0	6.4	5.9	4226452
	Beryllium (Be)	0.065	0.32	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Bismuth (Bi)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
3	Boron (B)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
	Cadmium (Cd)	0.0070	0.035	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Calcium (Ca)	39	130	µg/L	220	220	260	200	4226452
	Chromium (Cr)	0.38	1.9	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Cobalt (Co)	0.037	0.18	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Copper (Cu)	0.069	0.35	µg/L	0.42	<RDLw	0.39	0.45	4226452
	Iron (Fe)	3.2	16	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Lead (Pb)	0.024	0.12	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Lithium (Li)	0.19	0.94	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Magnesium (Mg)	2.7	14	µg/L	<MDLw	<MDLw	<RDLw	<MDLw	4226452
	Manganese (Mn)	0.17	0.83	µg/L	11	9.0	6.6	9.5	4226452
1, 6	Molybdenum (Mo)	0.11	0.36	µg/L	2.8	2.9	3.2	3.0	4226452
1	Nickel (Ni)	0.29	0.96	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Phosphorus (P)	3.2	16	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
4	Potassium (K)	4.0	20	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Selenium (Se)	0.087	0.44	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Silver (Ag)	0.0027	0.014	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Sodium (Na)	110000	370000	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1	Strontium (Sr)	0.16	0.53	µg/L	1.7	1.8	2.2	1.9	4226452
	Thallium (Tl)	0.0010	0.0048	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Tin (Sn)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
5	Titanium (Ti)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
6	Uranium (U)	0.0056	0.028	µg/L	0.086	0.093	0.091	0.094	4226452
6	Vanadium (V)	0.070	0.17	µg/L	0.43	0.39	0.46	0.44	4226452
	Zinc (Zn)	0.24	1.2	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452

1 DLs increased due to presence in the fabrication control or in the method blanks
2 DLs increased due to presence in the trip blank or in the field blanks
3 No gel or water diffusion coefficient reported, water concentrations cannot be calculated
4 Metal has low affinity for the resin; reported values should be interpreted with caution
5 Metal cannot be reported when using a Chelex-Metsorb resin
6 Metal present as oxyanion

MDLw – Method Detection Limit in water
RDLw – Reporting Detection Limit in water
Cw – Estimated concentration in water

6740 Campobello Road, Mississauga, ON L5N 2L8

Time averaged concentrations of free metal ions in water

	Maxxam ID	BDF192-01	BDF193-01	BDF194-01	BDF195-01	
	Client ID	B2-1 N14273	B2-2 N14274	B2-3 N14275	B2-4 N14276	
	Deployment time	37.9 days	37.9 days	37.8 days	37.8 days	QC BATCH
	Average temperature	8.6 °C	8.6 °C	8.6 °C	8.6 °C	

Note	Metal Name	MDLw	RDLw	Units	Time-averaged concentration in water, C_w				
1	Aluminum (Al)	1.8	5.9	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Antimony (Sb)	0.058	0.29	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Arsenic (As)	0.059	0.30	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
	Barium (Ba)	0.19	0.75	µg/L	8.1	9.4	10	12	4226452
	Beryllium (Be)	0.060	0.30	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Bismuth (Bi)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
3	Boron (B)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
	Cadmium (Cd)	0.0064	0.032	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Calcium (Ca)	36	120	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
	Chromium (Cr)	0.35	1.8	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Cobalt (Co)	0.034	0.17	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
	Copper (Cu)	0.064	0.32	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
	Iron (Fe)	2.9	15	µg/L	340	350	264	333	4226452
	Lead (Pb)	0.022	0.11	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Lithium (Li)	0.17	0.87	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Magnesium (Mg)	2.5	13	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Manganese (Mn)	0.15	0.77	µg/L	56	64	69	86	4226452
1, 6	Molybdenum (Mo)	0.10	0.33	µg/L	0.51	0.53	0.52	0.54	4226452
1	Nickel (Ni)	0.26	0.88	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Phosphorus (P)	3.0	15	µg/L	27	35	37	44	4226452
4	Potassium (K)	3.7	18	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Selenium (Se)	0.080	0.40	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Silver (Ag)	0.0025	0.013	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Sodium (Na)	100000	340000	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1	Strontium (Sr)	0.15	0.49	µg/L	1.1	1.3	1.2	1.5	4226452
	Thallium (Tl)	0.00089	0.0045	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Tin (Sn)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
5	Titanium (Ti)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
6	Uranium (U)	0.0052	0.026	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Vanadium (V)	0.064	0.16	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Zinc (Zn)	0.22	1.1	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452

1 DLs increased due to presence in the fabrication control or in the method blanks
2 DLs increased due to presence in the trip blank or in the field blanks
3 No gel or water diffusion coefficient reported, water concentrations cannot be calculated
4 Metal has low affinity for the resin; reported values should be interpreted with caution
5 Metal cannot be reported when using a Chelex-Metsorb resin
6 Metal present as oxyanion

MDLw – Method Detection Limit in water
RDLw – Reporting Detection Limit in water
Cw – Estimated concentration in water

Time averaged concentrations of free metal ions in water

Maxxam ID	BDF196-01	BDF197-01	BDF198-01	BDF199-01	
Client ID	PNF-1 N14277	PNF-2 N14278	PNF-3 N14279	PNF-4 N14280	
Deployment time	35.6 days	35.6 days	35.6 days	35.6 days	QC BATCH
Average temperature	4.5 °C	4.5 °C	4.5 °C	4.5 °C	

Note	Metal Name	MDLw	RDLw	Units	Time-averaged concentration in water, C_w				
1	Aluminum (Al)	2.2	7.2	µg/L	<RDLw	12	<RDLw	<RDLw	4226452
	Antimony (Sb)	0.071	0.35	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Arsenic (As)	0.073	0.36	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Barium (Ba)	0.23	0.91	µg/L	6.9	6.3	5.2	7.2	4226452
	Beryllium (Be)	0.073	0.37	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Bismuth (Bi)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
3	Boron (B)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
	Cadmium (Cd)	0.0079	0.039	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Calcium (Ca)	44	150	µg/L	310	280	260	260	4226452
	Chromium (Cr)	0.43	2.2	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Cobalt (Co)	0.041	0.21	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Copper (Cu)	0.078	0.39	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
	Iron (Fe)	3.6	18	µg/L	<MDLw	<RDLw	<MDLw	<MDLw	4226452
	Lead (Pb)	0.027	0.14	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Lithium (Li)	0.21	1.1	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Magnesium (Mg)	3.1	16	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Manganese (Mn)	0.19	0.94	µg/L	3.9	4.9	3.9	4.4	4226452
1, 6	Molybdenum (Mo)	0.12	0.41	µg/L	<RDLw	<RDLw	<RDLw	<RDLw	4226452
1	Nickel (Ni)	0.32	1.1	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Phosphorus (P)	3.6	18	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Potassium (K)	4.5	22	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Selenium (Se)	0.10	0.49	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Silver (Ag)	0.0031	0.016	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Sodium (Na)	120000	410000	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1	Strontium (Sr)	0.18	0.60	µg/L	2.2	1.8	1.4	2.0	4226452
	Thallium (Tl)	0.0011	0.0055	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Tin (Sn)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
5	Titanium (Ti)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
6	Uranium (U)	0.0064	0.032	µg/L	0.072	0.078	0.075	0.086	4226452
6	Vanadium (V)	0.079	0.20	µg/L	<RDLw	<RDLw	<MDLw	<RDLw	4226452
	Zinc (Zn)	0.27	1.4	µg/L	<MDLw	15	<MDLw	<MDLw	4226452

1 DLs increased due to presence in the fabrication control or in the method blanks
2 DLs increased due to presence in the trip blank or in the field blanks
3 No gel or water diffusion coefficient reported, water concentrations cannot be calculated
4 Metal has low affinity for the resin; reported values should be interpreted with caution
5 Metal cannot be reported when using a Chelex-Metsorb resin
6 Metal present as oxyanion

MDLw – Method Detection Limit in water
RDLw – Reporting Detection Limit in water
Cw – Estimated concentration in water

Time averaged concentrations of free metal ions in water

	Maxxam ID	BDF200-01	BDF201-01	BDF202-01	BDF203-01	
	Client ID	PRef1-1 N14281	PRef1-2 N14282	PRef1-3 N14283	PRef1-4 N14284	
	Deployment time	34.3 days	34.3 days	34.3 days	34.2 days	QC BATCH
	Average temperature	3.9 °C	3.9 °C	3.9 °C	3.9 °C	

Note	Metal Name	MDLw	RDLw	Units	Time-averaged concentration in water, C_w				
1	Aluminum (Al)	2.3	7.7	µg/L	<RDLw	<RDLw	12	<RDLw	4226452
	Antimony (Sb)	0.075	0.38	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Arsenic (As)	0.078	0.39	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Barium (Ba)	0.24	0.97	µg/L	5.8	5.6	6.2	5.8	4226452
	Beryllium (Be)	0.078	0.39	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Bismuth (Bi)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
3	Boron (B)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
	Cadmium (Cd)	0.0084	0.042	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Calcium (Ca)	47	155	µg/L	200	290	310	310	4226452
	Chromium (Cr)	0.46	2.3	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Cobalt (Co)	0.044	0.22	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Copper (Cu)	0.083	0.42	µg/L	<RDLw	<RDLw	<RDLw	<MDLw	4226452
	Iron (Fe)	3.8	19	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Lead (Pb)	0.029	0.15	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Lithium (Li)	0.23	1.1	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Magnesium (Mg)	3.3	17	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Manganese (Mn)	0.20	1.0	µg/L	4.5	2.4	5.1	7.0	4226452
1, 6	Molybdenum (Mo)	0.13	0.43	µg/L	<MDLw	<MDLw	<MDLw	<RDLw	4226452
1	Nickel (Ni)	0.35	1.2	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Phosphorus (P)	3.9	19	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Potassium (K)	4.8	24	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
6	Selenium (Se)	0.10	0.52	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
4	Silver (Ag)	0.0033	0.017	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1, 4	Sodium (Na)	130000	440000	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
1	Strontium (Sr)	0.19	0.64	µg/L	1.6	2.2	2.2	2.2	4226452
	Thallium (Tl)	0.0012	0.0058	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
3	Tin (Sn)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
5	Titanium (Ti)	n/a	n/a	µg/L	n/a	n/a	n/a	n/a	4226452
6	Uranium (U)	0.0068	0.034	µg/L	0.070	0.054	0.061	0.058	4226452
6	Vanadium (V)	0.084	0.21	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452
	Zinc (Zn)	0.29	1.5	µg/L	<MDLw	<MDLw	<MDLw	<MDLw	4226452

1 DLs increased due to presence in the fabrication control or in the method blanks
2 DLs increased due to presence in the trip blank or in the field blanks
3 No gel or water diffusion coefficient reported, water concentrations cannot be calculated
4 Metal has low affinity for the resin; reported values should be interpreted with caution
5 Metal cannot be reported when using a Chelex-Metsorb resin
6 Metal present as oxyanion

MDLw – Method Detection Limit in water
RDLw – Reporting Detection Limit in water
Cw – Estimated concentration in water

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Quality Assurance Notes

1. Estimated water concentrations (C_W), Method Detection Limits (MDL_W) and Reporting Detection Limits (RDL_W) were calculated using the average temperature and DGT deployment times reported by the client.
2. A single average Detection Limit is reported for samples from the same site as the temperature and deployment time variability was considered to be not significant compared with analytical variance.
3. The following DGT specifications, provided by the supplier, were used for the water concentration estimations:
    - Diffusive layer thickness, gel plus membrane, (Δg) = 0.90 mm
    - Area of exposed diffusive layer = 3.14 cm^2
    - Volume of resin = 0.2 mL
4. Diffusion coefficients in diffusive gel at 25 °C were taken from the Technical Documentation published by DGT Research LTD and other published literature values. Where diffusion coefficients in the diffusion gel were not available, water diffusion coefficients at 25°C were used. Diffusion coefficients at 25 °C were, in turn, used to calculate the diffusion coefficients at the average temperature of deployment.
5. Diffusion coefficients for Bi, B and Sn were not reported in the available sources and therefore water concentration estimates for these metals have not been included in this report. These can be calculated in the future if appropriate diffusion coefficients become available.
6. The Chelex-Metsorb resin is selective towards di-and tri-valent cationic metal species and oxyanionic species; as a result, monovalent metal species including Lithium (Li), Sodium (Na), Potassium (K), and Silver (Ag) have extremely low affinity and data for these metals should be interpreted with caution. Calcium (Ca), despite being divalent, is also known to have a low affinity for this resin.
7. Titanium (Ti) cannot be reported when using a Chelex-Metsorb mixed binding layer because Metsorb is a titanium-based resin.
8. All results have been rounded to two significant figures.
9. All DGTS, including fabrication controls, trip blanks and field blanks were from the same lot of DGTs, obtained from the supplier at the same time. Trip blanks and field blanks were shipped to accompany the deployed DGTs while the fabrication controls were retained in the lab for QC purposes. Copper was detected in the trip blank DGT (N14283), which was shipped to the field, double sealed in zip-lock bags and stored by the client along with the field blanks during the deployment. We note that copper was not detected in the laboratory method blank prepared from the same reagents that were used for all of the resin digests. Copper was also not detected in any of the fabrication controls or most importantly, any of the field blanks. Because of this we suggest the presence of copper in the trip blank may be considered as spurious and we determined that it was not necessary to increase the copper Detection Limits of estimated water concentrations.

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Quality Assurance Report

Metals Extracted by Field Blanks and Trip Blanks

	Maxxam ID	BDF204-01	BDF205-01	BDF206-01	
	Client ID	Field Blank 1 N14289	Field Blank 2 N14282	Trip Blank N14283	
	Deployment time	n/a	n/a	n/a	QC BATCH
	Temperature	n/a	n/a	n/a	

Note	Metal Name	MDL	RDL	Units	Mass Extracted by DGT			
3	Aluminum (Al)	0.59	1.96	µg	<MDL	<MDL	<MDL	4226497
	Antimony (Sb)	0.025	0.13	µg	<MDL	<MDL	<MDL	4226497
	Arsenic (As)	0.025	0.13	µg	<MDL	<MDL	<MDL	4226497
	Barium (Ba)	0.063	0.25	µg	<MDL	<MDL	<MDL	4226497
	Beryllium (Be)	0.013	0.063	µg	<MDL	<MDL	<MDL	4226497
3	Bismuth (Bi)	0.077	0.26	µg	<MDL	<MDL	<MDL	4226497
	Boron (B)	0.25	1.3	µg	<MDL	<MDL	<MDL	4226497
	Cadmium (Cd)	0.0025	0.013	µg	<MDL	<MDL	<MDL	4226497
1, 3	Calcium (Ca)	20	66	µg	<MDL	<MDL	<MDL	4226497
	Chromium (Cr)	0.125	0.63	µg	<MDL	<MDL	<MDL	4226497
	Cobalt (Co)	0.013	0.063	µg	<MDL	<MDL	<MDL	4226497
	Copper (Cu)	0.025	0.13	µg	<MDL	<MDL	1.06	4226497
	Iron (Fe)	1.25	6.3	µg	<MDL	<MDL	<MDL	4226497
	Lead (Pb)	0.013	0.063	µg	<MDL	<MDL	<MDL	4226497
1	Lithium (Li)	0.125	0.63	µg	<MDL	<MDL	<MDL	4226497
	Magnesium (Mg)	1.25	6.3	µg	<MDL	<MDL	<MDL	4226497
	Manganese (Mn)	0.05	0.25	µg	<MDL	<MDL	<MDL	4226497
3	Molybdenum (Mo)	0.044	0.15	µg	<MDL	<MDL	<MDL	4226497
3	Nickel (Ni)	0.095	0.32	µg	<MDL	<MDL	<MDL	4226497
	Phosphorus (P)	1.25	6.3	µg	<MDL	<MDL	<MDL	4226497
1	Potassium (K)	5	25	µg	<MDL	<MDL	<MDL	4226497
	Selenium (Se)	0.05	0.25	µg	<MDL	<MDL	<MDL	4226497
3	Strontium (Sr)	0.082	0.27	µg	<MDL	<MDL	<MDL	4226497
1	Silver (Ag)	0.0025	0.013	µg	<MDL	<MDL	<MDL	4226497
1, 3	Sodium (Na)	94000	310000	µg	<MDL	<MDL	<MDL	4226497
	Thallium (Tl)	0.0013	0.013	µg	<MDL	<MDL	<MDL	4226497
3	Tin (Sn)	0.092	0.31	µg	<MDL	<MDL	<MDL	4226497
2	Titanium (Ti)	n/a	n/a	µg	n/a	n/a	n/a	4226497
	Uranium (U)	0.0025	0.013	µg	<MDL	<MDL	<MDL	4226497
	Vanadium (V)	0.025	0.063	µg	<MDL	<MDL	<MDL	4226497
	Zinc (Zn)	0.125	0.63	µg	<MDL	<MDL	<MDL	4226497

1 – Metal has very low affinity for the resin
2 – Metal cannot be reported when using Chelex-Metsorb resin (titanium based resin)
3 – MDL and RDL were raised due to presence in the fabrication controls and/or blanks (see QA report)

Notes:
a. The data presented here have not been rounded due to the wide range of concentrations reported and to facilitate further data manipulation. In any final data presentation, only two significant figures should be reported.
b. <MDL: Target compound not detected (below Method Detection Limit).
c. <RDL: Target compound detected above MDL but below Reporting Detection Limit.

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Background information

Diffusion coefficients at 25 °C

Metal Name	D_{25}	Units
Aluminum (Al)	4.75	10^{-6} cm^2/s
Antimony (Sb)	6.22	10^{-6} cm^2/s
Arsenic (As)	6.02	10^{-6} cm^2/s
Barium (Ba)	4.80	10^{-6} cm^2/s
Beryllium (Be)	3.00	10^{-6} cm^2/s
Cadmium (Cd)	6.09	10^{-6} cm^2/s
Calcium (Ca)	7.93	10^{-6} cm^2/s
Chromium (Cr)	5.05	10^{-6} cm^2/s
Cobalt (Co)	5.94	10^{-6} cm^2/s
Copper (Cu)	6.23	10^{-6} cm^2/s
Iron (Fe)	6.11	10^{-6} cm^2/s
Lead (Pb)	8.03	10^{-6} cm^2/s
Lithium (Li)	10.3	10^{-6} cm^2/s
Magnesium (Mg)	7.05	10^{-6} cm^2/s
Manganese (Mn)	5.85	10^{-6} cm^2/s
Molybdenum (Mo)	6.33	10^{-6} cm^2/s
Nickel (Ni)	5.77	10^{-6} cm^2/s
Phosphorus (P)	6.05	10^{-6} cm^2/s
Potassium (K)	19.6	10^{-6} cm^2/s
Selenium (Se)	8.91	10^{-6} cm^2/s
Silver (Ag)	14.1	10^{-6} cm^2/s
Sodium (Na)	13.3	10^{-6} cm^2/s
Strontium (Sr)	14.1	10^{-6} cm^2/s
Thallium (Tl)	13.3	10^{-6} cm^2/s
Uranium (U)	5.56	10^{-6} cm^2/s
Vanadium (V)	7.98	10^{-6} cm^2/s
Zinc (Zn)	6.08	10^{-6} cm^2/s

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