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Ministry of Environment
Mining Operations Environmental Protection
2080 Labieux Rd.
Nanaimo, BC
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WEEKLY UPDATE REPORT – NOVEMBER 18 TO 24, 2015

Government, First Nations and Stakeholder Engagement

Publications and Website Updates	Mount Polley will continue to present interpreted environmental monitoring results and updates on remediation work on the Mount Polley Updates page of the Imperial Metals website (www.imperialmetals.com). • Last week's update report to the BC Ministry of Environment (MoE) was posted this week. The bridge repair on the Likely-Horsefly Forest Service Road (Ditch Road) has been completed and the road is open. This information was sent to Likely Community, MOE, FLRNO, and the MoE Environmental Woring Group.
Engagement Activities and Communications with Regulators	Activities relating to government, First Nations, and stakeholder communication and engagement this week included: • The MoE weekly update call on November 18th

Rehabilitation Work

Hazeltine Creek Rehabilitation	Hazeltine Creek rehabilitation work carried out this week included: • Trucking out of logs removed from the creek area continued. • Hazeltine Creek continues to flow through outfall pipes into Quesnel Lake (see below for monitoring information).
Polley Lake	Polley Lake water elevation = 919.96 m (November 24th)) The Polley Lake weir valve remains open, now at 25 turns.
Water Management	No releases of water to the environment occurred this week. Please refer to the May 28th, 2015 weekly report for an overview map of the TSF water management system.
Springer Pit	The total volume of tailings deposited in the Springer Pit as of November 24th is 1,126,778 tonnes (816,505 m^3 including water retained in tailings). Water Elevations (November 24th): • Springer Pit = 1023.99m (+0.33m from last week) • Groundwater well GW12-2a = 1014.66m (+0.14m from last week) • Groundwater well GW12-2b = 1014.91m (+0.14m from last week) • Groundwater well GW15-1a = 1024.38m (+0.22m from last week) • Groundwater well GW15-1b = 1024.33m (+0.22m from last week) • Groundwater well GW15-2a = 1024.45m (+0.29m from last week) • Groundwater well GW15-2b = 1025.067m (+0.30m from last week) A map of the groundwater well locations is included as Figure 1 of the July 23rd weekly report. Note that the suffix "a" indicates the deep well in the pair, and the suffix "b" indicates the shallow well in the pair. Monthly water quality results for parameters of interest from the Springer Pit supernatant and adjacent groundwater wells are included in Tables 1 through 7 in this report. MPMC has requested a third party Qualified Professional review of the water elevations and chemistry of the Springer Pit wells based on Section 2.6 Permit 11678.
Discharge System	Work related to installation of infrastructure for the proposed short-term water discharge plan was carried out this week including: • The commissioning and installation of the WTP and associated infrastructure is complete. MPMC is awaiting an amendment to Permit 11678 from MoE to commence discharging.
Monitoring	MPMC staff members conduct environmental monitoring when work in the Hazeltine Creek riparian zone is occurring.

Environmental Monitoring Program

Water Quality Monitoring Program

The current water quality monitoring program is outlined in the table below. All sampling was completed as scheduled this week. No changes were made to the monitoring program last week.

Area	Monitoring Type	Frequency	Stations
Hazeltine Creek	Samples	Weekly	HAC-12
		Monthly	HAC-05a, HAC-08, HAC-10
	Field Parameters	Continuous	HAC-12
Edney Creek	Samples	Monthly	EDC-01
Quesnel Lake	Profiles	Weekly	QUL-58
	Profiles	Bi-monthly	QUL-21a, QUL-18, QUL-66a, QUL-2a, QUL-79
	Profiles	Monthly	QUL-40a, QUL-120a
	Samples	Weekly	QUL-58 – when discharging
	Samples	Monthly	QUL-2a, QUL-18, QUL-40a, QUL-120a
Quesnel River	Samples	Bi-monthly	QUR-1
	Field Parameters	Continuous	QUR-1

Please refer to previous weekly reports, such as the May 7th, 2015 report, for a map of these sampling locations.

Water Quality Monitoring Results

Figure 1 has been updated from previous reports to display current turbidity readings from upper Hazeltine at the outlet of Polley Lake and at lower Hazeltine at the top of the outfall pipeline (HAC-12). Turbidity results were not collected at HAC-05a (upper Hazeltine) this week but have been scheduled for next week.

Figure 2 shows a time series graph of turbidity readings at site QUR-1 in the upper Quesnel River. Turbidity data are from laboratory analysis completed by ALS Environmental. This chart will be updated every second week, as per the monitoring frequency of this station in the sampling program.

Water profile results from November 18th for QUL-40 and QUL-120a indicate Quesnel Lake is turning over (the temperature is less than 7 °C at surface). Turbidity readings at all depths are below 1 NTU.

Other Monitoring

MPMC collected supplemental samples at the outlet of the Water Treatment Plant (HAD-3) and HAC-12 to provide baseline data for Hazeltine Creek and the WTP prior to discharging.

Table 1. Springer Pit Supernatant water chemistry results July – October, 2015

Sample Location	Springer Pit Supernatant								
Date Sampled		**9-Jul-15**	**29-Jul-15**	**12-Aug-15**	**27-Aug-15**	**15-Sep-15**	**30-Sep-15**	**13-Oct-15**	**29-Oct-15**
Physical Tests									
Conductivity	uS/cm	1070	1090	1070	1110	1110	1120	1100	1130
Hardness (as CaCO3)	mg/L	526	579	547	554	562	537	537	529
pH	pH	8.09	8.15	8.79	8.54	8.50	8.07	8.05	8.04
Total Suspended Solids	mg/L	<3.0	<3.0	20.40	14.30	6.20	<3.0	3.30	<3.0
Turbidity	NTU	0.60	1.47	10.30	11.20	2.04	0.61	0.45	1.00
Anions and Nutrients									
Nitrate (as N)	mg/L	7.46	7.58	7.45	7.98	8.31	8.26	8.13	8.44
Sulfate (SO4)	mg/L	457	472	459	483	502	497	490	513
Total Metals									
Aluminum (Al)-Total	mg/L	0.438	0.0791	0.195	0.183	0.0725	0.0373	0.03	0.09
Arsenic (As)-Total	mg/L	0.00132	0.00138	0.00576	0.00952	0.00155	0.00117	0.00091	0.00106
Cadmium (Cd)-Total	mg/L	0.0000358	<0.000060	0.0000565	<0.000020	0.0000075	<0.00002	0.0000108	0.0000121
Copper (Cu)-Total	mg/L	0.0211	0.0804	0.138	0.0542	0.0112	0.00845	0.00702	0.00829
Iron (Fe)-Total	mg/L	0.039	0.124	0.235	0.188	0.047	<0.030	<0.03	0.059
Lead (Pb)-Total	mg/L	<0.000050	0.000185	0.000198	0.00015	0.000056	<0.00005	<0.000050	<0.000050
Molybdenum (Mo)-Total	mg/L	0.122	0.128	0.139	0.14	0.147	0.153	0.148	0.152
Selenium (Se)-Total	mg/L	0.0365	0.0383	0.0375	0.0335	0.0332	0.0354	0.0336	0.0334
Dissolved Metals									
Aluminum (Al)-Dissolved	mg/L	0.0059	0.0048	0.0062	0.0106	0.0171	0.0123	0.0145	0.0143
Arsenic (As)-Dissolved	mg/L	0.00117	0.00117	0.00112	0.00100	0.00084	0.00100	0.00087	0.00099
Cadmium (Cd)-Dissolved	mg/L	0.000026	<0.000050	0.0000478	<0.000020	0.0000084	<0.00002	0.0000083	0.0000064
Copper (Cu)-Dissolved	mg/L	0.0166	0.0286	0.0240	0.0082	0.0052	0.0054	0.00498	0.00363
Iron (Fe)-Dissolved	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.122	0.124	0.127	0.144	0.147	0.137	0.149	0.148
Selenium (Se)-Dissolved	mg/L	0.0357	0.0389	0.0361	0.0338	0.0335	0.0363	0.0321	0.0318

Table 2. GW 12-2a water chemistry results (July – November 2015)

	GW12-2A					
Date Sampled	4-Jun-15	27-Jul-15	2-Sep-15	29-Sep-15	21-Oct-15	17-Nov-15
Physical Tests						
Conductivity (µS/cm)	213	226	219	224	230	227
Hardness (as CaCO3) (mg/L)	45.7	47.1	47.4	47.8	50.1	49.7
pH - in situ (pH)	7.92	8.21	8.24	8.1	8.08	8.16
Anions and Nutrients						
Nitrate (as N) (mg/L)	<0.0050	0.01	<0.0050	<0.0050	<0.0050	<0.0050
Sulfate (SO4) (mg/L)	49.7	53.2	54.1	56.1	59.6	60.8
Dissolved Metals						
Aluminum (Al)-Dissolved (mg/L)	0.0073	0.0085	0.0066	0.0072	0.0057	0.0056
Arsenic (As)-Dissolved (mg/L)	0.00234	0.00233	0.00224	0.00231	0.00215	0.00224
Cadmium (Cd)-Dissolved (mg/L)	0.0000064	0.0000083	0.0000076	<0.0000050	<0.0000050	<0.0000050
Copper (Cu)-Dissolved (mg/L)	<0.00050	<0.00050	0.00066	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved (mg/L)	0.0395	0.0402	0.0397	0.0394	0.0400	0.0398
Selenium (Se)-Dissolved (mg/L)	0.000203	0.00008	0.000075	<0.000050	<0.000050	<0.000050

Table 3. GW 12-2b water chemistry results (July – November 2015)

	GW12-2B					
Date Sampled	4-Jun-15	27-Jul-15	2-Sep-15	29-Sep-15	21-Oct-15	17-Nov-15
Physical Tests						
Conductivity (µS/cm)	461	484	510	557	593	653
Hardness (as CaCO3) (mg/L)	244	243	264	283	311.0	331.0
pH - in situ (pH)	7.48	7.64	7.63	7.85	8.10	8.09
Anions and Nutrients						
Nitrate (as N) (mg/L)	2.49	2.94	3.5	3.86	4.28	4.67
Sulfate (SO4) (mg/L)	39.5	63.3	93.7	119	137.0	160.0
Dissolved Metals						
Aluminum (Al)-Dissolved (mg/L)	<0.0030	<0.0030	0.0031	<0.0030	<0.0030	<0.0030
Arsenic (As)-Dissolved (mg/L)	0.00064	0.00051	0.00051	0.00051	0.00047	0.00049
Cadmium (Cd)-Dissolved (mg/L)	0.0000114	0.0000113	0.0000076	<0.000005	0.0000088	0.0000071
Copper (Cu)-Dissolved (mg/L)	0.00052	<0.00050	0.00118	0.00066	0.00177	0.00074
Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved (mg/L)	0.0238	0.0247	0.0244	0.0235	0.0230	0.0223
Selenium (Se)-Dissolved (mg/L)	0.00415	0.00816	0.0122	0.0151	0.015100	0.017500

Table 4. GW 15-1a water chemistry results (July – November 2015)

	GW15-1A				
Date Sampled	**23-Jul-2015**	**9-Sep-2015**	**1-Oct-2015**	**21-Oct-2015**	**18-Nov-2015**
Physical Tests					
Conductivity (µS/cm)	299	322	303	296	304
Hardness (as CaCO3) (mg/L)	24.8		93	93.5	94.5
pH - in situ (pH)	9.95	8.17	8.06	8.10	7.99
Anions and Nutrients					
Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.005	<0.0050	<0.0050
Sulfate (SO4) (mg/L)	64.8	71.4	67.8	63.9	63.3
Dissolved Metals					
Aluminum (Al)-Dissolved (mg/L)	0.0062	0.0037	0.0054	0.0031	0.0040
Arsenic (As)-Dissolved (mg/L)	0.00485	0.00586	0.00649	0.00563	0.00540
Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	0.0000061	0.0000084	0.0000071	0.0000241
Copper (Cu)-Dissolved (mg/L)	0.00109	0.00085	<0.00050	<0.00050	0.00058
Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved (mg/L)	0.0281	0.0221	0.0259	0.0249	0.0257
Selenium (Se)-Dissolved (mg/L)	0.000997	0.000400	0.000162	0.000116	0.000186

Table 5. GW 15-1b water chemistry results (July – November 2015)

	GW15-1B				
Date Sampled	**23-Jul-2015**	**9-Sep-2015**	**1-Oct-2015**	**21-Oct-2015**	**17-Nov-2015**
Physical Tests					
Conductivity (µS/cm)	520	559	543	568	577
Hardness (as CaCO3) (mg/L)	231		249	272	260
pH - in situ (pH)	7.75	7.72	7.94	8.12	8.12
Anions and Nutrients					
Nitrate (as N) (mg/L)	1.19	1.09	1.14	1.05	1.06
Sulfate (SO4) (mg/L)	114.0	118.0	118.0	118.0	118.0
Dissolved Metals					
Aluminum (Al)-Dissolved (mg/L)	<0.0030	<0.0030	<0.003	<0.0030	<0.0030
Arsenic (As)-Dissolved (mg/L)	0.00131	0.00164	0.00159	0.00156	0.00157
Cadmium (Cd)-Dissolved (mg/L)	0.0000054	<0.0000050	0.000005	<0.0000050	0.0000057
Copper (Cu)-Dissolved (mg/L)	0.00063	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved (mg/L)	0.00535	0.00548	0.00528	0.0053	0.0053
Selenium (Se)-Dissolved (mg/L)	0.0172	0.0150	0.0132	0.012900	0.013800

Table 6. GW 15-2a water chemistry results (July – November 2015)

	GW15-2A				
Date Sampled	27-Jul-2015	9-Sep-2015	29-Sep-2105	21-Oct-2015	17-Nov-2015
Physical Tests (Water)					
Conductivity	261	214	209	208	208
Hardness (as CaCO3)	71.8		61.3	62	61.5
pH	8.95	8.09	8.04	8.17	8.19
Anions and Nutrients (Water)					
Nitrate (as N)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sulfate (SO4)	48.9	39.7	38.8	38.2	38.1
Dissolved Metals (Water)					
Aluminum (Al)-Dissolved	0.0047	0.0035	0.0034	0.0067	<0.0030
Arsenic (As)-Dissolved	0.00299	0.00325	0.00355	0.0033	0.0034
Cadmium (Cd)-Dissolved	<0.0000050	<0.0000050	<0.0000050	0.0000	<0.0000050
Copper (Cu)-Dissolved	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	0.0359	0.0402	0.0415	0.0410	0.0419
Selenium (Se)-Dissolved	0.000171	0.000088	0.000056	<0.000050	0.0001

Table 7. GW 15-2b water chemistry results (July – November 2015)

	GW15-2B				
Date Sampled	27-Jul-2015	9-Sep-2015	29-Sep-2105	21-Oct-2015	17-Nov-2015
Physical Tests (Water)					
Conductivity	344	333	340	344	358
Hardness (as CaCO3)	134		127	135	140
pH	8.05	8.15	7.98	8.10	8.04
Anions and Nutrients (Water)					
Nitrate (as N)	0.02	0.14	0.10	0.23	0.44
Sulfate (SO4)	73	68	69.3	70	73.3
Dissolved Metals (Water)					
Aluminum (Al)-Dissolved	0.0038	0.0035	0.0032	<0.0030	<0.0030
Arsenic (As)-Dissolved	0.00269	0.00261	0.00285	0.00261	0.00240
Cadmium (Cd)-Dissolved	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Copper (Cu)-Dissolved	<0.00050	<0.00050	0.00013	<0.00050	<0.00050
Iron (Fe)-Dissolved	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	0.04090	0.04240	0.0432	0.04440	0.04400
Selenium (Se)-Dissolved	0.0001	0.0001	0.000084	0.0001	0.0002

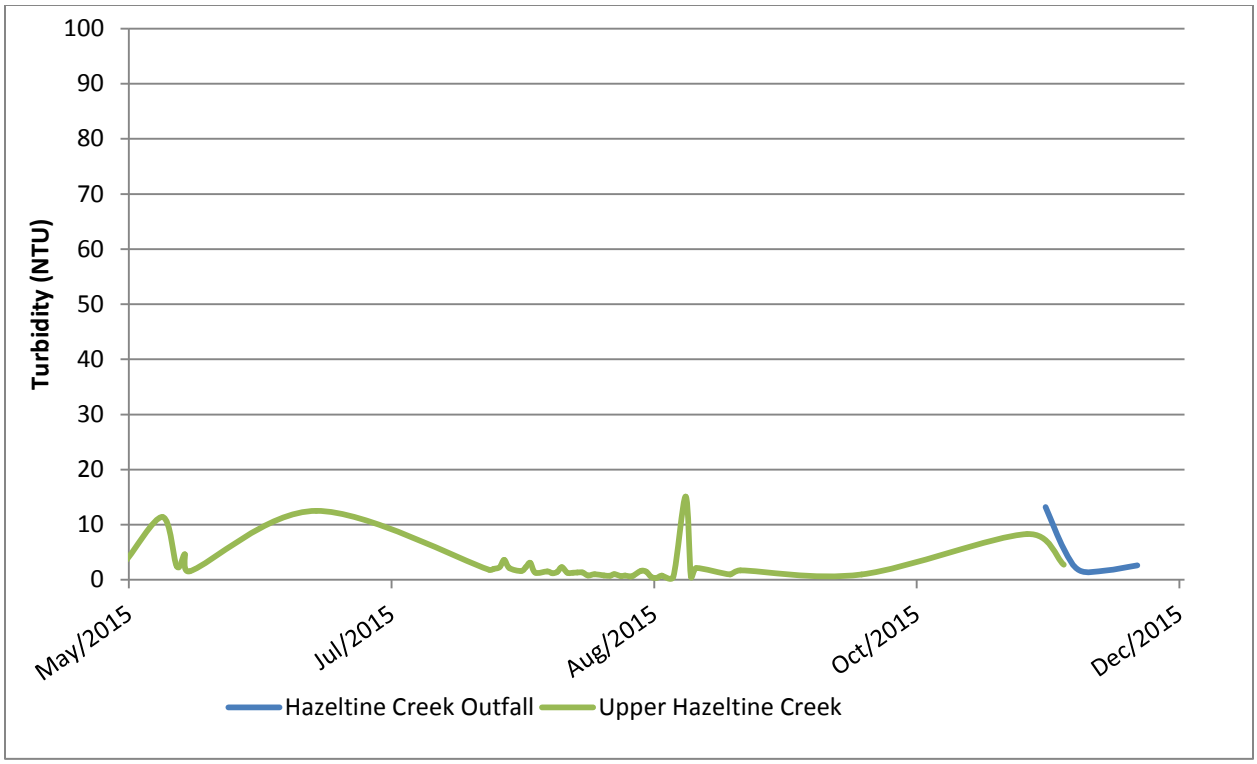

Figure 1. Time series graph for May 15th – November 23rd showing turbidity levels at monitoring locations in upper and lower Hazeltine Creek.

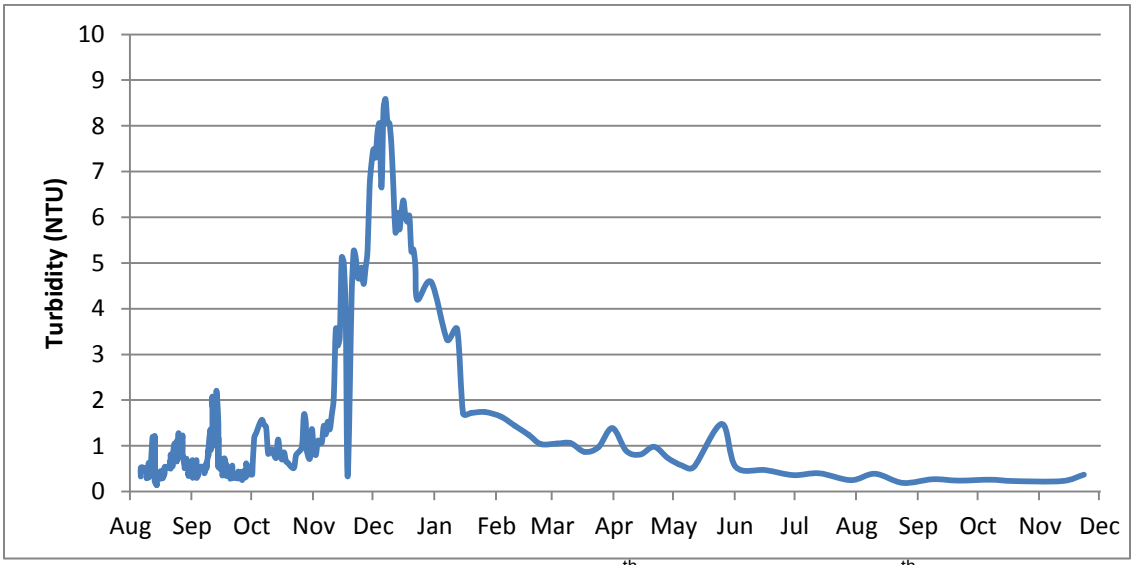

Figure 2. Turbidity time series at station QUR-1 (August 6th, 2014 – November 20th 2015).

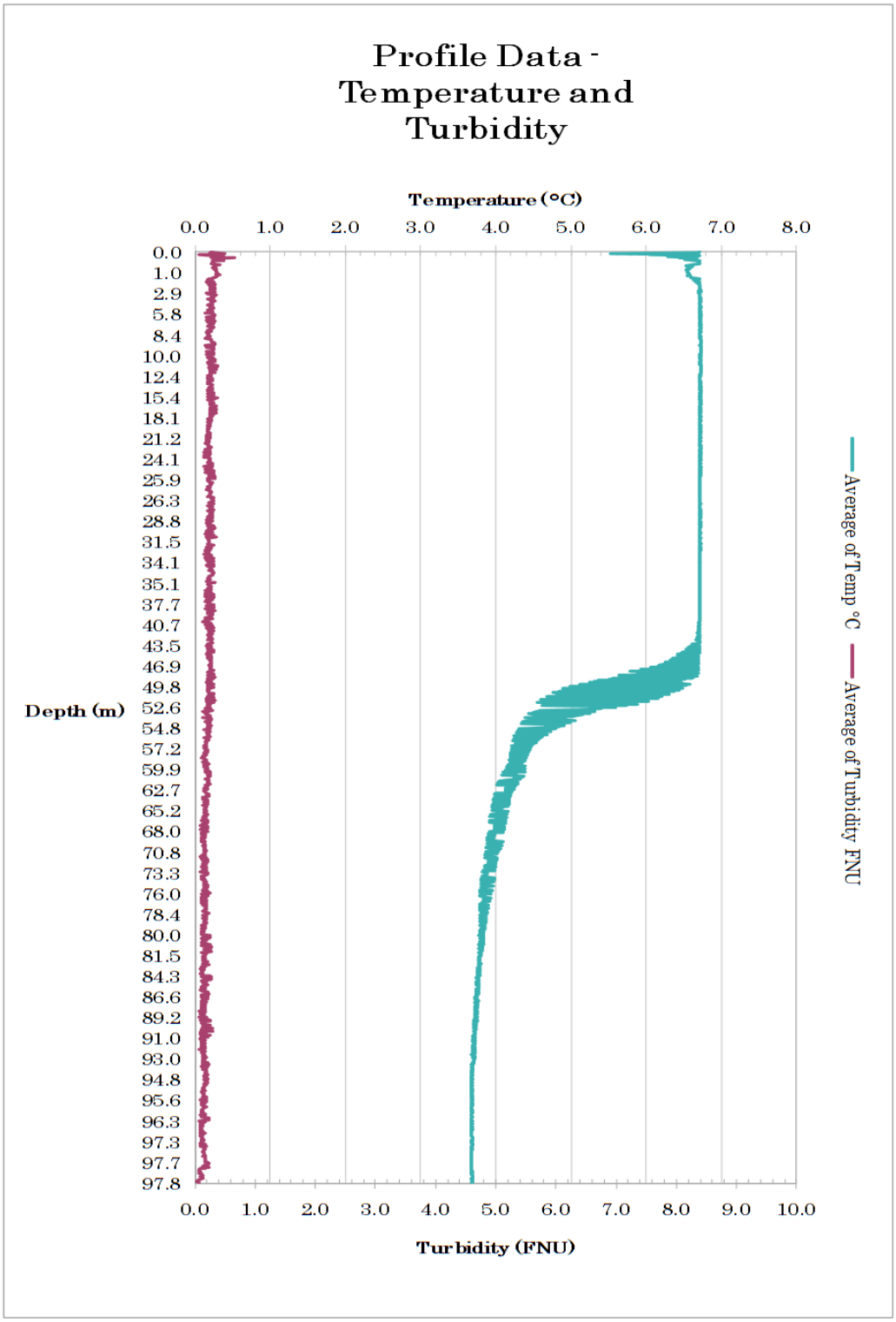

Figure 3. Lake profile at QUL-120a (east of Plato Island) on November 18, 2015