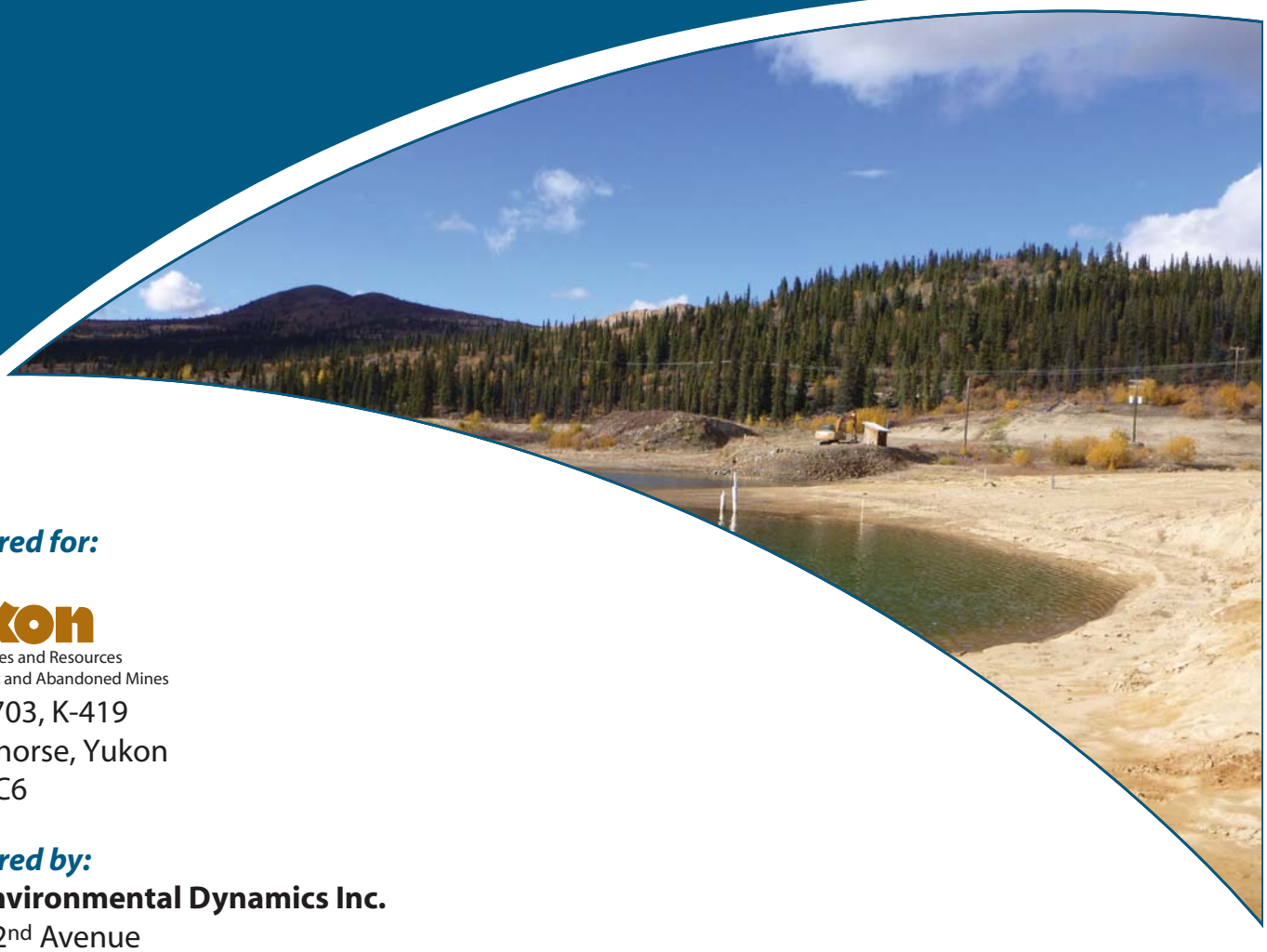
Mount Nansen Water Resources Investigations Quarterly Report (Q2) July – September, 2014



Prepared for:

Yukon
Energy, Mines and Resources
Assessment and Abandoned Mines
Box 2703, K-419
Whitehorse, Yukon
Y1A 2C6

Prepared by:

EDI Environmental Dynamics Inc.
2195-2nd Avenue
Whitehorse, YT
Y1A 3T8

EDI Contact:

Meghan Marjanovic, R.P.Bio., P.Biol.
Jane Bachman, P.Geo.
867-393-4882

EDI Project No:

14-Y-0455
February, 2015

This page is intentionally blank.

EXECUTIVE SUMMARY

EDI Environmental Dynamics Inc. (EDI) was retained by Yukon Government, Assessment and Abandoned Mines (AAM) in 2014 to conduct the Water Resource Investigations 2014/15 program at the Mount Nansen Site. This program involves meteorological monitoring and surface water hydrometric and water quality monitoring for four watersheds at the Mount Nansen Site, including sites and stations on Dome Creek, Victoria Creek, Back Creek and Pony Creek. The data presented in this report comprises the second quarter of the program (Q2), from July 1 to September 30, 2014, which involved three monthly monitoring events: July 14-16, 2014, August 11-13, 2014, and September 15-17, 2014.

Daily and hourly **meteorological data** for the Q2 period is presented in this report. Overall, air temperatures during the period ranged from -6.5°C to 20.3°C. A total of 169 mm of rain fell during the Q2 period, with the highest monthly rainfall occurring in July 2014 (70.7 mm). In addition to rain, snow fell during the Q2 period, between July 5 and September 30, 2014. EDI identified some erroneous snow depth data that may indicate a problem with the snow sensor. An investigation into the issue is ongoing.

Hydrometric monitoring was completed at up to 13 hydrometric stations during the three measurement events, 9 of these stations also collected continuous water level data for conversion to discharge based on open water rating curves. Monitoring at each station included discharge measurements and water level surveys where continuous stage data loggers are installed. Hydrometric results in this report include stream discharge measurements, updated rating curve expressions for each station (where possible) and hydrographs. The following points include some key hydrology observations from the Q2 period:

- Hydrometric conditions were characterized by very low flows interrupted by intense rain storm events. These rain storms resulted in rapid hydrologic responses in Victoria Creek and Dome Creek.
- During the drier periods of Q2 (July and August), several stations had zero flow.
- Channel conditions at H-DC-DX+105 were unsuitable to obtain a reliable discharge measurement.
- The v-notch weir station installed upstream of the original H-DC-M station was operational from July through August; however the weir head pond filled with sediment between the August and September events requiring maintenance.

Water quality investigations were completed at the 23 regular water quality sites. Water samples were collected along with *in situ* water quality parameters. Samples were analyzed for total and dissolved metals, anions and nutrients, routine parameters, and cyanides, in addition to drinking water samples from a drinking water well and an toxicity sample from the seepage pond discharge (WQ-SEEP). Results presented in this report include a summary of parameters that exceed applicable water quality guidelines and standards. Water chemistry results for the Q2 period are similar to previous quarters. Cyanide concentrations at all sites in Q2 were below the required standards for the Site. Most sites on Dome Creek, Pony Creek, and the seepage discharge, tailings pond, and pit lake consistently exceeded the guidelines for arsenic and cadmium, in addition to the guidelines and/or standards for copper, iron, lead, manganese, and zinc at some sites. Sites on Victoria Creek rarely exceeded any guidelines and/or standards, except when Back Creek was flowing and very turbid, in which case aluminum, cadmium, copper and iron guidelines were exceeded.

AUTHORSHIP

This report was prepared by EDI Environmental Dynamics Inc. The EDI staff who contributed to this project includes:

Jane Bachman, P.Geo. ..... Primary Author, Hydrology Sections

Meghan Marjanovic, R.P.Bio, P.Biol.. .....Primary Author, Water Quality Sections

Brett Pagacz, B.Sc. .....Author, Meteorological Results Section

Lyndsay Doetzel, M.Sc., R.P.Bio .....Senior Review

Field work was completed by the following staff:

Dawn Hansen
Laura Grieve
Jane Bachman
Brodie Smith
Danny Skookum
Frank Annau

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Yukon Government Assessment and Abandoned Mines (AAM) retained the services of EDI Environmental Dynamics Inc. (EDI) in 2014 to conduct the Water Resource Investigations 2014/15 program at the Mount Nansen Site. This program involves three monitoring components: surface water hydrology, surface water quality, and meteorology. Data is recorded on a quarterly basis. This report presents the data for the second quarter (Q2) of the program, from July 1, 2014 to September 30, 2014.

The Q2 period consisted of three monthly monitoring events during the summer and early-fall period:

- July 14-16, 2014
- August 11-13, 2014
- September 15-17, 2014

This report outlines the methodology used for all program components, presents the results for each monitoring event and provides recommendations to implement within the program. The data included in this report for each component is summarized in Table 1, below.

Table 1. Summary of meteorology, hydrology and water quality data included in this report.

Monitoring Component	Data Included	Section
Meteorology	• Summary of daily meteorological data • Hourly meteorological plots	• 3.1, APPENDIX F • APPENDIX F
Hydrology	• Rating curve data summary tables • Database tables • Stage-discharge and hydrographs	• 3.2 • APPENDIX D • APPENDIX D
Water Quality	• Guideline/standard exceedance summary tables • *In situ* water quality data summary tables • Lab result plots • Lab results table and QA/QC analysis	• 3.3 • 3.3 • APPENDIX E • APPENDIX E

1.1 Monitoring Network Description

The Mount Nansen Site lies within the Victoria Creek drainage which is a tributary to the Nisling River. Several smaller watercourses drain the mine site area, including Dome Creek and Pony Creek. Dome Creek is a tributary to Victoria Creek and originates upstream of the mill, flows through the valley and is diverted around the tailings pond. Pony Creek lies within the northern portion of the mine site area to the north of the Brown-McDade pit lake. Pony Creek is a tributary to Back Creek, which flows into Victoria Creek

upstream of the Dome Creek confluence. Minnesota Creek also flows into Victoria Creek downstream of the Dome Creek confluence. See Figure 1 and Figure 2 for a regional overview of the watersheds present within the study area as well as water resources investigation site and station locations.

The 2014/15 project scope has some differences from the previous year's programs (2013/14, 2012/13), particularly the addition of several surface water quality sites, including the Dome Creek east slope seeps (WQ-DESS-01 to 03), WQ-CH-P-13-01 and WQ-LW-SEEP-01. The H-PC-U hydrometric station was removed from the scope of work at the beginning of Q2, as the station was destroyed by placer activity when the creek was ploughed over with an excavator on June 24, 2014. The list of water quality sites and hydrometric stations that were part of the Q2 investigation period are presented below (Table 2). Refer Section 2.2 and Section 2.3 for coordinates. There is also one meteorological station on site (ATM-ROAD).

Table 2. List of surface water monitoring locations at the Mount Nansen Site investigated during Q2.

Station/Site Name	Hydrology	Water Quality	Station/Site ID
Upper Pony Creek	X[1]	✓	H/WQ-PC-U
Pony Creek Downstream of Pit	✓	✓	H-PC-DSP/WQ-PC-D
Dome Creek at DX	-	✓	WQ-DC-DX
Dome Creek at DX+105	✓	✓	H/WQ-DC-DX+105
Dome Creek at D1b	✓	✓	H/WQ-DC-D1b
Diversion Channel at Bridge	✓	✓	H/WQ-DC-B
Middle Dome Creek	✓	✓	H-DC-M/WQ-DC-U
Dome Creek at Road	✓	✓	H/WQ-DC-R
Seepage Pond Outflow	✓	✓	H/WQ-SEEP
Tailings Pond	✓	✓	H/WQ-TP
Brown-McDade Pit Lake	-	✓	WQ-PIT-1,2,3
Mill Site Seep 08	-	✓	WQ-MS-S-08
Back Creek	✓	✓	H/WQ-BC
Upper Victoria Creek	✓	✓	H/WQ-VC-U
Victoria Creek Downstream of Back Creek	✓	✓	H/WQ-VC-DBC
Victoria Creek Upstream of Minnesota Creek	✓	✓	H/WQ-VC-UMN
Victoria Creek at Road	✓	✓	H/WQ-VC-R
Pump House Well	-	✓	WQ-PW
Dome East Slope Seep 01	-	✓	WQ-DESS-01
Dome East Slope Seep 02	-	✓	WQ-DESS-02
Dome East Slope Seep 03	-	✓	WQ-DESS-03
CH-P-13-01	-	✓	WQ-CH-P-13-01
Lower West Toe of Waste Rock Dump Seep 01	-	✓	WQ-LW-SEEP-01

Note:
1 – The H-PC-U stations was removed from the scope of work for Q2 onwards, as the station was destroyed by placer activity with a portion of the stream ploughed over. This occurred from June 23, 2014 to June 24, 2014.

Regional Overview Map of Mount Nansen Site Area

Legend

- Secondary Road
- Highway
- Topographic Contour
- Watercourse
- Waterbody
- Wetland Area
- Drainage Areas (Local)

Digital Elevation Model provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Watercourse, drainage areas and Mount Nansen Road layers digitized / modified by EDI (2011) using orthophotos provided by Yukon Government, Energy, Mines and Resources (2011).

This document is not an official land survey and the spatial data presented is subject to change.

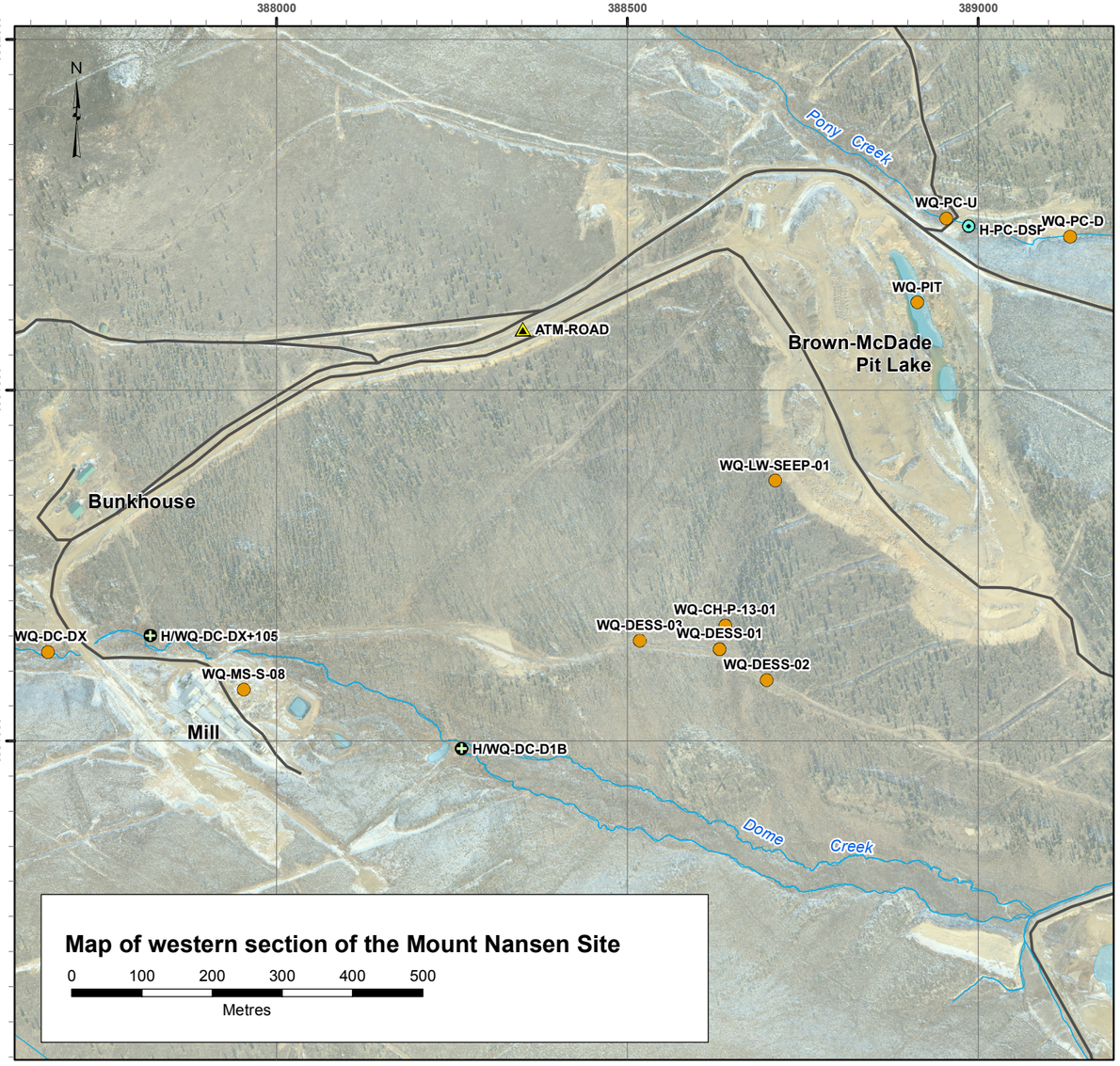
0 2 4 6 8 10
Kilometres

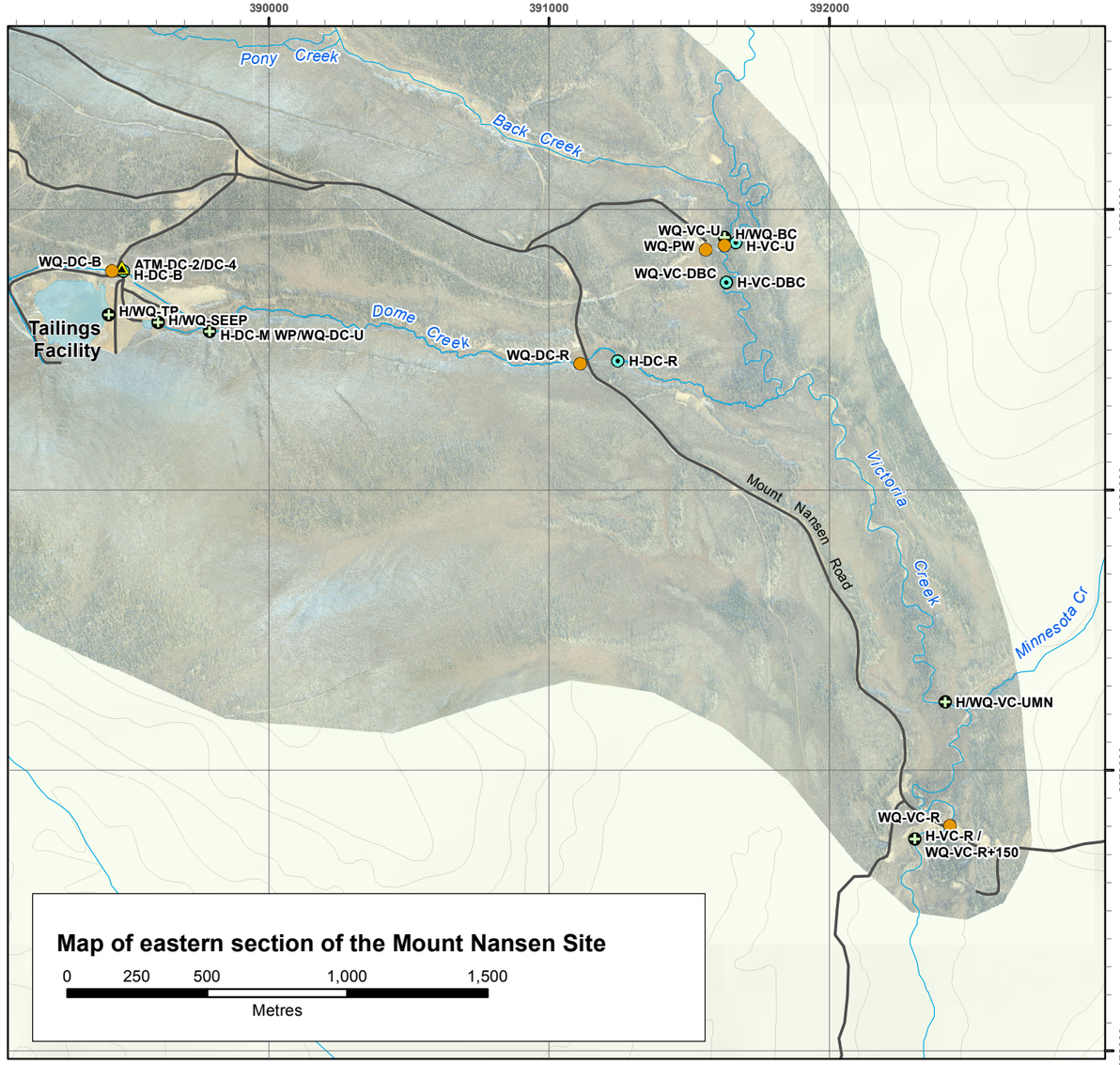
Map Scale = 1:200,000 (printed on 11 x 17)
Map Projection: North American Datum 1983 UTM Zone 8N

Drawn:	Checked:		
LG	MM	FIGURE 1	Date: 20/03/2014

Alaska, USA
Yukon
Northwest Territories
Map Area
Carmacks
Whitehorse

Path: J:\Yukon\Projects\2013\13_Y_0167_AAM_Mount_Nansen_Surface_Water\Mapping\Fig1_Overview.mxd





Mount Nansen Site: Hydrometric Stations and Water Quality Sites

Legend

- Atmospheric Station (label ex: ATM-DC-2)
- Hydrometric Station and Water Quality Site (label ex: H/WQ-VC-UMN)
- Hydrometric Station (label ex: H-VC-R)
- Water Quality Site (label ex: WQ-PC-U)
- Unpaved Road/Access

Notes:

1:50,000 and 1:250,000 Topographic Spatial Data provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Digital Elevation Model provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Watercourse, drainage areas and Mount Nansen Road layers digitized / modified by EDI (2011) using orthophotos provided by Yukon Government, Energy, Mines and Resources (2011).

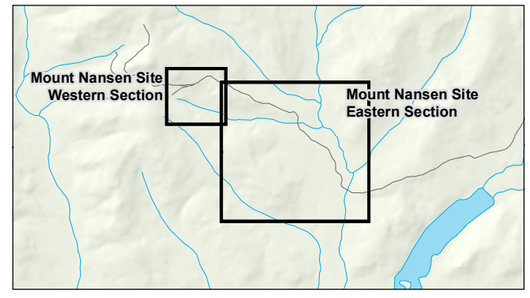
Imagery provided by Yukon Government - Energy, Mines and Resources - Abandoned Mines Branch.

Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. (2014) was obtained using Garmin GPS technology.

This document is not an official land survey and the spatial data presented is subject to change.

Map Projection: North American Datum 1983 UTM Zone 8N

Drawn:	Checked:	FIGURE 2	Date: 30/01/2015
LG	MM		



Yukon EDI

Path: C:\Users\mpower\Desktop\Fig2_MonitoringSites_14Jan2015.mxd

1.2 Site Conditions

Site conditions during the Q2 period were typical of the summer and early fall period, with dry channel conditions in July and August; flashy hydrologic responses to rain storm events and increased discharge in the creeks in September. The following specific observations were made during each trip to the Mount Nansen Site:

- **July 14-16, 2014** – Air temperatures varied from 15°C to 22°C during the July 2014 investigation. Weather conditions were sunny to overcast. Water levels at all stations and sites were considered very low and many sites were dry. Pony Creek was dry at both of the water sampling sites, while there was very minimal flow through the Pony Creek culvert. Back Creek was also dry at the sampling location; an unusual event that is likely attributed a combination of dry conditions and placer activity upstream. The Dome Creek at DX location, upstream of the mill site, was also dry. The CH-P-13-01 seep was dry along with many of the other seeps on site. Some ice still remained within the Dome Creek valley just upstream of the WQ/H-DC-D1b site/station. The WQ/H-DC-DX+105 site/station had substantial algal growth in the stream.

- **August 11-13, 2014** – Air temperatures during the trip ranged from 14°C to 20°C for the duration of the field sampling, with sunny to overcast conditions. From inspection of the site and channel conditions, discharge conditions remain low across the site; however, there were some differences from the July 2014 trip. Back Creek had minimal flow through the channel, insufficient for a discharge measurement but sufficient for water sampling. Pony Creek had flow in some parts of the channel. Ice had melted from the Dome Creek D1b area. Substantial algal growth was again noted at the WQ/H-DC-DX+105 site/station.

- **September 15-17, 2014** – Air temperatures during the trip ranged from 3°C to 20°C. Weather conditions were sunny to overcast during the monitoring program, with periods of rain on September 16, 2014. Discharge conditions were moderate to high across the site. Ice was beginning to form on the vegetation at the WQ/H-DC-D1b site/station. Substantial algal growth was again noted at the WQ/H-DC-DX+105 site/station.

2 METHODOLOGY

The Mount Nansen surface water and meteorological monitoring program consists of several discrete components: meteorology, surface water hydrology and surface water quality. The following sub-sections include descriptions of site/station locations and general program methodology for each component. Detailed methodology has been included in APPENDIX A for reference.

2.1 Meteorology

A Campbell Scientific meteorological station (ATM-ROAD AAM) was established at the Mount Nansen Site in October 2011. The station is located adjacent to the Mount Nansen Road, east of the camp (Figure 2). The ATM-ROAD AAM station is administered by Northern Avcom and data is accessible through an internet download. EDI is responsible for downloading and compiling these raw data into a database. A copy of the updated database is provided with this report. A basic quality control/quality assurance review is completed upon data retrieval; however, EDI is not responsible for meteorological station instrumentation maintenance or sensor calibration. The ATM-ROAD station records air and ground temperature, humidity, rainfall, snow depth, net shortwave and long-wave radiation, total radiation, wind speed, wind direction and battery voltage (Table 3). There is also a barometric logger at ATM-DC-4 within the Dome Creek diversion channel area, which collects barometric pressure and air temperature for use in the hydrometric program.

Table 3. Summary of weather data parameters collected at Mount Nansen Meteorological Station (ATM-ROAD AAM)

Meteorological Parameter Daily Collection	Units	Notes
Air Temperature Maximum	°C	Measured every 5 minutes; Daily maximum value is reported
Air Temperature Minimum	°C	Measured every 5 minutes; Daily minimum value is reported
Humidity Maximum	%	Measured every 5 minutes; Daily maximum value is reported
Humidity Minimum	%	Measured every 5 minutes; Daily minimum value is reported
Snow Depth	cm	Reports the depth of snow at the end of the day
Battery Voltage	Volts	Measured every 5 minutes; Daily minimum value is reported
Hourly Collection		
Net Shortwave	W/m^2	Measured every 5 minutes; Hourly average is reported
Net Longwave	W/m^2	Measured every 5 minutes; Hourly average is reported
Net Total Radiation	W/m^2	Measured every 5 minutes; Hourly average is reported
Wind Speed	m/s	Measured every 5 minutes; Hourly average is reported
Wind Direction	degrees	Measured every 5 minutes; Hourly average is reported
Rainfall	mm	Total hourly rainfall
Snow Depth	cm	Hourly sample recorded
Air Temperature	°C	Measured every 5 minutes; Hourly average is reported
Humidity	%	Measured every 5 minutes; Hourly average is reported
Ground Temperature Surface	°C	Hourly sample recorded
Barometric Pressure	mbar	Hourly sample recorded

2.2 Hydrology

Discharge and/or stage were measured at 13 different hydrometric stations either continuously with water level loggers or instantaneously during each site visit depending on field conditions. There were ten combined continuous/instantaneous hydrometric stations and four instantaneous hydrometric stations (Table 4). Only five of these stations (H-DC-M, H-VC-U, H-VC-DBC, H-VC-UMN and H-VC-R) will remain active through the winter 2014/15 period (Q3 and Q4). During each monitoring event, instantaneous discharge measurements were made at all sites (continuous/instantaneous) as long as channel conditions allowed. Instantaneous discharge measurements and concurrent water surface elevations are used to develop a stage-discharge rating curve equation that is used to convert the continuous stage data to discharge values. In addition to the 13 hydrometric stations, there are two atmospheric stations with barometric loggers that collect atmospheric pressure to be used in compensating water level logger data.

The hydrometric station characteristics that comprise the monitoring network at the Mount Nansen site were summarized (Table 4). A detailed description of each hydrometric station is found in APPENDIX D.

Methods employed for discharge measurement in Q2 included:

- the velocity-area mid-section method;
- volumetric measurements at perched outlets such as culverts, weirs and pipes; and,
- salt dilution gauging (brine salt slug injection) methods.

The velocity-area mid-section method is standardized by British Columbia's Resources Information Standards Committee (RISC 2009), however many of the channels at the Site are inappropriate for using this method (*i.e.,* too shallow, too narrow or low discharge). In such cases, alternative methods including salt-dilution gauging and volumetric measurements are used. When salt dilution or volumetric measurements are made, field crews collect replicate measurements and mean resultant discharge estimates are calculated. An elevation survey is completed during each hydrometric station visit where there are continuous data loggers installed. These surveys were used to monitor shifts in benchmarks, station, and staff gauge elevations. Due to periglacial processes, shifting installations are common and require post-collection data adjustments.

Given the small channel sizes and relatively low discharge at many stations, the minimum reportable discharge is set to 0.001 m^3/s or 1 L/s; this value is lower than what is typically reported for other hydrometric programs (e.g., Water Survey of Canada uses +/-0.01 m^3/s for open water conditions). Field methods used at Mount Nansen can accommodate this higher resolution of discharge under ideal conditions, however measurement uncertainty for each method should be considered when interpreting results. Measurement uncertainty is partly based on instrument accuracy (APPENDIX D, Table D-1). Discharges calculated for several stations were less than 0.001 m^3/s and reported as 0.000 m^3/s, below reportable confidence limits.

All velocity-area measurements of stream discharge used the Sontek Acoustic Doppler Velocimeter (ADV). The ADV is advantageous to the hydrometric program because it has the ability to collect velocity

measurements in two dimensions and thus compensate for measurement error associated with velocity angles. The ADV also provides a variety of quality control and assurance assessments in real-time, reducing field measurement error. The absence of moving parts on the acoustic sensor also decreases measurement error during winter conditions.

For more detailed explanation of methodology used for discharge measurements, hydrometric levelling surveys, hydrometric validation and QA/QC, rating curve development, continuous stage and discharge and overall data management see APPENDIX A.

Table 4. Mount Nansen hydrometric and atmospheric station information, July 1 to September 30, 2014.

HID[1]	Hydrometric Station Name	Type[2]	Location [3] Easting	Northing	Drainage Area (km^2)	Elevation [4] (m)
ATM-DC2	Barometric at Diversion Channel (Back-Up)	ATM	389476	6880792	-	1099
ATM-DC4	Barometric at Diversion Channel	ATM	389476	6880792	-	1100
H-PC-DSP	Pony Creek Downstream of Pit	C	388986	6881734	1.0	1191
H-DC-DX+105	Dome Creek at DX+105	I	387820	6881150	0.9	1204
H-DC-D1b	Dome Creek at D1b	I	388262	6881000	1.4	1156
H-DC-B	Diversion Channel at Bridge	C	389480	6880780	3.0	1095
H-DC-M/ H-DC-M WP	Middle Dome Creek/ Weir Pond	C/CW	389788	6880565	3.3	1065
H-TP	Tailings Pond	I	389427	6880625	-	1093
H-SEEP	Seepage Pond Outflow	I	389604	6880598	-	1072
H-DC-R	Dome Creek at Road	C	392540	6879249	4.5	1020
H-BC	Back Creek	C	391626	6880901	10.4	1021
H-VC-U	Upper Victoria Creek	C/CW	391667	6880882	64.6	1019
H-VC-DBC	Victoria Creek Downstream of Back Creek	C/CW	391627	6880840	75.0	1017
H-VC-UMN	Victoria Creek Upstream of Minnesota Creek	C	392413	6879244	83.4	986
H-VC-R	Victoria Creek at Road	C/CW	392305	6878755	97.7	975

Notes:

1 - HID = unique station identifier that corresponds with hydrometric database tables.

2 - Station Type: ATM = atmospheric pressure monitoring; C = continuous water level monitoring with instantaneous discharge rating measurements; I = instantaneous discharge measurement; CW = continuous winter water level monitoring with instantaneous discharge rating measurements.

3 - NAD 83, UTM Zone 8.

4 - Elevations for hydrometric stations are estimates based on field data collected by handheld Garmin GPS units.

2.3 Water Quality

Water quality sampling occurred on a monthly basis during the Q2 period from July 1, 2014 to September 30, 2014. Water samples were collected at each of the 23 water quality sites, along with *in situ* data, photo documentation, and general site comments during each field visit.

The sampling frequency varies by site, as some sites are sampled monthly, seasonally or only three times per year. Samples are submitted for analysis to ALS in Whitehorse, YT under chain of custody documentation. A 'standard site package' includes lab analysis of cyanides, routine physical tests, anions and nutrients, total metals, and dissolved metals. The 'pit lake package' is similar to the standard package, but excludes cyanides. The 'drinking water package' includes physical tests, anions and nutrients, total metals and bacteriological tests (total coliforms and E. coli). A toxicity test for rainbow trout (LT50) is completed for one sample at one site (WQ-SEEP) every second month. The *in situ* water quality data that is collected includes water temperature, specific conductivity, pH and turbidity. A list of sampling sites, coordinates and sampling information is provided in Table 5.

The water quality field program also includes collection of QA/QC samples including: replicate samples, field blanks, and travel blanks. Details on the specific field methodologies, laboratory analysis, QA/QC program, and data analysis are provided for reference in APPENDIX A. Once both the *in situ* data and the laboratory data have been reviewed for QA/QC it is entered into the project database (Microsoft Access).

Data is analyzed and compared to the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of freshwater aquatic life (CCME-AL; CCME 2014) as well as the Mount Nansen Effluent Quality Standards (EQS) outlined in Yukon Water Board Water license No. QZ94-004, issued to BYG Natural Resources Inc. on February 13, 1996. The drinking water sample results are compared to the applicable Guidelines for Canadian Drinking Water Quality (Health Canada 2012). See APPENDIX A for applicable guideline and standard values.

Table 5. Mount Nansen water quality site and sampling information.

Water Quality Site Name	Site ID	Site Location [1] Easting	Site Location [1] Northing	Sampling Frequency	Parameters Included in Lab Analysis [2]
Pony Creek upstream	WQ-PC-U	388955	6881745	Monthly	Standard Package
Pony Creek downstream	WQ-PC-D	389131	6881719	Monthly	Standard Package
Pit Lake (3 samples)	WQ-PIT-1,2,3	388913	6881625	Monthly	Pit Lake Package
Dome Creek at DX	WQ-DC-DX	387674	6881127	Monthly	Standard Package
Dome Creek at DX+105	WQ-DC-DX+105	387820	6881150	Monthly	Standard Package
Dome Creek at D1b	WQ-DC-D1b	388264	6880989	Monthly	Standard Package

Water Quality Site Name	Site ID	Site Location [1] Easting	Northing	Sampling Frequency	Parameters Included in Lab Analysis [2]
Diversion Channel at Bridge	WQ-DC-B	389439	6880781	Monthly	Standard Package
Upper Dome Creek	WQ-DC-U	389788	6880565	Monthly	Standard Package
Dome Creek at Road	WQ-DC-R	391111	6880449	Monthly	Standard Package
Tailings Pond	WQ-TP	389427	6880625	Monthly	Standard Package
Seepage Pond Outlet Pipe	WQ-SEEP	389604	6880598	Variable[3]	Standard Package, LT50
Mill Site Seep 08	WQ-MS-S-08	387954	6881073	3X Per Year	Standard Package
Back Creek	WQ-BC	391626	6880901	Monthly	Standard Package
Upper Victoria Creek	WQ-VC-U	391626	6880872	Monthly	Standard Package
Victoria Creek downstream Back Creek	WQ-VC-DBC	391633	6880740	Monthly	Standard Package
Victoria upstream of Minnesota	WQ-VC-UMN	392413	6879244	Monthly	Standard Package
Victoria Creek at Road	WQ-VC-R	392431	6878802	Monthly	Standard Package
Pump House Well	WQ-PW	391558	6880856	Monthly	Drinking Water Package
Dome East Slope Seep 01	WQ-DESS-01	388632	6881131	Seasonal[4]	Standard Package
Dome East Slope Seep 02	WQ-DESS-02	388699	6881087	Seasonal [4]	Standard Package
Dome East Slope Seep 03	WQ-DESS-03	388518	6881143	Seasonal [4]	Standard Package
Upwelling near CH-P-13-01	WQ-CH-P-13-01	388640	6881165	Monthly	Standard Package
Lower West Toe of Waste Rock Pile Seep	WQ-LW-Seep-01	388711	6881371	Seasonal [4]	Standard Package

1 - NAD 83, UTM Zone 8.

2 - Parameters included in various sampling packages are explained in greater detail in Appendix A.

3 - Sampling frequency for this site was variable as the WQ-SEEP site is sampled on a monthly basis for the standard package samples and every second month for the LT50 samples.

4 - Sampling frequency for these sites is seasonal as these seeps are to be sampled during freshet and every three months thereafter.

3 RESULTS

Results are separated into the three program components in the sections below: meteorology, hydrology, and water quality results. The description and discussion of the results presented in this document is limited to the data collected in the Q2 period, unless otherwise noted. Results data can also be found in the following appendices:

- Select field photographs for the period and for each site and station are provided in APPENDIX B;
- A record of which sites were sampled during each field visit during the period is available in APPENDIX C;
- Hydrometric data is provided in APPENDIX D;
- Water quality data is provided in APPENDIX E; and
- Meteorological data is provided in APPENDIX F.

All raw data is provided in the corresponding Microsoft Access databases submitted with this report.

- EDI_14Y0455_Meteorological_Database_2014-2015.accdb
- EDI_14Y0455_Hydrology_Database_2014-2015.accdb
- EDI_14Y0455_Water_Quality_Database_2014-2015.accdb

3.1 Meteorology

Meteorological data from the ATM-ROAD AAM station is summarized below for the Q2 period. All relevant data from ATM-ROAD AAM station is plotted in APPENDIX F (Figures F-1 to F-8), with selected summary statistics described below for air and ground temperature, precipitation, wind direction and wind speed, short and long-wave radiation and relative humidity. Daily summary statistics for the Q2 period from the meteorological station are provided in APPENDIX F (Table F-1).

3.1.1 Air and Ground Temperature

The minimum daily air temperature recorded at the ATM-ROAD-AAM station for the Q2 period was -6.5°C on September 30, 2014 (APPENDIX F: Figure F-1). Maximum daily air temperature during the same sampling period was 20.3°C on August 2, 2014. Generally, mean daily air temperatures remained above zero degrees with the exception of two days near the end of the Q2 period (September 29 and September 30, 2014). The lowest recorded mean daily air temperature was -4.3°C on September 30, 2014 and the highest mean daily air temperature was 14.7°C on August 3, 2014.

Similarly, mean daily ground temperatures remained above zero degrees for the Q2 period with the exception of two days, September 25 and September 30, 2014 (APPENDIX F: Figure F-1). The lowest recorded mean daily ground temperature was -2.1°C on September 30, 2014. For the entire Q2 period, the highest recorded mean daily ground temperature was 17.5°C on July 10, 2014; the minimum daily ground

temperature was as low as -3.9°C on September 30, 2014; the maximum daily ground temperature was 25.8°C on July 10, 2014.

3.1.2 Precipitation

Precipitation measured as rainfall occurred sporadically between July 1, 2014 and September 30, 2014 for the Q2 period (APPENDIX F: Figure F-2). A total of 169 mm of rain fell during the Q2 period, with 70.7 mm of rain in July 2014, 41.0 mm of rain in August 2014, and 57.3 mm of rain in September 2014. The maximum hourly rainfall event recorded at the station occurred during July 29, 2014 at 14:00 hours, when a max of 10.1 mm/hr fell.

Precipitation measured as snowfall occurred intermittently between July 5, 2014 and September 30, 2014 during the Q2 period (APPENDIX F: Figure F-3, F-4). During QA/QC of the data, EDI identified some erroneous snow depth data that may indicate a problem with the snow sensor, including several points reading +200/-200 cm in July, as well as in September (Figure F-3). The snowfall data for the summer is therefore suspect, unless it can be confirmed by the Care and Maintenance Staff (Denison Environmental). EDI crews onsite in October 2014 (part of the Q3 investigation period) also indicated that there was less than 2 cm of snow on the ground, while the snow sensor was reading 7-8 cm at that time, indicating that some re-calibration may be required. There may be uneven ground surfaces beneath or vegetation interfering with the sensor data. EDI is not responsible for the design or maintenance of the meteorological station and visits the station only when requested by AAM. EDI notified AAM and Northern AvCom of the potential sensor issue on October 17, 2014.

In light of these potential errors, snow data reported in the following paragraph may require offsetting in the future, if the snow depth sensor is re-calibrated. The maximum monthly snow depth was 11.4 cm on September 1, 2014. Cumulative snow depth at the station gradually increased from 0 cm on July 5, 2014 at 0:00 hours to 6.9 cm on September 21, 2014 at 17:00 hours. The maximum hourly snowfall occurred on September 21, 2014 with 6.9 cm of snow. In general, precipitation fell as both as rainfall and snowfall throughout the Q2 period with generally more rainfall earlier in the sampling period and more snowfall later in the sampling period at the meteorological station.

3.1.3 Wind

Dominant wind directions at the Mount Nansen Site during the Q2 period were south, southeast, and southwest (APPENDIX F: Figure F-5). Wind speeds were generally low during the sampling period with an average wind speed of 2.5 m/s (9.0 km/hr). Average monthly wind speed was highest at the end of September 2014 at 3.0 m/s (10.8 km/hr) and the lowest average monthly wind speed was 2.4 m/s (8.6 km/hr) recorded in both July and September. The maximum hourly wind speed recorded for the Q2 period was recorded on September 19, 2014 at 14:00 hours at 8.5 m/s (30.6 km/hr) (APPENDIX F: Figure F-6).

3.1.4 Short and Long Wave Radiation

Net radiation is the balance of solar energy emitted from the sun in the form of short- and long-wave radiation with the surface of the earth. This balancing act of radiation fluxes produces the seasonal patterns typical in northern latitudes. As ground surface contributes to change (*i.e.,* the accumulation and disappearance of snow) and solar insolation angles shift in the spring and fall, the net solar radiation swings from ~0 W/m^2 (spring and fall) to over 600 W/m^2 (summer). Net radiation exhibits a diurnal cycle associated with increases and decreases in the amount of received solar insolation. In other words, low net radiation values are due to reduced solar insolation and tilt away from the sun, whereas high net radiation values are due to greater solar insolation or tilt towards the sun.

During the Q2 period, net radiation values gradually decreased from July to September 2014, with average values as high as 107 W/m^2 in July and as low as 37 W/m^2 in September, 2014 (APPENDIX F: Figure F-7). The lowest recorded net radiation value was -85.9 W/m^2 on July 7, 2014 at 1:00 hours; the highest recorded value was 637 W/m^2 on July 1, 2014 at 14:00 hours.

3.1.5 Relative Humidity

During the Q2 period, relative humidity at Mount Nansen generally remained above 30% and fluctuated up to 99.5% (APPENDIX F: Figure F-8). During this period, hourly average humidity was 69.8%; minimum and maximum hourly average humidity was 27.0% on August 2, 2014 at 18:00 hours and 99.5%, on September 22, 2014 at 06:00 hours, respectively.

3.2 Hydrology

Three hydrologic measurement events occurred between July 1, 2014 and September 30, 2014 and are included in this quarterly report. There were 13 hydrometric stations where instantaneous hydrologic measurements were obtained during this period; nine of these stations also collected continuous water level data for conversion to discharge based on open water rating curves. This report includes updates to rating curves and the continuous discharge hydrographs that were unavailable at the time of reporting for the Q1 quarterly report (due to insufficient ice-free rating measurements between April 1, 2014 and June 30, 2014). The hydrologic records in this report cover the period April 1, 2014 to September 30, 2014 corresponding to the Q1 and Q2 periods.

The summer period was characterized by very low flows interrupted by intense rain storm events that rapidly raised water levels and discharge in all the creeks. While rainstorm events were common throughout the Q2 monitoring period, three large rainfall events where rainfall exceeded 8 mm/hr occurred in July and August (Section 3.1.2; APPENDIX F: Figure F-2). These storms resulted in rapid hydrologic responses where discharge increased in Victoria Creek approximately 0.4 m^3/s to 1.0 m^3/s over the course of 0.5 to 2 days with similarly rapid declines. Where continuous data was available in Dome Creek (H-DC-B and H-DC-M and H-DC-R), the response to the rain storms was faster and generally for shorter duration. The hydrologic response of the creeks to the rainfall events was captured by the continuous loggers installed at nine of the hydrometric stations; none of the rainfall events corresponded with field measurement events.

In July and August 2014, Back Creek (H-BC) and Pony Creek Downstream of the Pit (H-PC-DSP) were observed to have zero flow; an unusual occurrence for both these stations (see Section 3.2.2.1 for more details). Channel conditions at H-DC-DX+105 were unsuitable to obtain a reliable discharge measurement during any of the measurement events of the reporting period (see Section 3.2.1.1 for more details). The v-notch weir and water level logger installed upstream of the H-DC-M station designed for improved hydrometric measurements was operational in July; however the weir head pond filled with sediment between the August and September measurement events. The following sections describe the results from each gauging station. A summary of each hydrometric measurement event is presented in APPENDIX D, Table D-3 in addition to the measured discharge, river stage record and hydrographs are presented for each station. A copy of the updated hydrometric database containing all raw field data accompanies this report.

Hydrometric gauging and data collection at all stations is designed to meet the Grade A data standard defined by British Columbia's RISC (see RISC, 2009). The Grade A data standard is the highest level of data quality in the hierarchy of provincial standards and is similar to that in the National standards. Grade A criteria are met when instrumentation, stream channel conditions, field procedures, data calculation and assessment meet the requirements specified in RISC (2009). However, due to small channel sizes, discharge rating accuracy and challenging operating conditions at the site, data is considered to be on average Grade B. Uncertainties associated with the instruments used for hydrometric monitoring is presented in Table D-1 in APPENDIX D.

3.2.1 Dome Creek

Throughout the year, hydrometric stations in the upper reaches of the Dome Creek watershed have higher discharge estimate uncertainty due to the small size of the channel and environmental factors that complicate standard field measurement methods. These environmental factors included discharge below reportable confidence limits (*i.e.,* <0.001 m^3/s), excessive vegetation in the channel, and the presence and accumulation of aufeis into spring. Professional judgement was used to assess the channel conditions for obtaining good quality discharge measurements and the appropriate measurement methods during the Q2 period.

3.2.1.1 H-DC-DX+105

Located 105 m downstream of WQ-DC-DX, station H-DC-DX+105 represents a drainage area of 0.52 km^2. The station receives groundwater contributions associated with the road and mill building pad cut out upstream of the station. The channel is poorly defined with a bed of predominantly sand and silts. Channel depth averages 0.60 m wide and 0.05 m deep and is generally unsuitable for cross-section area and salt dilution gauging. Discharge measurements were attempted during each of the three site visits during the monitoring period, however the channel conditions were unsuitable for any hydrometric measurement methods due to substantial algal growth in the channel and the development of a deep pool in the measurement reach. Nearby reaches were investigated for measurement suitably, but none were found.

While discharge measurement could not be obtained, the flow at H-DC-DX+105 was documented with photos and field notes on each visit. The flow appeared to remain relatively constant throughout the

monitoring period, even during dry periods without rain. It is anticipated that once ice forms in the channel, it may be possible to obtain salt tracer or volumetric measurements at the station once the algae dies in the winter.

It is recommended that if future hydrologic monitoring is required at this station during summer months that a small, temporary weir or flume structure is installed to confine flow so that a volumetric measurement can be obtained.

3.2.1.2 H-DC-D1b

The channel at H-DC-D1b is approximately 0.35 m wide, 0.13 m deep, and is unsuitable for cross-section velocity and often unsuitable for salt dilution gauging. Similar to other stations within the Dome Creek watershed, thick layers of aufeis (commonly referred to as creek 'glaciation') develop through the winter period (typically late during the Q3 period and into Q4) as a surface expression of groundwater contribution to the channel. Complex, braided channels develop within the ice cover during the spring melt period, making hydrometric gauging nearly impossible. During the summer months the channel is confined and deeply incised into the substrate. The channel banks are flanked by willow roots where the fine-grained substrate is eroding around them. The salt tracer measurement reach is a short, steep section of the channel where full mixing can occur. At the downstream end of the measurement reach the water flows over a small waterfall and abruptly reports to a sub-surface channel. Since the establishment of this station in 2012, the location of where the flow reports to sub-surface has migrated upstream.

During July and August, discharge appeared relatively low, whereas the flow in September appeared high. Three discharge measurements were obtained during the Q2 investigation period, however the calculated discharge values do not match the field observations of the relative discharge magnitude. On July 15, 2014 discharge was calculated to be 0.002 m^3/s, and in August 2014 was 0.005 m^3/s; whereas in September 2014, when flow appeared high, the salt tracer calculation resulted in a value of 0.004 m^3/s. On each occasion, the background conductivity was unstable. The measurement uncertainty associated with the salt tracer in a small, high conductivity stream is the probable reason for the mis-match between visual observations and flow calculations. Using salt tracers at this station is the only available option for measurement unless a weir or flume structure is installed.

Station discharge measurements collected at H-DC-D1b are presented in APPENDIX D.

3.2.1.3 H-DC-B

The H-DC-B station is a continuous gauging station during the open water season established at the downstream end of the Dome Creek diversion channel, downstream of the bridge. The channel is approximately 1.3 m wide and 0.2 m deep with substantial quantities of fine grained sediment transported past the station due to channel disturbance (excavations to maintain conveyance in the diversion channel) through the spring and summer periods, non-cohesive bank material, and the erosion of upstream bank material during rain events.

Three instantaneous discharge measurements were collected during the Q2 period using salt tracers. The discharges measured at the station increased throughout the summer from 0.004 m^3/s on July 15, 2014, to 0.010 m^3/s on August 12, 2014, and 0.014 m^3/s on September 16, 2014. The continuous water level record from July 15, 2014 to September 16, 2014 was corrupted and the data was not able to be recovered. As a result the continuous stage record is shortened for the Q2 period.

Station discharge measurements collected at H-DC-B are presented in APPENDIX D.

3.2.1.4 H-TP

The tailings pond station (H-TP) is a water level monitoring station only. There are three staff gauges installed at the tailings pond; the lowest of which is not normally visible. Staff gauge readings are collected when the tailings pond is ice free. Readings were collected on July 15, 2014 (1.475 m), August 12, 2014 (1.388 m) and September 16, 2014 (1.376 m).

3.2.1.5 H-SEEP

The Seepage Pond Outlet (H-SEEP) is an instantaneous hydrometric monitoring station where a volumetric measurement is collected during each site visit. Volumetric measurements are collected at the pipe outlet that discharges to Dome Creek. In addition, readings are obtained from the flow meter operated by AAM in the Seepage Pond pump house. The pump house flow meter units of measurement are litres per minute (L/min). DES manages pumping rates from the seepage pond on a daily basis by maintaining pond levels at 0.200 m on the staff gauge installed at the pump house, and recording pump rates (based on communications with R. Wilkinson, DES).

Volumetric measurements at the pipe outlet and readings observed at the flow meter (shown in *italics*) were collected on July 16, 2014 (0.003 m^3/s, *154.447 L/min*), August 12, 2014 (0.003 m^3/s, *182.775 L/min*), and September 16, 2014 (0.003 m^3/s, *186.925 L/min*). The volumetric measurements at the pipe outlet and the flow meter measurements obtained by EDI are in good agreement. While the volumetric measurements collected by EDI indicate a constant discharge rate, the daily instantaneous record provided by DES shows that there is some day to day variability; this is shown in the plots of EDI and DES measurements (APPENDIX D, Figure E-5). DES measurements are obtained at the end of each day from the flow meter in the pump house.

3.2.1.6 H-DC-M and H-DC-M WP

A continuous monitoring station operates within the middle reaches of Dome Creek at H-DC-M, downstream of the seepage pond outlet. This station is intended to measure the cumulative flow from the seepage pond outlet and the diversion channel (H-SEEP and H-DC-B). The channel is moderately well defined within fine grained substrate. Some cobble to boulder sized material persists upstream in the diversion channel where stream gradients are greater. The channel averages 1.08 m in width and 0.16 m in depth. In previous quarters and years of the program, salt dilution gauging was the primary discharge method measurement due to channel conditions being unsuitable for the ADV. In addition, this site is

typically maintained as a continuous hydrometric station during the winter; the only winter station in Dome Creek. During the winter months instantaneous discharge measurements can be difficult due to ice conditions and channel avulsion (due to ice). The conditions also produce poor data quality from the continuous logger.

In April 2014, EDI identified that the hydrometric measurements obtained at this site could be improved (by reducing discharge measurement uncertainty) with the installation of a v-notch weir at a location approximately 15 m upstream of the existing station. A v-notch weir and a new water level logger were installed in the head pond on May 20, 2014 and completed on June 23, 2014 by EDI. The weir provides an opportunity for volumetric measurements and discharge measurements based on a rating equation for the weir structure; both methods will reduce uncertainty associated with salt tracers at this station. The weir pond also provides a more stable location for continuous water level data collection.

This new station was named H-DC-M WP; the old logger at H-DC-M remained in place during the Q2 period, and will remain there until the new station is well established. Discharge measurements were obtained using volumetric measurements and water level elevations at the weir were obtained for rating equation development.

Continuous water stage elevations and discharge measurements are presented in APPENDIX D which covers the Q1 and Q2 monitoring period. During the Q2 period there were three discharge measurements obtained at H-DC-M WP using the volumetric method at the weir outlet. On July 15, 2014 the discharge was 0.005 m^3/s, and 0.010 m^3/s and 0.014m^3/s on August 12, 2014 and September 16, 2014 respectively.

Table 6 summarizes the rating curve expressions presented for the 2012-2013, 2013-2014 rating periods for H-DC-M; with the installation of H-DC-M WP a new rating relationship will be developed and H-DC-M discontinued in 2015.

At the end of August, 2014 excavations were occurring in the diversion channel upstream to improve conveyance and a relatively intense rainstorm occurred. While there were no field observations at the H-DC-M hydrometric station at the end of August 2014, evidence observed during the September 16, 2014 field visit indicated that a large amount of sediment had been transported down the channel and deposited in the weir head pond. The pond was filled to within approximately 15 cm of the top edge of the weir and the water level logger was buried in approximately 0.30 m of sediment. This sediment deposition rendered the continuous stage record from the new H-DC-M WP water level logger between August and September suspect and the data was removed from the plots. Further, the weir measurement from September 2014 could not be used because the head pond depths were significantly altered from the original design depths. A relationship between volumetric and weir measurements could not be established with only two effective measurements therefore a relationship will be determined in the open water season of 2015.

Sedimentation in the weir pond during the open water season associated with intense rainstorms and/or diversion channel excavations will continue unless a sediment control plan is implemented. Following discussion with AAM, during the open water season, sediment will be managed by AAM upstream of the weir during excavations to prevent sedimentation in the weir pond.

Table 6. Middle Dome Creek (H-DC-M) open water rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2012 to March, 2013 (EDI 2013)				
1.556	0.005	1.5	-	-
1.701	0.060	1.5	1.986	$Q = 1.44074 (h-1.5)^{1.98631}$
2.003	0.356	1.5	1.950	$Q = 1.35912 (h-1.5)^{1.94996}$
Rating Curve, April, 2013 to March, 2014 (EDI 2014a)				
1.550	0.001	1.52	-	-
1.891	0.771	1.52	2.558	$Q=10.60 (h-1.52)^{2.64}$
Rating Curve, April, 2014 to June, 2014 (EDI 2014b)				
Insufficient measurement events to produce a curve for Q1	-	-	-	-
Rating Curve, July 2014 to September, 2014				
1.550	0.001	1.52	-	-
1.891	0.771	1.52	2.558	$Q=10.60 (h-1.52)^{2.64}$

3.2.1.7 H-DC-R

The station at H-DC-R was re-established after the winter on June 23, 2014 for the open-water season. The station was re-established at this time because this section of Dome Creek accumulates significant quantities of ice due to the broad, flat nature of the valley bottom and location at the downstream end of the watershed.

During the Q2 period three discharge measurements were obtained; each used the salt tracer method. Low flows were observed in July 2014 while the discharge in August and September 2014 were moderately high. The discharges on July 15, 2014, August 11, 2014 and September 16, 2014 were 0.009 m^3/s, 0.023 m^3/s and 0.024 m^3/s. The continuous water level record from July 15, 2014 to September 16, 2014 was corrupted and the data was not able to be recovered. As a result the continuous stage record is shortened for the Q2 period and was not converted to a continuous discharge record. The rating curve equations for H-DC-R are shown in Table 7.

Table 7. Dome Creek at the Road (H-DC-R) open water rating equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2012 to March, 2013 (EDI 2013)				
0.2747	0.002	0.16	-	-
0.6621	0.100	0.16	2.758	$Q = 0.666494 (h-0.16)^{2.75760}$
1.062	0.477	0.16	2.671	$Q = 0.628053 (h-0.16)^{2.67137}$

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2013 to March, 2014 (EDI 2014a)				
0.274	0.002	0.125	-	-
1.062	0.477	0.125	2.98	$Q = 0.579 (h - 0.125)^{2.98}$
Rating Curve, April 2014 to June, 2014 (EDI 2014b)				
Insufficient measurement events to produce a curve for Q1	-	-	-	-
Rating Curve, April, 2013 to September 2014 (portion of continuous stage data corrupted, equation not applied)				
0.274	0.274	0.274	0.274	0.274
1.062	1.062	1.062	1.062	1.062

3.2.2 Back Creek

3.2.2.1 Back Creek (H-BC)

A continuous station on Back Creek at H-BC was re-installed on May 21, 2014 when the channel was ice-free. The channel is stable and entrenched into alluvial sediments of both the Back Creek and Victoria Creek floodplains. Wetted channel width averages 1.30 m and 0.20 m in depth. Small channel sizes prohibit the use of the ADV as a standard discharge measurement method; therefore, all discharge measurements were made using the salt dilution method.

Typically upstream placer activity increases the sediment load observed within the creek, however during the Q2 period zero flow was observed on two occasions (July 14, 2014 and August 11, 2014); an unusual observation for this station. EDI suspects that the probable cause for this was placer operations operating upstream that were altering the flow regime in such a way that the Back Creek channel was de-watered; however there is no direct evidence of this. The continuous stage record was corrected for periods of zero flow by removing records below the elevation of zero flow established at the station. During the Q2 period, only one instantaneous discharge measurement was obtained; the discharge was 0.070 m^3/s on September 16, 2014. A new rating could not be established for the 2014 open water season; therefore the most recent rating curve presented in Table 8 was used to convert the Q1 and Q2 stage data to discharge values. Time-series water stage and hydrographs for the Q2 monitoring period are presented in APPENDIX D.

Table 8. Back Creek (H-BC) open water rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2012 to March, 2013 (EDI 2013)				
1.630	0.001	1.62	-----	-----
1.893	0.063	1.62	1.252	$Q = 0.319 (h-1.62)^{1.252}$
2.168	0.602	1.62	3.244	$Q = 4.239 (h-1.62)^{3.244}$

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2013 to March, 2014 (EDI 2014a)				
1.63	0.001	1.49	-	-
2.168	0.602	1.49	4.057	$Q = 2.91 (h - 1.49)^{4.06}$
Rating Curve, April, 2014 to June 2014 (EDI 2014b)				
Insufficient measurement events to produce a curve for Q1	-	-	-	-
Rating Curve, April, 2014 to September 2014				
Insufficient measurement events to produce an updated curve for Q1/Q2. April 2013-March 2014 rating curve applied to 2014/15 Q2 data.	-	-	-	-

3.2.3 Victoria Creek

3.2.3.1 Upper Victoria Creek (H-VC-U)

The Upper Victoria Creek gauging station (H-VC-U) continuously monitors Victoria Creek stage elevations downstream of the former H-VC-REF station (decommissioned in January 2014), and approximately 65 metres upstream of the Back Creek confluence. Based on continuous measurements collected from the station during the spring, the peak stage occurred on May 9, 2014 and declined to summer low flows during Q2.

Discharge measurements were collected at H-VC-U during Q2 on July 14, 2014 (0.144 m^3/s), August 11, 2014 (0.261 m^3/s) and September 16, 2014 (0.571 m^3/s) using the velocity-area mid-section method with an ADV. The responses of Victoria Creek to rainfall events during the Q2 period were prominent in the hydrograph for H-VC-U (APPENDIX D). Rating curves for the 2012-2013 and 2013-2014 rating periods are presented in Table 9. Continuous stage records and time-series hydrographs for April 1, 2014 through September 30, 2014 are presented in APPENDIX D.

Table 9. Upper Victoria Creek (H-VC-U) open water rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2012 to March, 2013 (EDI 2013)				
1.986	0.038	1.85	-	-
2.385	2.632	1.85	3.098	$Q = 18.2757 (h-1.85)^{3.09810}$
2.641	8.465	1.85	2.987	$Q = 17.0539 (h-1.85)^{2.98748}$

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2013 to March, 2014 (EDI 2014a)				
2.018	0.109	1.86	-	-
2.516	5.770	1.86	2.789	$Q = 18.702 (h - 1.86)^{2.789}$
Rating Curve, April 2013 to June, 2014 (EDI 2014b)				
Insufficient measurement events to produce a curve for Q1	-	-	-	-
Rating Curve, April, 2013 to September, 2014				
1.980	0.04	1.86	-	
2.300	1.65	1.86	2.863	$Q = 10.874 * (h-1.91)^{2.172}$
2.641	7.87	1.86	2.723	$Q = 20.997 * (h-1.91)^{2.633}$

3.2.3.2 Victoria Creek, downstream of Back Creek (H-VC-DBC)

The Victoria Creek gauging station downstream of Back Creek (H-VC-DBC) continuously monitors Victoria Creek stage elevations downstream of the Back Creek confluence. Based on continuous measurements collected from the station during the spring, the peak stage occurred on May 9, 2014 and declined to summer low flows during Q2.

The continuous gauging station H-VC-DBC was visited three times during the Q2 period. Discharge measurements were collected using the ADV on July 14, 2014 (0.104 m^3/s), August 11, 2014 (0.288 m^3/s) and September 16, 2014 (0.670 m^3/s).

The continuous stage measurements and hydrograph are presented in APPENDIX D. Rating curve expressions are shown in Table 10 and include previously reported rating curve expressions for the 2012-2013 and 2013-2014 rating periods.

Table 10. Victoria Creek, downstream of Back Creek (H-VC-DBC) open water rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2012 to March, 2013 (EDI 2013)				
1.681	0.178	1.316	-	-
2.048	2.090	1.316	3.538	$Q = 6.30234 (h-1.316)^{3.53797}$
2.315	9.631	1.316	4.913	$Q = 9.67846 (h-1.316)^{4.91302}$
Rating Curve, April, 2013 to March, 2014 (EDI 2014a)				
1.720	0.109	1.65	-	-
2.147	5.220	1.65	1.568	$Q = 6.189 (h - 1.65)^{1.568}$

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2013 to June, 2014 (EDI 2014b)				
Insufficient measurement events to produce a curve for Q1	-	-	-	-
Rating Curve, April, 2013 to September, 2014				
1.61	0.04	1.35	-	
2.34	7.65	1.35	3.929	$Q = 7.958 * (h-1.35)^{3.929}$

3.2.3.3 Victoria Creek, upstream of Minnesota Creek (H-VC-UMN)

Victoria Creek upstream of Minnesota Creek (H-VC-UMN) is located in a straight reach upstream of the Minnesota Creek confluence. The channel averages 5.7 m in width and 0.20 m in depth, with channel conditions suitable for standard discharge measurement methods using the ADV. Based on continuous measurements collected from the station during the spring, the peak stage occurred on May 9, 2014 and declined to summer low flows during Q2.

Three discharge measurements were collected during the Q2 monitoring period. Discharge was measured using the ADV on July 15, 2014 (0.120 m^3/s), August 11, 2014 (0.283 m^3/s) and on September 15, 2014 (0.660 m^3/s). Rating curve expressions for H-VC-UMN are presented in Table 11 and include previously reported rating curve expressions for the 2012-2013 and 2013-2014 rating periods.

The continuous stage and hydrograph records for H-VC-UMN are found in APPENDIX D.

Table 11. Victoria Creek, upstream of Minnesota Creek (H-VC-UMN) open water rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2012 to March, 2013 (EDI 2013)				
1.382	0.019	0.979	-----	-----
1.780	1.214	0.979	6.037	$Q = 4.63406 (h-0.979)^{6.03671}$
1.954	3.684	0.979	5.647	$Q = 4.25022 (h-0.979)^{5.64705}$
2.140	9.980	0.979	5.708	$Q = 4.25676 (h-0.979)^{5.70783}$
Rating Curve, April, 2013 to March, 2014 (EDI 2014a)				
1.411	0.049	0.98		
2.066	6.271	0.98	4.250	$Q = 4.066 (h - 0.979)^{5.250}$
Rating Curve, May, 2014 to June, 2014 (EDI 2014b)				
Insufficient measurement events to produce a curve for Q1	-	-	-	-

Rating Curve, April, 2013 to September, 2014				
1.50	0.10	0.99	-	
2.06	6.03	0.99	5.53	$Q = 4.15\ (h - 0.99)^{5.532}$

3.2.3.4 Victoria Creek at Road (H-VC-R)

Victoria Creek at Road (H-VC-R) station was established in 2011 as a continuous gauging station. The station is located 90 metres downstream of the Mount Nansen Road culvert in a low gradient, meandering section of the channel. Channel measurements average 6.7 m in width and 0.25 m in depth at the discharge measurement location. The channel geometry and downstream hydraulic control (riffle) shifted after the 2014 freshet due to a large slug of sediment deposited in the immediate vicinity of the hydrometric station. This change to channel geometry also caused the relationship between stage and discharge to change therefore a new rating period was initiated on May 20, 2014 (Q1).

Three discharge measurements were collected during the Q2 monitoring period using the ADV method. Measured discharge was 0.121 m^3/s on July 14, 2014, 0.329 m^3/s on August 11, 2014, and 0.770 m^3/s on September 15, 2014.

Rating curve expressions for the H-VC-R station are presented in Table 12 in addition to the 2012-2013 monitoring period rating curve expressions. Continuous stage measurements are collected at H-VC-R; Stage time-series and hydrographs are presented in APPENDIX D.

Table 12. Victoria Creek at Road (H-VC-R) open water rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Rating Curve, April, 2012 to March, 2013 (EDI 2013)				
1.849	0.057	1.51	-	-
2.196	4.015	1.51	6.041	$Q = 39.1267\ (h\text{-}1.51)^{6.04113}$
2.307	9.974	1.51	6.067	$Q = 39.5133\ (h\text{-}1.51)^{6.06722}$
Rating Curve, April, 2013 to September, 2013 (EDI 2014a)				
2.010	0.149	1.90	-	-
2.541	10.340	1.90	2.406	$Q = 30.139\ (h - 1.90)^{2.406}$
Rating Curve, May 2014 to June 2014 (EDI 2014b)				
Insufficient measurement events to produce a curve for Q1	-	-	-	-
Rating Curve, April, 2013 to September, 2014				
1.90	0.02	1.58	-	-
2.43	6.59	1.58	5.934	$Q = 17.288\ (h - 1.58)^{5.934}$

3.2.4 Pony Creek

3.2.4.1 Pony Creek Downstream of Pit (H-PC-DSP)

Pony Creek Downstream of the Pit (H-PC-DSP) station was originally installed to supplement a hydrogeological investigation. Average widths for the channel at the station range from 0.15 m to 0.50 m while depths range from 0.05 to 0.20 m. Current channel morphology and conditions indicate that the best method of discharge measurement is the volumetric method. A small rock weir was installed as a control structure immediately downstream of the stilling well and appears to be functioning as an effective control. Due to the large uncertainty associated with the collected rating measurements and stage data, no rating curve is applied to water stage recordings at the H-PC-DSP station. As of May 8, 2014, a Solinst data logger has been recording continuous stage data.

Three discharge measurements were collected during the Q2 period using volumetric methods and all season the flows were very low. The discharge measurements on July 14, 2014 (0.002 m^3/s), August 12, 2014 (0.494 m^3/s) and on September 15, 2014 (0.003 m^3/s). During the July 2014 visit there was zero flow at the station, but flow measurements were obtained at the culvert just upstream of the station. This is an unusual occurrence for the station to be dry during the summer, however the channel downstream of the hydrometric station, up and downstream of the WQ-PC-D site, does go dry occasionally in the summer months when weather conditions are hot and dry, with the creek flowing underground.

Continuous time-series stage elevations and instantaneous discharge measurements are presented in APPENDIX D.

3.3 Water Quality

Water quality results for the Q2 investigation period are discussed for each sampling area in the sections below. The reported results include a summary of samples that exceeded guidelines and/or standards for each site and sampling trip, as well as *in situ* water quality parameters. Detailed lab result data is provided in APPENDIX E, in graphical and table format, and is compared to the CCME-AL guidelines and the Mount Nansen EQS. The graphical format displays data from Q1 and Q2.

3.3.1 Tailings Pond & Seepage Pond Discharge

The tailings pond (WQ-TP) and seepage pond discharge site (WQ-SEEP) were sampled during every visit of the Q2 period and results remained relatively consistent during the entire quarter. Both sites commonly exceeded the guideline and/or standard criteria for arsenic, cadmium and copper (Table 13; APPENDIX E). The tailings pond samples also consistently exceeded the CCME-AL for lead, silver and zinc, and on one occasion fluoride. The seepage pond samples also consistently exceeded the guidelines and/or standards for ammonia, iron and manganese. These results are similar to results from the previous quarter (Q1; EDI 2014b) and the 2013/14 program (EDI 2014a).

Samples from WQ-TP and WQ-SEEP may also exceed the CCME-AL interim guideline for fluoride on some occasions; however because samples are diluted and detection limits are adjusted to protect lab instrumentation there is uncertainty in this result. The lab commonly has to dilute several samples (e.g., chloride, fluoride, nitrate and nitrite) for testing in order to protect lab instrumentation from high conductivities and high sulfates. Consequently the detection limits have to be adjusted. This is typically not a concern for our analysis unless the adjusted detection limit is above a CCME-AL guideline or Mount Nansen EQS value, which occurs in the case of fluoride. The interim CCME-AL guideline for fluoride is 0.12 mg/L and when the lab adjusts the fluoride detection limit it is raised from 0.02 to 0.20 mg/L (see APPENDIX E, Tables E-1 to E-3 for samples with adjusted detection limits). This is a common occurrence for Mount Nansen samples and is typically required for samples from the seep, tailings pond, pit lake and Dome Creek where there are high sulfates and high conductivities. To re-analyze fluoride in these cases, a different method would be required. At this time AAM has requested that EDI continue to use consistent methods to previous years.

LT50 samples from WQ-SEEP were collected on July 16, 2014 and September 16, 2014. Both samples passed the lab tests, with the 96 hour LT50 result being greater than 96 hours, with no fish mortalities and no fish with any signs of stress. As mentioned in Section 3.3.1 Dome Creek, total and WAD cyanide concentrations did not exceed Mount Nansen EQS criteria during the Q2 investigation period. The WQ-SEEP and WQ-DC-U did have the highest concentrations (APPENDIX E).

Table 13. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for WQ-TP and WQ-SEEP for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-TP	WQ-SEEP
July 14-16, 2014	F, As, Cd, Cu, Pb, Ag, Zn	NH_3, As, Cd, Cu, **Fe**, Mn
August 11-13, 2014	As, Cd, Cu, Pb, Ag, Zn	NH_3, As, Cd, Cu, **Fe**, Mn
September 15-17, 2014	As, Cd, Cu, Pb, Ag, Zn	NH_3, As, Cd, Cu, **Fe**, Mn

In situ water quality parameters for the WQ-TP and WQ-SEEP sites for each trip of Q2 are summarized in Table 14. Water temperatures recorded in the tailings pond ranged from 12.9°C to 18.0°C from July to September 2014. Specific conductivity was highest in September 2014 (1,285 µS/cm). The pH for the Q2 period ranged from pH 8.16 to pH 8.41. Turbidity ranged from 4.23 NTU to 6.22 NTU. The WQ-SEEP water temperatures ranged from 5.8°C to 9.9°C during the Q2 period (Table 14). Specific conductivity ranged from 1,730 µS/cm to 1,749 µS/cm during Q2 and pH ranged from pH 6.75 to pH 6.94. Turbidity ranged from 27.30 NTU to 45.20 NTU during the Q2 period.

Table 14. *In situ* water quality data for WQ-TP and WQ-SEEP for the Q2 period.

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-TP	15-Jul-14	18.0	1212	8.41	6.22
WQ-TP	12-Aug-14	15.1	1260	8.27	4.97
WQ-TP	16-Sep-14	12.9	1285	8.16	4.23
WQ-SEEP	16-Jul-14	7.9	1749	6.91	27.30
WQ-SEEP	12-Aug-14	9.9	1730	6.75	38.00
WQ-SEEP	16-Sep-14	5.8	1745	6.94	45.20

3.3.2 Dome Creek

All six sites on Dome Creek were sampled on all three trips of Q2, except for the WQ-DC-DX site which was dry during the July 2014 trip, due to dry conditions across the mine site.

The samples from the most upstream site, WQ-DC-DX, north of the mill site, consistently exceeded the CCME-AL guideline criteria for arsenic and iron. The sample from September 2014 also exceeded guideline and/or standard criteria for total suspended solids (TSS), aluminum, cadmium, copper, lead, mercury, silver and zinc (Table 15; Appendix E). Increased total metals concentrations are associated with the increase in TSS.

The samples from WQ-DC-DX+105 site, which lies 105 m downstream from WQ-DC-DX, consistently exceeded the CCME-AL guidelines and/or standards for arsenic, cadmium, iron, manganese and zinc, while also exceeding the CCME-AL guideline for fluoride in July 2014 (Table 15; Appendix E). The WQ-DC-D1b site lies down valley from the mill and downstream of an older tailings pond. Samples from this site typically exceeded the guideline and/or standard criteria for arsenic, cadmium, iron, manganese and zinc (Table 15; APPENDIX E). The guideline for lead was also exceeded in the July 2014 samples, and the guidelines for aluminium and copper were also exceeded in the September 2014 samples.

The WQ-DC-B site within the Dome Creek diversion channel exceeded guidelines and/or standards for aluminium, arsenic, cadmium, iron and manganese in all Q2 samples (Table 16; Appendix E). Samples also exceeded the guideline for copper during the August and September 2014 sampling events. The WQ-DC-U site, which lies downstream of WQ-DCD-B and the seepage pond discharge site (WQ-SEEP), had samples that consistently exceeded the guidelines and/or standards for ammonia, arsenic, cadmium, iron, and manganese during Q2 (Table 16; APPENDIX E). Samples also exceeded the guidelines and/or standards for aluminum, TSS and copper on some occasions. The most downstream site on Dome Creek, WQ-DC-R, had samples that exceeded the guidelines and/or standards for arsenic, cadmium, iron, and manganese on all trips, with the addition of ammonia in the July 2014 samples and aluminum in the September 2014 sample (Table 16; APPENDIX E).

As noted with the WQ-SEEP and WQ-TP sites in Section 3.3.1, samples for chloride, fluoride, nitrate and nitrite are commonly diluted and the detection limits adjusted for sites on Dome Creek due to higher

conductivities and sulfates which could damage lab instrumentation. Many results for fluoride concentrations are reported as below the adjusted detection limit of 0.20 mg/L (APPENDIX E), and thus may exceed the CCME-AL interim guideline for fluoride of 0.12 mg/L. While detection limits for chloride, nitrate and nitrite were also adjusted, the adjusted detection limits are below the CCME-AL guidelines.

Total and weak acid dissociable (WAD) cyanide concentrations in Dome Creek did not exceed Mount Nansen EQS criteria during the Q2 investigation period. These results are similar to results from previous quarters during the 2013/14 investigations (EDI 2014a). Concentrations in Q2 ranged from below the detection limit of 0.005 mg/L up to 0.0535 mg/L. The WQ-SEEP and WQ-DC-U had the highest concentrations.

Table 15. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS at the upper Dome Creek sites for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-DC-DX	WQ-DC-DX+105	WQ-DC-D1b
July 14-16, 2014	Dry	F, As, Cd, Fe, Mn, **Zn**	As, Cd, **Fe**, Pb, Mn, Zn
August 11-13, 2014	As, Fe	As, Cd, Fe, Mn, **Zn**	As, Cd, Fe, Mn, Zn
September 15-17, 2014	TSS, Al, As, Cd, Cu, **Fe**, Pb, Hg, Ag, Zn	As, Cd, Fe, Mn, **Zn**	Al, As, Cd, Cu, **Fe**, Mn, Zn

Table 16. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for the lower Dome Creek sites for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-DC-B	WQ-DC-U	WQ-DC-R
July 14-16, 2014	Al, As, Cd, **Fe**, Mn	NH_3, As, Cd, **Fe**, Mn	NH_3, As, Cd, **Fe**, Mn
August 11-13, 2014	Al, As, Cd, Cu, **Fe**, Mn	NH_3, Al, As, Cd, **Fe**, Mn	As, Cd, **Fe**, Mn
September 15-17, 2014	Al, As, Cd, Cu, **Fe**, Mn	TSS, NH_3, Al, As, Cd, Cu, **Fe**, Mn	Al, As, Cd, **Fe**, Mn

In situ water quality parameters for the Dome Creek sites for Q2 are summarized in Table 17. Water temperatures in Dome Creek ranged from 1.1°C to 13.2°C, with the coolest temperatures at WQ-DC-DX+105 and WQ-DC-DX sites and the warmest at the WQ-DC-B, WQ-DC-D1b, and WQ-DC-U (Table 17). Specific conductivity was highest during the July 2014 trip at all sites, as water levels were low and ions were concentrated in the water column (Table 17). In general, there is an increase in conductivity from WQ-DC-DX (500 µS/cm range) to WQ-DC-DX+105 (1,000-1,200 µS/cm range), and then to WQ-DC-D1b (1,400-1,600 µS/cm range) (Table 17). From the WQ-DC-D1b site, specific conductivity generally decreases downstream, with only a slight increase at the WQ-DC-U site which receives inputs from WQ-SEEP. For all sampling trips during Q2, conductivity was highest at the WQ-DC-D1b site. The pH across Dome Creek was variable during the Q2 period, ranging from pH 7.01 to 8.00. Turbidity was also variable, ranging from

1.51 to 75.10 NTU during the sampling events. The higher turbidity observed at some sites during the September 2014 trip may be attributed to higher water levels and the higher potential for suspended sediment introduction.

Table 17. *In-situ* water quality data for the Dome Creek sites for the Q2 period.

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-DC-DX	14-Jul-14		Dry		
WQ-DC-DX	12-Aug-14	4.6	518	7.61	3.51
WQ-DC-DX	16-Sep-14	2.9	506	7.68	75.10
WQ-DC-DX+105	14-Jul-14	1.1	1201	7.01	2.53
WQ-DC-DX+105	12-Aug-14	1.2	1170	7.28	1.51
WQ-DC-DX+105	16-Sep-14	1.2	1097	7.17	2.83
WQ-DC-D1b	15-Jul-14	8.7	1628	7.90	9.35
WQ-DC-D1b	12-Aug-14	9.7	1518	7.98	8.00
WQ-DC-D1b	17-Sep-14	2.0	1419	8.00	19.42
WQ-DC-B	15-Jul-14	12.8	1469	7.91	28.30
WQ-DC-B	12-Aug-14	11.7	1304	7.80	27.30
WQ-DC-B	16-Sep-14	10.7	1063	7.72	32.60
WQ-DC-U	15-Jul-14	13.2	1505	7.91	12.25
WQ-DC-U	12-Aug-14	7.7	1363	7.67	16.75
WQ-DC-U	16-Sep-14	9.0	1158	7.98	52.80
WQ-DC-R	16-Jul-14	7.8	1314	7.60	39.60
WQ-DC-R	11-Aug-14	11.0	1255	7.52	40.90
WQ-DC-R	16-Sep-14	2.9	1032	7.22	28.30

3.3.3 Regular Seep Sites

There are a total of six surface water seep sites included in the 2014/15 program. The WQ-DESS-01, 02, 03, and the LW-SEEP-01 are sampled on a seasonal basis. During Q1 period they were sampled in May 2014 and June 2014 (spring freshet and early-summer), and then during Q2, again in September 2014. The WQ-CH-P-13-01 and WQ-MS-S-08 sites are sampled monthly.

The WQ-LW-SEEP-01 site on the lower west waste rock dump was dry during September 2014 trip, therefore no samples were collected for the Q2 period. This site was also dry during all trips during the previous quarter. The Dome East Slope Seeps (WQ-DESS-01, -02, -03) were sampled during the September 2014 trip, except for the WQ-DESS-03 site which was dry at that time. The samples from the WQ-DESS-01 site exceeded guidelines and/or standards for pH, aluminum, cadmium, iron and zinc (Table 18). This is similar to Q1 results (EDI 2014b). The WQ-DESS-02 site exceeded the CCME-AL guideline for cadmium (Table 18; Appendix E).

The WQ-CH-P-13-01 site was sampled during the August and September 2014 trips, but was dry during the July 2014 trip. The August and September 2014 samples consistently exceeded the guidelines and/or standards for pH, aluminum, cadmium and zinc, in addition to manganese in the August 2014 samples.

The WQ-MS-S-08 site, located near the mill site was not sampled during the Q2 period due to dry surface water conditions. During the August 2014 trip, field crews noted that they could hear water flowing subsurface at the site (approximately 1 m underground) and it was suggested that a peristaltic pump could potentially be used to sample the water during the next trip. During the September 2014 trip, a peristaltic pump was brought to site; however, conditions were not suitable for sample collection, due to a very high likelihood of sediment introduction and site disruption. This site only appears to have surface flow during the freshet period, while during other times of year flows underground and may report to the surface at another location. See Section 4 for recommendations for this site.

As noted in Section 3.3.1 and 3.3.2, samples for chloride, fluoride, nitrate and nitrite are commonly diluted and the detection limits adjusted for sites on Dome Creek due to higher conductivities and sulfates which could damage lab instrumentation. Many results for fluoride concentrations are reported as below adjusted detection limits of 0.20 mg/L (APPENDIX E), and thus may exceed the CCME-AL interim guideline for fluoride of 0.12 mg/L. While detection limits for chloride, nitrate and nitrite were also adjusted, the reported detection limits are below CCME-AL guidelines.

Table 18. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for the WQ-DESS-01-03 sites for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-DESS-01	WQ-DESS-02	WQ-DESS-03
July 14-16, 2014	Not scheduled	Not scheduled	Not scheduled
August 11-13, 2014	Not scheduled	Not scheduled	Not scheduled
September 15-17, 2014	pH, Al, Cd, Fe, **Zn**	Cd	Dry

Table 19. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for the WQ-CH-P-13-01 and WQ-MS-S-08 sites for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-CH-P-13-01	WQ-MS-S-08
July 14-16, 2014	Dry	Dry
August 11-13, 2014	pH, Al, Cd, Mn, **Zn**	Dry
September 15-17, 2014	pH, Al, Cd, **Zn**	Dry

The *in situ* water quality at the WQ-DESS sites varied with the WQ-DESS-01 site characterized by a low pH and a high conductivity and the WQ-DESS-02 site with a high conductivity but a neutral pH (Table 20). The WQ-CH-P-13-01 seep site had a high conductivity and slightly acidic pH to neutral pH (Table 20).

Table 20. I*n situ* water quality data for the WQ-DESS-01 to -03, WQ-CH-P-13-01 and WQ-MS-S-08 sites for the Q2 period.

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-DESS-01	15-Jul-14			Not scheduled	
WQ-DESS-01	12-Aug-14			Not scheduled	
WQ-DESS-01	15-Sep-14	2.0	979	6.15	0.19
WQ-DESS-02	15-Jul-14			Not scheduled	
WQ-DESS-02	12-Aug-14			Not scheduled	
WQ-DESS-02	15-Sep-14	5.0	1680	7.10	1.18
WQ-DESS-03	15-Jul-14			Not scheduled	
WQ-DESS-03	12-Aug-14			Not scheduled	
WQ-DESS-03	15-Sep-14			Dry	
WQ-CH-P-13-01	15-Jul-14			Dry	
WQ-CH-P-13-01	12-Aug-14	2.9	1523	7.36	0.50
WQ-CH-P-13-01	15-Sep-14	1.9	1491	6.27	0.28
WQ-MS-S-08	15-Jul-14			Dry	
WQ-MS-S-08	12-Aug-14			Dry	
WQ-MS-S-08	16-Sep-14			Dry	
WQ-LW-SEEP-01	15-Jul-14			Not scheduled	
WQ-LW-SEEP-01	12-Aug-14			Not scheduled	
WQ-LW-SEEP-01	15-Sep-14			Dry	

3.3.4 Brown-McDade Pit Lake

The Brown-McDade pit lake was sampled during all three events over the Q2 investigation period. All pit lake samples from all three sample depths (surface, middle and bottom) consistently exceeded the CCME-AL guidelines for arsenic, cadmium, copper, and zinc, which is common for the site (Table 21; APPENDIX E). The zinc concentrations from some samples also exceeded the Mount Nansen EQS value (Table 21; APPENDIX E). The Mount Nansen EQS value for manganese was also exceeded from the WQ-PIT-3 samples (Table 21; APPENDIX E). The WQ-PIT-3 sample from July 2014 also exceeded the CCME-AL guideline for iron. Fluoride concentrations exceeded the CCME-AL guideline from some sample depths during the July and September 2014 trips (Table 21; APPENDIX E).

There may also be additional samples that exceeded the fluoride guideline on other occasions; however, because samples are often diluted and detection limits adjusted to protect lab instrumentation there is uncertainty in this result. The detection limit for pit lake samples during Q2 were often adjusted to <0.2 or <0.4 mg/L, which is above the CCME interim fluoride guideline value of 0.12 mg/L (APPENDIX E). Refer to Section 3.3.1 for additional details on why detection limits are adjusted by the lab for some analyses - this is a common occurrence at sites where conductivity and sulfate concentrations are high and have the potential to damage lab instrumentation if not diluted.

Table 21. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for the Brown McDade Pit Lake for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-PIT-1 (surface)	WQ-PIT-2 (mid-depth)	WQ-PIT-3 (bottom)
July 14-16, 2014	F, As, Cd, Cu, Zn	As, Cd, Cu, **Zn**	As, Cd, Cu, Fe, Mn, **Zn**
August 11-13, 2014	As, Cd, Cu, Zn	As, Cd, Cu, Zn	As, Cd, Cu, Mn, **Zn**
September 15-17, 2014	F, As, Cd, Cu, Zn	F, As, Cd, Cu, Zn	TSS, F, As, Cd, Cu, Zn

Water temperatures in the pit lake ranged from 7.4°C to 12.8°C during the Q2 period (Table 22). Specific conductivity was highest typically from the bottom sample depth (WQ-PIT-3), where it is associated with higher suspended particulate matter, also evidenced by higher turbidity. Dissolved oxygen was lowest at the bottom of the pit lake, likely due to higher biological demand and less recharge through wave action. The pH in the pit lake varied from pH 6.89 to 8.06. Turbidity of all samples ranged from 1.05 to 6.98 NTU.

Table 22. *In-situ* water quality data for the Brown McDade Pit Lake for the Q2 period.

Date	Site ID	Sample Depth (m)	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)	Dissolved Oxygen[1] (mg/L)
16-Jul-14	WQ-PIT-1	0.3	12.8	1564	7.83	1.36	-
	WQ-PIT-2	3.4	12.2	1722	6.89	1.88	-
	WQ-PIT-3	7.0	7.5	2655	6.90	6.98	-
12-Aug-14	WQ-PIT-1	0.3	12.4	1647	7.91	1.19	11.11
	WQ-PIT-2	3.5	12.6	1652	7.97	1.05	8.71
	WQ-PIT-3	6.5	11.6	2531	6.46	2.88	3.19
17-Sep-14	WQ-PIT-1	0.3	7.5	1696	8.06	1.43	9.01
	WQ-PIT-2	3.0	7.4	1695	8.03	1.14	0.96
	WQ-PIT-3	6.0	7.6	1709	7.93	1.43	1.92

Notes:
1 - Dissolved oxygen was not recorded in the correct units during the July 2014, and could not be reported.

3.3.5 Pony Creek

Both Pony Creek sites could not be sampled during the July 2014 trip as both sites were dry. During the August 2014 trip, the downstream site remained dry, while the upstream site had some flow. The creek in the vicinity of the downstream site typically goes to ground during periods with minimal precipitation and/or hot weather. During Q2, the dry conditions are likely compounded by placer activities upstream.

The samples from WQ-PC-U in August and September 2014 did not exceed any water quality guidelines or standards (Table 23; APPENDIX E). This site is upstream of the impacts of the Mount Nansen Mine; however, it is currently affected by placer mining activities upstream, particularly in the vicinity of the old H-PC-U hydrometric station (EDI 2014b). Recent activity in that area has resulted in a portion of the stream being ploughed over with an excavator (June 2014; EDI 2014b) and additional activities may affect both the WQ-PC-U and WQ-PC-D sites, although no activity was observed at these sites during Q2.

The September 2014 samples for the WQ-PC-D site exceeded the CCME-AL guideline for arsenic, cadmium, copper and zinc (Table 23; APPENDIX E). Note the portion of the creek just upstream from the WQ-PC-D sampling location runs through an old waste rock pile which results in higher total metals concentrations than found in samples from the WQ-PC-U samples (which is upstream of the waste rock area).

Table 23. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for the Pony Creek sites for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-PC-U	WQ-PC-D
July 14-16, 2014	Dry	Dry
August 11-13, 2014	None	Dry
September 15-17, 2014	None	As, Cd, Cu, Zn

In situ water quality data at the Pony Creek sites for the Q2 period is shown in Table 24. Water temperatures ranged from 4.5°C to 7.4°C and specific conductivity ranged from 289 µS/cm to 486 µS/cm. The pH at the both sites remained around neutral for the Q2 period. Turbidity ranged from 0.45 NTU to 2.71 NTU.

Table 24. In *situ* water quality data for the Pony Creek sites for the Q2 period.

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-PC-U	14-July-14			Dry	
WQ-PC-U	12-Aug-14	7.4	386	7.71	0.76
WQ-PC-U	15-Sep-14	4.8	289	7.57	0.45
WQ-PC-D	14-July-14			Dry	
WQ-PC-D	12-Aug-14			Dry	
WQ-PC-D	15-Sep-14	4.5	346	7.12	2.71

3.3.6 Back Creek

The Back Creek site was dry during the July 14-16, 2014 trip. This was an unusual observation for this time of year and is likely a result of placer activity upstream; however conditions were also dry across the Mount Nansen Site during this time. Based on continuous hydrology record for the site, it appears the site may have been dry for a period of time (refer to results for H-BC, Section 3.2.2.1). During the August 11-13, 2014 trip, there was very minimal water at the site; however, by the September 15-17, 2014 sampling event, water levels had risen significantly and the water was very turbid. The high turbidity during the September 2014 event and the variable water levels during the Q2 period are attributed to placer activity upstream.

The samples collected on the August 2014 trip exceeded guideline and/or standard criteria for total aluminum, cadmium, copper, and iron (Table 25; APPENDIX E). Samples collected on the September 2014 trip exceeded the guidelines and/or standard criteria for numerous parameters, including TSS, aluminum, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, silver and zinc. The TSS value was 1,630 mg/L, which likely contributed to the high concentrations of many total metals parameters because metals readily bind to sediment in the water column rather than dissolving in the water itself (Table 25; APPENDIX E). This is supported by the fact that dissolved metals concentrations were much reduced compared to total metals (APPENDIX E). The high TSS and high *in situ* turbidity (Table 26) are attributed to placer activity upstream as mentioned above.

Table 25. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for WQ-BC for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Date	WQ-BC
July 14-16, 2014	Dry
August 11-13, 2014	Al, Cd, Cu, Fe,
September 15-17, 2014	TSS, Al, As, Cd, Cr, Cu, **Fe**, Pb, Mn, Hg, Ag, Zn

In situ water quality data at the Back Creek site for the Q2 period is shown in Table 26, with water temperature ranging from 7.0°C to 12.6°C. Specific conductivity during Q2 ranged from 309.6 µS/cm to 373.8 µS/cm. The pH at the site in ranged from pH 7.87 to pH 7.96 and turbidity was highest on September 16, 2014 at 721 NTU.

Table 26. I*n situ* water quality data for WQ-BC for the Q2 period.

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-BC	15-Jul-14		Dry		
WQ-BC	11-Aug-14	12.6	373.8	7.87	4.73
WQ-BC	16-Sep-14	7.0	309.6	7.96	721.00

3.3.7 Victoria Creek

Victoria Creek was sampled at all four sites during the Q2 period (WQ-VC-U, WQ-VC-DBC, WQ-VC-UMN and WQ-VC-R). The water samples from WQ-VC-U, the most upstream site on Victoria Creek did not exceed any water quality guidelines or standards during the Q2 investigation period (Table 27; APPENDIX E). The samples from WQ-VC-DBC, WQ-VC-UMN and WQ-VC-R did not exceed any guidelines or standards during the July or August 2014 trips, but did exceed the CCME-AL guideline for aluminum, cadmium, copper and iron in September 2014, which may be a result of a change in water quality in Back Creek due to very high suspended sediment loads (see WQ-BC results, Section 3.3.6).

Table 27. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for sites within the Victoria Creek watershed for the Q2 period. Parameters in red bold text exceed both standard and guideline values.

Sampling Trip Dates	WQ-VC-U	WQ-VC-DBC	WQ-VC-UMN	WQ-VC-R
July 14-16, 2014	None	None	None	None
August 11-13, 2014	None	None	None	None
September 15-17, 2014	None	Al, Cd, Cu, Fe	Al, Cd, Cu, Fe	Al, Cd, Cu, Fe

In situ water quality parameters for the Victoria Creek sites during each trip in Q2 are summarized in Table 28. Water temperatures were warmest in Victoria Creek during the August 2014 trip, ranging from 9.6°C to 10.9°C (Table 28). By September 2014, water temperatures had dropped, ranging from 3.5°C to 7.2°C. Specific conductivity in Victoria Creek ranged from 142 µS/cm to 267 µS/cm. The pH across the Victoria Creek sites ranged from pH 7.06 to pH 8.00. Turbidity at the Victoria Creek sites was generally low, less than 2 NTU, with the exception being the September 2014 event, when turbidity was higher in the sites downstream of Back Creek, 12.16 to 16.94 NTU. These levels were only observed in sites downstream of WQ-VC-U and Back Creek, which corresponds with when turbidity was very high in Back Creek (Section 3.3.6).

Table 28. *In situ* water quality data for sites within Victoria Creek for the Q2 period.

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-VC-U	15-Jul-14	5.5	199	7.57	0.79
WQ-VC-U	11-Aug-14	10.4	203	7.51	0.59
WQ-VC-U	16-Sep-14	3.7	142	7.71	0.81
WQ-VC-DBC	15-Jul-14	5.3	201	7.55	0.80
WQ-VC-DBC	11-Aug-14	10.7	204	7.59	1.90
WQ-VC-DBC	16-Sep-14	3.5	171	7.80	15.91
WQ-VC-UMN	15-Jul-14	5.9	267	7.63	1.29
WQ-VC-UMN	11-Aug-14	10.9	258	7.63	0.89
WQ-VC-UMN	15-Sep-14	7.2	203	8.00	12.16
WQ-VC-R	15-Jul-14	6.0	253	7.79	1.16
WQ-VC-R	11-Aug-14	9.6	247	7.06	1.71
WQ-VC-R	15-Sep-14	6.5	182	7.91	16.94

3.3.8 Pump House Well

The pump house well (WQ-PW) was sampled during all visits of the Q2 period. Drinking water package samples were collected in addition to bacteriological samples. There were no water quality criteria that were exceeded from the Health Canada Guidelines for Canadian Drinking Water, the CCME-AL guidelines or the Mount Nansen EQS. All monthly bacteriological samples collected were free of E. coli and total coliforms. Water quality parameters collected *in situ* are presented in Table 29. Water temperatures ranged from 0.9°C to 1.8°C, specific conductivity ranged from 372 to 408 µS/cm, pH ranged from pH 6.39 to pH 8.00, and turbidity ranged from 0.00 to 0.52 NTU (Table 29). All results are within range of the Q1 results (EDI 2014b) except that pH was slightly out of the range of values from Q1, when pH was between pH 6.72 to 7.64.

Table 29. I*n situ* water quality data for WQ-PW for the Q2 period.

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-PW	16-Jul-14	1.8	369	7.56	0.43
WQ-PW	13-Aug-14	1.0	408	6.39	0.52
WQ-PW	17-Sep-14	0.9	372	8.00	0.00

3.3.9 QA/QC Program

Field blank and travel blank samples were included on every trip during the Q2 period. At least two replicate samples were also collected during each sampling event. Table 30 summarizes the sample trip dates and sites where replicate samples were collected during each trip. In general, field blank and travel blank samples

showed no contamination from field sampling methodologies or transportation and storage (*i.e.,* all metals levels were below detection limits); however there was one anomaly. The field blank sample from the July 2014 trip had dissolved zinc and manganese concentrations above detection limits (but below any guidelines and/or standards), which suggests some contamination during field sampling. This is a rare occurrence and has not occurred before during the 2014/15 program nor under the previous 2013/14 program. The contamination could have been introduced through windy site conditions at the time of sampling, or through an improperly tightened lid. The data from samples collected at the same time as the field blank were reviewed, and data was found to be within expected ranges.

Replicate samples were compared for each trip to check the accuracy and precision of the laboratory analysis. Differences were within ±10% for most parameters; however, some differences of over ±10% were identified). See APPENDIX E - Tables E1-E3 for parameters that were flagged as greater than +/-10% (highlighted in yellow). Average percent differences for QA/QC sample sets ranged from 4% to 9%. Some of the duplicate sites with larger differences had either relatively high TSS and/or large differences in TSS values within the replicate sample sets. Total suspended solid concentrations are generally associated with total metals concentrations as metals are often bound to the suspended sediments.

Table 30. Summary of sites randomly selected as replicate samples for each sampling trip over the Q2 period, with average percent differences in brackets.

Sampling Trip Date	Replicate #1	Replicate #2	Replicate #3
July 14-16, 2014	WQ-DC-B-r (7%)	WQ-VC-R-r (4%)	-
August 11-13, 2014	WQ-VC-R-r (3%)	WQ-DC-DX+105-r (7%)	-
September 15-17, 2014	WQ-DC-DX+105-r (5%)	WQ-VC-DBC-r (9%)	WQ-VC-R-r (5%)

4 CONCLUSIONS & RECOMMENDATIONS

Based on results of the Q2 period of the Mount Nansen Water Resources Investigations Program from July 1, 2014 to September 30, 2014, EDI recommends that monitoring should continue as scheduled for 2014/15 investigations with added consideration of several recommendations outlined below. These recommendations attempt to improve the overall program data quality and efficiency.

- The meteorological station at the Mount Nansen Site requires some investigation as snow depth sensors appear to be recording erroneous data as discussed in Section 3.1.2. EDI recommends that the issue be looked into as soon as possible, in order that accurate snow data can be collected for the Q3 and Q4 periods. AAM is currently looking into the issue with Northern AvCom.

- Volumetric measurements at H-SEEP continue to be redundant based on available flow meter (totalizer) instrumentation in the pump house. Flow records maintained by on-going care and maintenance staff should be considered sufficient for hydrometric monitoring of the H-SEEP location, which has been confirmed by concurrent measurements over the last 2 years. Confirmation measurements can periodically be taken to confirm flow meter readings.

- The H-DC-M weir pond will likely require continued maintenance due to sedimentation, particularly following rain storms and excavation work upstream which mobilize sediment into the stream. Depending on the frequency and location of required excavation activities, AAM should ensure adequate erosion control plans are in place to minimize sedimentation downstream in the weir pond.

- The WQ-MS-S-08 site had no surface flows during all trips of Q2. This particular site appears to have surface flow only during the freshet period, and during other times of year may report to the surface at other locations. There are multiple seeps down valley of the mill area that are flowing at particular times of year (mostly during spring and fall), and many have been documented in past investigations (September 2011). If a better understanding of mill seep water quality is required for the project, it may be more valuable to put a concerted effort into documenting seeps in the larger mill site area (similar to the September 2011 program conducted by Diane Lister and EDI), with at least two sampling events in 2015 (May and September).

5 REFERENCE

AECOM. 2010. Memorandum Re: Mount Nansen Hydrology Program Progress Summary (2009). Prepared for Assessment and Abandoned Mines Branch, Yukon Government. February 4, 2010

Canadian Council Ministers of the Environment (CCME). 2014. Canadian Environmental Quality Guidelines Summary Table. http://st-ts.ccme.ca/, accessed April 2014.

Cohn T., Kiang, J. Mason, R. 2006. U.S. Geological Survey. Personal Communication. June-August 2006.

EDI 2013. Mount Nansen Site Data Report: Surface Water and Meteorological Monitoring 2012/13. Prepared for Assessment and Abandoned Mines Branch, Yukon Government. Prepared by J. Bachman and L. Doetzel. March, 2013.

EDI 2014a. Mount Nansen Water Resources Investigations Quarterly Report (Q4): January – March, 2014. Prepared for Assessment and Abandoned Mines Branch, Yukon Government. Prepared by C. Light and M. Marjanovic. April, 2014.

EDI 2014b. Mount Nansen Water Resources Investigations Quarterly Report (Q1) April – July 2014. Prepared for Assessment and Abandoned Mines Branch, Yukon Government. Prepared by J. Bachman and M. Marjanovic. September, 2014.

Health Canada. 2012. Guidelines for Canadian Drinking Water Quality Summary Table. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water.

Laberge Environmental Services. 1999. Winter low flow stream discharge measurements using the salt slug injection method: Field trials and method development for use in location mine monitoring applications. Report prepared for the Mining Environment Research Group (MERG).

Maidment, D.R. (Editor in Chief). 1993. Handbook of Hydrology. McGraw-Hill Inc. 1,424 pages.

Moore, R.D. 2004a. Introduction to Salt Dilution Gauging for Streamflow Measurement: Part I. *Streamline Watershed Management Bulletin*. 7 (4). 20-25.

Moore, R.D. 2004b. Introduction to Salt Dilution Gauging for Streamflow Measurement Part 2: Constant-rate Injection. *Streamline Watershed Management Bulletin*. 8 (1). 11-15.

Moore, R.D. 2005. Slug Injection Using Salt in Solution. *Streamline Watershed Management Bulletin*. 8 (2). 1-6.

Kite, G. 1994. Measuring glacier outflows using a computerized conductivity system. Journal of Glaciology, 40 (134), 93-96.

RISC. 2009. Manual of British Columbia Hydrometric Standards. Resources Inventory Standards Committee (RISC), Ministry of Environment, Science and Information Branch, Government of British Columbia.

Sontek/YSI Inc. 2009. FlowTracker Handheld ADV Technical Manual Firmware Version 3.7, Software Version 2.30

WSC. 1999. Hydrometric Technician Career Development Program. Principles of Discharge Measurement. Volume 2 No. 10.1 Prepared for The Water Survey of Canada (WSC) by R. J. Lane of WSC. Environment Canada.

5.1 SPATIAL DATA

EDI Environmental Dynamics Inc. (EDI). 2011. Detailed Watercourse, Drainage Areas and Road Layers for the Mount Nansen Area. Digitized / modified by EDI using orthophotos provided by Yukon Government, Energy, Mines and Resources (2011).

EDI Environmental Dynamics Inc. (EDI). 2012. Mount Nansen Area Sampling Data. Collected by EDI Environmental Dynamics Inc. (2012) and was obtained using Garmin GPS technology.

Government of Canada. 2012a. 1:50,000 Topographic Spatial Data (CanVec Edition 10.0). Department of Natural Resources Canada (NRCAN), Earth Sciences Sector. Provided by Geomatics Yukon, Corporate Spatial Warehouse, Yukon Government. Accessed in 2012. www.geomaticsyukon.ca.

Government of Canada. 2012b. 1:250,000 Topographic Spatial Data (National Topographic Data Base [NTDB]). Department of Natural Resources Canada (NRCAN), Earth Sciences Sector, Mapping Services Branch, Centre for Topographic Information, Sherbrooke. Provided by Geomatics Yukon, Corporate Spatial Warehouse, Yukon Government. Accessed in 2012. www.geomaticsyukon.ca.

Yukon Government, 2011. Mount Nansen Area Orthophoto (10 cm resolution). Department of Energy, Mines and Resources. Provided by Yukon Government, Department of Energy, Mines and Resources (2011).

Yukon Government, 2012. Mount Nansen Area Detailed Contours (1 metre interval). Department of Energy, Mines and Resources. Provided by Yukon Government, Department of Energy, Mines and Resources (2012).

Yukon Government, 2002. Digital Elevation Model (30 m resolution). Yukon Department of Environment, Information Management & Technology Branch. Yukon Department of the Environment. Provided by Geomatics Yukon, Corporate Spatial Warehouse, Yukon Government. Accessed in 2012. www.geomaticsyukon.ca.

Disclaimer:
Maps presented in this document are a geographical representation of known features. Although the data collected and presented herein has been obtained with the utmost attention to quality, this document is not an official land survey and should not be considered for spatial calculation. EDI Environmental Dynamics Inc. does not accept any liability for errors, omissions or inaccuracies in the data.

This page is intentionally blank.

APPENDIX A. SUPPORTING METHODOLOGY

This page is intentionally blank.

HYDROLOGY METHODOLOGY

Velocity-Area Mid-Section

The velocity-area mid-section method was used to determine discharge at hydrometric stations where channel criteria met those outlined in standard guidance documents (RISC 2009; WSC 1999). Cross-section locations were established for each hydrometric station where this method was applied; these cross-sections were located in close proximity to continuous data logger installations.

Using the continuity relationship for discharge (Q),

$$Q = v \cdot A = bdv \qquad [1]$$

Depth (d), velocity (v) and width (b) measurements were obtained for at least 20 panels across the metering cross-section. The cross-section panel width and depth were multiplied by the velocity and averaged over 40 seconds (RISC 2009) to obtain an instantaneous discharge measurement (q) for each panel. Panel discharges were subsequently summed to obtain total discharge. The discharge for the first and last panels was calculated using half the distance from the edge to the first and last mid-panel verticals.

The velocity-area discharge calculation is described by the following equations:

$$q_n = v_n d_n \frac{(b_{n+1} - b_{n-1})}{2} \qquad [2]$$

$$Q = q_1 + q_2 + q_3 + q_4 + q_5 + \cdots q_n \qquad [3]$$

Where SI units of m^3/s, m/s, and m are used for discharge, velocity and depth respectively.

The current meter used to obtain the velocity measurements is a 2-dimension, side looking, FlowTracker Handheld Acoustic Doppler Velocimeter (ADV) (Sontek/YSI Inc. 2009). The FlowTracker is used by both the Water Survey of Canada and the U.S. Geological Survey. The FlowTracker computer calculates discharge using the mid-section method and calculates the statistical discharge uncertainty based on methods developed by the U.S. Geological Survey (Cohn *et al.* 2006). This method of calculating uncertainty accounts for the uncertainty associated with width, depth and accuracy of the FlowTracker calibration and the effects of channel variability on depth and velocity across the cross-section (Sontek/YSI 1999). The statistical discharge uncertainty calculated by the FlowTracker at Mount Nansen was typically less than ±5%. An uncertainty of ±10% is considered by industry as acceptable for the velocity-area mid-section method. The statistical uncertainty was applied for all velocity-area discharge measurements obtained with the ADV.

Salt Dilution Gauging

Salt dilution gauging was used at hydrometric stations where the channel conditions were not suitable for using a current meter. Typically this occurred when water depths were less than 0.05 m, channel widths were

less than 3.0 m or during winter months when ice was prohibitively thick for conducting velocity-area measurements beneath the ice.

There are three different methods of salt dilution gauging: constant rate injection (brine); slug injection (brine) and dry salt injection. Method selection depends on the magnitude of discharge to be measured, channel conditions and feasibility for remote sites as the required equipment varies for each method. All methods require the selection of an input (injection) site and a downstream electrical conductivity measurement site. The distance between these sites (mixing length) is optimized for the minimum distance required for complete mixing of the fully dissolved salt tracer.

Specific channel conditions during open water and winter periods are required for successful salt dilution gauging. These criteria ensure that complete lateral and vertical mixing occurs in as short a distance as possible: minimal pools; no backwater areas; no braiding; little to no in-stream vegetation; and no losses or gains of water (Moore 2004a; Moore 2004b; Laberge Environmental Services 1999).

Channel geomorphology and winter temperatures required some adaptations to the methodology presented in Moore (2004; 2005), therefore field protocols and subsequent calculations were modified to incorporate methods presented in Kite (1994) and Laberge Environmental Services (1999). Laberge Environmental Services (1999) describes practical, field tested and validated protocols for winter low flow measurements in the Yukon with a focus on streams with high background conductivities similar to the Mount Nansen region. However, the methods and calculations provided by Moore (2004a; 2004b; 2005) were used as they were thought to be significantly more robust and adaptable to site-specific stream conditions.

The gram conductivity of salt, the conductivity of 1 g NaCl in 1 m^3 of solution at 25 °C, is non-linear at higher background conductivities (Laberge Environmental Services 1999). Background specific conductance at the hydrometric stations range widely, from ~29 µS/cm to upwards of 1,500 µS/cm. The field protocol presented in Moore (2004a; 2004b; 2005) accounts for the non-linearity of the gram conductivity but requires additional field calibration tests for each visit and each gauging location. This method was not practical during extremely cold temperatures but was employed whenever possible in the Q1 period.

The slug injection (brine) method was selected for use at the Mount Nansen Site hydrometric stations because this method was most feasible for the remote sites, channel conditions, discharges and the most efficient method for the field monitoring program. In addition, the use of brine slugs allows for shorter mixing lengths to be used; ideal for channels at Mount Nansen. Measurement reaches were carefully selected to meet the measurement criteria and overlap with the physical location of continuous water level loggers. Salt injection sites were located upstream of constrictions (e.g., culverts) where possible to facilitate full mixing. A conductivity meter records specific conductance approximately 60 m downstream for the smaller creeks and approximately 90 m for Victoria Creek, depending on channel conditions.

The same measurement reach was used for each field visit unless changes to the channel conditions warranted minor adjustments to the measurement locations. The slug injection method requires an electrical conductivity meter (YSI ProPlus Multi-Meters with logging capabilities) to be set up at the downstream end of the measurement reach. Background electrical conductivity was logged for several minutes before the

slug injection to allow for the instrument to equilibrate and to measure background variability. Specific electrical conductance[1] (SPC) is measured (logged) because the values are compensated for water temperature. A known mass of salt (NaCl) is dissolved into a graduated bucket of stream water at the injection site. Once fully dissolved, the salt slug is injected at the upstream site and the electrical conductivity of the salt wave is measured at the downstream location at two to five second intervals depending on the stream velocity. Two trials were conducted at each station. When possible, a secondary method of discharge measurement was used to validate the salt dilution measurement (*i.e.,* volumetric discharge measurement, ADV measurement).

The formula used to calculate discharge for the Mount Nansen salt slug injections is:

$$Q = \frac{V_{ss}}{1000 \cdot CF.T \cdot \tau \cdot \sum(SPC_t - SPC_o)} \qquad [4]$$

Where Q is discharge (m^3/s), V_{ss} is the volume of salt slug injection (L), τ is the time interval in seconds and SPC_t and SPC_o are the measured and background conductivity at time interval t, respectively. The CF.T value is the calibration factor that accounts for the non-linearity of electrical conductance and salt concentration in stream water. The CF.T value is taken as the slope of the line of SPC and relative concentration of the salt slug in an aliquot of sample stream water. The target peak specific conductance for the salt wave was an increase of at least ten-times the resolution of the conductivity meter used. Typically, an increase between 10% and 50% of SPC_0 was achieved, above the required increase of 2 to 5 µS/cm.

Stream discharge was calculated for each salt slug trial using Equation [4] and averaged to provide a discharge estimate. The average estimated measurement accuracy for the salt dilution gauging method is ± 20%. However, salt dilution gauging accuracy will vary between each station due to differences in individual channel conditions and stream water velocities.

In some instances where ambient air temperatures were prohibitively cold (*i.e.,* <-30°C), the dry salt slug injection method using a mass-balance approach was used. This was due to limitations that rapidly freezing water placed on equipment, field procedures and safety of field personnel. The formula for calculating discharge using the dry salt slug injection differs slightly from equation [4], and follows the calculations provided by Moore (2004). The discharge calculation formula for the dry salt slug injection is:

$$Q = \frac{m}{\sum(EC - EC_0) \cdot CF \cdot t_{int}} \qquad [5]$$

Where *m* is the mass of salt used for the dry slug injection, EC is the electrical conductivity measured at a defined time interval (t_{int}), EC_0 is the background electrical conductivity. CF is a site-specific constant that is determined by measuring changes in specific conductivity with known masses of salt. Stream discharge was calculated using equation 5 for each salt slug trial during the monitoring period. The estimated measurement accuracy for dry salt slug injection is ±30%. However, the discharge uncertainty varies considerably between each station due to differences in channel conditions and stream water velocities.

[1] Specific electrical conductivity measured by the YSI ProPlus and the YSI 556 multi-meters are linearly compensated for temperature. The multi-meters are calibrated daily during each field visit before use.

Volumetric

Volumetric discharge measurement is ideal for low flows because all the stream flow is captured in a bucket of a known volume at a confined outlet or constriction in the channel. Channel constrictions created by culverts, pipes and weirs provided an opportunity to measure stream flow by measuring the time to fill a bucket of known volume. The volumetric method for measuring discharge is used periodically at two stations at Mount Nansen where a culvert or pipe is available (H-PC-U; H-SEEP). During extreme low flows it is also possible to obtain volumetric estimates at H-DC-DX+105.

The volumetric measurement is completed using a graduated 20 L bucket and a timing device. The time required to fill the volume is recorded over five separate volumetric trials. All five volumetric trials are averaged to provide a discharge estimate. The estimated measurement accuracy is ± 30 %.

The volumetric measurement method employed at H-SEEP (Tailings Dam Seepage Pond pump pipe outlet) is used to validate daily instantaneous measurements read at the flow meter attached to the pump that is used to manage water levels in the Seepage Pond. Daily flow meter readings were collected by the site maintenance crews and data is maintained by AAM. EDI staff collects concurrent flow meter readings when volumetric measurements are made at the pipe outlet.

Ice-Cover Hydrometrics

Hydrologic measurements completed during periods when the channel is covered with ice have lower accuracy than open channel measurements because the standard hydrometric methods are based on open channel hydraulic relationships between the impelling and resisting forces of flow. Ice increases the resistance to flow, slowing velocities and increasing the water surface elevation (backwater effect). Frazil ice, anchor ice, slush and ice jams influence the water surface profile and effective depth of flow in the channel. As a result, the relationship between stage and discharge changes during the winter. Cold temperatures frequently cause problems with measurement equipment, including continuous water level loggers. In the Yukon, winter measurement instruments are usually working at or beyond the cold temperature operating limits and resultant data is carefully analyzed and often excluded from analysis. All measurements collected when ice was observed in the channel were flagged in the data record with 'B'; the standard data flag used by the WSC indicating backwater or ice effects. Measurements influenced by ice are not included in the open water stage-discharge rating curve development.

In Victoria Creek, the velocity-area and salt dilution methods were feasible during ice-cover periods when ice thicknesses and ambient air temperatures were not prohibitive. Salt dilution was used on the smaller channels if they were not frozen to the bed. Regardless of the technique used, careful attention was paid to ice and flow conditions. In many of the streams at the Mount Nansen Site, multiple layers of ice are present with flow travelling through complex networks within and on the surface of the ice. In such conditions, discharge measurements become increasingly uncertain and are not performed.

Hydrometric Leveling Surveys

Hydrometric leveling surveys are performed during each visit at stations where continuous data loggers are installed. The purpose of the survey is to tie the data logger water levels to the local station datum. Each station has a local, relative datum defined by benchmarks in close proximity to the data logger and stilling well. Three benchmarks are installed at each continuous station as per RISC (2009) Data Grade A guidelines. Each survey includes a survey with a level and rod for Benchmark 1 (BM1), Benchmark 2 (BM2), Benchmark 3 (BM3), the top of the staff gauge (TOS), the water surface elevation (WATER) and the elevation of the fixed-length logger apparatus (named LOGGERROD). The elevation of Benchmark 1 at every station defines a local elevation of 3.000 m above datum. The local datum is always located below the elevation of zero flow. The benchmarks and the top of the staff gauge are regularly checked for shifting as a result of periglacial processes and survey error. While there is some apparent movement in the benchmark elevations and occasionally anomalous survey data, the water surface elevation data was carefully reviewed using staff gauge readings and the field records of stilling well maintenance (logger or staff gauge shifts) before applying local datum offsets to the raw data logger record. All suspect data is excluded from the corrected data. All stage data is presented in metres referenced to the local datum (L.D.) unless otherwise noted.

Hydrometric Validation & QA/QC Program

The velocity-area, weir and volumetric hydrometric measurement methods used for the Mount Nansen hydrometric program are standardized by the WSC and the USGS. Several stations do not meet standardized criteria. At these stations, alternative methods (e.g., salt dilution) are used. In some cases, concurrent standardized methods (e.g., velocity-area measurements) allow for the validation and calibration of alternate methods. Concurrent measurements also facilitate uncertainty estimates for stream discharge measurements.

Quality control and quality assurance (QA/QC) checks begin during field visits. The Flow Tracker ADV provides numerous QA/QC checks in real-time during velocity measurements that allow the field crew to increase the precision of the measurements. Upon return from the field, data entry staff performs preliminary checks and reviews of the raw data and discharge calculations prior to the production of trip and quarterly reports. A third round of QA/QC is completed during data entry into the hydrometric database. A final QA/QC is completed during the development of rating curves and hydrographs for each hydrometric station.

Rating Curve Development

Rating curves are based on open channel hydraulic relationships between stage (water level) and discharge. They are based on open-water conditions only and are not representative of ice-cover channel conditions. The y-axis represents the recorded stage level at the gauge and the x-axis the discharge. The rating curve equation represents the hydraulic reaction of flow a smoothly varying channel with increasing stage (or a constant control point at all stages) (Maidment 1993). The rating curve equation [6] has the form:

$$Q = C(h + a)^N \qquad [6]$$

Where Q is discharge in m^3/s, C is typically proportional to the channel width, $(h+a)$ represents the depth of water above the stage of zero flow (water level where flow becomes zero) and the value of N is a function of the channel geometry (Maidment, 1993). If the pressure transducer is below the point of zero flow, the value of 'a' is negative; conversely a positive 'a' value indicates that it is above. Typically as the stage increases, the hydraulic control shifts from low flow hydraulic control to channel friction control or to ice related controls. As a result multiple rating curve expressions for a single channel and various stages are often required to accurately represent the full range of flows.

By taking the log of both sides of the rating curve in equation [7], we obtain:

$$\log Q = logC + N\ log(h + a) \qquad [7]$$

the rating curve equation [8] takes the linear form $y=mx+b$ and can be fit to the discharge rating points as a straight line. Rating curves may be developed using several different methods including fitting the calibration points by eye and the maximum likelihood solution. Given the small size of the channels at the Mount Nansen Site, the narrow range of stage changes, and channel instabilities, each rating curves is developed by fitting by eye within the Aquarius Time-Series Software environment (Aquarius Informatics Inc. 2014).

Rating curves are developed for stations with continuous water level loggers using surveyed water levels (stage) and instantaneous discharge measurements. A rating curve is considered preliminary if the following conditions are met: there are less than 10 reliable rating measurements (RISC 2009), if rating measurements do not capture an acceptable range of flows (*i.e.,* 10 %-200 % of mean discharge (MD)), or, if there is a high rating curve error.

Rating curves are developed with rating measurements obtained when the channel is ice free. Any rating measurement obtained during ice conditions are reported simply as instantaneous measurements. Rating curves are valid only for a defined rating period. A rating period represents a section of time where both the channel and hydrometric installation are stable.

Timely monitoring events during the spring freshet period allow the capture of higher spring flows. A conservative approach was adopted for presenting the continuous hydrometric record in this report. Predicting flood or low flows can introduce error into hydrologic analysis and should be carefully considered in the context of channel hydraulic geometry.

Continuous Stage and Discharge

A combination of HOBO (Model: U20-001-04, Onset Corporation) and Levelogger (Model Gold 3001, Solinst) pressure transducers are used on site. Two barometric and temperature data loggers (ATM-DC2 (HOBO) and ATM-DC4 (Solinst)) were maintained in the middle of the watershed near hydrometric station H-DC-B. All of the data loggers are non-vented pressure transducers that record water or air temperature and pressure.

The hydrostatic pressure data was compensated for atmospheric pressure using data from the barometric pressure logger located at ATM-DC4. Data from the redundant barometric loggers was not required.

Sensor depth below the surface of the water was calculated manually for the HOBO loggers submerged in the streams using the following relationship from the Euler equation [8] where:

$$H = \frac{P}{\gamma} + z \qquad [8]$$

Hydraulic head (H) or water depth above the sensor, hydrostatic pressure (P) in Pa, the specific weight of water $\gamma = pg$ where p is the density of water at a given temperature (kg·m^{-3}), g is acceleration due to gravity (m·s^{-2}) and z is elevation above a datum. Density of water varies with temperature and given the wide range in stream temperatures throughout the year, the density was computed using the Thiesen-Scheel–Diesselhorst equation [9] (Maidment 1993):

$$\rho = 1000\left[1 - \frac{t+288.94}{508929.2(t+68.12963)}(t-3.9863)^2\right] \qquad [9]$$

Where t = temperature (°C). The Solinst logger records at stream sites did not require water depth conversions because water depth is automatically calculated as an output from the record.

Continuous stage records are collected at 15 minute intervals and re-sampled to 30 minute intervals. Continuous discharge is calculated using the stage-discharge rating curve developed for the rating period at each respective station. The continuous stage record (rather than discharge record) is presented for stations where developing reliable rating curves is considered unsuitable due to channel conditions and available measurement techniques.

Hydrometric Data Management

Hydrometric data is compiled into a MS Access database after each visit to the Mount Nansen Site (*EDI 14-Y-0455 Hydrology Database.accdb*). The hydrometric database is designed to hold raw field data including hydrometric station metadata, station history, field measurements, survey data and data logger files. The hydrometric database is also used for QA/QC.

WATER QUALITY METHODOLOGY

Field Sampling Methods

An Oakton T100 turbidity meter was used to collect *in situ* turbidity (NTU). This meter is calibrated on a monthly basis according to instrument specifications. A YSI ProPlus multi-meter was used to collect *in situ* water temperature (degrees Celsius), pH (pH units), specific conductivity (µS/cm). Field crews calibrated the YSI meter prior to each trip and as required in the field. A YSI ProODO meter was used to measure dissolved oxygen (mg/L) from the pit lake (this probe does not require any calibration). Field data is recorded on standard field datasheets including site name, sample identifier, sample date and time, water temperature, specific conductivity, pH, photo numbers and a record of qualitative site conditions including flow stage (low, moderate, high), turbidity (clear, low, moderate, high), and ice observations (if present).

Laboratory-cleaned bottles are filled using clean techniques (*i.e.,* nitrile gloves, appropriate bottle handling) and samples are filtered and preserved on site, as directed by the lab (ALS Laboratories). Samples from the pit lake are taken from the same general location on the lake at three different depths, from the surface, at mid depth and just off the bottom. In the event that ice covers the water surface, an ice auger is used to access the water column. A Kemmerer sampler is used to collect all pit samples and is also used to measure the depth. When the pit lake is ice free, a row boat is used to access the sampling location, and samples are collected again with the Kemmerer.

Samples are kept in coolers immediately following collection, and later transferred to the Mount Nansen Site sample refrigerator until they could be transferred to Whitehorse on the final day of each sampling event. For chemical analysis, Chain of Custody forms, supplied by the lab, are included in each sample cooler, and samples are delivered to ALS Laboratories upon arrival back in Whitehorse, YT to ensure lab holding times were met.

Laboratory Analysis

All surface water quality laboratory analysis is conducted by ALS. Several lab analysis packages have been organized for the Mount Nansen Site, including a pit lake package (WQ-PIT), a drinking water package (WQ-PW), an LT50 package (WQ-SEEP), and a standard site package (all other sites). The parameters included in each package are outlined in Table A-1.

Table A-1. Laboratory analysis parameters included in various 'packages' created for surface water quality sampling at Mount Nansen (continues on next page).

Analysis Package	Parameters Included
Standard Site Package	**Cyanides:** Cyanate, Total Cyanide (as Strong Acid Dissociable), Weak Acid Dissociable, Thiocyanate
	Physical Tests: Conductivity, Hardness, pH, Total Dissolved Solids, Total Suspended Solids
	Anions and Nutrients: Bicarbonate, Carbonate, Hydroxide, Total Alkalinity, Total Ammonia, Chloride, Fluoride, Nitrate, Nitrite, Sulphate
	Total Metals: Aluminum, Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Phosphorus, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfur, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc.
	Dissolved Metals: Aluminum, Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Phosphorus, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfur, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc.
Pit Lake Package	**Physical Tests:** Conductivity, Hardness, pH, Total Dissolved Solids, Total Suspended Solids
	Anions and Nutrients: Bicarbonate, Carbonate, Hydroxide, Total Alkalinity, Total Ammonia, Chloride, Fluoride, Nitrate, Nitrite, Sulphate
	Total Metals: Aluminum, Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium,

Analysis Package	Parameters Included
	Manganese, Mercury, Molybdenum, Nickel, Phosphorus, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfur, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc. **Dissolved Metals:** Aluminum, Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Phosphorus, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfur, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc.
Drinking Water Package	**Physical Tests:** True Colour, Conductivity, Hardness, pH, Total Dissolved Solids, Turbidity **Anions and Nutrients:** Alkalinity, Total, Chloride, Fluoride, Nitrate, Nitrite, Sulphate **Total Metals:** Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Potassium, Selenium, Sodium, Uranium, Zinc.
LT50	LT50 test, 96-hr test to be conducted with Rainbow trout.

QA/QC Program

A QA/QC sampling program is conducted as part of the monitoring program, including replicate samples, a field blank sample and a trip blank sample. These are described in detail below:

- Replicate samples are essentially sample replicates collected at the same date, time and location as the regular sample. All sampling methodology is the same, as if it is a separate site. Replicates are collected from one to three sites, randomly selected, during each trip, depending on the total number of sites per trip, to cover approximately 10% of the total sites sampled. The replicate samples are collected to check the accuracy and precision of the laboratory analysis, as well as a measure of the variability in water quality at a site for a given time.
- The field blank samples are collected on site, where a set of sample bottles is filled with deionized water at some point during the sampling trip. Sampling methodology is the same as if sampling from a stream, with filtering and preserving as required. The purpose of a field blank is to identify any contamination introduced to the sample during the act of field sampling (*i.e.*, sample filling/handling, exposure to questionable air quality) or via the supplies (filter, syringe, bottle, or preservative).
- The travel blank is a sample set provided by the laboratory to be carried by the staff to and from site during the field work. The travel blank is not opened at any time during the trip. The purpose of including a travel blank is to identify any contamination of the sample caused during transportation or storage.

Following receipt of the laboratory analysis results, a review of the QA/QC sample results is completed. This involved comparing the replicate samples and the regular samples collected at the randomly selected replicate sites to ensure they are within acceptable limits of each other (within +/-10%). Field and travel

blank sample data is also reviewed to ensure that concentrations of all potential contaminants are low to below detection limits.

Data Analysis

Data are reviewed and parameters of concern are graphed and compared with the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of freshwater aquatic life (CCME-AL; CCME 2014; Table A-2), and with the Effluent Quality Standards (EQS) outlined in Yukon Water Board Water license No. QZ94-004, issued to BYG Natural Resources Inc. on February 13, 1996 (Table A-3). Drinking water quality from the WQ-PW site is compared to the applicable Guidelines for Canadian Drinking Water Quality (Health Canada 2012; Table A-4).

Table A-2. CCME-AL guidelines applicable to Mount Nansen surface water quality sampling program (CCME 2014).

Water Quality Parameter	CCME-AL Guideline	Units	Comments
Aluminum (Al)	0.1	mg/L	CCME is 0.1 at pH > 6.5, if pH is lower than 6.5, guideline is set at 0.005 mg/L
Ammonia (Total N)	0.75	mg/L	Guideline is temperature and pH dependent. This represents a highly conservative guideline calculated for a pH of 8.5 and a water temperature of 0°C. Guideline decreases with increasing pH and temperature.
Arsenic (As)	0.005	mg/L	-
Cadmium (Cd)	0.000033	mg/L	Guideline is hardness dependent; this value is for a hardness of 100 mg/L, conservative for the Mount Nansen Site.
Chloride (Cl)	120	mg/L	-
Chromium (Cr)	0.0089	mg/L	-
Copper (Cu)	0.002	mg/L	Guideline is hardness dependent; this value is for a hardness of 100 mg/L, conservative for the Mount Nansen Site.
Total Cyanide	0.005	mg/L	SAD Cyanide is used as a measure of total cyanide
Fluoride (F)	0.120	mg/L	-
Iron (Fe)	0.3	mg/L	-
Lead (Pb)	0.003	mg/L	Guideline is hardness dependent; this value is for a hardness of 100 mg/L, conservative for the Mount Nansen Site.
Mercury (Hg)	0.000026	mg/L	-
Molybdenum (Mo)	0.0073	mg/L	-
Nickel (Ni)	0.1	mg/L	Guideline is hardness dependent; this value is for a hardness of 100 mg/L, conservative for the Mount Nansen Site.
Nitrate (N)	13	mg/L	-
Nitrite (N)	0.06	mg/L	-
pH	6.5 - 9.0	pH	-
Selenium (Se)	0.001	mg/L	-

Water Quality Parameter	CCME-AL Guideline	Units	Comments
Silver (Ag)	0.0001	mg/L	-
Thallium (Tl)	0.0008	mg/L	-
Uranium (U)	0.015	mg/L	-
Zinc (Zn)	0.03	mg/L	-

Table A-3. Mount Nansen Effluent Quality Standards outlined in Yukon Water License #QZ94-004.

Water Quality Parameter	Effluent Discharge Standard
pH	6.0 to 8.5 pH
Total Suspended Solids (TSS)	50 mg/L
Toxicity (LT50 – 96 hr. for rainbow trout, pH non-adjusted)	100%
WAD Cyanide	0.1 mg/L
Total (SAD) Cyanide	0.3 mg/L
Antimony (Total)	0.15 mg/L
Arsenic (Dissolved)	0.15 mg/L
Barium (Total)	1.0 mg/L
Cadmium (Total)	0.02 mg/L
Chromium (Total)	0.04 mg/L
Copper (Total)	0.2 mg/L
Iron (Total)	1.0 mg/L
Lead (Total)	0.1 mg/L
Manganese (Total)	0.5 mg/L
Mercury (Total)	0.005 mg/L
Nickel (Total)	0.3 mg/L
Silver (Total)	0.10 mg/L
Zinc (Total)	0.3 mg/L

Table A-4. Applicable Guidelines for Canadian Drinking Water Quality for WQ-PW (Health Canada 2012).

Water Quality Parameter	Health Canada Guideline
Antimony	0.006 mg/L
Arsenic	0.010 mg/L
Barium	1.0 mg/L
Boron	5.0 mg/L
Cadmium	0.005 mg/L
Chromium	0.05 mg/L
Fluoride	1.5 mg/L

Water Quality Parameter	Health Canada Guideline
Lead	0.010 mg/L
Mercury	0.001 mg/L
Nitrate	45 mg/L
Selenium	0.01 mg/L
Uranium	0.02 mg/L

APPENDIX B. Q2 PHOTOGRAPHS

This page is intentionally blank.

Dome Creek Sites/Stations

Photo 1. WQ-DC-DX, looking upstream (Aug 12, 2014).

Photo 2. H/WQ-DC-DX+105, looking at left downstream bank (Aug 12, 2014).

Photo 3. H-DC-B station looking downstream (Aug 12, 2014).

Photo 4. WQ-DC-B looking upstream (Aug 12, 2014).

Photo 4. H/WQ-DC-D1b, looking upstream (Aug 12, 2014).

Photo 6. H-DC-M/WQ-DC-U looking downstream (old H-DC-M logger and stilling well on left) (Aug 12, 2014).

Photo 7. H-DC-M WP downstream view of weir pond filled in with sediment (Sept 16, 2014).

Photo 8. H-DC-R, looking downstream (Aug 11, 2014).

Photo 9. WQ-DC-R, looking upstream at sampling location (Aug 12, 2014).

Victoria Creek & Back Creek Sites/Stations

Photo 10. H-VC-U, looking upstream (Aug 11, 2014).

Photo 11. WQ-VC-U, looking downstream towards Back Creek confluence (Aug 8, 2014).

Photo 12. H-VC-DBC, looking upstream (Aug 11, 2014).

Photo 13. WQ-VC-DBC, looking downstream (Aug 11, 2014).

Photo 14. H/WQ-VC-UMN, looking upstream (Aug 11, 2014).

Photo 15. H-VC-R, looking upstream towards Mount Nansen Access Road (Aug 11, 2014).

Photo 16. WQ-VC-R, looking upstream from road crossing (Aug 11, 2014).

Photo 17. H/WQ-BC, looking downstream (Aug 11, 2014).

Photo 18. H/WQ-BC, showing dry conditions (July 14, 2014).

Pit Lake/Tailings Pond/Seepage Pond Discharge

Photo 19. H/WQ-SEEP (Aug 12, 2014).

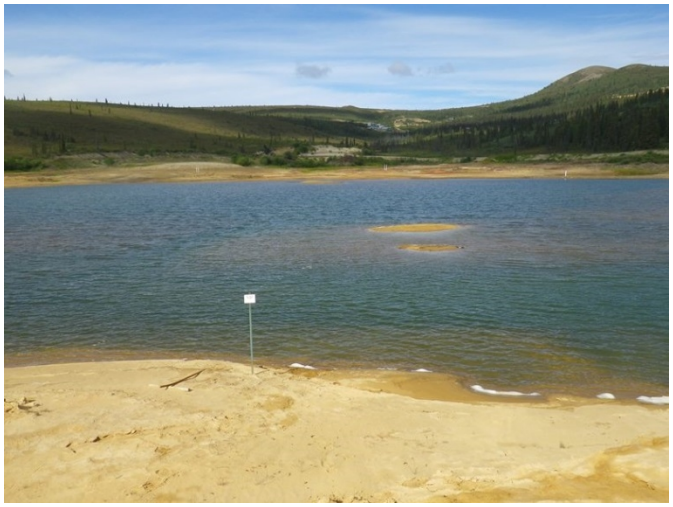


Photo 20. H/WQ-TP (Aug 12, 2014).

Photo 21. WQ-PIT overview (Aug 12, 2014).

Photo 22. WQ-PIT sampling location (Sept 17, 2014).

Pony Creek Sites/Stations

Photo 23. H-PC-DSP, looking upstream (Sept 15, 2014).

Photo 24. H-PC-DSP, looking upstream showing dry conditions (July 14, 2014).

Photo 25. WQ-PC-U, looking upstream at sample location (Aug 12, 2014).

Photo 26. WQ-PC-D, looking upstream (Sept 15, 2014).

Regular Seep Sites

Photo 27. WQ-LW-SEEP-01, showing dry surface conditions (Sept 16, 2014).

Photo 28. WQ-MS-S-08, showing dry surface conditions (Aug 12, 2014).

Photo 29. WQ-CH-P-13-01, looking upstream (Aug 12, 2014).

Photo 30. WQ-DESS-01, looking upstream (Sept 15, 2014).

Photo 31. WQ-DESS-02, looking up slope to seep location (Sept 15, 2014).

Photo 32. WQ-DESS-03, showing dry conditions, sampling location is on right of photo where flagging (Sept 15, 2014).

Pumphouse Well

Photo 33. WQ-PW (Aug 13, 2014).

This page is intentionally blank.

APPENDIX C. Q2 VISIT RECORD

This page is intentionally blank.

Table C-1. Record of sites sampled and stations monitored during each site visit during the Q2 period, July 1 to September 30, 2014.

Station/Site Name	July 14-16, 2014	August 11-13, 2014	September 15-17, 2014
H/WQ-PC-U	N	n/a	n/a
H-PC-DSP/WQ-PC-D	Y_h	Y_h	Y_h
WQ-PIT-1,2,3	Y	Y	Y
WQ-DC-DX	N	Y	Y
H/WQ-DC-DX+105	Y_w	Y_w	Y_w
H/WQ-DC-D1b	Y	Y	Y
H/WQ-DC-B	Y	Y	Y
H-DC-M/WQ-DC-U	Y	Y	Y
H/WQ-DC-R	Y	Y	Y
H/WQ-TP	Y	Y	Y
H/WQ-SEEP	Y	Y	Y
WQ-MS-S-08	N	N	N
H/WQ-BC	N	Y_w	Y
H/WQ-VC-U	Y	Y	Y
H/WQ-VC-DBC	Y	Y	Y
H/WQ-VC-UMN	Y	Y	Y
H/WQ-VC-R	Y	Y	Y
WQ-PW	Y	Y	Y
WQ-DESS-01	Not scheduled		Y
WQ-DESS-02	Not scheduled		Y
WQ-DESS-03	Not scheduled		N
WQ-CH-P-13-01	N	Y	Y
WQ-LW-Seep-01	Not scheduled		N

Codes
N – site or station not sampled due to no observations of flow or lack of suitable conditions for sampling
Y – water sampling conducted and/or discharge measurement collected
Y_w – water quality only (if a combined hydrology station and water quality site)
Y_h – hydrology only (if a combined hydrology station and water quality site)
n/a – not applicable as sampling/monitoring not required (removed from scope)

This page is intentionally blank.

APPENDIX D. HYDROLOGY DATA

This page is intentionally blank.

Table D-1. Hydrometric Instrument Accuracy.

Units	Instrument Accuracy
Acoustic Doppler Velocimeter (ADV)	± 1%
Swoffer Current Meter	± 1%
Staff Gauge	± 1 mm
Survey Rod	± 1 mm
Measuring Tape	± 1 mm
YSI ProPlus Multi-Meter - Temperature	± 0.2 ^{0}C
YSI ProPlus Multi-Meter - Specific Conductivity	0.5% of reading or 0.001 µs/cm, whichever is greater
Stop Watch	± 0.01 s
HOBO Pressure Transducer- Pressure	± .03 kPa ; ± 0.003 m
HOBO Pressure Transducer- Temperature	± 0.37 (at 20C) (-20 to -50C Op. Range)
Solinst Barologger	± 0.001 m
Solinst Pressure Transducer - Pressure	± 0.003 m
Solinst Pressure Transducer - Temperature	± 0.05 ^{0}C (-10 to +40 C Comp. Range)
Graduated Bucket	± .5 L
Lab Scale	± 0.00005 kg

Table D-2. Hydrometric station monitoring record from Q1 to Q2 (April 1 through September 30, 2014).

HID	Monitoring Start	Q1 Measurements		Q2 Measurements		Q3 Measurements		Q4 Measurements		Logger Type	Rating Curve Status[1]	Method
		#	# Q Ratings	#	# Q Ratings	#	# Q Ratings	#	# Q Rating			
ATM-DC-2	Continuous Year-Round	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	HOBO	N/A	N/A
ATM-DC-4	Continuous Year-Round	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Solinst	N/A	N/A
H-PC-U	14-Apr-14	4	N/A	Discontinued/Destroyed July, 2014						Solinst	N/A	SS,V
H-PC-DSP	14-Apr-14	5	3	3	2	N/A	N/A	N/A	N/A	Solinst	P	SS, V
H-DX+105	14-Apr-14	3	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	SS, V
H-DC-D1b	14-Apr-14	1	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	SS
H-TP	14-Apr-14	2	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	SG
H-SEEP	14-Apr-14	4	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	V, Flow Meter
H-DC-B	14-Apr-14	3	1	3	3	N/A	N/A	N/A	N/A	HOBO	P	SS
H-DC-M	14-Apr-14	5	4	3	3	N/A	N/A	N/A	N/A	Solinst	P	SS, V
H-DC-M WP	23-Jun-14	1	N/A	3	3	N/A	N/A	N/A	N/A	Solinst	P	V, Weir
H-DC-R	14-Apr-14	3	3	3	3	N/A	N/A	N/A	N/A	HOBO	P	ADV, SS, V
H-BC	15-Apr-14	3	2	3	1	N/A	N/A	N/A	N/A	Solinst	P	ADV, SS
H-VC-U	15-Apr-14	6	4	3	3	N/A	N/A	N/A	N/A	Solinst	P	ADV, SS
H-VC-DBC	15-Apr-14	5	3	3	3	N/A	N/A	N/A	N/A	Solinst	P	ADV, SS
H-VC-UMN	15-Apr-14	6	2	3	3	N/A	N/A	N/A	N/A	Solinst	P	ADV, SS
H-VC-R	15-Apr-14	4	1	3	3	N/A	N/A	N/A	N/A	Solinst	P	ADV, SS

Q - Discharge
P – preliminary
SS – Salt Slug, V – volumetric, ADV – acoustic Doppler velocimeter, Flow Meter – Flow master totalizer.

Table D-3 Hydrometric data summary for station visits between April 1 and September 30, 2014.

HID	Date	Time	Measurement	Staff Gauge	Discharge	Data Flag	Water Surface Elevation
	(DD/MM/YYYY)	(HH:MM)	Type	(m, ± 2 mm)	(m^3/s)	Flag	(m L.D., ± 5 mm)
ATM-DC2	4/14/2014	16:49	N	-	-	-	-
ATM-DC2	5/8/2014	-	N	-	-	-	-
ATM-DC2	5/20/2014	15:00	N	-	-	-	-
ATM-DC2	6/23/2014	9:00	N	-	-	-	-
ATM-DC2	7/15/2014	12:48	N	-	-	-	-
ATM-DC2	8/12/2014	10:22	N	-	-	-	-
ATM-DC2	9/16/2014	16:00	N	-	-	-	-
ATM-DC4	4/14/2014	16:38	N	-	-	-	-
ATM-DC4	5/8/2014	-	N	-	-	-	-
ATM-DC4	5/20/2014	15:24	N	-	-	-	-
ATM-DC4	6/24/2014	8:56	N	-	-	-	-
ATM-DC4	7/15/2014	12:49	N	-	-	-	-
ATM-DC4	8/12/2014	10:18	N	-	-	-	-
ATM-DC4	9/16/2014	16:00	N	-	-	-	-
H-BC	4/15/2014	11:50	N	0.000	0.000	X	
H-BC	5/9/2014	11:25	SS	0.420	0.373	-	2.060
H-BC	5/21/2014	12:10	SS	0.201	0.047	-	1.847
H-BC	6/24/2014	20:38	N	0.000	0.000	X	-
H-BC	7/14/2014	15:33	N	0.000	0.000	X	-
H-BC	8/11/2014	19:28	N	0.055	0.000	X	-
H-BC	9/16/2014	12:44	SS	0.173	0.07	-	1.858
H-DC-B	4/14/2014	16:15	N	-	0.000	X	-
H-DC-B	5/8/2014	14:37	SS		0.119	-	1.810
H-DC-B	5/8/2014	14:37	SS		0.119	-	1.808
H-DC-B	5/20/2014	15:17	SS		0.04	-	-
H-DC-B	6/24/2014	10:40	SS		0.01	-	1.430
H-DC-B	7/15/2014	13:19	SS	0.165	0.004	-	-
H-DC-B	8/12/2014	10:51	SS	0.19	0.01	-	-
H-DC-B	9/16/2014	15:59	SS	0.201	0.014	-	1.458
H-DC-D1b	4/14/2014		N		0	X	-
H-DC-D1b	5/8/2014	15:00	N			X	-

HID	Date	Time	Measurement	Staff Gauge	Discharge	Data Flag	Water Surface Elevation
	(DD/MM/YYYY)	(HH:MM)	Type	(m, ± 2 mm)	(m^3/s)	Flag	(m L.D., ± 5 mm)
H-DC-D1b	5/21/2014	18:07	N	-		X	-
H-DC-D1b	6/24/2014	13:35	SS	-	0.005	E	-
H-DC-D1b	7/15/2014	17:45	SS	-	0.002	-	-
H-DC-D1b	8/12/2014	14:08	SS	-	0.005	-	-
H-DC-D1b	9/17/2014	11:11	SS	-	0.004	-	-
H-DC-DX+105	4/14/2014	17:18	N	-	0.000	X	-
H-DC-DX+105	5/8/2014	17:11	SS	-	0.019	-	-
H-DC-DX+105	5/21/2014	15:08	SS	-	0.011	E	-
H-DC-DX+105	6/24/2014	15:15	SS	-	0.001	E	-
H-DC-DX+105	7/15/2014	18:43	N	-	-	X	-
H-DC-DX+105	8/12/2014	15:15	N	-	-	X	-
H-DC-DX+105	9/16/2014	18:00	N	-	-	X	-
H-DC-M	4/14/2014	14:40	SS	-	0.002	B	1.617
H-DC-M	5/8/2014	13:59	SS	0.322	0.154	-	1.798
H-DC-M	5/20/2014	14:30	SS	0.194	0.045	-	1.667
H-DC-M	6/23/2014	18:49	V	0.150	0.009	-	1.621
H-DC-M	6/23/2014	18:49	SS	0.150	0.012	-	1.621
H-DC-M	6/23/2014	18:49	V	0.150	0.009	-	1.619
H-DC-M	6/23/2014	18:49	SS	0.150	0.012	-	1.619
H-DC-M	7/15/2014	12:30	V	0.148	0.005	-	-
H-DC-M	9/16/2014	14:15		0.158		X	-
H-DC-M WP	6/23/2014	18:49	V	-	0.009	-	-
H-DC-M WP	7/15/2014	14:30	V	-	0.005	-	2.242
H-DC-M WP	8/12/2014	9:15	V	0.382	0.010	-	-
H-DC-M WP	9/16/2014	14:15	V	-	0.014	-	2.296
H-DC-R	4/14/2014	13:58	N	-	-	X	-
H-DC-R	5/8/2014	13:24	SS	-	0.152	B	-
H-DC-R	5/20/2014	13:48	SS	-	0.056	-	
H-DC-R	6/23/2014	17:17	SS	0.301	0.014	-	0.428
H-DC-R	7/15/2014	11:18	SS	0.262	0.009	-	
H-DC-R	8/11/2014	16:26	SS	0.295	0.023	-	
H-DC-R	9/16/2014	8:58	SS	0.355	0.024	-	0.501
H-PC-DSP	4/14/2014	19:10	N	0.000	0.000	X	-

HID	Date	Time	Measurement	Staff Gauge	Discharge	Data Flag	Water Surface Elevation
	(DD/MM/YYYY)	(HH:MM)	Type	(m, ± 2 mm)	(m^3/s)	Flag	(m L.D., ± 5 mm)
H-PC-DSP	5/8/2014	15:29	SS	0.318	0.027	-	2.493
H-PC-DSP	5/8/2014	15:29	SS	0.318	0.027	-	2.491
H-PC-DSP	5/20/2014	15:56	SS	0.296	0.006	-	2.456
H-PC-DSP	5/20/2014	15:56	V	0.296	0.005	-	2.456
H-PC-DSP	6/24/2014	16:54	V	0.171	0.001	-	2.323
H-PC-DSP	6/24/2014	16:54	V	0.171	0.001	-	2.325
H-PC-DSP	7/14/2014	17:45	V	0.000	0.002	-	
H-PC-DSP	8/12/2014	12:34	V	0.162	0.494	-	
H-PC-DSP	9/15/2014	17:50	V	0.276	0.003	-	2.425
H-PC-U	4/14/2014		N	-	0.000	X	-
H-PC-U	5/8/2014	16:12	SS	-	0.024	-	-
H-PC-U	5/20/2014	16:46	SS	-	0.006	-	-
H-PC-U	6/23/2014	13:25	SS	-	0.001	-	-
H-SEEP	4/14/2014	15:40	V	-	0.003	-	-
H-SEEP	5/9/2014	13:03	N	-	-	-	-
H-SEEP	5/21/2014	13:15	V	-	0.001	-	-
H-SEEP	6/24/2014	9:28	V	0.208	0.003	-	-
H-SEEP	7/16/2014	10:25	V	0.205	0.003	-	-
H-SEEP	8/12/2014	10:00	V	0.230	0.003	-	-
H-SEEP	9/16/2014	15:21	V	0.200	0.003	-	-
H-TP	4/14/2014	15:16	N	-	-	X	-
H-TP	5/9/2014	13:25	N	1.855	-	-	-
H-TP	5/21/2014	13:35	N	1.877	-	-	-
H-TP	6/24/2014	9:45	N	1.629	-	-	-
H-TP	7/15/2014	16:30	N	1.475	-	-	-
H-TP	8/12/2014	11:20	N	1.388	-	-	-
H-TP	9/16/2014	16:42	N	1.376	-	-	-
H-VC-DBC	4/15/2014	9:50	CM-MID	0.368	0.047	B	1.724
H-VC-DBC	4/15/2014	9:50	SS	0.368	0.044	B	1.724
H-VC-DBC	5/9/2014	11:40	ADV-MID	0.732	2.388	-	2.086
H-VC-DBC	5/9/2014	11:40	ADV-MID	0.732	2.388	-	2.083
H-VC-DBC	5/21/2014	10:25	ADV-MID	0.526	0.627	-	1.878
H-VC-DBC	6/24/2014	19:28	ADV-MID	0.406	0.177	-	1.748

HID	Date	Time	Measurement	Staff Gauge	Discharge	Data Flag	Water Surface Elevation
	(DD/MM/YYYY)	(HH:MM)	Type	(m, ± 2 mm)	(m^3/s)	Flag	(m L.D., ± 5 mm)
H-VC-DBC	6/24/2014	19:28	ADV-MID	0.406	0.177	-	1.751
H-VC-DBC	7/14/2014	14:40	ADV-MID	0.378	0.104	-	1.729
H-VC-DBC	8/11/2014	17:45	ADV-MID	0.433	0.288	-	-
H-VC-DBC	9/16/2014	10:07	ADV-MID	0.526	0.670	-	1.874
H-VC-R	5/8/2014	11:54	ADV-MID	0.765	3.204	-	2.338
H-VC-R	5/8/2014	11:54	ADV-MID	0.765	3.204	-	2.345
H-VC-R	5/8/2014	11:54	ADV-MID	0.765	3.204	-	2.337
H-VC-R	5/20/2014	13:03	ADV-MID	0.594	0.758	-	2.167
H-VC-R	6/23/2014	16:03	ADV-MID	0.487	0.179	SH-L	2.061
H-VC-R	7/14/2014	16:46	ADV-MID	0.471	0.121	-	2.050
H-VC-R	8/11/2014	12:40	ADV-MID	0.522	0.329	-	-
H-VC-R	9/15/2014	14:39	ADV-MID	0.579	0.770	-	2.173
H-VC-U	5/9/2014	11:37	ADV-MID	0.415	1.929	-	2.313
H-VC-U	5/9/2014	11:37	ADV-MID	0.415	1.929	-	2.315
H-VC-U	5/21/2014	11:21	SS	0.227	0.392	-	2.133
H-VC-U	5/21/2014	11:21	ADV-MID	0.227	0.556	-	2.133
H-VC-U	6/24/2014	20:05	ADV-MID	0.138	0.172	-	2.048
H-VC-U	7/14/2014	13:09	ADV-MID	0.113	0.144	-	2.021
H-VC-U	8/11/2014	18:52	ADV-MID	0.160	0.261	-	-
H-VC-U	9/16/2014	11:20	ADV-MID	0.238	0.571	-	2.147
H-VC-UMN	4/15/2014	8:40	SS	0.528	0.019	B	-
H-VC-UMN	4/15/2014	8:40	CM-MID	0.528	0.022	B	-
H-VC-UMN	5/9/2014	8:30	ADV-MID	0.900	2.605	-	1.918
H-VC-UMN	5/9/2014	8:30	ADV-MID	0.900	2.605	-	1.919
H-VC-UMN	5/21/2014	8:51	SS	0.709	0.741	-	1.695
H-VC-UMN	5/21/2014	8:51	ADV-MID	0.709	0.702	SH-SG	1.695
H-VC-UMN	6/24/2014	18:29	ADV-MID	0.592	0.188	-	1.587
H-VC-UMN	7/15/2014	9:00	ADV-MID	0.571	0.120	-	1.569
H-VC-UMN	8/11/2014	15:00	ADV-MID	0.622	0.283	-	-
H-VC-UMN	9/15/2014	16:10	ADV-MID	0.700	0.660	-	1.681

Notes:

HID = Hydrometric ID, unique hydrometric station identifier in hydrometric database. L.D. = Local datum. Measurement types: ADV – acoustic Doppler volocimeter; SS – salt dilution, slug injection; V – volumetric; CM – current meter; W – weir; N – no measurement obtained. Data Flag = B – Ice Present, X – Poor channel conditions not appropriate for discharge measurement, E – Estimated Value

Table D-4. Hydrometric survey data summary from April 1 through September 30, 2014.

Station	Date	Time	BM 1	BM 2	BM 3	Logger Rod	TOS	Water Surface
			(m L.D.)	(m L.D.)	(m L.D.)	(m L.D.)	(m L.D.)	(m L.D.)
H-BC	5/9/2014	11:40	3	2.991	3.018	2.876	2.640	2.060
H-BC	5/21/2014	12:21	3	3.009	3.028	2.881	2.645	1.847
H-BC	9/16/2014	13:03	3	3.016	3.065	2.919	2.686	1.858
H-BC	9/16/2014	13:03	3	3.016	3.065	2.919	2.686	1.858
H-DC-B	5/8/2014		3	3.355	2.997	-	-	1.809
H-DC-B	6/24/2014	10:50	3	3.351	2.9925	2.775	-	1.4305
H-DC-B	9/16/2014	16:27	3	3.351	2.993	2.796	2.252	1.458
H-DC-B	9/16/2014	16:27	3	3.351	2.993	2.796	2.252	1.458
H-DC-M	4/14/2014	14:32	3	2.713	2.319	2.711	2.480	1.617
H-DC-M	5/8/2014	14:10	3	2.313	2.713	2.727	2.479	1.798
H-DC-M	5/20/2014	14:34	3	2.315	2.712	2.709	2.478	1.667
H-DC-M	6/23/2014	19:23	3	2.519	2.718	2.702	2.470	1.620
H-DC-M	7/14/2014	14:45	3	2.338	2.725	2.716	2.483	1.617
H-DC-M	7/14/2014	14:45	3	2.338	2.725	2.716	2.483	1.617
H-DC-M	9/16/2014	15:00	2.035*	1.756	1.376			
H-DC-M	9/16/2014	15:00	2.035*	1.756	1.376			
H-DC-M WP	7/15/2014	15:45	3	2.284	2.875	3.523	2.973	2.242
H-DC-M WP	7/15/2014	15:45	3	2.284	2.875	3.523	2.973	2.242
H-DC-M WP	9/16/2014	15:00	3	2.287	2.876			2.296
H-DC-M WP	9/16/2014	15:00	3	2.287	2.876			2.296
H-DC-R	6/23/2014		3	2.973	2.3125	1.968	1.132	0.425
H-DC-R	9/16/2014	9:01	3	2.986	2.314	1.984	1.15	0.502
H-PC-DSP	5/8/2014	15:56	3	3.658	3.248	3.424	3.1725	2.492
H-PC-DSP	5/20/2014	16:09	3	3.250	3.635	3.418	3.169	2.456
H-PC-DSP	6/24/2014	17:00	3	3.2425	3.6225	3.3965	3.148	2.324
H-PC-DSP	9/15/2014	17:40	3	3.242	3.625	3.398	3.148	2.425

Station	Date	Time	BM 1	BM 2	BM 3	Logger Rod	TOS	Water Surface
			(m L.D.)	(m L.D.)	(m L.D.)	(m L.D.)	(m L.D.)	(m L.D.)
H-VC-DBC	4/15/2014	10:40	3	3.029	2.919	2.571	2.354	1.724
H-VC-DBC	5/9/2014	9:50	3	3.024	2.917	2.565	2.341	2.084
H-VC-DBC	5/21/2014	10:37	3	3.028	2.918	2.568	2.355	1.878
H-VC-DBC	6/24/2014	19:33	3	3.026	2.910	2.567	2.348	1.749
H-VC-DBC	7/14/2014	14:55	3	3.026	2.911	2.569	2.35	1.729
H-VC-DBC	9/16/2014	10:28	3	3.027	1.911	2.567	2.349	1.877
H-VC-R	4/14/2014	13:20	3	3.431	3.170	2.812	2.573	-
H-VC-R	4/14/2014	13:20	3	3.431	3.170	2.812	2.573	-
H-VC-R	5/8/2014	12:20	3	3.4315	3.171	2.811	-	2.34
H-VC-R	5/8/2014	12:20	3	3.432	3.171	2.811	-	2.34
H-VC-R	5/20/2014	13:16	3	3.426	3.172	2.870	2.575	2.167
H-VC-R	5/20/2014	13:16	3	3.426	3.172	2.87	2.575	2.167
H-VC-R	6/23/2014	16:22	3	3.417	3.167	2.891	2.575	2.059
H-VC-R	6/23/2014	16:22	3	3.417	3.167	2.891	2.575	2.059
H-VC-R	7/14/2014	16:50	3	3.423	3.167	2.893	3.579	2.05
H-VC-R	9/15/2014	14:50	3	3.433	3.178	2.902	2.588	2.173
H-VC-U	4/15/2014		3	3.359	3.243	3.15	2.904	-
H-VC-U	5/9/2014	10:40	3	3.361	3.244	3.149	2.902	2.314
H-VC-U	5/21/2014	11:45	3	3.359	3.242	3.148	2.904	2.133
H-VC-U	6/24/2014	20:31	3	3.356	3.244	3.1555	2.910	2.048
H-VC-U	7/14/2014	13:55	3	3.356	3.243	3.156	2.91	2.026
H-VC-U	9/16/2014	11:34	3	3.357	3.241	3.156	2.91	2.147
H-VC-UMN	5/9/2014	9:00	3	3.008	2.678	2.191	1.984	1.918
H-VC-UMN	5/21/2014	9:18	3	3.007	2.678	2.207	1.993	1.695
H-VC-UMN	6/24/2014	18:27	3	3.009	2.677	2.21	1.996	1.588
H-VC-UMN	7/15/2014	9:00	3	3.007	2.678	2.212	1.997	1.57
H-VC-UMN	9/15/2014	16:52	3	3.004	2.673	2.214	1.999	1.681

Notes:
L.D. = Local datum.
TOS = Top of Staff Gauge
LoggerRod = Top of fixed-length data logger installation rod.
*Survey measurements obtained using H-DC-M WP local datum

Table D-5. Seepage Pond discharge volumetric measurements, April 1 to September 30, 2014.

HID	Measurement Date		Method	Discharge	
	Date	Time		m^3/s	L/s
H-SEEP	4/14/2014	15:40	V	0.003	3
H-SEEP	5/9/2014	13:03	-	-	-
H-SEEP	5/21/2014	13:15	V	0.001	1
H-SEEP	6/24/2014	9:28	V	0.003	3
H-SEEP	7/16/2014	10:25	V	0.003	3
H-SEEP	8/12/2014	10:00	V	0.003	3
H-SEEP	9/16/2014	15:21	V	0.003	3

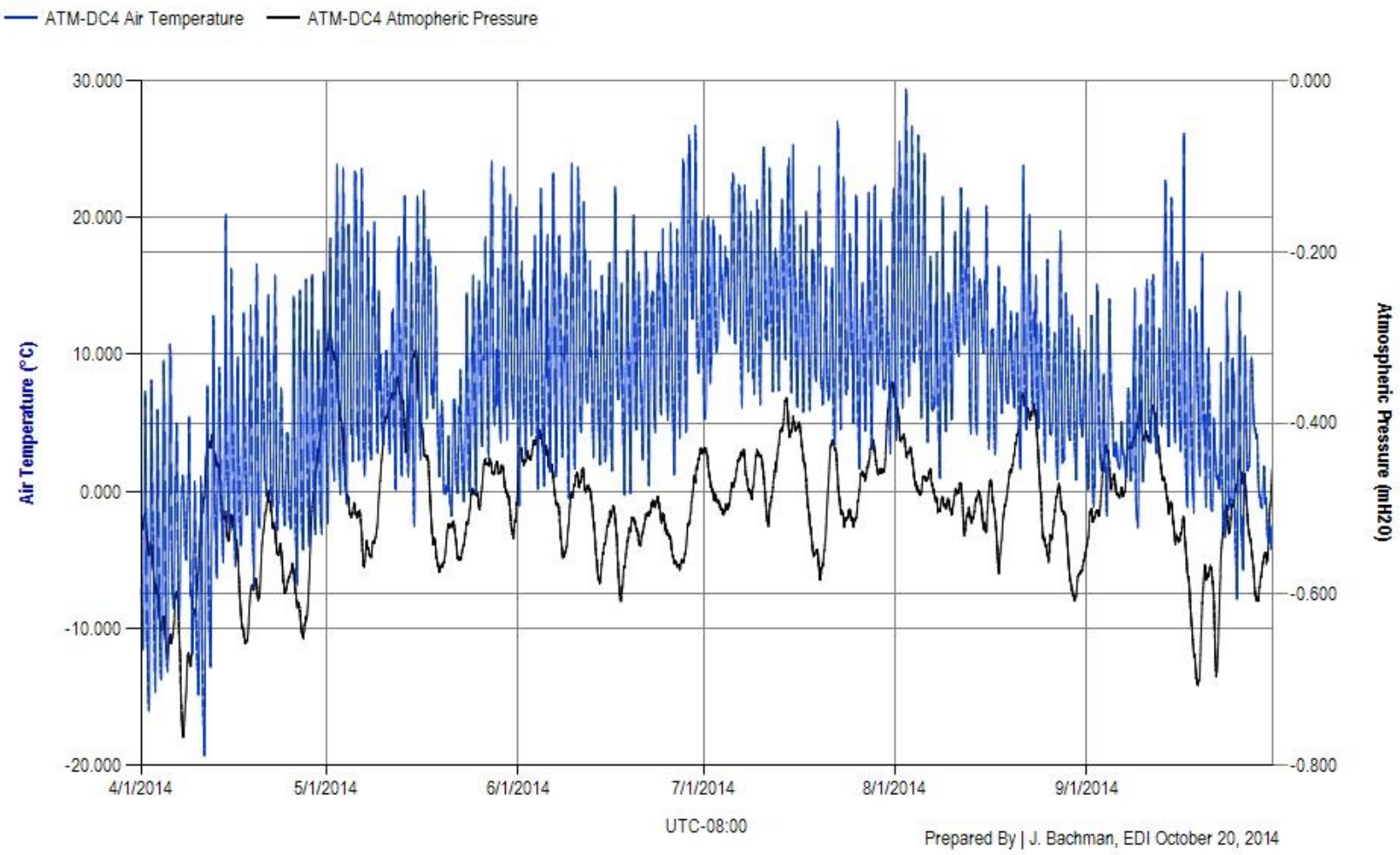


Figure D-1. ATM-DC4 atmospheric pressure and air temperature.

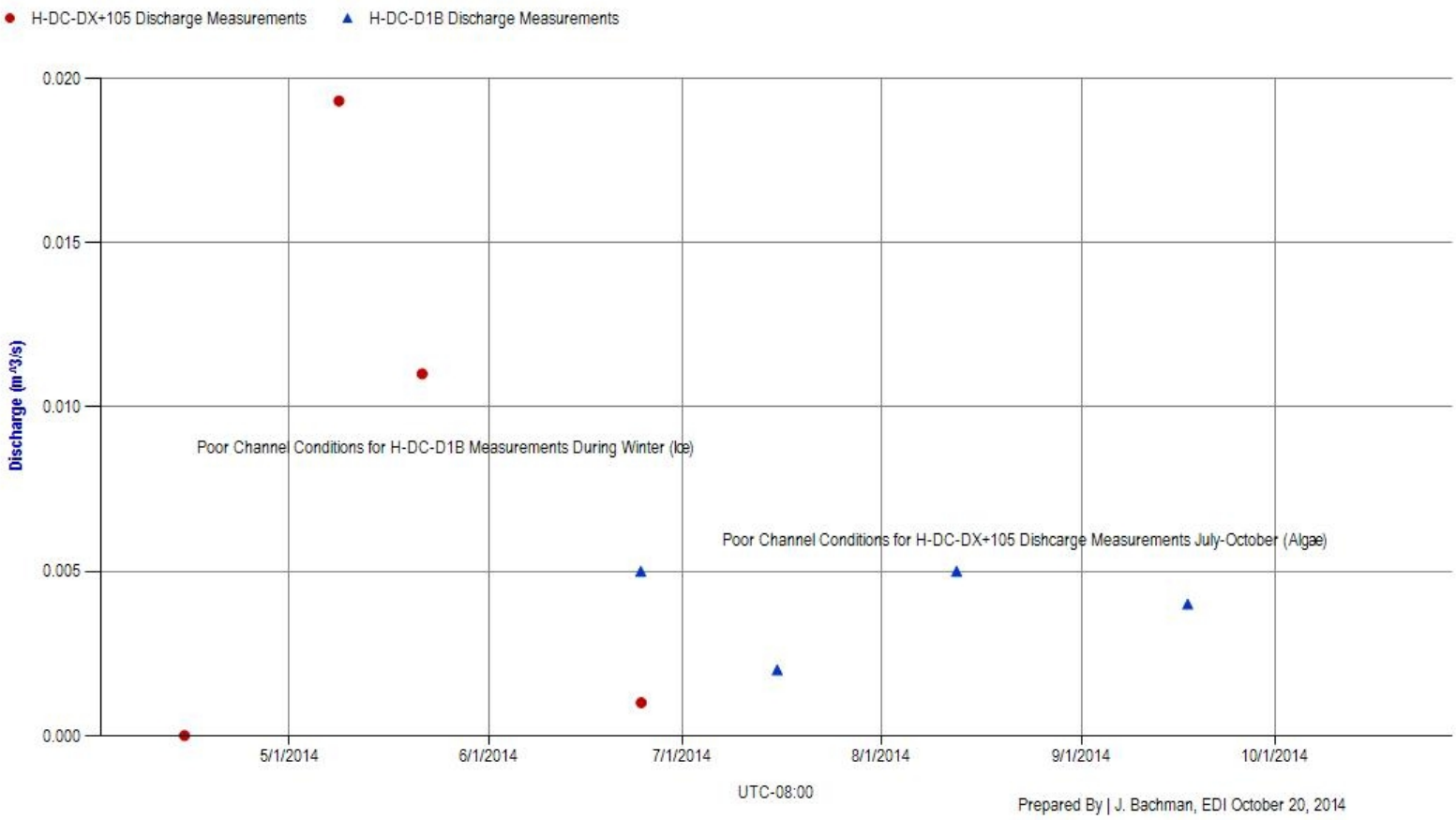


Figure D-2. Instantaneous discharge measurements from the upper Dome Stations: H-DC-DX+105 and H-DC-D1B

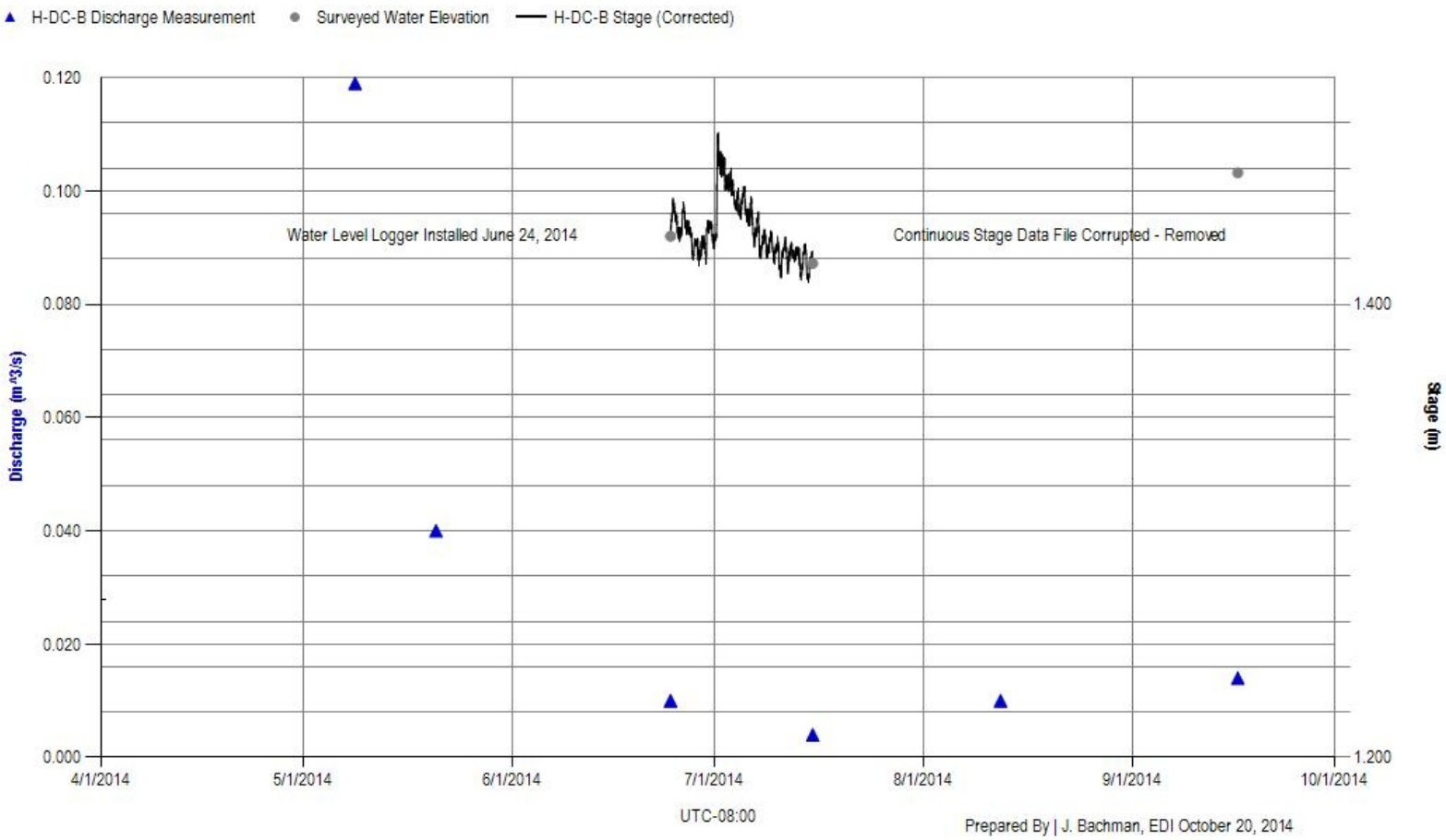


Figure D-3. Instantaneous discharge and continuous stage measurements at H-DC-B .

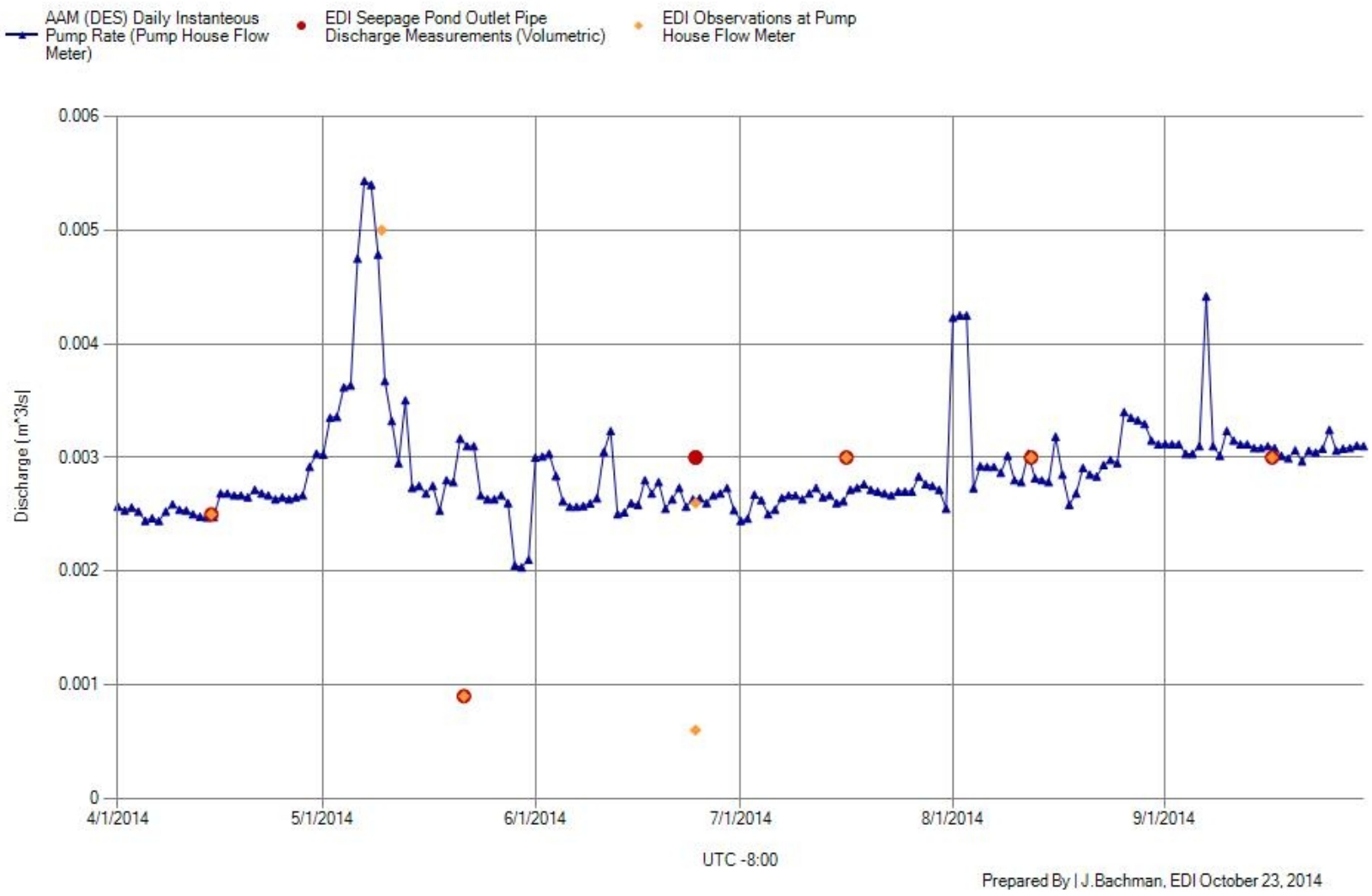


Figure D-4. Instantaneous discharge measurements at H-SEEP, and Pump House Flow Meter

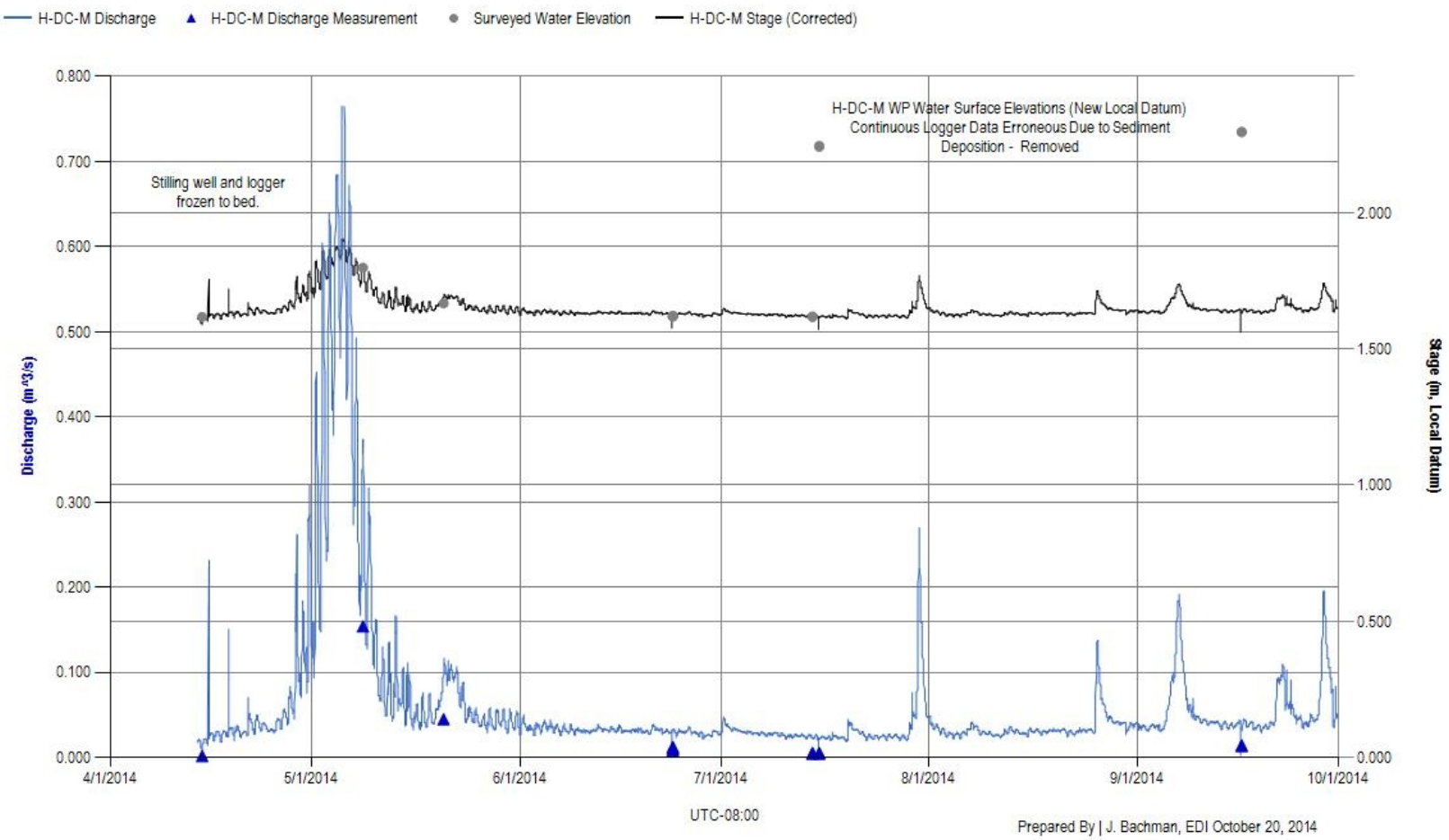


Figure D-5. Instantaneous and continuous stage and discharge measurements at H-DC-M.

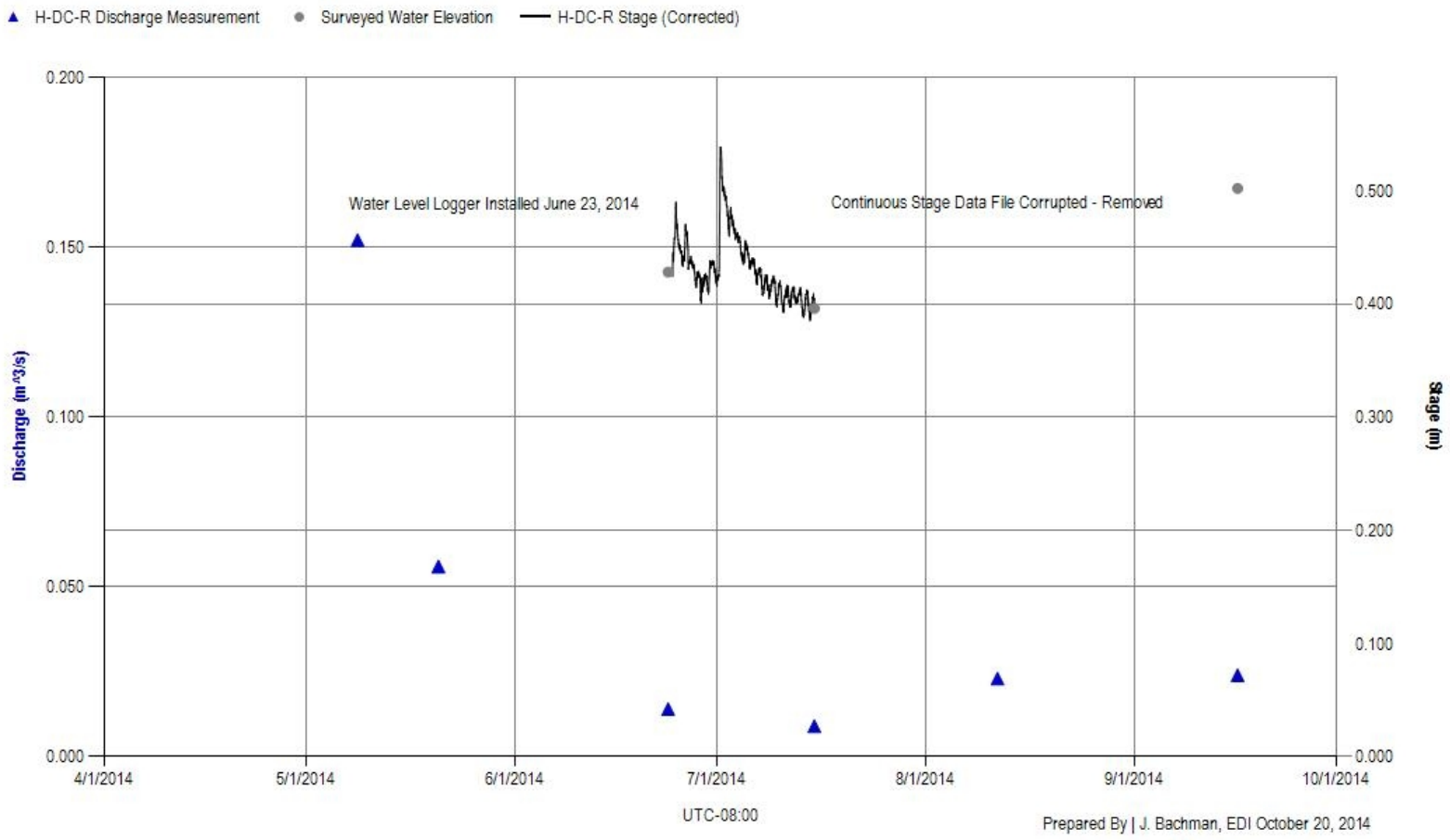


Figure D-6. Instantaneous discharge and stage measurements with continuous stage record at H-DC-R.

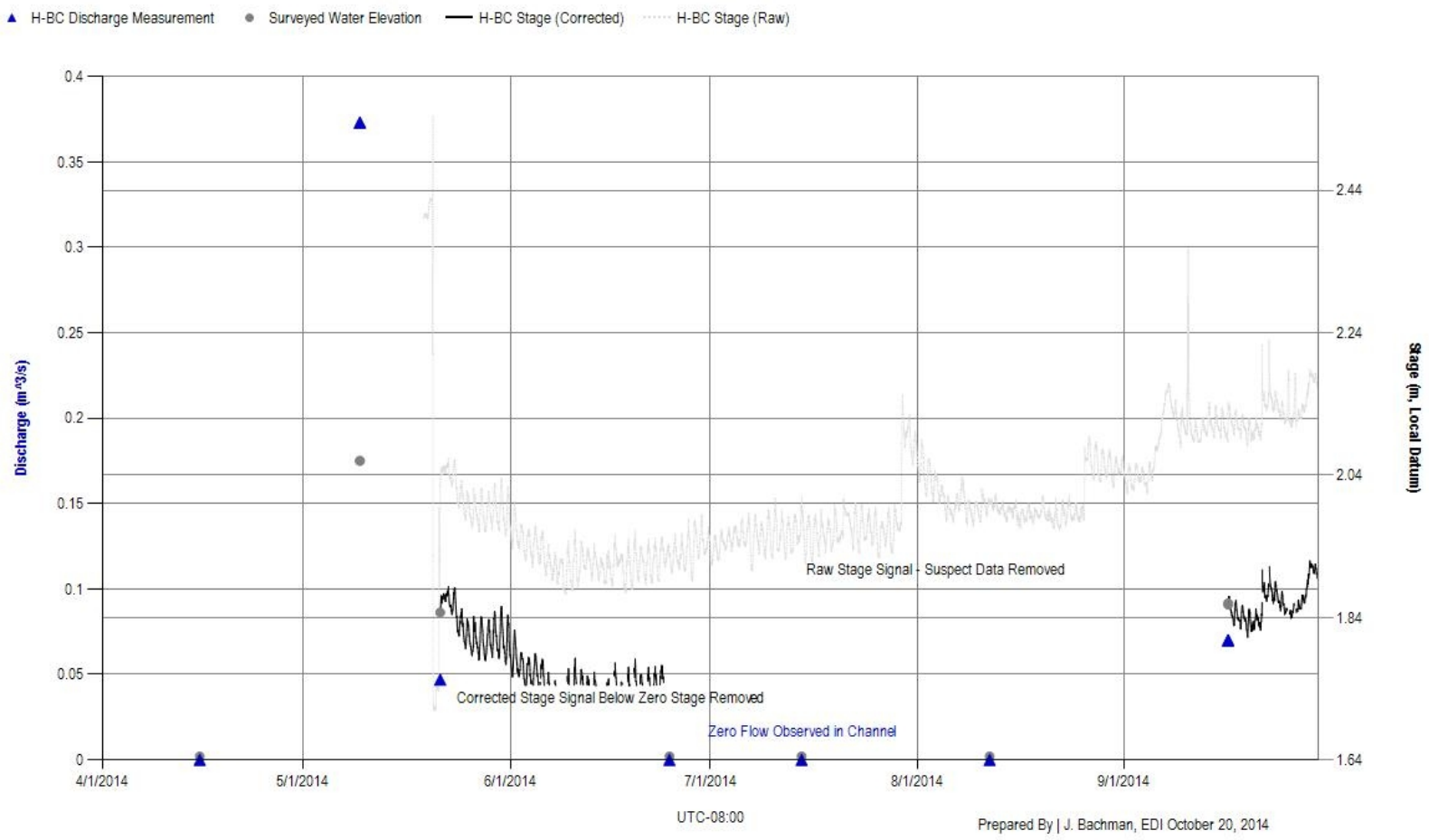


Figure D-7. Instantaneous and continuous discharge and stage measuremetns at H-BC.

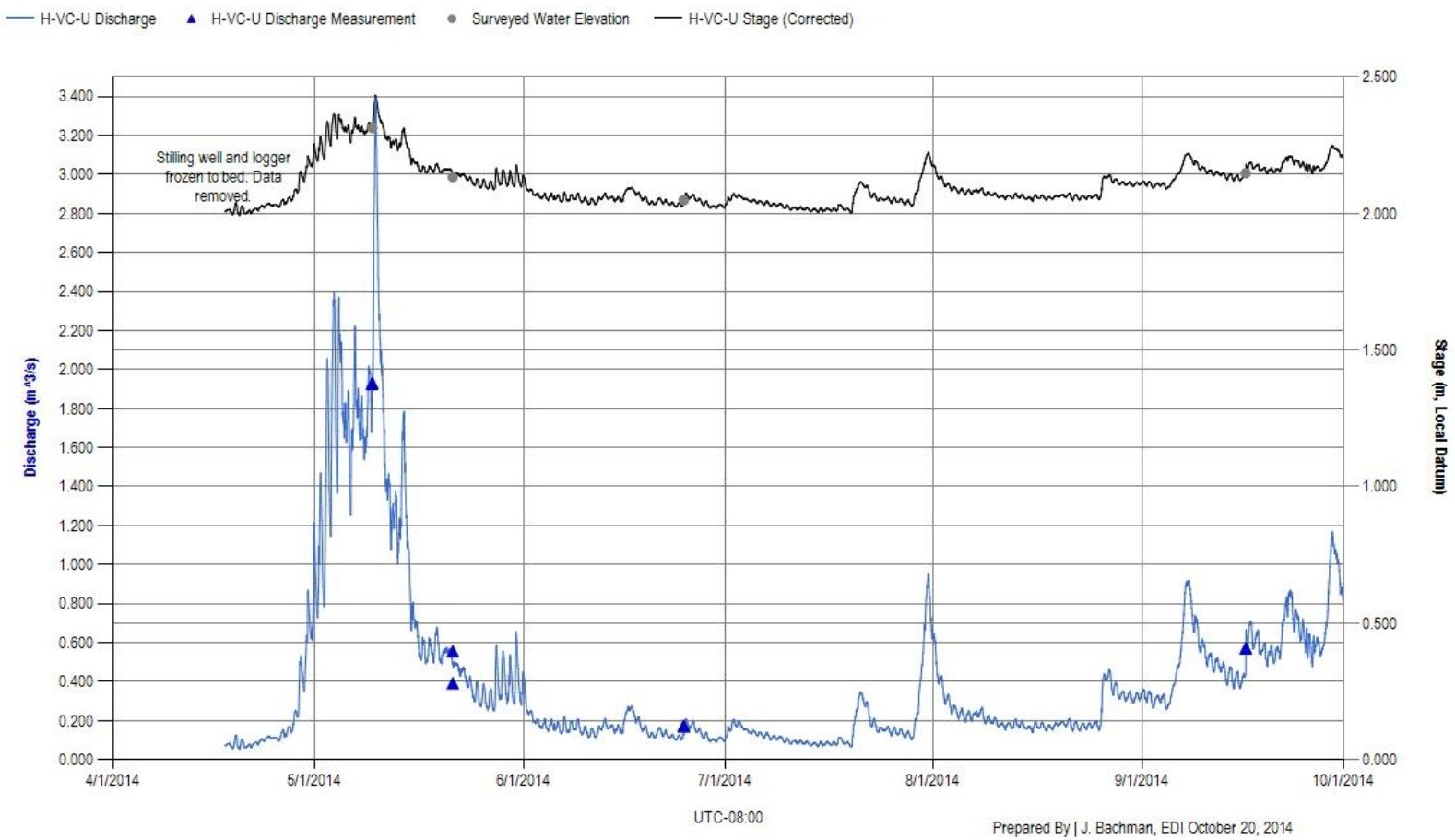


Figure D-8. Instantaneous and contiunuous discharge and stage measurements at H-VC-U.

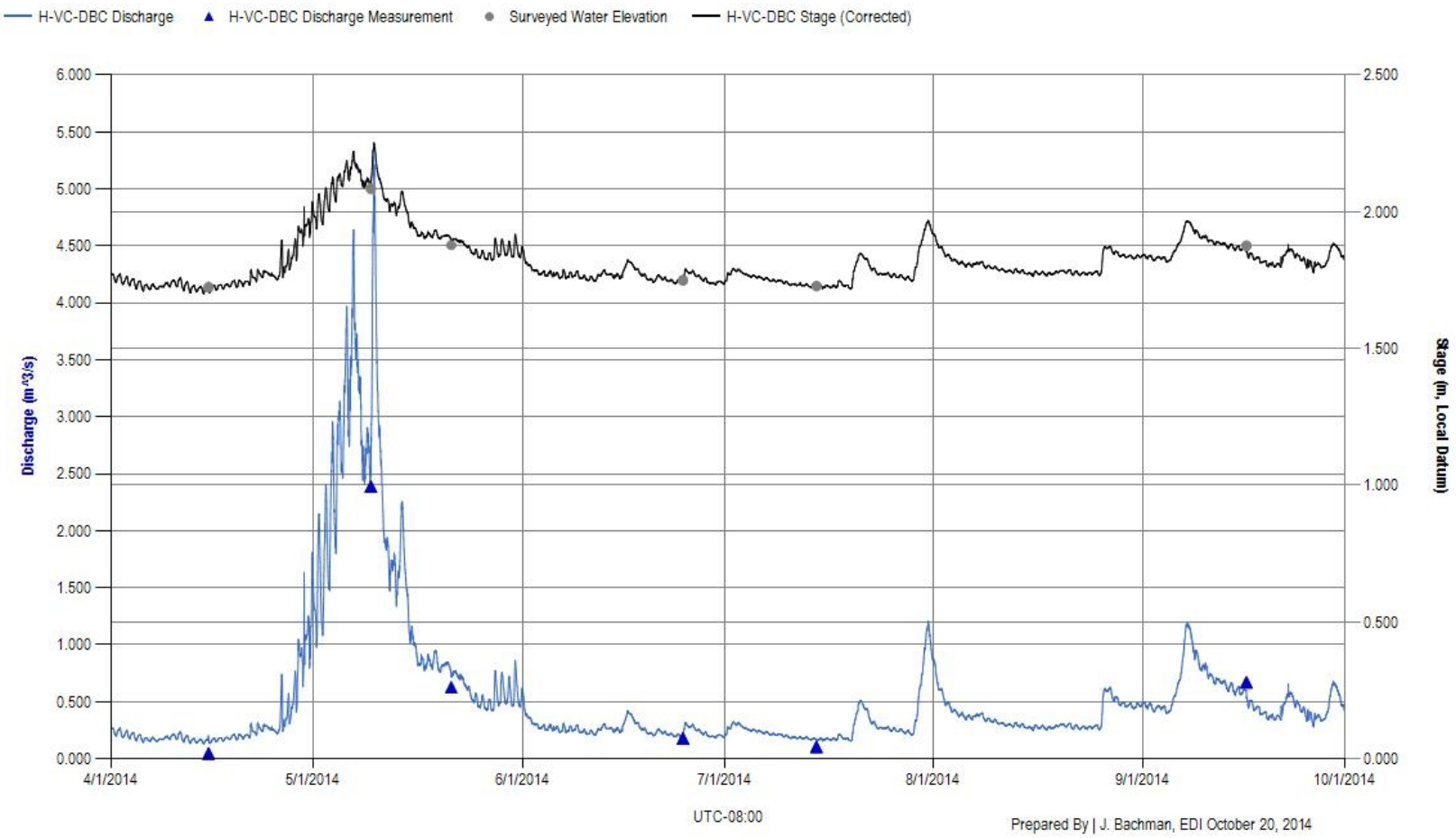


Figure D-9. Instantaneous and continuous stage and discharge measurements at H-VC-DBC.

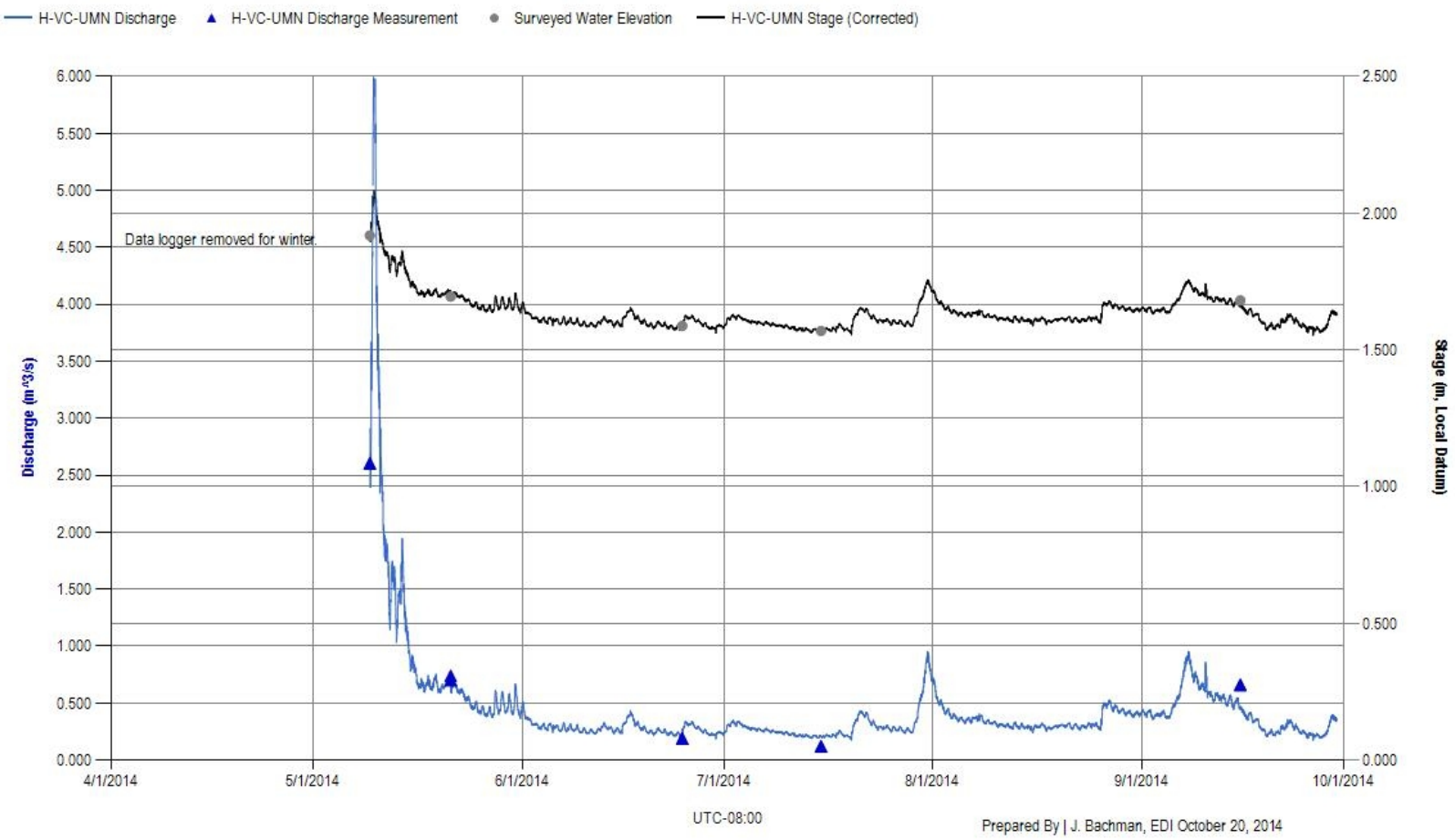


Figure D-10. Instantaneous and continuous stage and discharge measurements at H-VC-UMN.

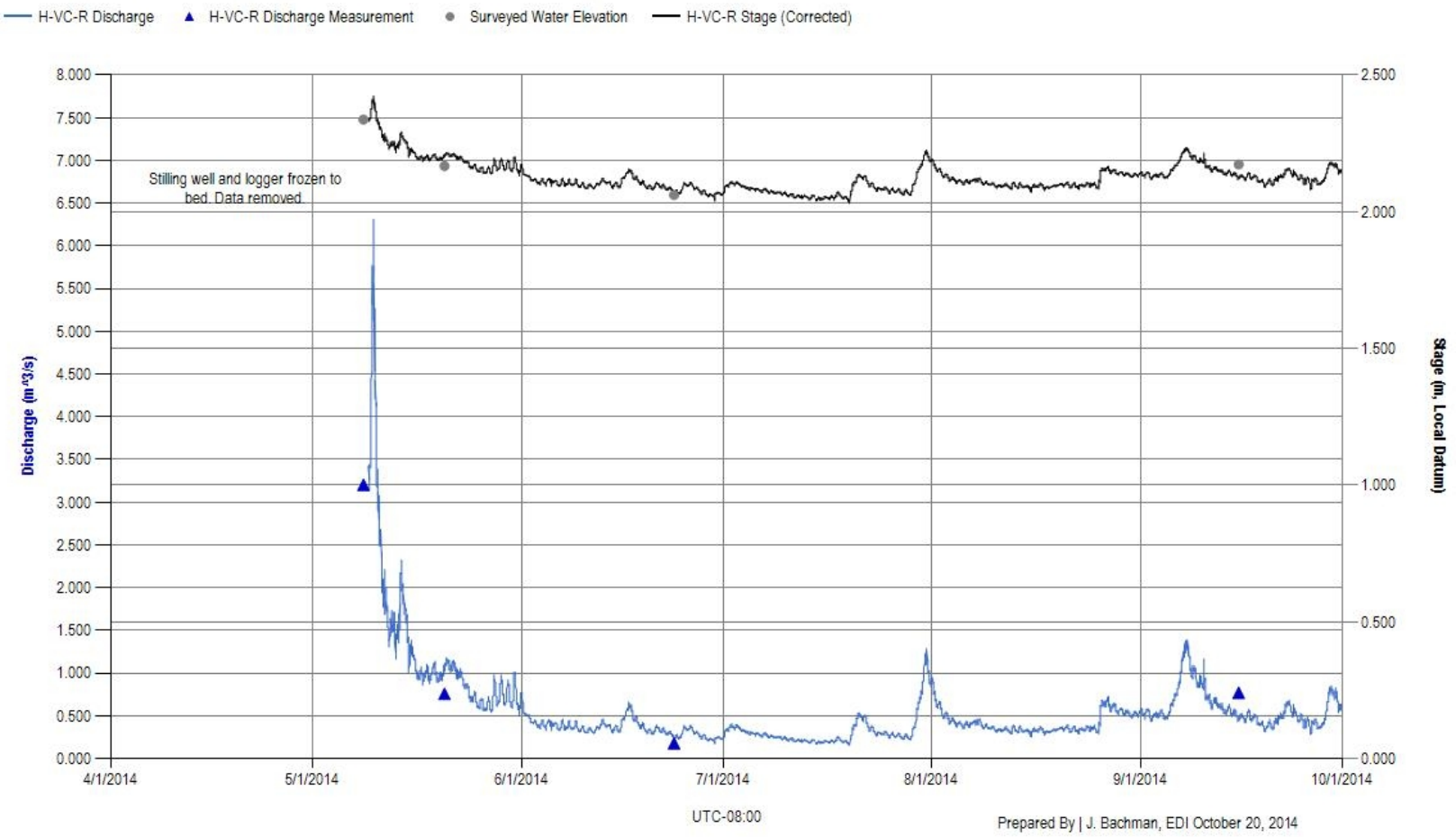


Figure D-11. Instantaneous and continuous stage and discharge measurements at H-VC-R.

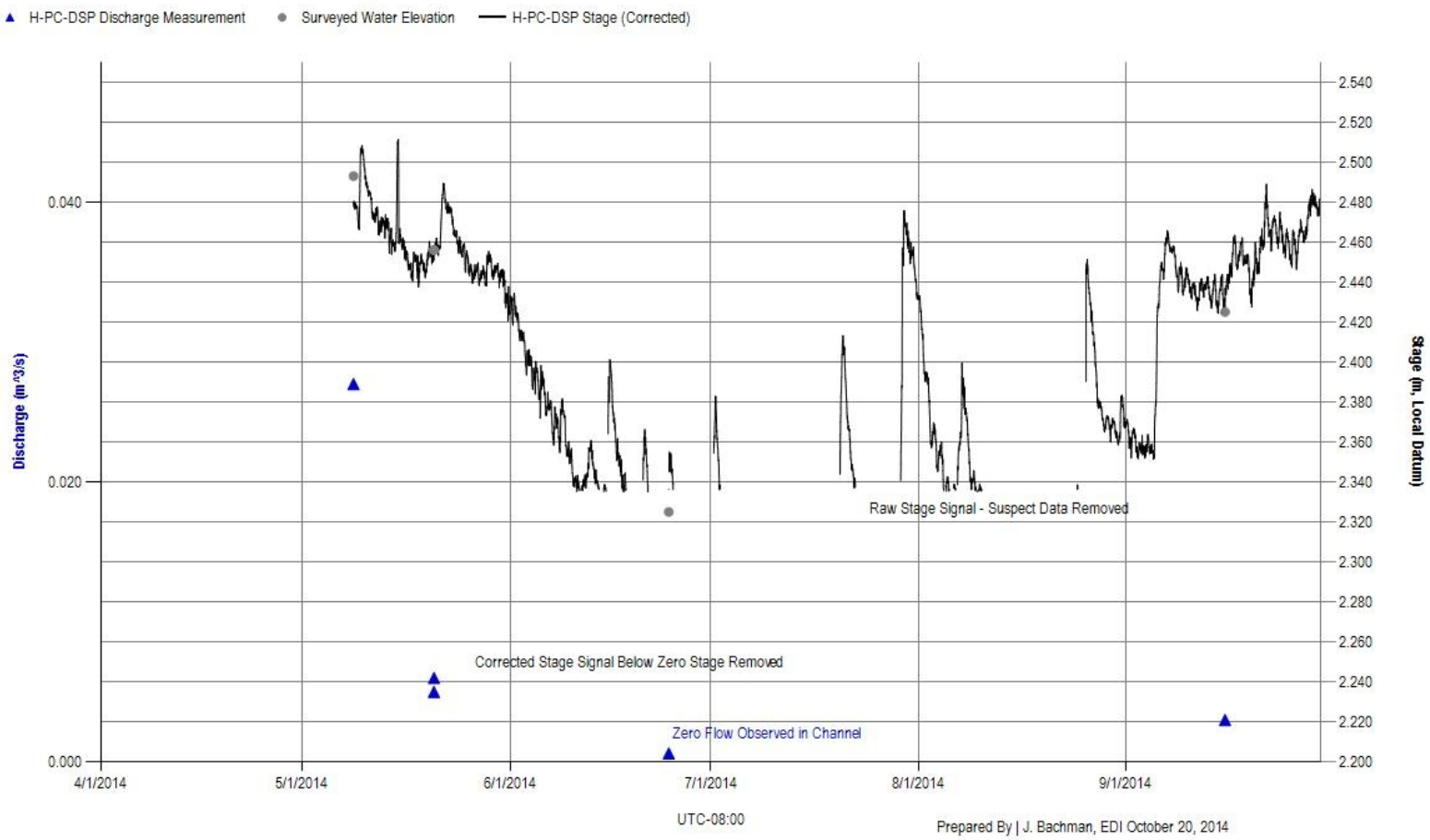


Figure D-12. Instantaneous discharge and discharge measurements with continuous stage H-PC-DSP.

APPENDIX E. WATER QUALITY DATA

This page is intentionally blank.

Figure E-1. Concentrations of aluminum, arsenic and ammonia for sites on Upper Dome Creek (left column) and Lower Dome Creek (right column).

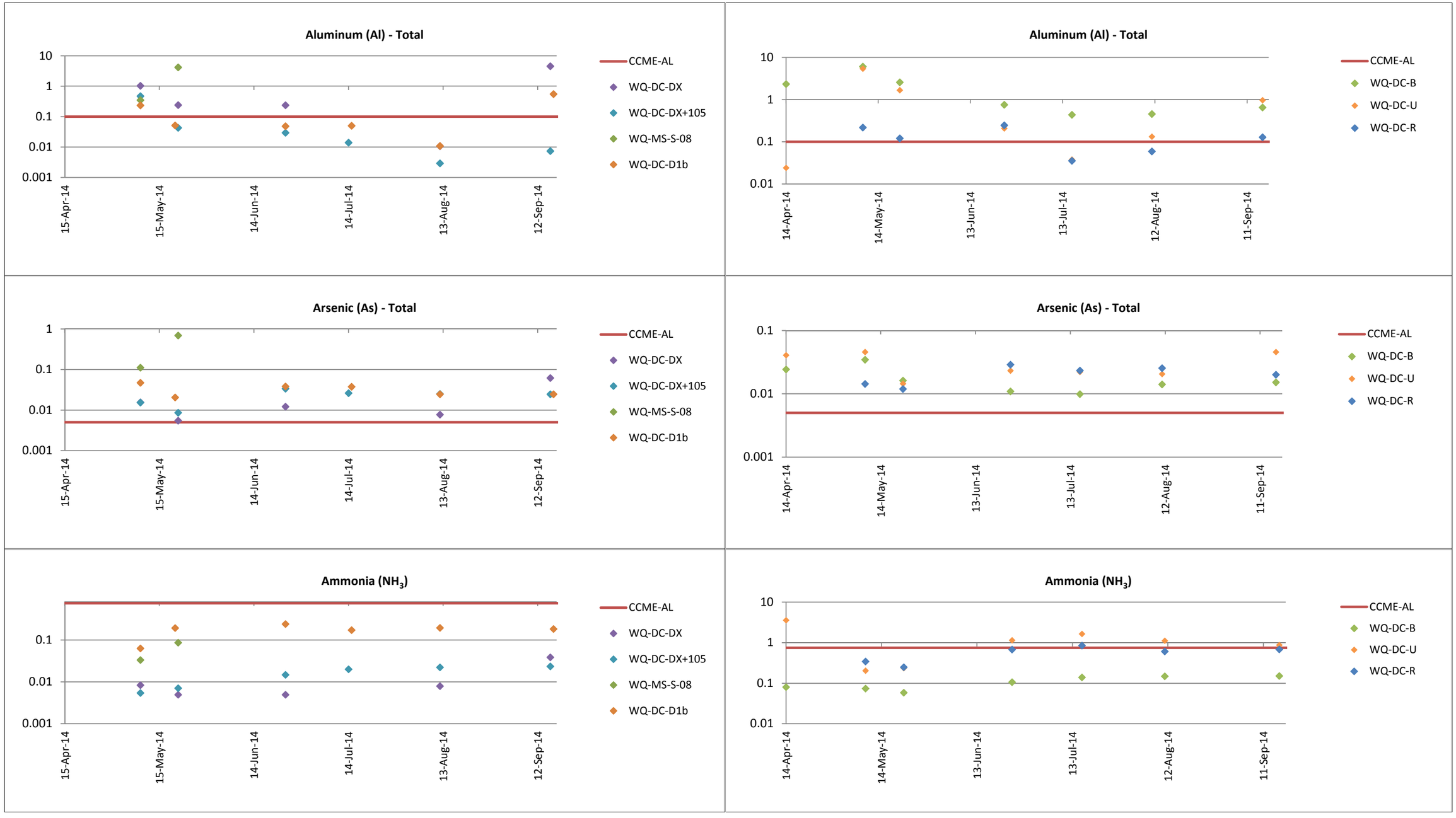
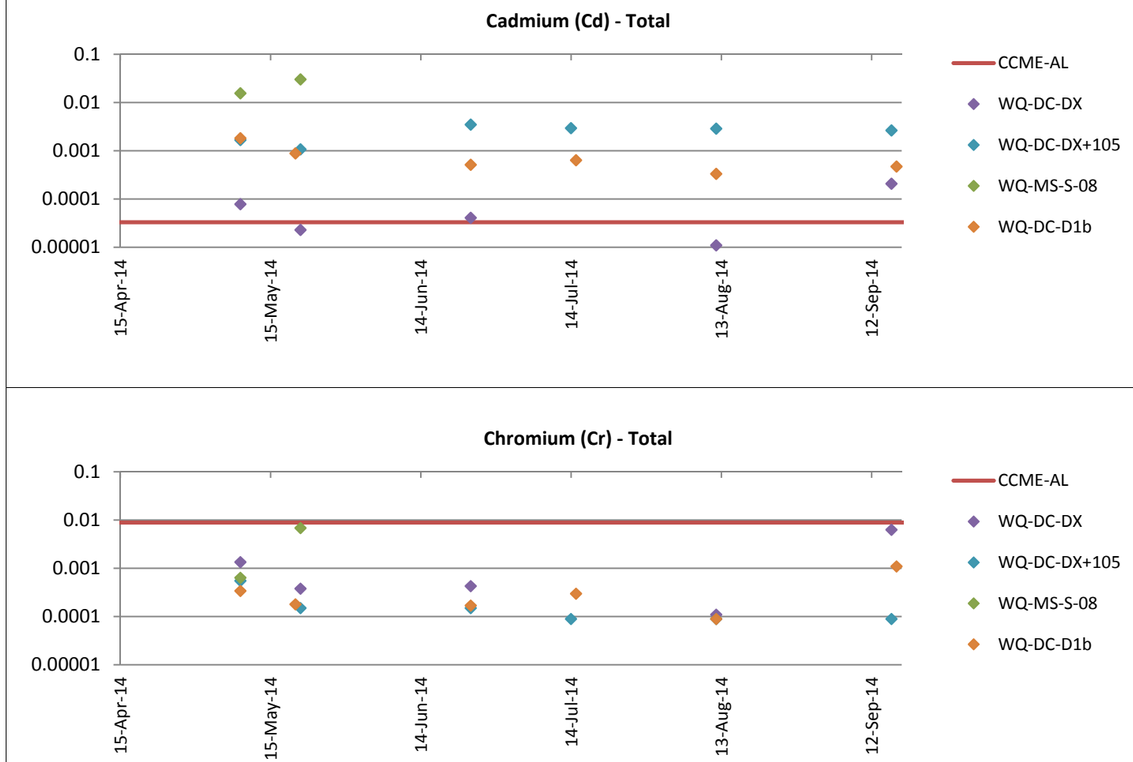
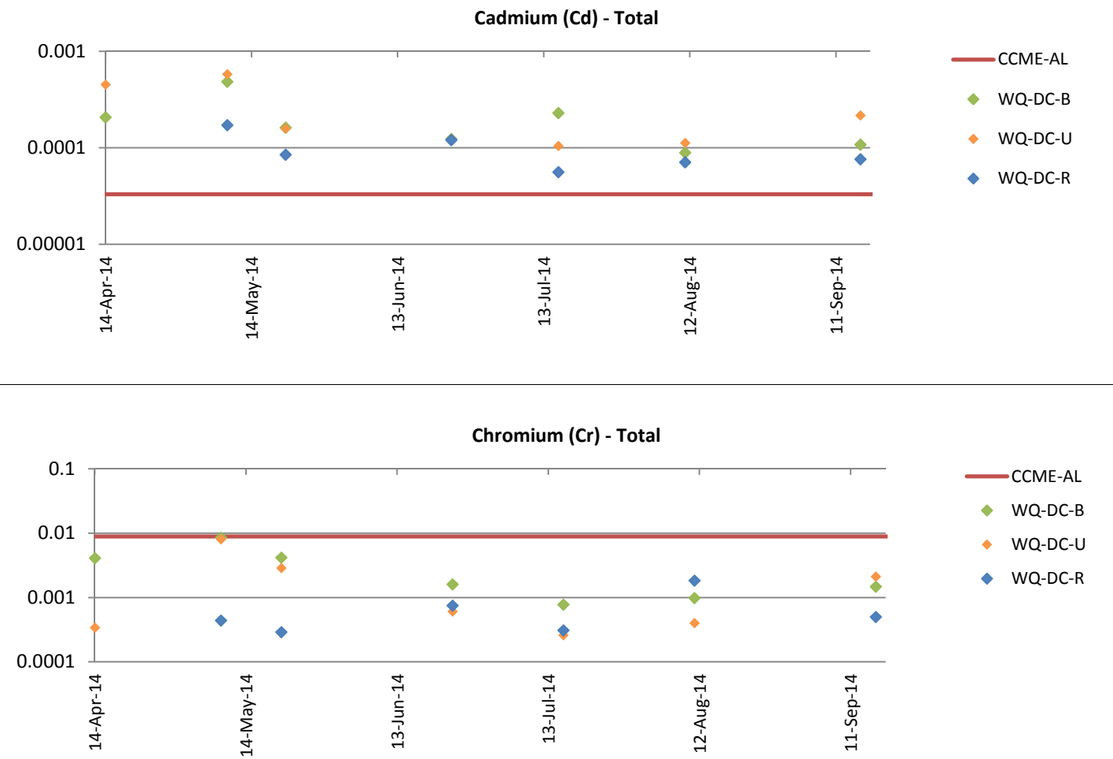
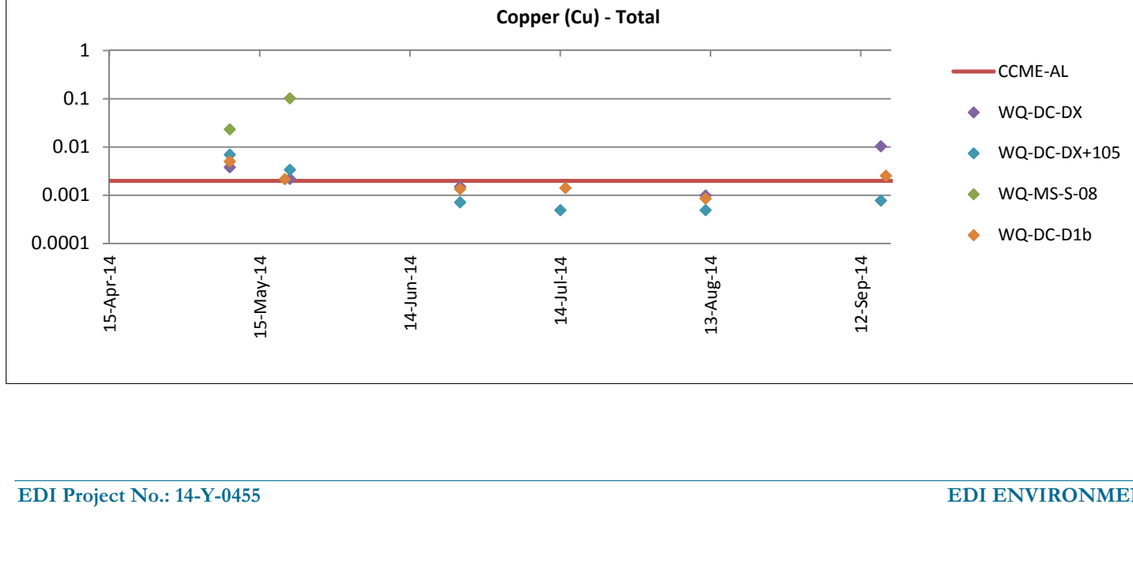


Figure E-2. Concentrations of cadmium, chromium and copper for sites on Dome Creek (Left column: Upper Dome Creek sites, Right Column: Lower Dome Creek sites).







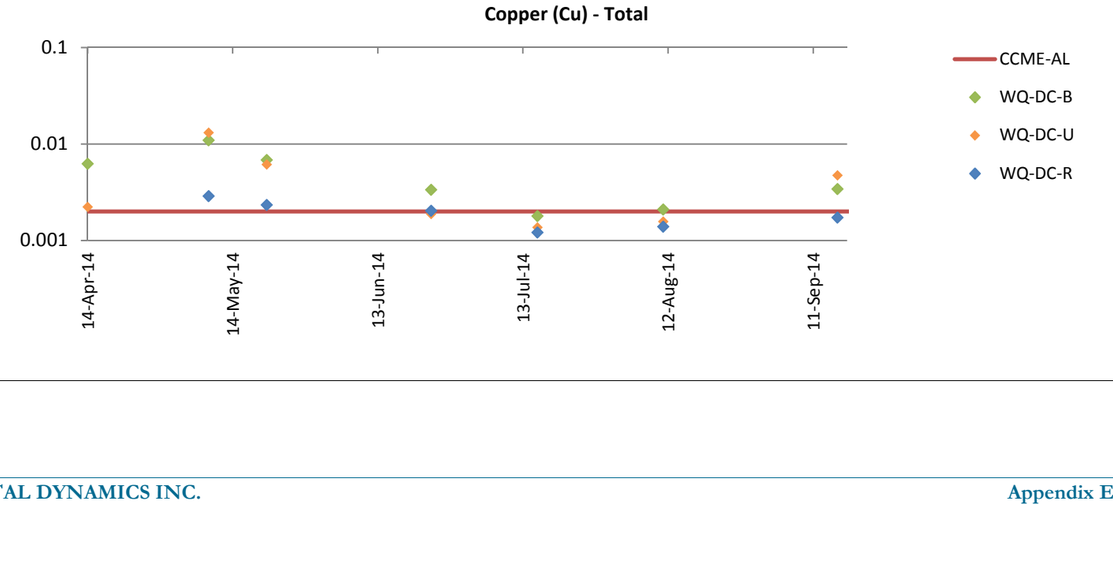


Figure E-3. Concentrations of iron, lead, and manganese for sites on Dome Creek (Left column: Upper Dome Creek sites, Right Column: Lower Dome Creek sites).

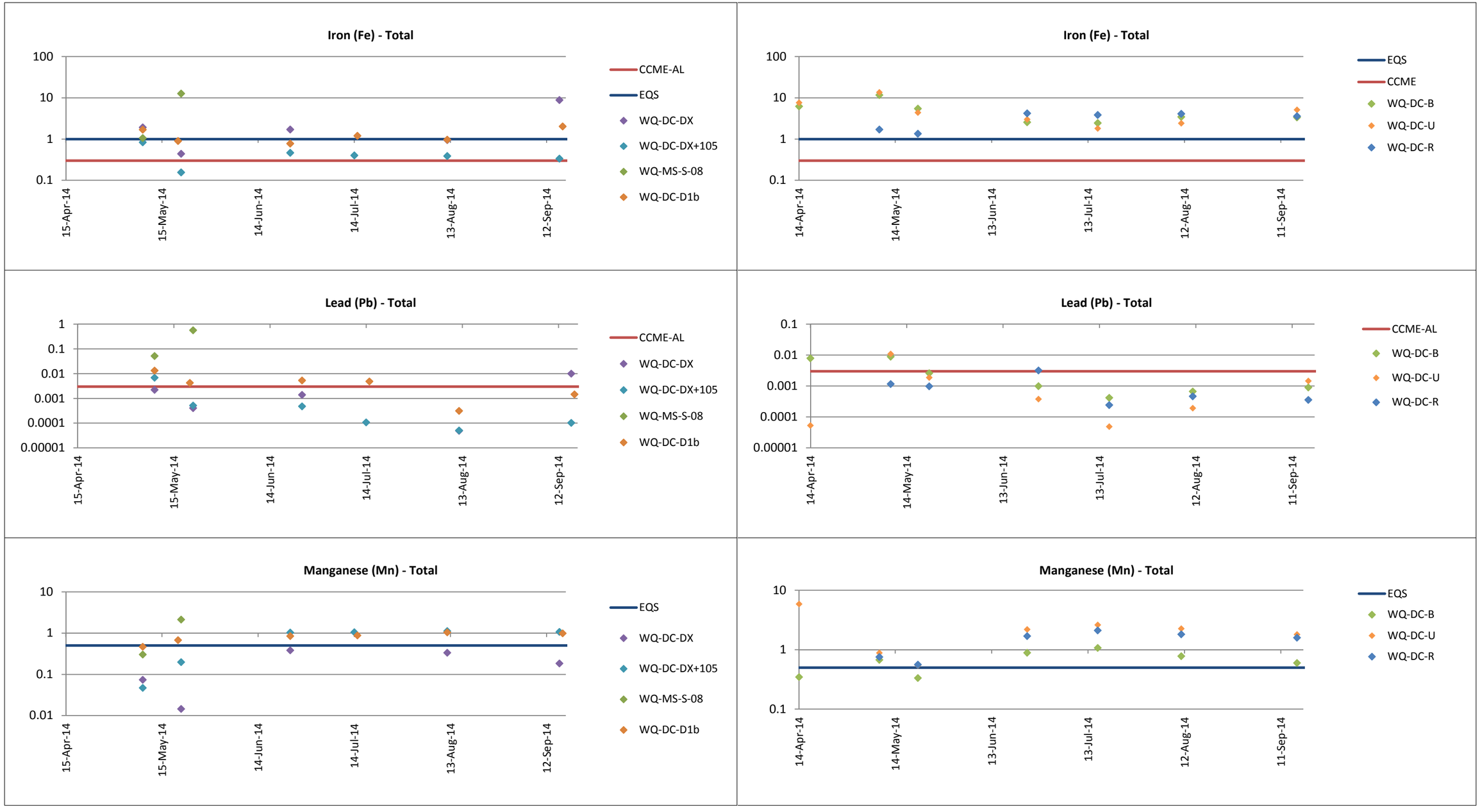


Figure E-4. Concentrations of mercury, silver and zinc for sites on Dome Creek (Left column: Upper Dome Creek sites, Right Column: Lower Dome Creek sites).

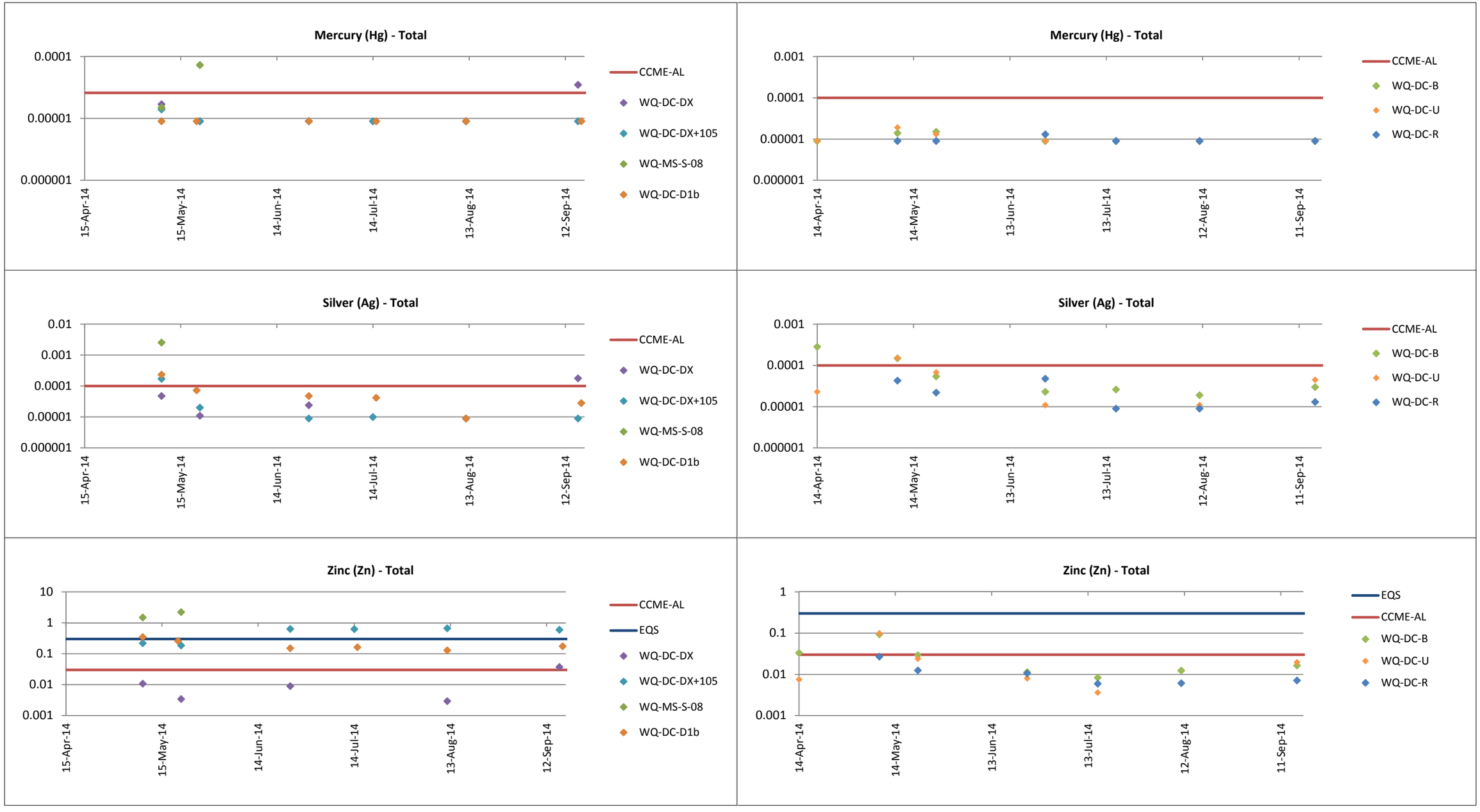


Figure E-5. Concentrations of total suspended solids for sites on Dome Creek (Left column: Upper Dome Creek sites, Right Column: Lower Dome Creek sites).

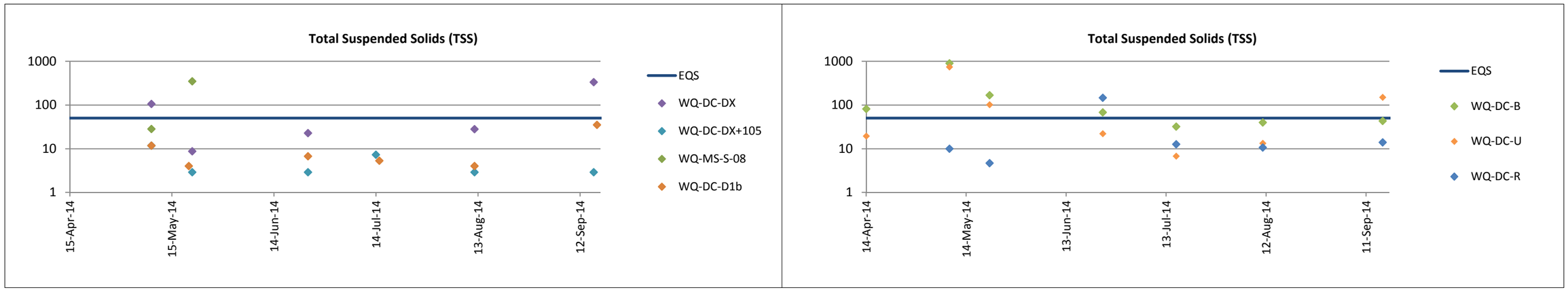


Figure E-6. Concentrations of total suspended solids for the tailings pond and seepage site (left column) and the Brown-McDade pit lake site (right column).

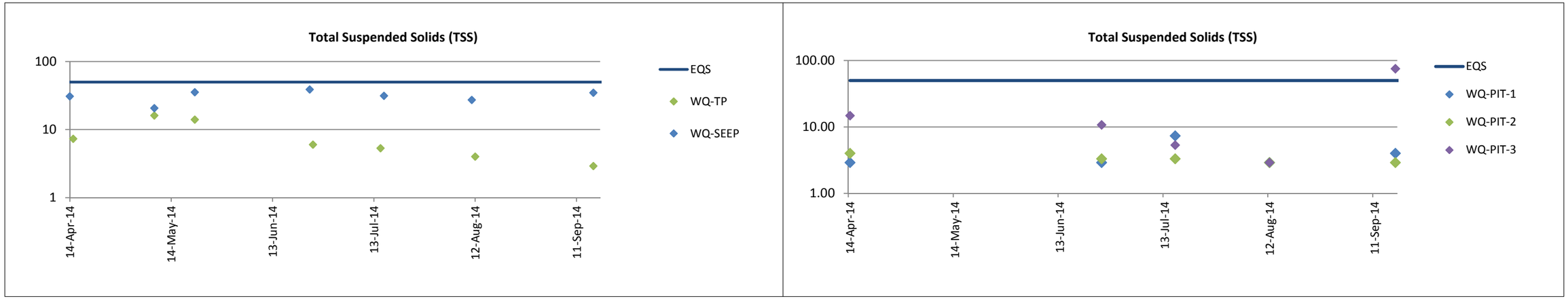


Figure E-7. Concentrations of aluminum, arsenic and ammonia for the tailings pond and seepage site (left column) and the Brown-McDade pit lake site (right column).

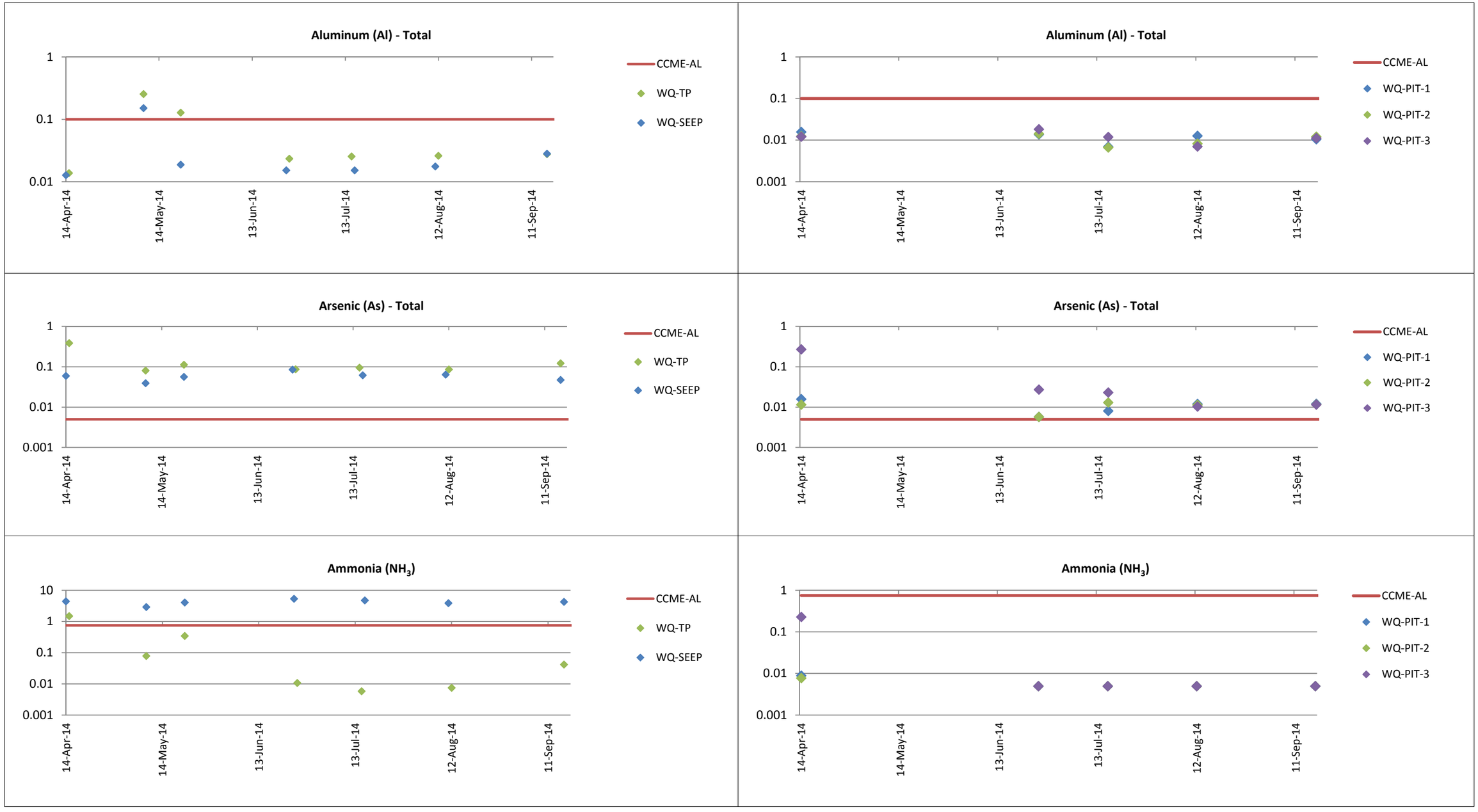


Figure E-8. Concentrations of cadmium, chromium and copper for the tailings pond and seepage site (left column) and the Brown-McDade pit lake site (right column).

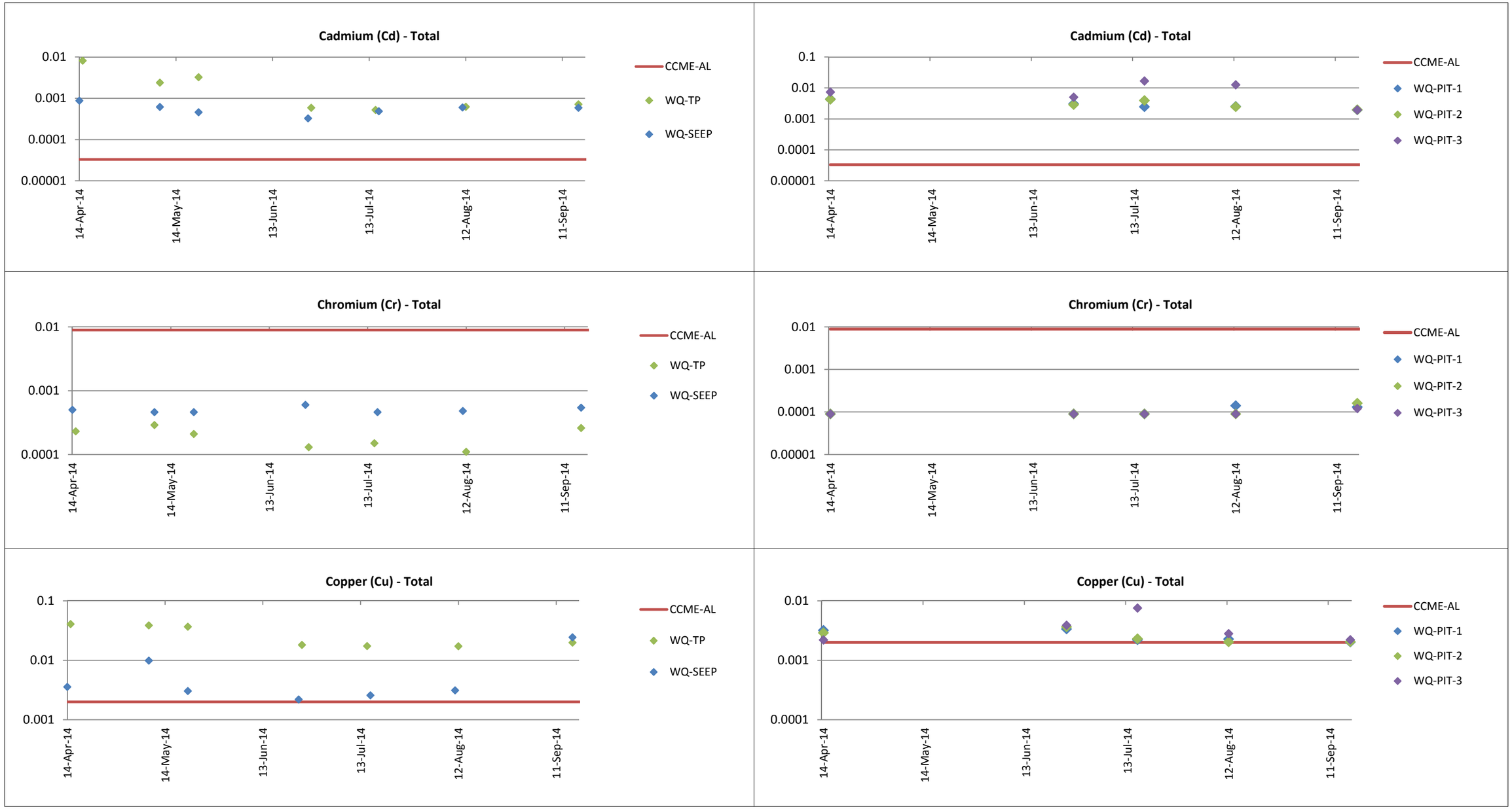


Figure E-9. Concentrations of iron, lead and manganese for the tailings pond and seepage site (left column) and the Brown-McDade pit lake site (right column).

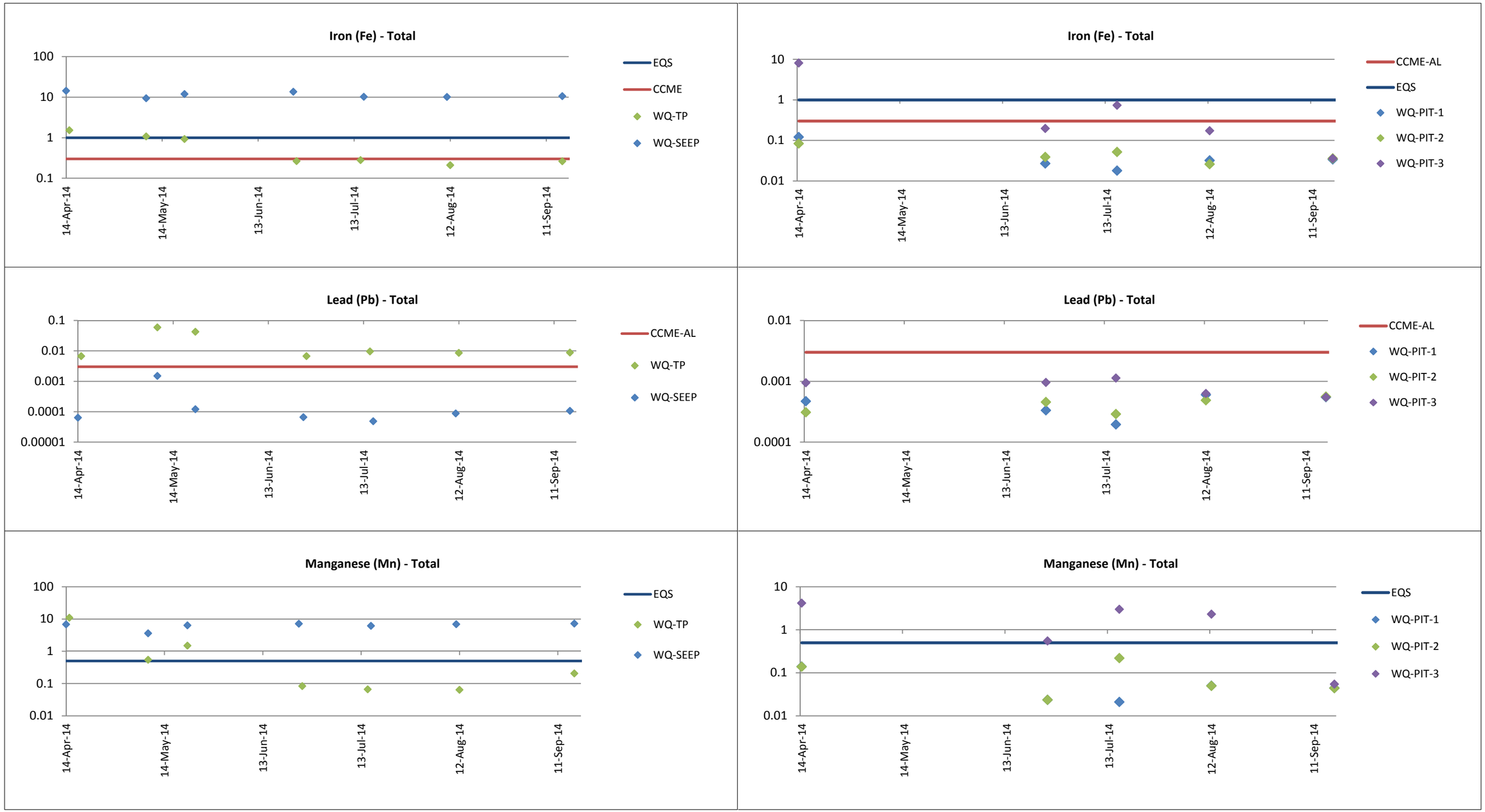
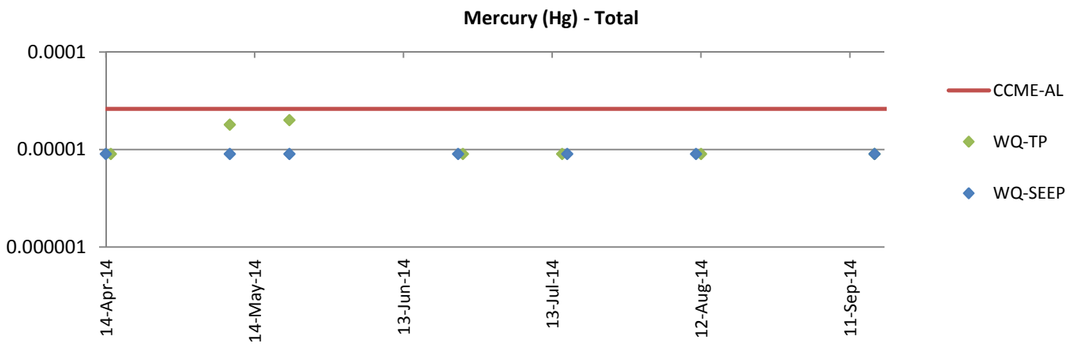
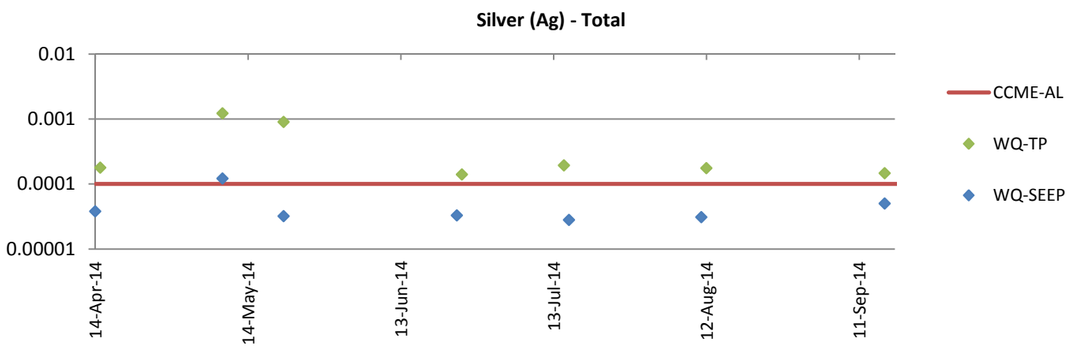
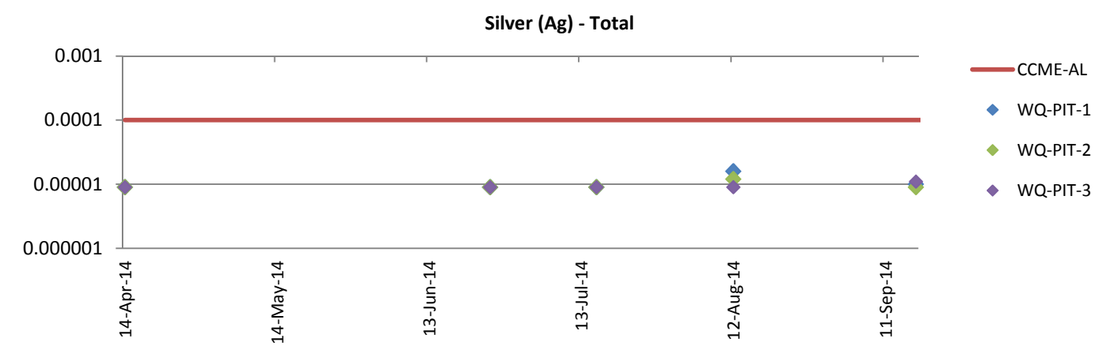


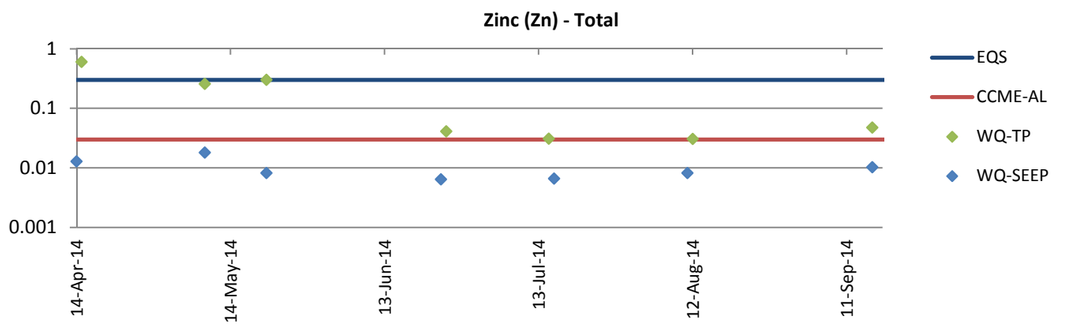
Figure E-10. Concentrations of mercury, silver and zinc for the tailings pond and seepage site (left column) and the Brown-McDade pit lake site (right column).



n/a







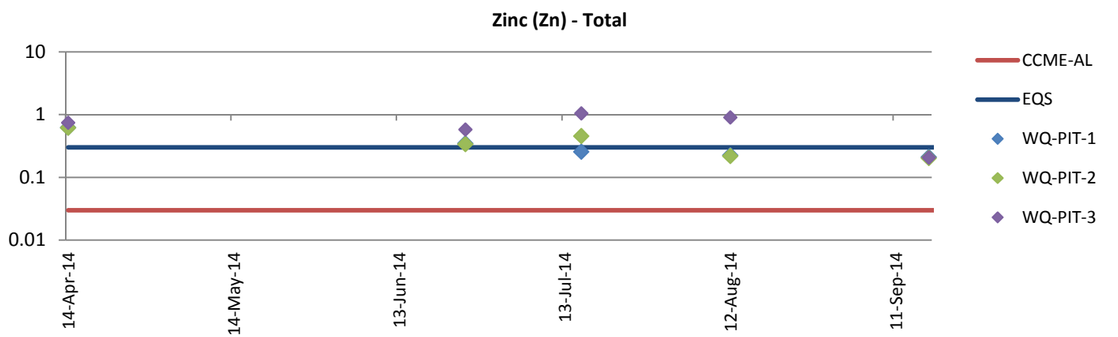
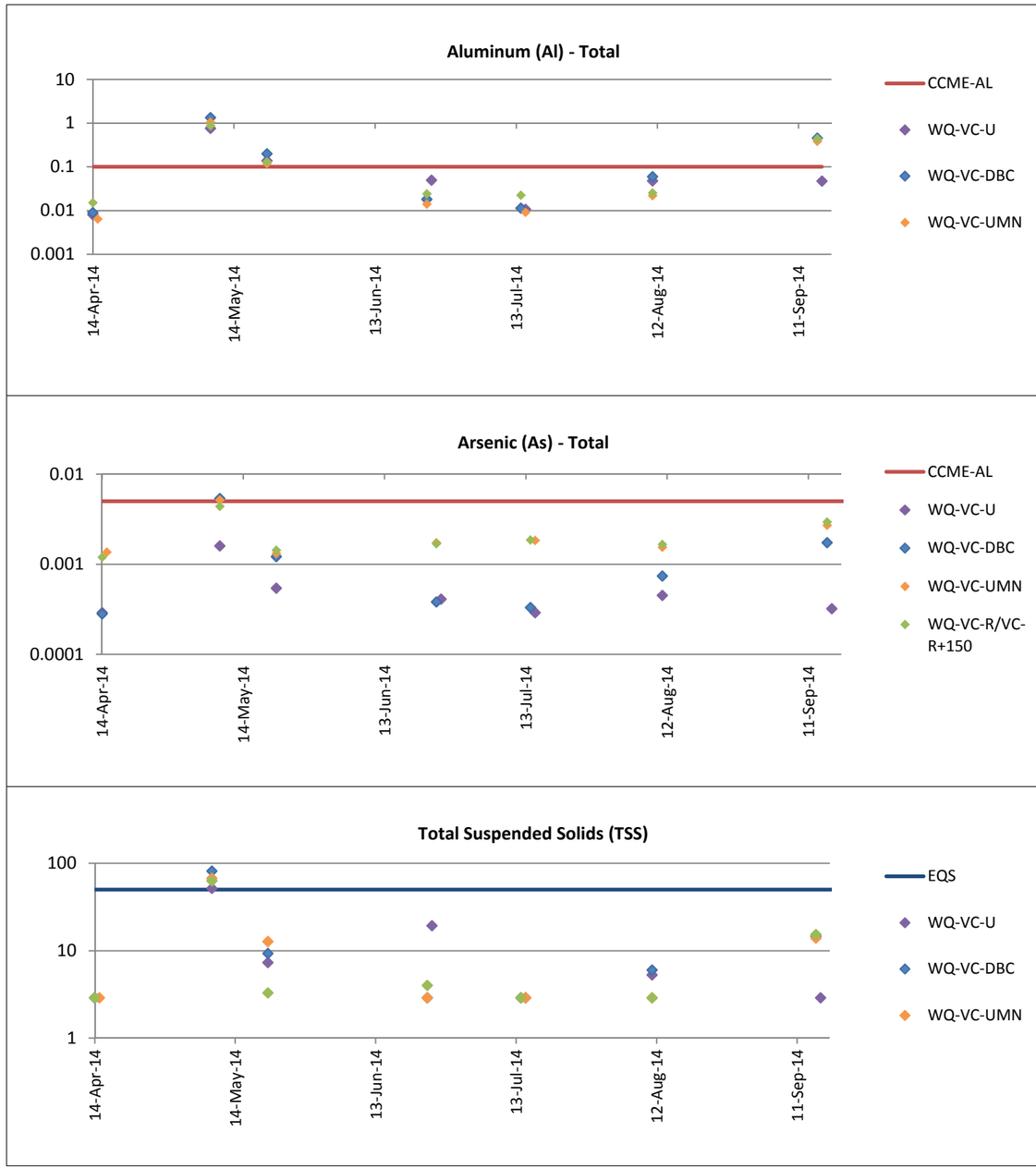


Figure E-11. Concentrations of aluminum, arsenic and total suspended solids for sites on Victoria Creek (left column) and sites on Back and Pony creeks (right column).



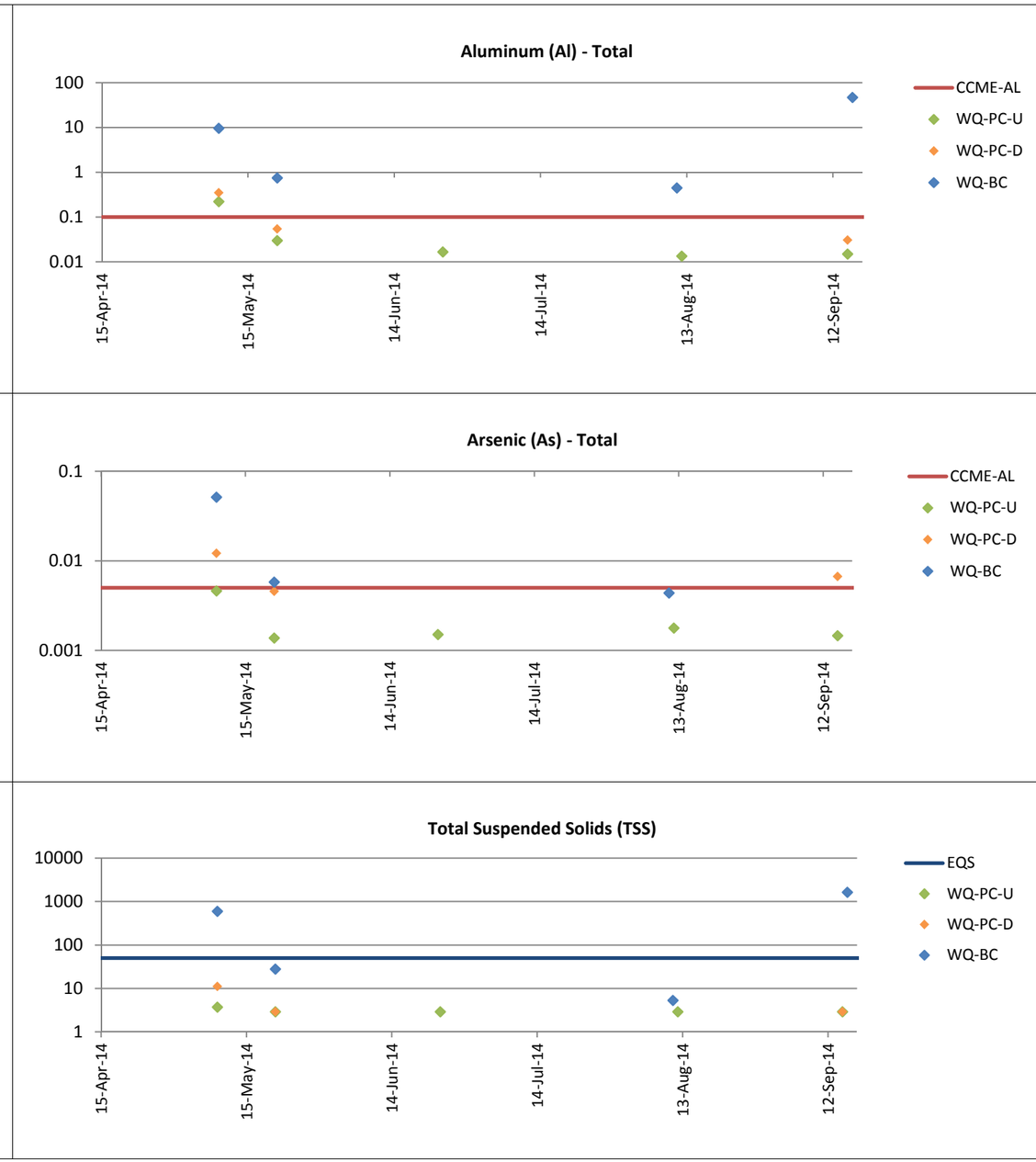


Figure E-12. Concentrations of cadmium, chromium and copper for sites on Victoria Creek (left column) and sites on Back and Pony creeks (right column).

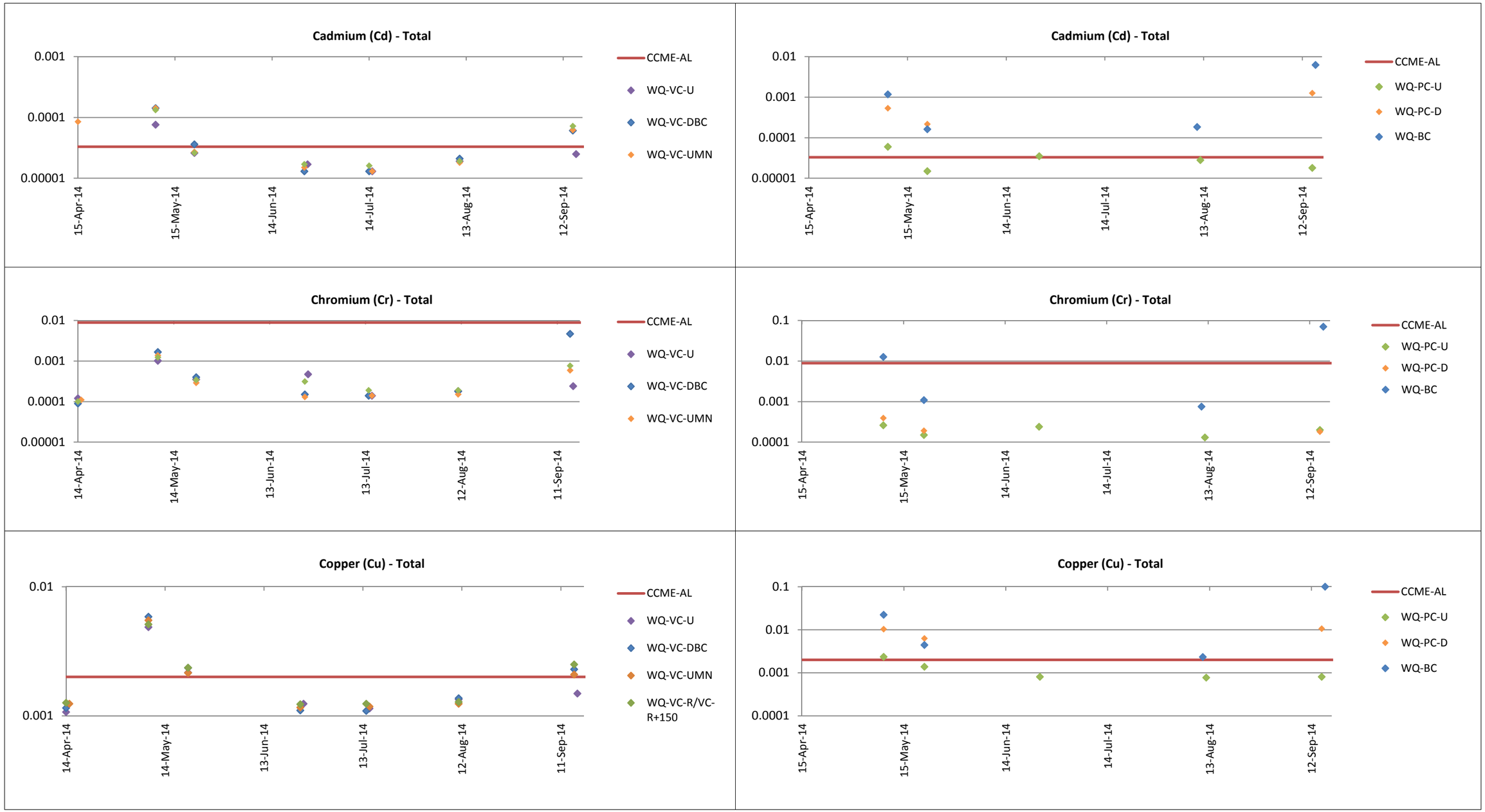


Figure E-13. Concentrations of iron, lead and manganese for sites on Victoria Creek (left column) and sites on Back and Pony creeks (right column).

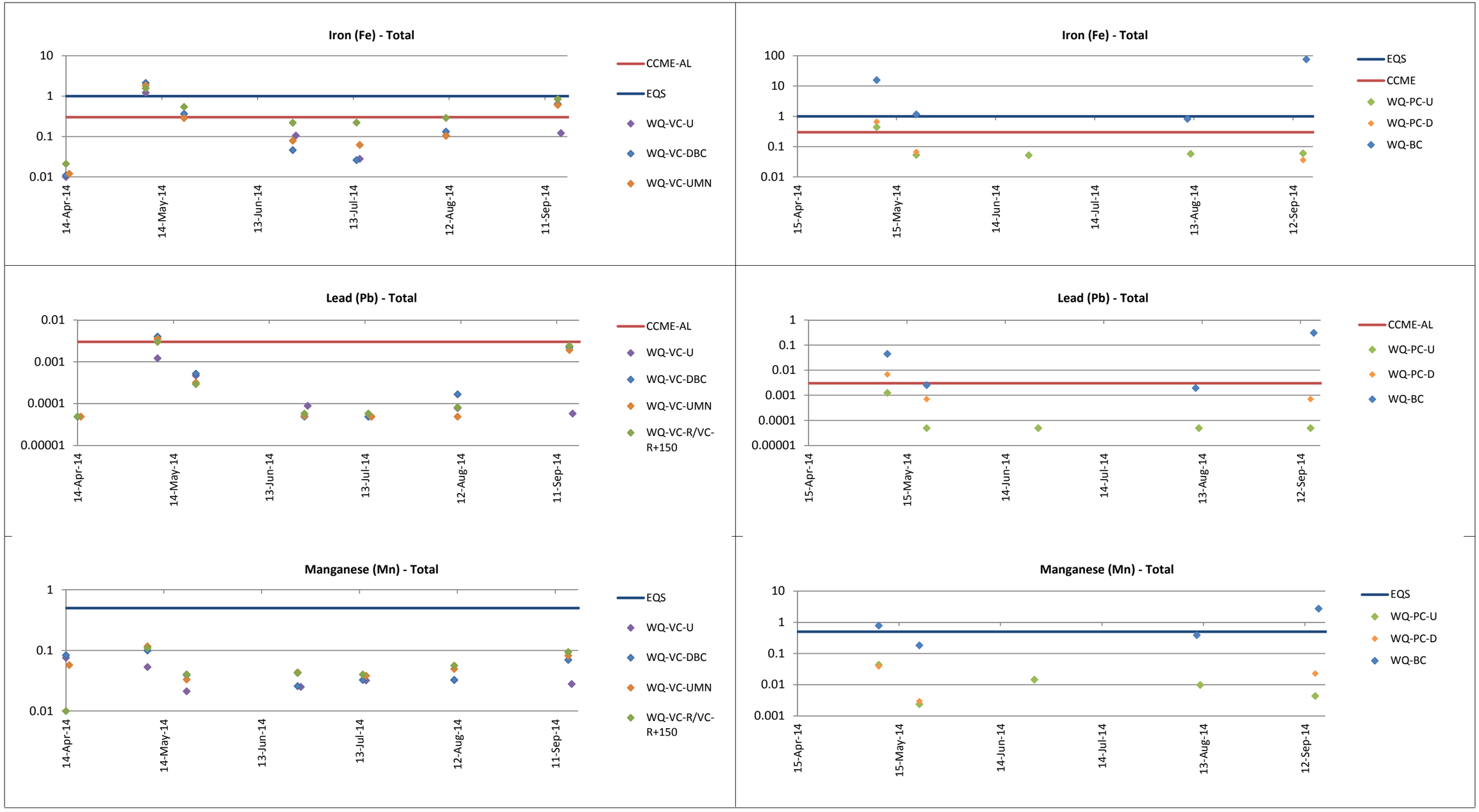


Figure E-14. Concentrations of mercury, silver and zinc for sites on Victoria Creek (left column) and sites on Back and Pony creeks (right column).

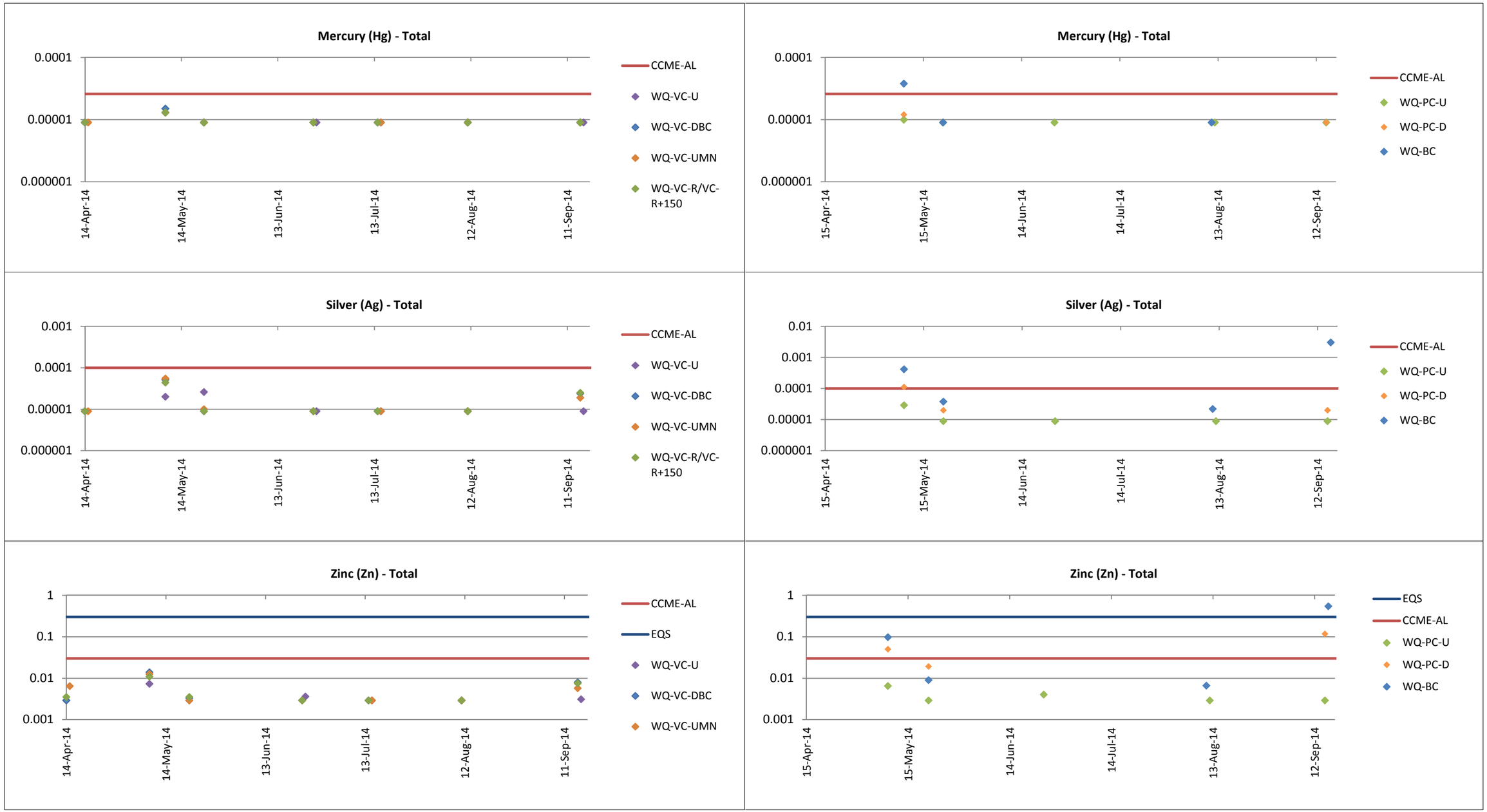


Figure E-15. Concentrations of aluminum, arsenic, total suspended solids, cadmium, chromium and copper for the regular seep sites.

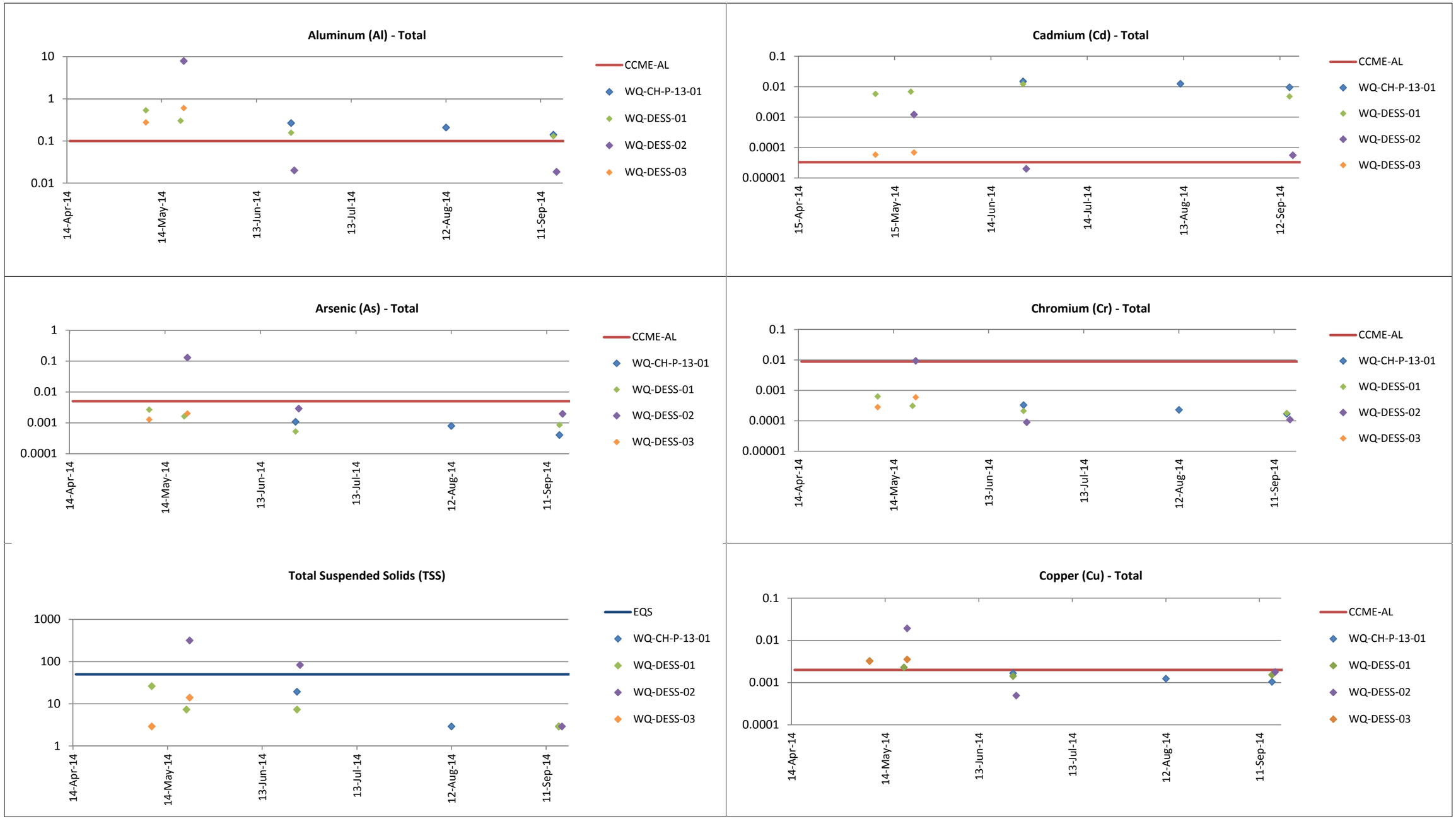


Figure E-16. Concentrations of iron, lead, manganese, mercury, silver and zinc for the regular seep sites.

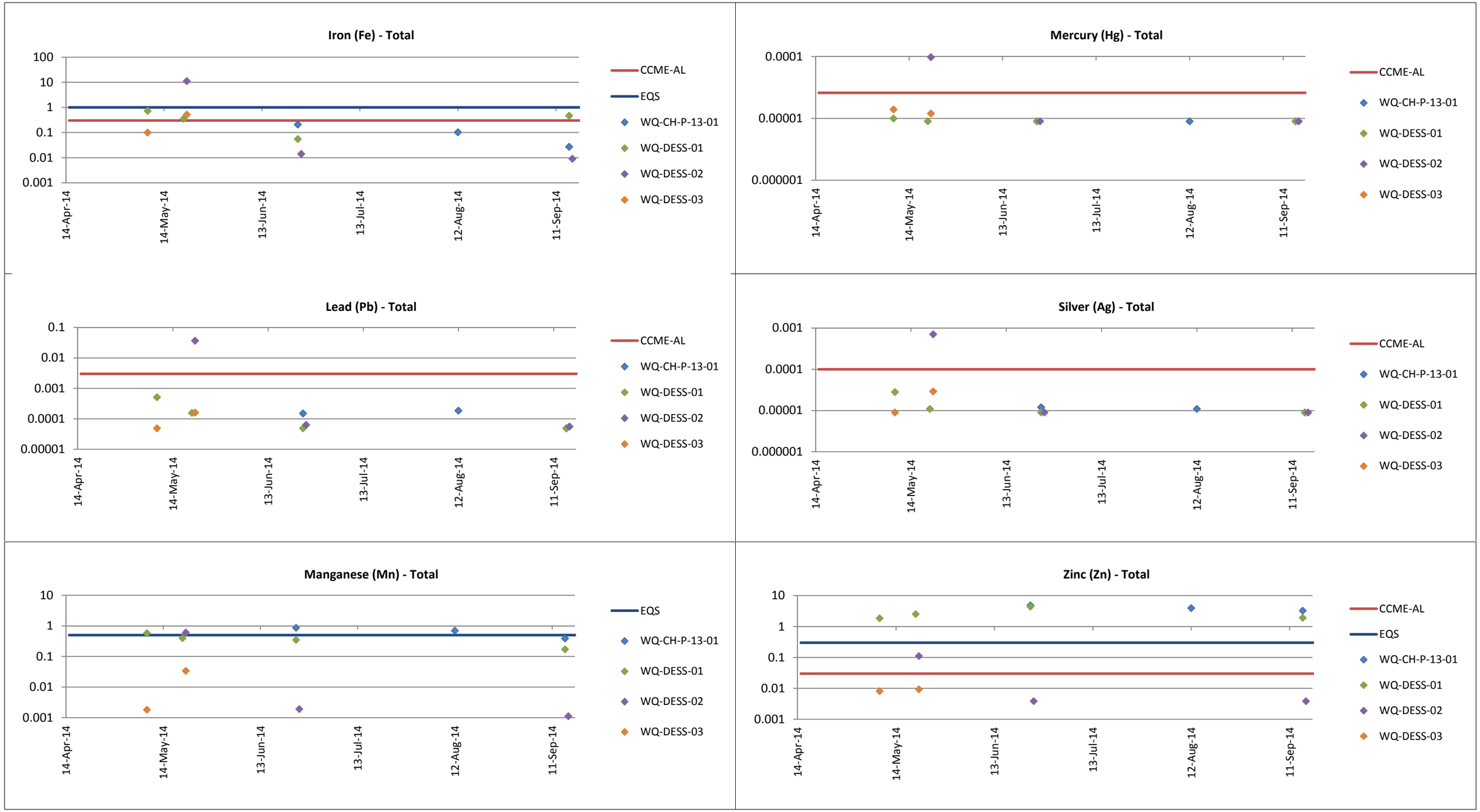


Table E-1. Summary of Water Quality Results for the July 14-16, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0352-140615-005 WQ-DC-B 15-Jul-14	0352-140615-003 WQ-DC-B-r 15-Jul-14	QA/QC WQ-DC-B Replicate Sample	0352-140615-002 WQ-DC-R 15-Jul-14	0352-140615-013 WQ-DC-D1b 15-Jul-14	0352-140615-015 WQ-DC-U 15-Jul-14	0352-140615-012 WQ-DC-DX+105 15-Jul-14	0352-140615-006 WQ-VC-U 15-Jul-14	0352-140615-004 WQ-VC-DBC 15-Jul-14
Temperature (in-situ)	°C	-	-	-	12.8	-	-	7.8	8.7	13.2	1.1	5.5	5.3
Specific Conductivity (in-situ)	µS/cm	-	-	-	1469	-	-	1314	1628	1505	1201	199	200.7
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	7.91	-	-	7.6	7.9	7.91	7.01	7.57	7.55
Turbidity (In-situ)	NTU	-	-	-	28.3	-	-	39.6	9.35	12.25	2.53	0.79	0.8
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	1450	1450	0%	1300	1490	1480	1180	200	200
Hardness (as CaCO3)	mg/L	-	-	0.5	941	945	0%	776	985	930	732	111	99.3
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	8.32	8.34	0%	8.23	8.23	8.16	8.19	8.14	8.18
Total Suspended Solids	mg/L	-	50	3	32	30.7	4%	12.7	5.3	6.7	7.3	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	1150	1150	0%	1000	1190	1190	873	112	108
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	224	222	1%	192	266	220	280	89.7	89.7
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	2.5	5	100%	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	227	227	0%	192	266	220	280	89.7	89.7
Ammonia, Total (as N)	mg/L	0.75	-	0.005	0.138	0.141	2%	***0.847***	0.171	***1.64***	0.0198	<0.0050	<0.0050
Chloride (Cl)	mg/L	120	-	0.5	<5.0	<5.0	<DL	<5.0	<5.0	<5.0	<5.0	<0.50	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	<0.20	<0.20	<DL	<0.20	<0.20	<0.20	***0.24***	0.049	0.049
Nitrate (as N)	mg/L	13	-	0.005	0.081	0.097	20%	0.569	0.137	0.329	<0.050	0.0512	0.0521
Nitrite (as N)	mg/L	0.06	-	0.001	<0.010	<0.010	<DL	0.02	<0.010	0.029	<0.010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	681	683	0%	587	687	701	441	16.3	16.5
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	<DL	<0.0050	<0.0050	0.0069	<0.0050	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	<2.0	<0.20	<DL	0.45	<0.20	1.2	<0.20	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	<DL	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	***0.436***	***0.372***	15%	0.0352	0.0503	0.0377	0.0139	0.0107	0.0113
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.0018	0.00164	9%	0.00099	0.00774	0.00096	0.0113	0.00013	0.00014
Arsenic (As)-Total	mg/L	0.005	-	0.0001	***0.00987***	***0.00952***	4%	***0.0233***	***0.0376***	***0.0221***	***0.0261***	0.00029	0.00033
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0857	0.0893	4%	0.0659	0.024	0.0644	0.0122	0.0668	0.0683
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	0.024	0.018	25%	0.03	0.056	0.043	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	***0.000229***	***0.000215***	6%	***0.000056***	***0.000637***	***0.000104***	***0.00294***	0.000013	0.000013
Calcium (Ca)-Total	mg/L	-	-	0.05	216	215	0%	190	217	233	183	25.2	25.1
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00078	0.00081	4%	0.00031	0.0003	0.00026	<0.00010	0.00014	0.00014
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.00078	0.00074	5%	0.00236	0.00032	0.00297	0.00049	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.00179	***0.00301***	68%	0.00121	0.00142	0.00137	<0.00050	0.00114	0.00109
Iron (Fe)-Total	mg/L	0.3	1	0.01	***2.44***	***2.42***	1%	***3.85***	***1.2***	***1.8***	***0.403***	0.028	0.026
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.000418	0.000373	11%	0.000244	***0.00485***	<0.000050	0.000107	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	0.00452	0.00433	4%	0.00152	0.00766	0.00215	0.00869	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	0.1	98.6	96.3	2%	61.3	99.1	76.2	60	8.68	8.63
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	***1.07***	***1.09***	2%	***2.11***	***0.873***	***2.6***	***1.05***	0.032	0.0325
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000463	0.000429	7%	0.000466	0.000256	0.000595	0.000358	0.00043	0.000419
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	0.00138	0.00138	0%	0.00143	0.00071	0.00137	0.00148	<0.00050	<0.00050
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	3.42	3.35	2%	3.46	4.3	4.43	3.5	0.66	0.62
Selenium (Se)-Total	mg/L	0.001	-	0.0001	0.0001	<0.00010	<DL	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	6.64	6.59	1%	5.44	5.91	5.73	6.37	5.73	5.63
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	0.000026	0.000016	38%	<0.000010	0.000042	<0.000010	0.00001	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	10.2	9.56	6%	17.1	7.25	20.7	4.94	2.41	2.44
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.757	0.709	6%	0.627	0.575	0.772	0.425	0.289	0.285
Sulfur (S)-Total	mg/L	-	-	0.5	234	230	2%	178	211	220	136	5.48	5.22
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	0.00001	<DL	<0.000010	0.000033	<0.000010	0.000097	<0.000010	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	0.018	0.016	11%	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00343	0.00317	8%	0.00181	0.003	0.00243	0.00461	0.000536	0.00055
Vanadium (V)-Total	mg/L	-	-	0.001	0.002	0.0019	5%	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	0.0083	0.0082	1%	0.0059	***0.162***	0.0036	***0.624***	<0.0030	<0.0030
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	-	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0116	0.0139	20%	0.008	0.0025	0.0118	<0.0010	0.0082	0.0082
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00165	0.00164	1%	0.00093	0.00677	0.00093	0.0113	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.00497	***0.00502***	1%	***0.0105***	***0.0179***	***0.0163***	***0.00899***	0.0003	0.00029

Table E-1. Summary of Water Quality Results for the July 14-16, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0352-140615-005 WQ-DC-B 15-Jul-14	0352-140615-003 WQ-DC-B-r 15-Jul-14	QA/QC WQ-DC-B Replicate Sample	0352-140615-002 WQ-DC-R 15-Jul-14	0352-140615-013 WQ-DC-D1b 15-Jul-14	0352-140615-015 WQ-DC-U 15-Jul-14	0352-140615-012 WQ-DC-DX+105 15-Jul-14	0352-140615-006 WQ-VC-U 15-Jul-14	0352-140615-004 WQ-VC-DBC 15-Jul-14
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0511	0.0512	0%	0.0635	0.0229	0.0642	0.0126	0.0714	0.0707
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	0.021	0.022	5%	0.028	0.052	0.039	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	***0.000037***	***0.000035***	5%	***0.000038***	***0.000301***	***0.000068***	***0.00125***	0.000013	0.000013
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	216	217	0%	203	225	245	190	28.9	25.4
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00010	<0.00010	<DL	0.00016	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00059	0.00061	3%	0.00239	0.00027	0.00292	0.0005	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00056	0.0005	11%	0.00075	0.0007	0.00096	<0.00020	0.00103	0.00097
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	0.086	0.08	7%	***1.08***	0.137	***0.427***	0.22	0.023	0.018
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	<0.000050	<0.000050	<DL	<0.000050	0.000053	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.00407	0.00408	0%	0.0016	0.00756	0.00209	0.0088	<0.00050	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	97.4	97.7	0%	65.4	103	77.5	62.2	9.35	8.72
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	1.06	1.07	1%	2.15	0.817	2.57	1.08	0.0319	0.0322
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	0.00043	0.000423	2%	0.000471	0.00024	0.000583	0.000347	0.000413	0.000424
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	0.001	0.001	0%	0.0013	0.00063	0.00133	0.00147	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	3.28	3.29	0%	3.7	4.42	4.59	3.65	0.72	0.63
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	5.83	5.92	2%	5.54	5.93	5.9	6.56	6.13	5.64
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	10.3	10.4	1%	18.3	7.19	20.6	5.22	2.51	2.53
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.74	0.741	0%	0.663	0.582	0.772	0.433	0.291	0.284
Sulfur (S)-Dissolved	mg/L	-	-	0.5	231	230	0%	184	216	220	138	5.74	5.4
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<DL	<0.000010	0.00003	<0.000010	0.000086	<0.000010	<0.000010
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.00321	0.00329	2%	0.00186	0.00308	0.0025	0.00452	0.000498	0.000523
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	<DL	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0024	0.0025	4%	0.0028	***0.131***	0.0015	***0.641***	0.0011	<0.0010

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Notes:

* WQ-PW is a drinking water sample and the analysis package has different detection limits than all other samples. The results are also compard to the *Guidelines for Canadian Drinking Water Quality* (Health Canada, October 2014) versus the CCME or MN Effluent Quality Standards.
* *The QA/QC Field Blank dissolved metals sample had managanese and zinc concentrations above detection limits, suggesting some contamination during sampling. This is a very rare occurrence. The contamination may have been introduced through windy conditions at the time of sampling or through incomplete tightening of the lid. Data from samples collected at the same time as the field blank sample were reviewed and data was found to be within expected ranges.

Table E-1. Summary of Water Quality Results for the July 14-16, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0352-140615-001 WQ-VC-UMN 15-Jul-14	0352-140615-008 WQ-VC-R 15-Jul-14	0352-140615-007 WQ-VC-R-r 15-Jul-14	QA/QC WQ-VC-R Replicate Sample	0352-140616-028 WQ-SEEP 16-Jul-14	0352-140615-016 WQ-TP 15-Jul-14	0352-140616-024 WQ-PIT-1 (Top) 16-Jul-14 (Depth:	0352-140616-025 WQ-PIT-2 (Middle) 16-Jul-14 (Depth:	0352-140616-026 WQ-PIT-3 (Bottom) 16-Jul-14 (Depth:
Temperature (in-situ)	°C	-	-	-	5.9	6.0	-	-	7.9	18.0	12.8	12.2	7.5
Specific Conductivity (in-situ)	µS/cm	-	-	-	266.5	253	-	-	1749	1212	1564	1722	2655
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	7.63	7.79	-	-	6.91	8.41	7.83	6.89	6.9
Turbidity (In-situ)	NTU	-	-	-	1.29	1.61	-	-	27.3	6.22	1.36	1.88	6.98
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	260	254	251	1%	1680	1180	1530	2160	2560
Hardness (as CaCO3)	mg/L	-	-	0.5	137	130	134	3%	1010	700	1020	1580	1860
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	8.04	8.19	8.19	0%	7.62	8.04	8.14	7.9	7.71
Total Suspended Solids	mg/L	-	50	3	<3.0	<3.0	<3.0	<DL	31.3	5.3	7.3	3.3	5.3
Total Dissolved Solids	mg/L	-	-	1	152	145	147	1%	1380	943	1270	2010	2420
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	90	88.9	88.3	1%	231	64.8	146	202	211
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	90	88.9	88.3	1%	231	64.8	146	202	211
Ammonia, Total (as N)	mg/L	0.75	-	0.005	0.0054	0.0056	0.0055	2%	***4.74***	0.0058	<0.0050	<0.0050	<0.0050
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<0.50	<DL	<5.0	<5.0	<5.0	<10	<10
Fluoride (F)	mg/L	0.12	-	0.02	0.052	0.053	0.053	0%	<0.20	***0.29***	***0.3***	<0.40	<0.40
Nitrate (as N)	mg/L	13	-	0.005	0.0681	0.0628	0.0621	1%	0.412	<0.050	<0.050	<0.10	<0.10
Nitrite (as N)	mg/L	0.06	-	0.001	0.0014	0.0011	0.001	9%	0.034	<0.010	<0.010	<0.020	<0.020
Sulfate (SO4)	mg/L	-	-	0.5	45.8	42.1	42.1	0%	812	625	810	1310	1610
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	<0.0050	<DL	0.012	<0.0050	-	-	-
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	<0.0050	<DL	0.053	<0.0050	-	-	-
Cyanate	mg/L	-	-	0.2	<0.20	0.47	<0.20	<DL	<2.0	<0.20	-	-	-
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	<0.50	<DL	3.99	<0.50	-	-	-
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0091	0.0224	0.0142	37%	0.0152	0.0253	0.0069	0.0066	0.0118
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00041	0.00039	0.00041	5%	0.00048	0.0419	0.00338	0.00092	0.00104
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00183	0.00185	0.00182	2%	***0.0618***	***0.0948***	***0.00804***	***0.013***	***0.0229***
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0683	0.068	0.0674	1%	0.0657	0.00794	0.019	0.0103	0.00945
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010
Boron (B)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<DL	0.07	0.078	<0.010	<0.020	<0.020
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	0.000013	0.000016	0.000016	0%	***0.000486***	***0.000521***	***0.00245***	***0.00395***	***0.0168***
Calcium (Ca)-Total	mg/L	-	-	0.05	36.2	33.9	33.9	0%	282	196	282	433	531
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00014	0.00019	0.00018	5%	0.00046	0.00015	<0.00010	<0.00020	<0.00020
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.0001	0.00013	0.00012	8%	0.0076	0.00049	<0.00010	<0.00020	0.00216
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.00118	0.00124	0.00118	5%	***0.00258***	***0.0174***	***0.00221***	***0.0023***	***0.0076***
Iron (Fe)-Total	mg/L	0.3	1	0.01	0.062	0.221	0.184	17%	***10.2***	0.28	0.018	0.052	***0.736***
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	<0.000050	0.000058	<0.000050	<DL	<0.000050	***0.00969***	0.000195	0.00029	0.00113
Lithium (Li)-Total	mg/L	-	-	0.0005	<0.00050	0.00063	0.00064	2%	0.00077	0.00766	0.00766	0.0097	0.0111
Magnesium (Mg)-Total	mg/L	-	-	0.1	11.5	10.8	10.8	0%	60.2	43.7	77.1	116	135
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.0382	0.0402	0.033	18%	***6.14***	0.0665	0.021	0.22	***3.0***
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000417	0.000407	0.000411	1%	0.000903	0.00162	0.000171	<0.00010	<0.00010
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	<0.00050	<0.00050	<0.00050	<DL	0.00258	0.00051	<0.00050	<0.0010	0.0024
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.89	0.86	0.86	0%	6.37	11.8	3.39	4.73	5.93
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.00010	<DL	0.00019	<0.00010	<0.00010	<0.00020	<0.00020
Silicon (Si)-Total	mg/L	-	-	0.05	5.85	5.96	5.9	1%	6.92	0.113	2.81	3.19	3.08
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000010	<0.000010	<0.000010	<DL	0.000028	***0.000193***	<0.000010	<0.000020	<0.000020
Sodium (Na)-Total	mg/L	-	-	0.05	3.54	3.4	3.48	2%	35.7	15.8	10.3	14.3	15.7
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.307	0.283	0.285	1%	0.862	0.545	0.899	1.28	1.36
Sulfur (S)-Total	mg/L	-	-	0.5	15	13.8	13.6	1%	251	195	273	428	532
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<DL	<0.000010	0.000236	0.000069	0.000095	0.000265
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.020	<0.020
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.000572	0.000539	0.000567	5%	0.0022	0.000959	0.0036	0.00448	0.00412
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<DL	0.0017	<0.0010	<0.0010	<0.0020	<0.0020
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	<0.0030	<0.0030	<DL	0.0066	***0.031***	***0.256***	***0.454***	***1.05***
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	FIELD	-	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0062	0.0098	0.0092	6%	0.0095	0.0069	0.0016	<0.0020	<0.0020
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00038	0.00034	0.00035	3%	0.00046	0.0373	0.00331	0.00083	0.00099
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.00158	0.00163	0.00164	1%	***0.0499***	***0.0687***	***0.0075***	***0.0086***	0.00238

Table E-1. Summary of Water Quality Results for the July 14-16, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0352-140615-001 WQ-VC-UMN 15-Jul-14	0352-140615-008 WQ-VC-R 15-Jul-14	0352-140615-007 WQ-VC-R-r 15-Jul-14	QA/QC WQ-VC-R Replicate Sample	0352-140616-028 WQ-SEEP 16-Jul-14	0352-140615-016 WQ-TP 15-Jul-14	0352-140616-024 WQ-PIT-1 (Top) 16-Jul-14 (Depth:	0352-140616-025 WQ-PIT-2 (Middle) 16-Jul-14 (Depth:	0352-140616-026 WQ-PIT-3 (Bottom) 16-Jul-14 (Depth:
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.07	0.0692	0.0698	1%	0.0678	0.0076	0.0191	0.0101	0.00918
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<DL	0.068	0.079	<0.010	<0.020	<0.020
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	0.000013	0.000012	0.000011	8%	***0.000388***	***0.000226***	***0.00234***	***0.00387***	***0.0165***
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	36.1	34.1	35.3	4%	300	205	281	441	533
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00010	0.0001	0.0001	0%	0.00037	<0.00010	<0.00010	<0.00020	<0.00020
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00011	0.00012	0.00012	0%	0.00775	0.00045	<0.00010	<0.00020	0.00209
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00102	0.00108	0.0011	2%	0.00158	***0.0119***	0.00179	0.0018	***0.00459***
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	0.016	0.118	0.126	7%	***8.58***	0.021	<0.010	<0.010	0.036
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	<0.000050	<0.000050	<0.000050	<DL	<0.000050	0.00065	<0.000050	<0.00010	<0.00010
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	<0.00050	0.0006	0.00062	3%	0.00067	0.00705	0.00731	0.0096	0.0109
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	11.4	10.9	11.2	3%	63.1	45.8	77.6	117	127
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.0376	0.0316	0.0321	2%	6.26	0.0123	0.0191	0.213	2.97
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	0.000404	0.000411	0.000391	5%	0.000874	0.00149	0.000159	<0.00010	<0.00010
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.00050	<0.00050	<0.00050	<DL	0.00251	<0.00050	<0.00050	<0.0010	0.0018
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	0.84	0.82	0.88	7%	6.83	12.2	3.32	4.87	5.84
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.00010	<DL	0.00016	<0.00010	<0.00010	<0.00020	<0.00020
Silicon (Si)-Dissolved	mg/L	-	-	0.05	5.77	5.93	6.1	3%	7.26	0.08	2.78	3.21	3.02
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	<0.000010	<DL	<0.000010	0.000033	<0.000010	<0.000020	<0.000020
Sodium (Na)-Dissolved	mg/L	-	-	0.05	3.68	3.5	3.54	1%	36.2	15.7	9.81	13.8	15.1
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.303	0.28	0.288	3%	0.868	0.518	0.895	1.29	1.35
Sulfur (S)-Dissolved	mg/L	-	-	0.5	14.5	13.8	13.9	1%	251	198	270	426	497
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<DL	<0.000010	0.000221	0.000065	0.000091	0.00026
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.020	<0.020
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.000547	0.000533	0.000533	0%	0.00227	0.000865	0.00353	0.00442	0.00407
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<DL	0.0014	<0.0010	<0.0010	<0.0020	<0.0020
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.001	0.0014	<0.0010	<DL	0.0064	0.012	***0.249***	***0.444***	***1.05***

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Table E-1. Summary of Water Quality Results for the July 14-16, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0352-140616-027 WQ-PW * 16-Jul-14	0352-140616-FIELD-BLANK FIELD BLANK ** 16-Jul-14	0352-140616-TRAVEL-BLANK TRAVEL BLANK n/a
Temperature (in-situ)	°C	-	-	-	1.8	-	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	369	-	-
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	7.56	-	-
Turbidity (In-situ)	NTU	-	-	-	0.43	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-
Colour, True	CU	15	-	5	<5.0	-	-
Conductivity	µS/cm	-	-	2	358	<2.0	<2.0
Hardness (as CaCO3)	mg/L	-	-	0.5	198	<0.50	-
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	8.17	***6.01***	***5.64***
Total Suspended Solids	mg/L	-	50	3	-	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	231	<1.0	<1.0
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	172	<1.0	<1.0
Ammonia, Total (as N)	mg/L	0.75	-	0.005	-	<0.0050	<0.0050
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	0.1	<0.020	<0.020
Nitrate (as N)	mg/L	13	-	0.005	0.135	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	32.2	<0.50	<0.50
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	-	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	-	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	-	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	-	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	<0.010	<0.0030	<0.0030
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	<0.00050	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.0004	<0.00010	<0.00010
Barium (Ba)-Total	mg/L	-	1	0.00005	0.083	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	-	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.10	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	<0.00020	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	0.05	46.2	<0.050	<0.050
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	<0.0020	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	<0.0010	<0.00050	<0.00050
Iron (Fe)-Total	mg/L	0.3	1	0.01	<0.030	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.00058	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	-	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	0.1	20	<0.10	<0.10
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	<0.0020	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.00020	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	-	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	-	<0.00050	<0.00050
Phosphorus (P)-Total	mg/L	-	-	0.05	-	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.9	<0.10	<0.10
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.0010	<0.00010	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	-	<0.050	<0.050
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	-	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	4.9	<0.050	<0.050
Strontium (Sr)-Total	mg/L	-	-	0.0002	-	<0.00020	<0.00020
Sulfur (S)-Total	mg/L	-	-	0.5	-	<0.50	<0.50
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	-	<0.000010	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	-	<0.010	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00187	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	-	-	0.001	-	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.050	<0.0030	<0.0030
Dissolved Metals Filtration Location		-	-	n/a	-	FIELD	-
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	-	<0.0010	-
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	-	<0.00010	-

Table E-1. Summary of Water Quality Results for the July 14-16, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0352-140616-027 WQ-PW * 16-Jul-14	0352-140616-FIELD-BLANK FIELD BLANK ** 16-Jul-14	0352-140616-TRAVEL-BLANK TRAVEL BLANK n/a
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	-	<0.000050	-
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	-	<0.00050	-
Boron (B)-Dissolved	mg/L	-	-	0.01	-	<0.010	-
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	-	<0.000010	-
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	-	<0.050	-
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	-	<0.00010	-
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	-	<0.00020	-
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	-	<0.010	-
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	-	<0.000050	-
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	-	<0.00050	-
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	-	<0.10	-
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	-	0.000138	-
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	-	<0.000010	-
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	-	<0.000050	-
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	-	<0.00050	-
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	-	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	0.1	-	<0.10	-
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	-	<0.00010	-
Silicon (Si)-Dissolved	mg/L	-	-	0.05	-	<0.050	-
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	-	<0.000010	-
Sodium (Na)-Dissolved	mg/L	-	-	0.05	-	<0.050	-
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	-	<0.00020	-
Sulfur (S)-Dissolved	mg/L	-	-	0.5	-	<0.50	-
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	-	<0.000010	-
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	-	<0.010	-
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	-	<0.000010	-
Vanadium (V)-Dissolved	mg/L	-	-	0.001	-	<0.0010	-
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	-	0.0214	-

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Table E-2. Summary of Water Quality Results for the August 11-13, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140812-020 WQ-SEEP 12-Aug-14	0455-140812-019 WQ-TP 12-Aug-14	0455-140812-015 WQ-DC-DX+105 12-Aug-14	0455-140812-014 WQ-DC-DX+105-r 12-Aug-14	QA/QC WQ-DC-DX+105 Replicate Sample	0455-140812-017 WQ-DC-B * 12-Aug-14	0455-140812-005 WQ-DC-U 12-Aug-14	0455-140812-010 WQ-DC-DX 12-Aug-14	0455-140812-016 WQ-DC-D1b 12-Aug-14	0455-140811-003 WQ-DC-R 11-Aug-14	0455-140812-012 WQ-CH-P-13-01 12-Aug-14
Temperature (in-situ)	°C	-	-	-	9.9	15.1	1.2	-	-	11.7	7.7	4.6	9.7	11.0	2.9
Specific Conductivity (in-situ)	µS/cm	-	-	-	1730	1260	1170	-	-	130.4	1363	517.9	1518	1255	1523
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	6.75	8.27	7.28	-	-	7.8	7.67	7.61	7.98	7.52	7.36
Turbidity (In-situ)	NTU	-	-	-	38.00	4.97	1.51	-	-	27.3	16.75	3.51	8	40.9	0.5
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	1790	1280	1230	1210	2%	1200	1400	514	1410	1220	1640
Hardness (as CaCO3)	mg/L	-	-	0.5	955	708	710	676	5%	792	807	269	944	648	1050
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	6.85	8.00	7.25	7.1	2%	7.68	7.84	7.35	7.79	7.62	***6.44***
Total Suspended Solids	mg/L	-	50	3	27.3	4	<3.0	4	<DL	40	13.3	28	4	10.7	<3.0
Total Dissolved Solids	mg/L	-	-	1	1540	1100	949	1030	9%	1140	1180	366	1350	1010	1500
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	246	68.7	287	285	1%	207	211	78.9	265	177	7.1
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	5	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	246	68.7	287	285	1%	207	211	78.9	270	177	7.1
Ammonia, Total (as N)	mg/L	0.75	-	0.005	***3.86***	0.0074	0.0221	0.0208	6%	0.147	***1.11***	0.0079	0.193	0.607	0.0082
Chloride (Cl)	mg/L	120	-	0.5	<5.0	<5.0	<5.0	<5.0	<DL	<5.0	<5.0	<0.50	<5.0	<5.0	<5.0
Fluoride (F)	mg/L	0.12	-	0.02	<0.20	<0.20	<0.20	<0.20	<DL	<0.20	<0.20	0.05	<0.20	<0.20	<0.20
Nitrate (as N)	mg/L	13	-	0.005	0.478	<0.050	<0.050	<0.050	<DL	0.067	0.251	0.0163	0.088	0.532	0.184
Nitrite (as N)	mg/L	0.06	-	0.001	0.025	<0.010	<0.010	<0.010	<DL	<0.010	0.013	<0.0010	<0.010	0.025	<0.010
Sulfate (SO4)	mg/L	-	-	0.5	806	669	434	434	0%	589	614	169	681	502	973
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	0.0107	<0.0050	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	0.0535	<0.0050	<0.0050	<0.0050	<DL	<0.0050	0.0097	<0.0050	<0.0050	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	4.08	<0.20	<0.20	<0.20	<DL	<0.20	1.23	<0.20	0.29	0.25	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	3.56	<0.50	<0.50	<0.50	<DL	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0175	0.026	<0.0030	0.0038	<DL	***0.454***	***0.131***	0.0107	0.0109	0.0588	***0.207***
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00048	0.0384	0.0102	0.0107	5%	0.00167	0.00106	0.00109	0.00598	0.00099	0.00015
Arsenic (As)-Total	mg/L	0.005	-	0.0001	***0.0636***	***0.0862***	***0.025***	***0.0262***	5%	***0.0141***	***0.0205***	***0.00771***	***0.0244***	***0.0254***	0.00079
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0717	0.00952	0.0125	0.013	4%	0.0614	0.059	0.0462	0.0268	0.0675	0.0112
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	0.071	0.079	<0.010	<0.010	<DL	0.022	0.034	<0.010	0.054	0.031	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	***0.000599***	***0.000622***	***0.00288***	***0.00293***	2%	***0.000089***	***0.000112***	0.000011	***0.000331***	***0.000071***	***0.0125***
Calcium (Ca)-Total	mg/L	-	-	0.05	279	211	185	184	1%	173	202	77.9	219	170	233
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00048	0.00011	<0.00010	<0.00010	<DL	0.00098	0.0004	0.00011	<0.00010	0.00184	0.00023
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.008	0.0004	0.00055	0.00056	2%	0.00075	0.00233	0.00037	0.00031	0.00206	0.00016
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	***0.00311***	***0.0173***	<0.00050	<0.00050	<DL	***0.0021***	0.00157	0.00098	0.00085	0.00139	0.00123
Iron (Fe)-Total	mg/L	0.3	1	0.01	***10.1***	0.21	***0.387***	***0.397***	3%	***3.46***	***2.4***	***0.945***	***0.966***	***4.09***	0.102
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.000088	***0.00858***	0.000051	0.000127	149%	0.000666	0.000193	<0.000050	0.000314	0.000466	0.000186
Lithium (Li)-Total	mg/L	-	-	0.0005	0.001	0.00664	0.00752	0.00838	11%	0.00314	0.00193	<0.00050	0.00707	0.00161	0.00224
Magnesium (Mg)-Total	mg/L	-	-	0.1	61.4	45.5	60	60.8	1%	77.6	69.2	20.6	98.6	54.4	87.9
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	***6.95***	0.064	***1.12***	***1.2***	7%	***0.776***	***2.25***	0.333	***1.04***	***1.81***	***0.698***
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000997	0.00152	0.000378	0.000408	8%	0.000417	0.000543	0.000059	0.000239	0.000825	<0.000050
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	0.00301	0.00055	0.00145	0.0015	3%	0.00142	0.00148	<0.00050	0.00062	0.00143	0.00856
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	6.36	13.1	3.64	3.75	3%	2.96	3.85	5.42	4.4	3.2	0.44
Selenium (Se)-Total	mg/L	0.001	-	0.0001	0.0002	<0.00010	<0.00010	<0.00010	<DL	0.00011	0.00011	<0.00010	<0.00010	0.00011	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	7.13	0.24	6.39	6.52	2%	6.47	6.16	4.85	5.99	6.12	7.77
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	0.000031	***0.000176***	<0.000010	<0.000010	<DL	0.000019	0.000011	<0.000010	<0.000010	<0.000010	0.000011
Sodium (Na)-Total	mg/L	-	-	0.05	35	16.3	5.01	5.17	3%	8.22	16	4.67	7.19	14.9	6.48
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.867	0.555	0.436	0.457	5%	0.587	0.653	0.235	0.591	0.574	0.565
Sulfur (S)-Total	mg/L	-	-	0.5	266	224	143	148	3%	186	202	64.7	228	166	312
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	0.00024	0.000093	0.000097	4%	<0.000010	<0.000010	<0.000010	0.000028	<0.000010	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<DL	0.022	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00227	0.00095	0.00468	0.00469	0%	0.00238	0.00209	0.000112	0.00281	0.00154	<0.000010
Vanadium (V)-Total	mg/L	-	-	0.001	0.0018	<0.0010	<0.0010	<0.0010	<DL	0.0026	0.0011	<0.0010	<0.0010	0.0012	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	0.0082	***0.0306***	***0.662***	***0.667***	1%	0.0123	0.006	<0.0030	***0.128***	0.0061	***3.98***
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	FIELD	FIELD	-	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.008	0.0089	0.0017	<0.0010	<DL	0.0093	0.0125	0.0071	0.004	0.0106	0.0774
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00043	0.0376	0.0104	0.00982	6%	0.00154	0.00098	0.00106	0.00591	0.00089	0.0001
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.0416	0.062	0.0111	0.0105	5%	0.0054	0.0142	0.00783	0.0172	0.00789	0.00043
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0687	0.00868	0.0126	0.0122	3%	0.0516	0.0549	0.0458	0.026	0.0618	0.00941
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	0.063	0.066	<0.010	<0.010	<DL	0.019	0.03	<0.010	0.047	0.026	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	***0.000475***	***0.000454***	***0.00122***	***0.00125***	2%	0.000021	***0.000066***	<0.000010	***0.000124***	***0.000034***	***0.00787***
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	280	210	186	176	5%	184	207	75.2	218	170	273

Table E-2. Summary of Water Quality Results for the August 11-13, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140812-020 WQ-SEEP 12-Aug-14	0455-140812-019 WQ-TP 12-Aug-14	0455-140812-015 WQ-DC-DX+105 12-Aug-14	0455-140812-014 WQ-DC-DX+105-r 12-Aug-14	QA/QC WQ-DC-DX+105 Replicate Sample	0455-140812-017 WQ-DC-B * 12-Aug-14	0455-140812-005 WQ-DC-U 12-Aug-14	0455-140812-010 WQ-DC-DX 12-Aug-14	0455-140812-016 WQ-DC-D1b 12-Aug-14	0455-140811-003 WQ-DC-R 11-Aug-14	0455-140812-012 WQ-CH-P-13-01 12-Aug-14
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	0.00033	<0.00010	<0.00010	<0.00010	<DL	<0.00010	0.00011	<0.00010	<0.00010	0.00014	<0.00010
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00762	0.00035	0.00054	0.00052	4%	0.00051	0.00226	0.0004	0.00031	0.00195	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00194	***0.013***	<0.00020	<0.00020	<DL	0.00053	0.00098	0.00086	0.00067	0.0009	0.00082
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	***6.36***	0.014	0.264	0.252	5%	0.149	***0.583***	***0.888***	0.131	***0.639***	0.023
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	<0.000050	0.000406	<0.000050	<0.000050	<DL	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.00086	0.00536	0.00761	0.00789	4%	0.00301	0.00199	<0.00050	0.00692	0.00152	0.00163
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	62.1	44.8	59.5	57.8	3%	80.8	70.3	19.6	97	54.1	89.8
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	6.69	0.045	1.11	1.12	1%	0.783	2.24	0.397	1.04	1.73	0.303
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	0.000912	0.0014	0.000349	0.000354	1%	0.000373	0.000496	0.000061	0.000238	0.000422	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	0.00288	<0.00050	0.00156	0.0014	10%	0.0009	0.00122	<0.00050	0.00067	0.00121	0.00598
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	6.34	12.9	3.63	3.54	2%	3.05	3.94	5.24	4.3	3.16	0.5
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	0.00019	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	7.04	0.204	6.44	6.19	4%	6.01	6.06	4.69	5.85	5.77	7.4
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	0.000022	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	33.7	15.2	5	4.88	2%	8.5	15.9	4.39	7.28	14.5	6.63
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.845	0.545	0.434	0.414	5%	0.605	0.66	0.223	0.579	0.557	0.626
Sulfur (S)-Dissolved	mg/L	-	-	0.5	261	218	140	139	1%	192	202	61.8	221	163	339
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	0.000225	0.00009	0.000085	6%	<0.000010	<0.000010	<0.000010	0.000026	<0.000010	<0.000010
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.0022	0.000898	0.0045	0.0044	2%	0.00239	0.00202	0.000095	0.00275	0.00146	<0.000010
Vanadium (V)-Dissolved	mg/L	-	-	0.001	0.0012	<0.0010	<0.0010	<0.0010	<DL	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0079	0.0171	***0.672***	***0.635***	6%	0.003	0.0024	<0.0010	***0.112***	0.0025	***2.75***

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Notes:
* WQ-DC-B sample for dissolved mercury analysis was not submitted in glass container with HCl preservative. Result may be biased for dissolved Hg.
** The QA/QC Travel Blank sample had an ammonia concentration above the detection limit. This can occur to the NH3 sample when the lab supplied travel blank samples are somewhat older. We do not suspect contamination from travel.
*** WQ-PW is a drinking water sample and the analysis package has different detection limits than all other samples. The results are also compard to the *Guidelines for Canadian Drinking Water Quality* (Health Canada, October 2014) versus the CCME or MN Effluent Quality Standards.

Table E-2. Summary of Water Quality Results for the August 11-13, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140812-018 WQ-PC-U 12-Aug-14	0455-140811-001 WQ-BC 11-Aug-14	0455-140811-007 WQ-VC-R 11-Aug-14	0455-140811-008 WQ-VC-R-r 11-Aug-14	QA/QC WQ-VC-R Replicate Sample	0455-140811-002 WQ-VC-U 11-Aug-14	0455-140811-006 WQ-VC-DBC 11-Aug-14	0455-140811-004 WQ-VC-UMN 11-Aug-14	0455-140812-026 WQ-PIT-1 (Top) 12-Aug-14 (Depth: 0.3 m)	0455-140812-024 WQ-PIT-2 (Middle) 12-Aug-14 (Depth: 3.5 m)	0455-140812-025 WQ-PIT-3 (Bottom) 12-Aug-14 (Depth: 6.5 m)
Temperature (in-situ)	°C	-	-	-	7.4	12.6	9.6	-	-	10.4	10.7	10.9	12.4	12.6	11.6
Specific Conductivity (in-situ)	µS/cm	-	-	-	386	373.8	247.3	-	-	202.8	203.9	257.8	1647	1652	2531
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	7.71	7.87	7.06	-	-	7.51	7.59	7.63	7.91	7.97	6.46
Turbidity (In-situ)	NTU	-	-	-	0.76	4.73	1.71	-	-	0.59	1.90	0.89	1.19	1.05	2.88
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	11.11	8.71	3.19
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	398	363	238	243	2%	197	200	250	1660	1700	1840
Hardness (as CaCO3)	mg/L	-	-	0.5	200	181	119	118	1%	95.6	96.7	121	1010	1040	1710
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.33	7.74	7.77	7.76	0%	7.5	7.8	7.66	7.98	7.82	7.01
Total Suspended Solids	mg/L	-	50	3	<3.0	5.3	<3.0	<3.0	<DL	5.3	6	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	298	244	168	157	7%	129	134	161	1330	1350	2360
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	90.3	112	83.4	84.4	1%	83.4	84.2	87.7	159	158	211
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	90.3	112	83.4	84.4	1%	83.4	84.2	87.7	159	158	211
Ammonia, Total (as N)	mg/L	0.75	-	0.005	<0.0050	0.0056	0.0067	0.0077	15%	<0.0050	<0.0050	0.0072	<0.0050	<0.0050	<0.0050
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<0.50	<0.50	<DL	<0.50	<0.50	<0.50	<5.0	<5.0	<10
Fluoride (F)	mg/L	0.12	-	0.02	0.059	0.07	0.052	0.052	0%	0.05	0.05	0.051	<0.20	<0.20	<0.40
Nitrate (as N)	mg/L	13	-	0.005	<0.0050	<0.0050	0.0635	0.0634	0%	0.0404	0.0453	0.0613	<0.050	<0.050	0.18
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	0.0011	<0.0010	<DL	<0.0010	<0.0010	0.001	<0.010	<0.010	<0.020
Sulfate (SO4)	mg/L	-	-	0.5	108	68.5	34.5	34.5	0%	16.5	16.2	36.6	867	874	1600
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<0.0050	-	-	-
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<0.0050	-	-	-
Cyanate	mg/L	-	-	0.2	0.23	<0.20	<0.20	<0.20	<DL	<2.0	<0.20	<0.20	-	-	-
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	<0.50	<0.50	<DL	<0.50	<0.50	<0.50	-	-	-
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0134	***0.444***	0.0253	0.0267	6%	0.0479	0.0595	0.0217	0.0126	0.0082	0.007
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00043	0.00037	0.00026	0.00027	4%	0.00015	0.00015	0.00028	0.00358	0.00352	0.00086
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00177	0.00436	0.00165	0.00165	0%	0.00045	0.00074	0.00154	***0.0119***	***0.0113***	***0.0103***
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0522	0.071	0.0658	0.0658	0%	0.0682	0.0675	0.0668	0.0157	0.0159	0.011
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010
Boron (B)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	0.000028	***0.000184***	0.000019	0.000017	11%	0.000019	0.000021	0.000018	***0.00251***	***0.00247***	***0.0127***
Calcium (Ca)-Total	mg/L	-	-	0.05	59.3	49.9	30.9	31.5	2%	25.4	24.9	32.4	278	281	503
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00013	0.00075	0.00019	0.00019	0%	0.00018	0.00018	0.00015	0.00014	<0.00010	<0.00020
Cobalt (Co)-Total	mg/L	-	-	0.0001	<0.00010	0.00038	0.00014	0.00014	0%	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00188
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.00077	***0.00232***	0.00128	0.0013	2%	0.00134	0.00137	0.00124	***0.00227***	***0.00204***	***0.0028***
Iron (Fe)-Total	mg/L	0.3	1	0.01	0.058	***0.828***	0.288	0.274	5%	0.106	0.132	0.104	0.032	0.026	0.174
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	<0.000050	0.00195	0.000082	0.000055	33%	0.000078	0.000167	<0.000050	0.000602	0.000487	0.00063
Lithium (Li)-Total	mg/L	-	-	0.0005	0.00083	0.00115	0.0005	<0.00050	<DL	<0.00050	<0.00050	0.0006	0.00807	0.00807	0.0127
Magnesium (Mg)-Total	mg/L	-	-	0.1	12.4	11.7	10.1	10.1	0%	8.42	8.32	10.5	74.6	76.3	118
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.00975	0.383	0.0562	0.0546	3%	0.0326	0.0325	0.0493	0.0501	0.0494	***2.31***
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000078	0.000746	0.000412	0.00042	2%	0.000499	0.000447	0.000434	0.000217	0.000183	0.00014
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	<0.00050	0.00114	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0015
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.51	1.07	0.82	0.78	5%	0.68	0.67	0.81	3.21	3.27	5.47
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	0.00015	<0.00010	0.00025
Silicon (Si)-Total	mg/L	-	-	0.05	6.63	7.21	6.21	6.21	0%	6.15	6.04	6.04	2.79	2.77	3.49
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000010	0.000022	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	0.000016	0.000012	<0.000020
Sodium (Na)-Total	mg/L	-	-	0.05	4.26	3.81	3.04	3.04	0%	2.44	2.42	3.22	10.7	10.5	14.8
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.431	0.311	0.28	0.28	0%	0.287	0.283	0.295	0.989	0.99	1.37
Sulfur (S)-Total	mg/L	-	-	0.5	36.4	22.3	12.2	12.2	0%	5.87	5.82	13	271	275	501
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	0.00007	0.000072	0.00019
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	0.02	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.000378	0.00121	0.000494	0.000499	1%	0.000471	0.000484	0.000511	0.0039	0.00388	0.00391
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	0.0015	<0.0010	<0.0010	<DL	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	0.0066	<0.0030	<0.0030	<DL	<0.0030	<0.0030	<0.0030	***0.224***	***0.219***	***0.904***
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	FIELD	FIELD	-	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0092	0.0081	0.0143	0.0133	7%	0.0133	0.0135	0.0104	0.0027	0.0037	<0.0020
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00041	0.00023	0.00024	0.00024	0%	0.00011	<0.00010	0.00026	0.00352	0.00353	0.00079
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.0017	0.0017	0.00127	0.00127	0%	0.00036	0.00036	0.00125	0.0107	0.0107	0.00307
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0513	0.0636	0.0639	0.0638	0%	0.0661	0.0665	0.0644	0.0159	0.0157	0.0105
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	0.000024	***0.000134***	0.000012	0.000014	17%	0.000016	0.000016	0.000014	***0.00248***	***0.00243***	***0.0123***
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	59.5	52.4	31.1	30.9	1%	24.8	25	31.7	277	289	498

Table E-2. Summary of Water Quality Results for the August 11-13, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140812-018 WQ-PC-U 12-Aug-14	0455-140811-001 WQ-BC 11-Aug-14	0455-140811-007 WQ-VC-R 11-Aug-14	0455-140811-008 WQ-VC-R-r 11-Aug-14	QA/QC WQ-VC-R Replicate Sample	0455-140811-002 WQ-VC-U 11-Aug-14	0455-140811-006 WQ-VC-DBC 11-Aug-14	0455-140811-004 WQ-VC-UMN 11-Aug-14	0455-140812-026 WQ-PIT-1 (Top) 12-Aug-14 (Depth: 0.3 m)	0455-140812-024 WQ-PIT-2 (Middle) 12-Aug-14 (Depth: 3.5 m)	0455-140812-025 WQ-PIT-3 (Bottom) 12-Aug-14 (Depth: 6.5 m)
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00010	0.00011	<0.00010	0.00011	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	<0.00010	0.00013	0.00013	0.00011	15%	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00181
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00072	0.00152	0.00115	0.00111	3%	0.00113	0.00115	0.00111	0.00182	0.00197	***0.00223***
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	0.041	0.067	0.151	0.151	0%	0.042	0.041	0.036	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<DL	<0.000050	<0.000050	<0.000050	0.000098	0.000108	<0.00010
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.00072	0.00101	0.00055	<0.00050	<DL	<0.00050	<0.00050	0.00075	0.00865	0.00801	0.0117
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	12.4	12.2	9.98	9.91	1%	8.2	8.34	10.2	76.1	77.2	114
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.00816	0.337	0.0499	0.0478	4%	0.0247	0.0253	0.0427	0.0484	0.0483	2.23
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	0.000061	0.000722	0.000376	0.000382	2%	0.00039	0.000392	0.000399	0.000173	0.000176	0.00011
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.00050	0.00079	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0015
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	0.48	1.02	0.78	0.77	1%	0.65	0.65	0.75	3.21	3.32	5.45
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	0.0001	<0.00010	<0.00020
Silicon (Si)-Dissolved	mg/L	-	-	0.05	6.63	6.81	6.08	6.04	1%	5.92	5.95	5.84	2.75	2.82	3.45
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020
Sodium (Na)-Dissolved	mg/L	-	-	0.05	4.11	3.93	3.02	2.87	5%	2.33	2.37	3.1	10.8	10.7	14.4
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.418	0.318	0.268	0.265	1%	0.271	0.272	0.277	0.964	0.975	1.32
Sulfur (S)-Dissolved	mg/L	-	-	0.5	36.2	23.3	11.9	11.7	2%	5.7	5.69	12.5	270	275	476
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	0.000069	0.00007	0.000179
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.000365	0.00118	0.00047	0.000467	1%	0.000436	0.000447	0.000479	0.00379	0.00381	0.00376
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<DL	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0017	0.0013	0.0035	<0.0010	<DL	<0.0010	0.0012	<0.0010	***0.224***	***0.225***	***0.889***

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Table E-2. Summary of Water Quality Results for the August 11-13, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140813-027 WQ-PW *** 13-Aug-14	0455-140811-FIELD-BLANK FIELD BLANK 11-Aug-14	0455-140813-TRAVEL-BLANK TRAVEL BLANK ** n/a
Temperature (in-situ)	°C	-	-	-	1.0	-	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	407.6	-	-
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	6.39	-	-
Turbidity (In-situ)	NTU	-	-	-	0.52	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-
Colour, True	CU	15	-	5	<5.0	-	-
Conductivity	µS/cm	-	-	2	359	<2.0	<2.0
Hardness (as CaCO3)	mg/L	-	-	0.5	188	<0.50	-
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.56	***5.9***	***5.97***
Total Suspended Solids	mg/L	-	50	3	-	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	202	<10	<10
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	168	<1.0	<1.0
Ammonia, Total (as N)	mg/L	0.75	-	0.005	-	<0.0050	0.006
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	0.098	<0.020	<0.020
Nitrate (as N)	mg/L	13	-	0.005	0.135	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	31.5	<0.50	<0.50
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	-	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	-	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	-	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	-	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	<0.010	<0.0030	<0.0030
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	<0.00050	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00037	<0.00010	<0.00010
Barium (Ba)-Total	mg/L	-	1	0.00005	0.079	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	-	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.10	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	<0.00020	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	0.05	44.7	<0.050	<0.050
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	<0.0020	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	<0.0010	<0.00050	<0.00050
Iron (Fe)-Total	mg/L	0.3	1	0.01	<0.030	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.00064	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	-	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	0.1	18.6	<0.10	<0.10
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	<0.0020	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.00020	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	-	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	-	<0.00050	<0.00050
Phosphorus (P)-Total	mg/L	-	-	0.05	-	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.88	<0.10	<0.10
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.0010	<0.00010	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	-	<0.050	<0.050
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	-	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	4.5	<0.050	<0.050
Strontium (Sr)-Total	mg/L	-	-	0.0002	-	<0.00020	<0.00020
Sulfur (S)-Total	mg/L	-	-	0.5	-	<0.50	<0.50
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	-	<0.000010	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	-	<0.010	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00178	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	-	-	0.001	-	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.050	<0.0030	<0.0030
Dissolved Metals Filtration Location		-	-	n/a	-	FIELD	-
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	-	<0.0010	-
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	-	<0.00010	-
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	-	<0.000050	-
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	-	<0.00050	-
Boron (B)-Dissolved	mg/L	-	-	0.01	-	<0.010	-
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	-	<0.000010	-
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	-	<0.050	-

Table E-2. Summary of Water Quality Results for the August 11-13, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140813-027 WQ-PW *** 13-Aug-14	0455-140811-FIELD-BLANK FIELD BLANK 11-Aug-14	0455-140813-TRAVEL-BLANK TRAVEL BLANK ** n/a
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	-	<0.00010	-
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	-	<0.00020	-
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	-	<0.010	-
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	-	<0.000050	-
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	-	<0.00050	-
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	-	<0.10	-
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	-	<0.000050	-
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	-	<0.000010	-
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	-	<0.000050	-
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	-	<0.00050	-
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	-	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	0.1	-	<0.10	-
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	-	<0.00010	-
Silicon (Si)-Dissolved	mg/L	-	-	0.05	-	<0.050	-
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	-	<0.000010	-
Sodium (Na)-Dissolved	mg/L	-	-	0.05	-	<0.050	-
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	-	<0.00020	-
Sulfur (S)-Dissolved	mg/L	-	-	0.5	-	<0.50	-
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	-	<0.000010	-
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	-
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	-	<0.010	-
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	-	<0.000010	-
Vanadium (V)-Dissolved	mg/L	-	-	0.001	-	<0.0010	-
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	-	<0.0010	-

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Table E-3. Summary of Water Quality Results for the September 15-17, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140915-007 WQ-VC-R-r 15-Sep-14	0455-140915-003 WQ-VC-R 15-Sep-14	QA/QC WQ-VC-R Replicate Sample	0455-140916-010 WQ-VC-DBC 16-Sep-14	0455-140916-013 WQ-VC-DBC-r 16-Sep-14	QA/QC WQ-VC-DBC Replicate Sample	0455-140915-008 WQ-VC-UMN 15-Sep-14	0455-140916-014 WQ-VC-U 16-Sep-14	0455-140916-015 WQ-BC 16-Sep-14	0455-140915-006 WQ-PC-D 15-Sep-14	0455-140915-004 WQ-PC-U 15-Sep-14	0455-140915-005 WQ-DESS-01 15-Sep-14
Temperature (in-situ)	°C	-	-	-	-	6.5	-	3.5	-	-	7.2	3.7	7.0	4.5	4.8	2.0
Specific Conductivity (in-situ)	µS/cm	-	-	-	-	182.1	-	170.5	-	-	202.9	141.7	309.6	346	289.4	979
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	-	7.91	-	7.8	-	-	8	7.71	7.96	7.12	7.57	***6.15***
Turbidity (In-situ)	NTU	-	-	-	-	16.94	-	15.91	-	-	12.16	0.81	721.00	2.71	0.45	0.19
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	196	196	0%	171	171	0%	201	161	305	352	282	961
Hardness (as CaCO3)	mg/L	-	-	0.5	96.4	95.4	1%	84.8	83.7	1%	101	81.2	154	176	141	553
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	8.06	8.08	0%	8.05	8.07	0%	8.06	8.04	8.08	7.94	7.68	***6.12***
Total Suspended Solids	mg/L	-	50	3	13.3	15.3	15%	14.7	30	104%	14	<3.0	***1630***	<3.0	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	138	145	5%	122	128	5%	141	117	229	253	212	918
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	75.3	77.5	3%	76.5	76.9	1%	78.4	75.2	94.4	84.1	58.8	2.4
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<DL	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<DL	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	75.3	77.5	3%	76.5	76.9	1%	78.4	75.2	94.4	84.1	58.8	2.4
Ammonia, Total (as N)	mg/L	0.75	-	0.005	0.0072	0.0078	8%	0.0051	<0.0050	<DL	0.0058	<0.0050	0.104	<0.0050	<0.0050	0.038
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<DL	<0.50	<0.50	<DL	<0.50	<0.50	<0.50	<0.50	<0.50	<5.0
Fluoride (F)	mg/L	0.12	-	0.02	0.051	0.052	2%	0.05	0.05	0%	0.051	0.05	0.08	0.053	0.056	<0.20
Nitrate (as N)	mg/L	13	-	0.005	0.0836	0.0833	0%	0.0881	0.0885	0%	0.0839	0.086	0.0986	0.105	<0.0050	0.071
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	<DL	<0.0010	<0.0010	<DL	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.010
Sulfate (SO4)	mg/L	-	-	0.5	27.8	27.8	0%	16.9	16.8	1%	29.5	14.1	67.1	97.5	83.2	534
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<DL	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	<0.20	<0.20	<DL	<0.20	<0.20	<DL	<0.20	<2.0	0.61	<0.20	<2.0	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	<DL	<0.50	<0.50	<DL	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	***0.484***	***0.436***	10%	***0.455***	***0.495***	9%	***0.383***	0.0475	***46.9***	0.0305	0.0149	***0.129***
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00026	0.00024	8%	0.00016	0.00018	13%	0.00024	<0.00010	0.00349	0.0035	0.00042	0.0002
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00282	0.00292	4%	0.00173	0.0019	10%	0.00269	0.00032	***0.182***	***0.00667***	0.00146	0.00085
Barium (Ba)-Total	mg/L	-	1	0.00005	0.066	0.0649	2%	0.0638	0.0635	0%	0.0643	0.0574	0.986	0.0301	0.0302	0.0161
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<DL	<0.00010	<0.00010	0.00184	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<DL	<0.00050	<0.00050	0.0023	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.010	<0.010	<DL	<0.010	<0.010	<DL	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	***0.000068***	***0.000072***	6%	***0.000061***	***0.000066***	8%	***0.000062***	0.000025	***0.00625***	***0.00125***	0.000018	***0.00479***
Calcium (Ca)-Total	mg/L	-	-	0.05	24	24.5	2%	21.4	21.2	1%	25.3	20.9	58.2	51.4	38.9	137
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00076	0.00076	0%	0.00466	0.00075	84%	0.00059	0.00024	***0.0705***	0.00018	0.0002	0.00018
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.00037	0.00034	8%	0.00028	0.00028	0%	0.00029	0.00012	0.0241	<0.00010	<0.00010	0.00058
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	***0.00228***	***0.0025***	10%	***0.00229***	***0.00214***	7%	***0.00209***	0.00149	***0.1***	***0.0106***	0.00081	0.00152
Iron (Fe)-Total	mg/L	0.3	1	0.01	***0.82***	***0.842***	3%	***0.638***	***0.663***	4%	***0.603***	0.121	***76.2***	0.036	0.06	***0.465***
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.00237	0.00241	2%	0.00223	0.00219	2%	0.00192	0.000058	***0.307***	0.000702	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	0.00101	0.00073	28%	0.00075	0.00065	13%	0.00095	<0.00050	0.0292	0.00062	0.00082	0.0016
Magnesium (Mg)-Total	mg/L	-	-	0.1	7.66	7.79	2%	6.82	6.68	2%	8.04	6.67	24.4	11.2	8.59	48
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.0936	0.094	0%	0.0696	0.0668	4%	0.0822	0.0279	***2.71***	0.0229	0.00434	0.171
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<DL	<0.000010	<0.000010	***0.000195***	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000372	0.000372	0%	0.000386	0.000367	5%	0.000384	0.000331	0.002	0.00007	0.000061	<0.000050
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	0.00081	0.00082	1%	0.00136	0.00068	50%	0.00065	<0.00050	0.0419	0.00054	<0.00050	0.00531
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<DL	<0.050	<0.050	<DL	<0.050	<0.050	1.25	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.7	0.68	3%	0.59	0.62	5%	0.7	0.51	6.12	0.63	0.55	0.34
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<DL	<0.00010	<0.00010	0.00062	<0.00010	<0.00010	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	6.62	6.7	1%	6.44	6.49	1%	6.33	5.89	80.2	6.58	6.7	8.93
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	0.000024	0.000025	4%	0.000024	0.000026	8%	0.000019	<0.000010	***0.00307***	0.00002	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	2.52	2.54	1%	2.15	2.13	1%	2.57	2.15	5.12	3.78	3.51	4.56
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.233	0.241	3%	0.236	0.219	7%	0.243	0.236	0.418	0.31	0.294	0.334
Sulfur (S)-Total	mg/L	-	-	0.5	9.09	9.04	1%	5.51	5.6	2%	9.64	4.91	23	32.5	27.4	172
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	0.000012	0.000011	8%	0.000011	0.000011	0%	<0.000010	<0.000010	0.00074	<0.000010	<0.000010	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<DL	<0.00010	<0.00010	0.00042	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	0.016	0.015	6%	0.016	0.017	6%	0.012	<0.010	1.14	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.000454	0.00048	6%	0.000424	0.00042	1%	0.000457	0.000347	0.00559	0.00032	0.000088	0.000012
Vanadium (V)-Total	mg/L	-	-	0.001	0.0015	0.0015	0%	0.0014	0.0014	0%	0.0012	<0.0010	0.133	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	0.0066	0.0075	14%	0.0079	0.0072	9%	0.0057	0.0031	***0.542***	***0.117***	<0.0030	***1.94***
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	-	FIELD	FIELD	-	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0241	0.0235	2%	0.0226	0.021	7%	0.0188	0.0231	0.0292	0.0163	0.0104	***0.121***
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00016	0.00017	6%	0.0001	<0.00010	<DL	0.00016	<0.00010	0.0003	0.00362	0.00044	0.00015
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.00098	0.00092	6%	0.00041	0.00046	12%	0.00087	0.00029	0.00253	0.00632	0.00147	0.00075
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0589	0.0581	1%	0.0569	0.0583	2%	0.0592	0.0559	0.091	0.0307	0.0322	0.016
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<DL	<0.010	<0.010	<DL	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	0.000027	0.000028	4%	0.000025	0.000024	4%	0.000026	0.000021	***0.000063***	***0.00125***	0.000017	***0.00481***
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	25.4	25.2	1%	22.4	22.1	1%	26.4	21.2	43.9	51.9	41.4	141
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	0.00013	0.00016	23%	0.00012	0.00012	0%	0.00011	0.00011	<0.00020	0.00011	<0.00010	0.00013
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00015	0.00015	0%	<0.00010	<0.00010	<DL	0.00012	<0.00010	0.00029	<0.00010	<0.00010	0.00058
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00134	0.00147	10%	0.00128	0.00143	12%	0.00128	0.00131	0.00156	***0.0104***	0.00077	0.00145
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	0.12	0.124	3%	0.06	0.061	2%	0.053	0.065	0.058	0.015	0.036	***0.435***
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	0.000076	0.00008	5%	<0.000050	<0.000050	<DL	0.000051	<0.000050	0.00034	0.000346	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.00081	<0.00050	<DL	0.00052	<0.00050	<DL	0.00083	<0.00050	<0.0010	0.00062	0.00085	0.00156
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	8.03	7.87	2%	7.01	6.95	1%	8.4	6.83	10.7	11.4	9.09	48.9
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.0706	0.0708	0%	0.0531	0.0552	4%	0.0629	0.025	0.525	0.0226	0.00377	0.17
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Table E-3. Summary of Water Quality Results for the September 15-17, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140915-007 WQ-VC-R-r 15-Sep-14	0455-140915-003 WQ-VC-R 15-Sep-14	QA/QC WQ-VC-R Replicate Sample	0455-140916-010 WQ-VC-DBC 16-Sep-14	0455-140916-013 WQ-VC-DBC-r 16-Sep-14	QA/QC WQ-VC-DBC Replicate Sample	0455-140915-008 WQ-VC-UMN 15-Sep-14	0455-140916-014 WQ-VC-U 16-Sep-14	0455-140916-015 WQ-BC 16-Sep-14	0455-140915-006 WQ-PC-D 15-Sep-14	0455-140915-004 WQ-PC-U 15-Sep-14	0455-140915-005 WQ-DESS-01 15-Sep-14
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	0.000358	0.000378	6%	0.000346	0.000337	3%	0.000373	0.000301	0.001	0.000066	0.000059	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.0010	0.00052	<0.00050	0.00538
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<DL	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	0.65	0.63	3%	0.53	0.53	0%	0.65	0.52	0.97	0.64	0.55	0.34
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	6.17	6.1	1%	5.92	5.93	0%	6	5.96	6.83	6.57	7.07	9.11
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	2.54	2.56	1%	2.17	2.27	5%	2.54	2.15	3.51	3.87	3.62	4.6
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.233	0.244	5%	0.24	0.234	2%	0.241	0.231	0.273	0.34	0.3	0.331
Sulfur (S)-Dissolved	mg/L	-	-	0.5	9.36	9.27	1%	5.73	5.69	1%	9.84	4.86	23.3	32.1	29	174
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<DL	<0.010	<0.010	<DL	<0.010	<0.010	<0.020	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.000428	0.00045	5%	0.000401	0.000398	1%	0.000429	0.000332	0.00121	0.000315	0.000091	<0.000010
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	<DL	<0.0010	<0.0010	<DL	<0.0010	<0.0010	<0.0020	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0012	0.0031	158%	0.005	0.0013	74%	0.0011	0.0044	0.0051	***0.115***	0.0018	***2.03***

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Notes:

* WQ-PW is a drinking water sample and the analysis package has different detection limits than all other samples. The results are also compard to the *Guidelines for Canadian Drinking Water Quality* (Health Canada, October 2014) versus the CCME or MN Effluent Quality Standards.

Table E-3. Summary of Water Quality Results for the September 15-17, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140915-001 WQ-DESS-02 15-Sep-14	0455-140915-002 CH-P-13-01 15-Sep-14	0455-140916-021 WQ-DC-DX 16-Sep-14	0455-140916-009 WQ-DC-R 16-Sep-14	0455-140917-023 WQ-DC-D1b 17-Sep-14	0455-140916-018 WQ-DC-DX+105 16-Sep-14	0455-140916-020 WQ-DC-DX+105-r 16-Sep-14	QA/QC WQ-DC-DX+105 Replicate Sample	0455-140916-022 WQ-TP 16-Sep-14	0455-140916-012 WQ-SEEP 16-Sep-14	0455-140916-011 WQ-DC-U 16-Sep-14	0455-140916-028 WQ-DC-B 16-Sep-14
Temperature (in-situ)	°C	-	-	-	5.0	1.9	2.9	2.9	2.0	1.2	-	-	12.9	5.8	9.0	10.7
Specific Conductivity (in-situ)	µS/cm	-	-	-	1680	1491	506.4	1032	1419	1097	-	-	1285	1745	1158	1063
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	7.1	***6.27***	7.68	7.22	8	7.17	-	-	8.16	6.94	7.98	7.72
Turbidity (In-situ)	NTU	-	-	-	1.18	0.28	75.10	28.30	19.42	2.83	-	-	4.23	45.20	52.80	32.60
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	1600	1470	489	1010	1370	1050	1070	2%	1270	1700	1150	1050
Hardness (as CaCO3)	mg/L	-	-	0.5	1030	899	259	578	888	647	660	2%	742	971	662	645
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	8.13	6.74	8.01	8.1	8.26	7.98	7.98	0%	8.02	7.81	8.21	8.18
Total Suspended Solids	mg/L	-	50	3	<3.0	<3.0	***335***	14	35.3	<3.0	<3.0	<DL	<3.0	34.7	***149***	43.3
Total Dissolved Solids	mg/L	-	-	1	1500	1410	365	874	1220	882	893	1%	1130	1550	1020	913
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	124	6.4	87.7	168	278	275	276	0%	79.4	253	185	173
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<DL	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	124	6.4	87.7	168	278	275	276	0%	79.4	253	185	173
Ammonia, Total (as N)	mg/L	0.75	-	0.005	0.0051	0.0054	0.0384	0.68	0.182	0.0233	0.023	1%	0.0413	***4.26***	***0.864***	0.15
Chloride (Cl)	mg/L	120	-	0.5	<5.0	<5.0	<0.50	<5.0	<5.0	<5.0	<5.0	<DL	<5.0	<5.0	<5.0	<5.0
Fluoride (F)	mg/L	0.12	-	0.02	<0.20	<0.20	0.058	<0.20	<0.20	<0.20	<0.20	<DL	<0.20	<0.20	<0.20	<0.20
Nitrate (as N)	mg/L	13	-	0.005	6.0	0.147	0.0411	0.314	0.092	<0.050	<0.050	<DL	<0.050	0.552	0.265	0.105
Nitrite (as N)	mg/L	0.06	-	0.001	<0.010	<0.010	<0.0010	0.014	<0.010	<0.010	<0.010	<DL	<0.010	0.023	0.017	<0.010
Sulfate (SO4)	mg/L	-	-	0.5	862	882	168	429	599	379	384	1%	668	801	506	454
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<DL	<0.0050	0.0109	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<DL	<0.0050	0.0419	0.0063	<0.0050
Cyanate	mg/L	-	-	0.2	<0.20	<0.20	<0.20	0.29	<0.20	<0.20	<0.20	<DL	<0.20	1.77	0.75	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<DL	<0.50	3.1	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0186	***0.14***	***4.52***	***0.128***	***0.554***	0.0074	0.0044	41%	0.0275	0.028	***0.96***	***0.652***
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00027	0.00011	0.00324	0.00099	0.0069	0.00875	0.00837	4%	0.0355	0.00045	0.00157	0.00192
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00195	0.0004	***0.0614***	***0.02***	***0.0244***	***0.0244***	***0.0233***	5%	***0.122***	***0.0471***	***0.0457***	***0.0152***
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0194	0.00929	0.126	0.0519	0.0356	0.0162	0.0154	5%	0.00994	0.0628	0.0754	0.0637
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	0.00019	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	0.024	0.04	<0.010	<0.010	<DL	0.079	0.06	0.029	0.02
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	***0.000056***	***0.00955***	***0.000209***	***0.000076***	***0.000472***	***0.00265***	***0.00244***	8%	***0.000716***	***0.000589***	***0.000216***	***0.000108***
Calcium (Ca)-Total	mg/L	-	-	0.05	305	221	71.7	140	197	164	162	1%	207	269	161	142
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00011	0.00017	0.00631	0.0005	0.0011	<0.00010	<0.00010	<DL	0.00026	0.00054	0.00212	0.00147
Cobalt (Co)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	0.00275	0.00153	0.00064	0.00051	0.0005	2%	0.00048	0.00749	0.00217	0.00074
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.00178	0.00104	***0.0103***	0.00173	***0.00251***	0.00077	0.0006	22%	***0.0199***	***0.0244***	***0.00473***	***0.00342***
Iron (Fe)-Total	mg/L	0.3	1	0.01	<0.010	0.027	***8.86***	***3.58***	***2.02***	***0.336***	***0.309***	8%	0.263	***10.6***	***5.09***	***3.36***
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.000056	<0.000050	***0.0101***	0.000358	0.00146	0.000103	0.000089	14%	***0.00889***	0.000107	0.00147	0.000908
Lithium (Li)-Total	mg/L	-	-	0.0005	<0.00050	0.00193	0.00341	0.00148	0.00736	0.00771	0.00755	2%	0.00763	0.00081	0.00267	0.00315
Magnesium (Mg)-Total	mg/L	-	-	0.1	51.1	77.8	20.3	47.5	86.3	54.2	52.8	3%	43	58.7	56.4	60.5
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.00113	0.389	0.183	***1.59***	***0.986***	***1.07***	***1.04***	3%	0.207	***7.23***	***1.8***	***0.598***
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	***0.000035***	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000164	<0.000050	0.00015	0.000375	0.000242	0.000301	0.000309	3%	0.00129	0.000886	0.000507	0.000367
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	<0.00050	0.00724	0.00381	0.00127	0.00127	0.00136	0.00139	2%	0.00071	0.00291	0.00238	0.00167
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	0.395	<0.050	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	0.06	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.72	0.42	4.98	2.64	4.05	3.59	3.52	2%	12.6	5.82	3.24	2.56
Selenium (Se)-Total	mg/L	0.001	-	0.0001	0.00025	<0.00010	0.00016	0.00012	<0.00010	<0.00010	<0.00010	<DL	<0.00010	0.00022	0.00017	0.00014
Silicon (Si)-Total	mg/L	-	-	0.05	5.35	8.35	11.2	6.33	6.87	6.53	6.13	6%	0.709	6.86	7.54	7.1
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000010	<0.000010	***0.000177***	0.000013	0.000028	<0.000010	<0.000010	<DL	***0.000147***	0.00005	0.000045	0.00003
Sodium (Na)-Total	mg/L	-	-	0.05	8.1	6.29	3.8	11.3	6.65	4.94	4.72	4%	16.3	33.5	12.2	7.06
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.622	0.523	0.249	0.448	0.513	0.397	0.38	4%	0.553	0.816	0.563	0.483
Sulfur (S)-Total	mg/L	-	-	0.5	282	281	56.6	132	195	126	122	3%	212	252	157	142
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	0.00013	<0.000010	0.00003	0.00009	0.000085	6%	0.000191	0.00001	0.000021	0.000016
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	<0.010	0.207	<0.010	0.026	<0.010	<0.010	<DL	<0.010	<0.010	0.049	0.029
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00126	<0.000010	0.000532	0.00122	0.00272	0.00379	0.00354	7%	0.000897	0.00201	0.00174	0.00186
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010	0.0216	0.0012	0.0024	<0.0010	<0.0010	<DL	<0.0010	0.0016	0.0051	0.0037
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	0.0039	***3.28***	***0.0372***	0.0071	***0.174***	***0.595***	***0.547***	8%	***0.0476***	0.0103	0.0195	0.0163
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	-	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0145	***0.142***	0.0094	0.0183	0.0069	0.0047	0.003	<DL	0.0079	0.0114	0.0237	0.0228
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00025	<0.00010	0.0013	0.00099	0.00654	0.00874	0.00879	1%	0.0357	0.00043	0.0012	0.00182
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.002	0.00042	0.00321	0.00832	0.0149	0.00779	0.00828	6%	0.0866	0.0378	0.0107	0.00601
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0198	0.00951	0.0543	0.0497	0.0273	0.0159	0.0161	1%	0.00998	0.0652	0.0552	0.0542
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<DL	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	0.022	0.036	<0.010	<0.010	<DL	0.077	0.06	0.025	0.018
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	***0.000056***	***0.0102***	0.000014	***0.000041***	***0.00011***	***0.00127***	***0.00122***	4%	***0.000581***	***0.000396***	***0.000047***	0.000015
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	324	229	72.4	149	209	168	173	3%	222	289	169	151
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00010	0.00011	<0.00010	0.00021	<0.00010	<0.00010	<0.00010	<DL	<0.00010	0.00034	0.00013	0.00014
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	0.00022	0.00159	0.0004	0.00052	0.00051	2%	0.00047	0.00808	0.00159	0.00045
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00063	0.00093	0.00107	0.00103	0.00069	0.00044	0.00035	20%	***0.015***	***0.00231***	0.00107	0.00092
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	<0.010	0.027	***0.527***	***1.03***	***0.406***	0.117	0.114	3%	<0.010	***8.36***	***0.34***	***0.382***
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<DL	0.000093	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	<0.00050	0.00208	<0.00050	0.00158	0.00709	0.00762	0.00799	5%	0.00742	0.00082	0.002	0.00308
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	53.3	79.4	19	50.4	89.1	55	55.4	1%	45.4	60.6	58.3	64.8
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.000739	0.416	0.0845	1.65	0.994	1.06	1.06	0%	0.186	7.3	1.67	0.581
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010

Table E-3. Summary of Water Quality Results for the September 15-17, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140915-001 WQ-DESS-02 15-Sep-14	0455-140915-002 CH-P-13-01 15-Sep-14	0455-140916-021 WQ-DC-DX 16-Sep-14	0455-140916-009 WQ-DC-R 16-Sep-14	0455-140917-023 WQ-DC-D1b 17-Sep-14	0455-140916-018 WQ-DC-DX+105 16-Sep-14	0455-140916-020 WQ-DC-DX+105-r 16-Sep-14	QA/QC WQ-DC-DX+105 Replicate Sample	0455-140916-022 WQ-TP 16-Sep-14	0455-140916-012 WQ-SEEP 16-Sep-14	0455-140916-011 WQ-DC-U 16-Sep-14	0455-140916-028 WQ-DC-B 16-Sep-14
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	0.000138	<0.000050	<0.000050	0.000379	0.000216	0.000275	0.00032	16%	0.00128	0.000856	0.00039	0.00034
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.00050	0.00779	<0.00050	0.00116	0.0006	0.00133	0.0014	5%	0.00063	0.00307	0.00111	0.00086
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<DL	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	0.77	0.42	4.62	2.84	4.18	3.61	3.75	4%	13.8	6.49	3.28	2.69
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	0.00028	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	0.00016	0.00011	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	5.68	8.83	5.19	6.31	6.2	6.53	6.49	1%	0.714	7.35	6.13	6.45
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<DL	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	8.02	6.3	3.57	11.9	6.97	4.95	4.85	2%	17.9	36.3	11.9	7.22
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.615	0.526	0.231	0.473	0.513	0.388	0.393	1%	0.569	0.837	0.496	0.514
Sulfur (S)-Dissolved	mg/L	-	-	0.5	291	282	57.5	138	198	126	126	0%	222	263	160	150
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	0.000014	0.000084	0.000084	0%	0.000196	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<DL	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<DL	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.00126	<0.000010	0.000129	0.00132	0.00265	0.00364	0.00368	1%	0.000911	0.00202	0.0015	0.0018
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<DL	<0.0010	0.0013	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0023	***3.59***	0.0019	0.0035	***0.137***	***0.593***	***0.571***	4%	***0.0325***	0.0084	0.0042	0.0046

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

Table E-3. Summary of Water Quality Results for the September 15-17, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140917-027 WQ-PW * 17-Sep-14	0455-140917-025 WQ-PIT-1 17-Sep-14	0455-140917-026 WQ-PIT2 17-Sep-14	0455-140917-024 WQ-PIT-3 17-Sep-14	0455-140917-TRAVEL-BLANK Travel Blank	0455-140917-FIELD BLANK Field Blank 17-Sep-14
Temperature (in-situ)	°C	-	-	-	0.9	7.5	7.4	7.6	-	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	371.5	1696	1695	1709	-	-
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	8	8.06	8.03	7.93	-	-
Turbidity (In-situ)	NTU	-	-	-	0.00	1.43	1.14	1.43	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	9.01	0.96	1.92	-	-
Colour, True	CU	15	-	5	<5.0	-	-	-	-	-
Conductivity	µS/cm	-	-	2	357	1670	1670	1670	<2.0	<2.0
Hardness (as CaCO3)	mg/L	-	-	0.5	189	1070	1070	1070	-	<0.50
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.71	8.21	8.23	8.21	***5.38***	***5.65***
Total Suspended Solids	mg/L	-	50	3	-	4	<3.0	***74.7***	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	199	1400	1400	1400	<10	<10
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	-	170	172	170	<1.0	<1.0
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	163	170	172	170	<1.0	<1.0
Ammonia, Total (as N)	mg/L	0.75	-	0.005	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<5.0	<5.0	<5.0	<0.50	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	0.102	***0.21***	***0.21***	***0.21***	<0.020	<0.020
Nitrate (as N)	mg/L	13	-	0.005	0.126	<0.050	<0.050	<0.050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.010	<0.010	<0.010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	31.9	905	905	910	<0.50	<0.50
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	-	-	-	-	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	-	-	-	-	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	-	-	-	-	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	-	-	-	-	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	<0.010	0.0104	0.012	0.0111	<0.0030	<0.0030
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	<0.00050	0.00318	0.00323	0.00327	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00039	***0.012***	***0.0116***	***0.0115***	<0.00010	<0.00010
Barium (Ba)-Total	mg/L	-	1	0.00005	0.084	0.0133	0.0131	0.0131	<0.000050	<0.000050
Beryllium (Be)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	<0.00020	***0.00195***	***0.00198***	***0.00195***	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	0.05	43.4	291	293	292	<0.050	<0.050
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	<0.0020	0.00013	0.00016	0.00012	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	<0.0010	***0.00203***	***0.00205***	***0.00221***	<0.00050	<0.00050
Iron (Fe)-Total	mg/L	0.3	1	0.01	<0.030	0.034	0.036	0.036	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.00063	0.00055	0.000557	0.000549	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	-	0.00875	0.00865	0.00899	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	0.1	19.6	79.5	79.3	80.2	<0.10	<0.10
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	<0.0020	0.0442	0.044	0.0544	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.00020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	-	0.000155	0.000145	0.000163	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Total	mg/L	-	-	0.05	-	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.84	3.58	3.56	3.59	<0.10	<0.10
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	-	2.95	2.94	2.98	<0.050	<0.050
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	-	0.00001	<0.000010	0.000011	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	4.8	10.1	10.5	10.4	<0.050	<0.050
Strontium (Sr)-Total	mg/L	-	-	0.0002	-	0.988	0.983	0.987	<0.00020	<0.00020
Sulfur (S)-Total	mg/L	-	-	0.5	-	312	312	314	<0.50	<0.50
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	-	0.000062	0.00006	0.000061	<0.000010	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	-	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00179	0.00387	0.00401	0.00397	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	-	-	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.050	***0.21***	***0.202***	***0.206***	<0.0030	<0.0030
Dissolved Metals Filtration Location		-	-	n/a	-	FIELD	FIELD	FIELD	-	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	-	0.0019	0.0023	0.0019	-	<0.0010
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	-	0.00323	0.00306	0.00296	-	<0.00010
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	-	0.0102	0.01	0.01	-	<0.00010
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	-	0.013	0.0128	0.013	-	<0.000050
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	<0.00010	<0.00010	-	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	-	<0.00050	<0.00050	<0.00050	-	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	-	<0.010	<0.010	<0.010	-	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	-	***0.00193***	***0.00192***	***0.00201***	-	<0.000010
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	-	297	296	298	-	<0.050
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	-	<0.00010	<0.00010	<0.00010	-	<0.00010
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	<0.00010	<0.00010	-	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	-	0.00162	0.00171	0.0019	-	<0.00020
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	-	<0.010	<0.010	<0.010	-	<0.010
Lead (Pb)-Dissolved	mg/L	0.003	-	0.00005	-	0.000074	0.000076	0.000075	-	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	-	0.00901	0.00884	0.0083	-	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	-	80.7	79.6	80.1	-	<0.10
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	-	0.0412	0.0416	0.0556	-	<0.000050
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	-	<0.000010	<0.000010	<0.000010	-	<0.000010

Table E-3. Summary of Water Quality Results for the September 15-17, 2014 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0455-140917-027 WQ-PW * 17-Sep-14	0455-140917-025 WQ-PIT-1 17-Sep-14	0455-140917-026 WQ-PIT2 17-Sep-14	0455-140917-024 WQ-PIT-3 17-Sep-14	0455-140917-TRAVEL-BLANK Travel Blank	0455-140917-FIELD BLANK Field Blank 17-Sep-14
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	-	0.00014	0.000142	0.000142	-	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	-	<0.00050	<0.00050	<0.00050	-	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	-	<0.050	<0.050	<0.050	-	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	-	3.6	3.55	3.57	-	<0.10
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	-	<0.00010	<0.00010	<0.00010	-	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	-	2.98	2.94	2.94	-	<0.050
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	-	<0.000010	<0.000010	<0.000010	-	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	-	10.4	10.4	10.5	-	<0.050
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	-	0.977	0.99	0.913	-	<0.00020
Sulfur (S)-Dissolved	mg/L	-	-	0.5	-	314	313	313	-	<0.50
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	-	0.000059	0.000059	0.000055	-	<0.000010
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	-	<0.00010	<0.00010	<0.00010	-	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	-	<0.010	<0.010	<0.010	-	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	-	0.00387	0.00387	0.00374	-	<0.000010
Vanadium (V)-Dissolved	mg/L	-	-	0.001	-	<0.0010	<0.0010	<0.0010	-	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	-	***0.199***	***0.198***	***0.202***	-	<0.0010

Applied Guidelines: 'Federal CCME Canadian Environmental Quality Guidelines (May 2014), CCME: Freshwater Aquatic Life
'Mount Nansen Effluent Discharge Standards

COLOUR KEY:
Exceeds CCME Guideline
Exceeds MN Effluent Discharge Standards
Exceeds both CCME and MN Standards
Data flag for Detection Limit Adjustment --> Please refer to the lab COA report and lab excel report for more info
Exceeds 10% difference threshold for QA/QC replicate samples. Note <DL = below detection limit

For those guidelines that are hardness dependent (Cd, Cu, Pb, Ni), the most conservative guideline has been applied. Same for guidelines that are pH and temperature dependent (Ammonia and Aluminum), unless otherwise noted.

APPENDIX F. METEOROLOGICAL DATA

This page is intentionally blank.

Table F-1. Mount Nansen Daily Average Meteorological Data (July 1 to September 30, 2014).

Date	Air Temperature			Ground Temperature			Rain (mm)	Snow Depth (cm)	Wind Direction (degrees)	Wind Speed (m/s)		Radiative Fluxes (W/m^2)			Relative Humidity (%)
	Min	Max	Mean	Min	Max	Mean	Sum	Max		Max Gust	Mean	Mean SW	Mean LW	Mean Net Rad	
01-Jul-14	5.1	14.0	9.6	7.0	18.1	11.8	11.3	0.7	166	3.9	1.7	196.5	-50.6	145.8	70.0
02-Jul-14	9.4	15.8	12.4	8.6	17.2	12.7	1.6	0.3	109	3.7	2.4	121.3	-38.2	83.1	58.9
03-Jul-14	9.4	15.4	11.9	10.2	15.9	12.6	0.7	0.1	222	2.8	1.5	99.1	-17.9	81.2	79.2
04-Jul-14	11.3	15.5	13.4	10.4	16.5	13.6	0.0	0.0	248	3.0	2.0	125.3	-35.1	90.2	65.7
05-Jul-14	11.7	17.5	14.1	11.6	20.2	15.4	0.9	0.4	122	4.3	2.1	152.5	-40.0	112.5	78.1
06-Jul-14	10.4	18.3	13.9	11.6	22.3	16.1	0.0	0.7	136	5.5	2.6	187.3	-61.1	126.2	66.0
07-Jul-14	6.3	16.4	11.3	6.9	21.7	14.3	0.0	0.6	180	4.8	3.4	191.1	-81.3	109.8	57.1
08-Jul-14	7.6	15.0	11.2	9.7	22.0	15.3	0.0	1.4	177	4.2	2.8	180.9	-56.7	124.1	67.9
09-Jul-14	6.9	15.4	11.0	8.8	20.7	14.7	0.0	0.8	248	6.3	3.4	238.5	-68.1	170.5	75.2
10-Jul-14	8.1	18.4	13.7	9.0	25.8	17.5	0.0	1.0	188	3.7	2.5	248.8	-94.5	154.2	56.8
11-Jul-14	9.6	17.0	12.5	11.3	21.9	15.3	0.0	1.1	159	8.1	4.4	164.4	-60.2	104.1	59.4
12-Jul-14	8.1	14.7	11.9	9.1	19.3	14.9	0.0	0.8	174	5.6	3.9	143.6	-63.4	80.2	69.6
13-Jul-14	9.2	17.1	13.1	9.6	20.1	14.9	0.0	1.5	185	8.2	4.7	164.1	-71.0	93.1	56.5
14-Jul-14	8.6	18.5	13.4	10.3	24.9	17.1	0.0	1.2	172	2.8	1.8	205.6	-68.2	137.4	54.5
15-Jul-14	8.8	15.3	12.0	9.9	20.1	15.0	0.0	0.5	258	3.1	2.1	152.8	-66.8	86.0	46.3
16-Jul-14	7.2	14.7	10.6	8.3	18.0	13.0	0.0	0.4	247	3.8	2.2	113.9	-50.2	63.7	65.1
17-Jul-14	9.1	16.1	11.3	8.8	20.2	13.5	1.0	0.9	186	3.6	1.2	127.1	-46.3	80.8	70.0
18-Jul-14	8.0	14.6	11.7	8.4	17.0	13.1	1.4	0.8	205	2.7	1.3	120.6	-38.3	82.3	68.6
19-Jul-14	8.2	18.5	13.3	7.0	23.4	15.4	10.2	0.9	162	3.8	2.0	194.6	-59.6	135.1	62.6
20-Jul-14	5.5	11.7	8.2	6.9	14.7	10.1	8.3	0.8	216	3.5	1.9	117.0	-14.3	102.7	86.1
21-Jul-14	5.6	12.8	8.5	7.6	14.6	10.6	0.6	1.1	261	3.7	2.1	121.8	-26.5	95.4	84.7
22-Jul-14	7.6	20.0	13.8	5.5	21.9	14.1	0.0	0.9	167	4.5	2.2	251.6	-90.1	161.5	54.8
23-Jul-14	8.1	17.7	12.6	7.2	21.9	14.0	0.0	1.1	170	4.4	2.7	176.4	-71.4	105.1	50.5
24-Jul-14	6.5	13.5	9.6	8.8	17.9	12.5	0.1	1.1	178	2.7	1.5	120.9	-35.9	85.0	73.2
25-Jul-14	5.9	14.6	9.7	7.2	21.2	13.1	0.0	1.2	172	5.9	3.3	194.6	-67.3	127.3	62.7
26-Jul-14	3.2	11.8	8.0	5.1	14.9	10.5	2.1	0.8	139	3.5	1.4	106.2	-42.6	63.6	76.2
27-Jul-14	6.6	14.9	10.2	6.7	19.1	12.0	0.1	1.2	113	5.8	3.1	181.5	-57.8	123.7	66.9
28-Jul-14	4.6	15.6	9.9	5.6	20.2	12.7	0.0	1.5	148	3.6	2.0	171.5	-55.4	116.1	66.8
29-Jul-14	6.9	13.0	9.2	8.5	15.9	11.4	22.7	2.7	96	3.2	1.7	115.3	-22.3	93.0	84.4
30-Jul-14	7.2	11.1	8.5	8.6	14.1	10.2	9.7	2.8	238	5.4	2.0	106.1	-23.1	83.1	83.8
31-Jul-14	4.4	15.5	10.5	4.0	18.6	11.8	0.0	1.3	210	2.6	1.8	196.5	-70.6	125.8	54.5
01-Aug-14	7.9	18.8	13.5	5.8	22.0	13.9	0.0	0.7	193	3.6	2.0	207.2	-76.5	130.7	49.0
02-Aug-14	9.7	20.3	14.6	8.1	25.1	15.8	0.0	0.9	219	4.1	2.1	215.3	-81.5	133.9	49.2
03-Aug-14	10.2	20.0	14.7	9.3	25.4	16.8	0.0	0.8	77	5.1	2.8	195.9	-78.4	117.5	53.5
04-Aug-14	9.8	17.2	12.9	10.4	21.3	14.6	0.1	0.7	53	8.2	4.9	153.1	-63.6	89.5	55.9
05-Aug-14	6.2	15.5	11.0	6.8	23.4	14.7	0.0	1.7	98	5.3	3.0	205.9	-84.1	121.7	53.2

Date	Air Temperature			Ground Temperature			Rain (mm)	Snow Depth (cm)	Wind Direction (degrees)	Wind Speed (m/s)		Radiative Fluxes (W/m^2)			Relative Humidity (%)
	Min	Max	Mean	Min	Max	Mean	Sum	Max		Max Gust	Mean	Mean SW	Mean LW	Mean Net Rad	
06-Aug-14	5.1	11.9	8.3	6.9	17.4	11.8	3.5	1.3	193	5.1	2.7	125.4	-55.8	69.6	69.2
07-Aug-14	5.2	11.3	7.2	7.2	14.7	9.7	6.3	3.4	139	3.8	2.1	102.4	-22.2	80.2	86.0
08-Aug-14	4.2	13.2	8.8	4.0	17.0	10.8	0.0	1.7	99	4.6	2.9	201.4	-73.7	127.7	62.6
09-Aug-14	5.6	11.8	8.7	5.4	13.1	9.3	0.0	1.3	92	5.0	3.4	85.3	-45.0	40.3	70.2
10-Aug-14	6.0	14.1	10.0	6.3	16.0	11.1	0.0	1.0	60	4.2	2.4	99.9	-35.9	64.0	75.4
11-Aug-14	8.2	17.1	12.3	8.0	21.0	13.9	0.3	1.1	65	4.2	3.0	160.3	-48.2	112.1	66.1
12-Aug-14	9.5	17.4	12.8	10.6	21.9	15.0	0.0	1.1	94	4.7	3.0	159.1	-54.8	104.4	65.0
13-Aug-14	6.4	13.0	9.5	6.8	15.9	11.4	0.0	1.1	107	5.4	3.3	98.2	-49.4	48.8	64.7
14-Aug-14	7.1	13.3	10.4	6.5	16.1	11.6	0.0	0.9	81	6.0	3.7	99.8	-52.4	47.4	71.4
15-Aug-14	6.8	16.2	11.3	8.7	19.3	12.7	0.3	1.4	52	7.9	5.6	133.1	-53.6	79.6	64.0
16-Aug-14	4.1	9.9	7.4	4.7	11.7	9.1	0.9	0.7	59	5.5	3.6	81.3	-43.0	38.3	70.5
17-Aug-14	4.8	12.8	8.1	4.6	14.7	9.0	1.0	0.8	65	7.1	3.5	79.0	-31.4	47.6	74.5
18-Aug-14	6.5	11.5	8.5	6.7	14.8	10.4	0.7	1.3	170	4.3	3.0	137.4	-30.6	106.8	78.2
19-Aug-14	6.1	10.3	8.0	6.6	12.2	9.1	3.4	1.1	243	2.8	2.1	93.9	-25.6	68.3	83.0
20-Aug-14	6.9	11.3	8.6	7.3	12.1	9.3	1.1	0.7	140	2.7	1.2	69.6	-25.7	43.9	78.9
21-Aug-14	6.3	14.7	10.5	4.0	17.9	11.0	0.0	1.1	42	2.9	1.2	176.8	-61.7	115.1	65.2
22-Aug-14	8.2	15.1	11.4	5.5	17.7	11.4	0.0	1.0	71	4.3	1.7	134.4	-59.6	74.8	60.2
23-Aug-14	6.3	13.4	9.6	7.3	14.8	10.7	2.3	1.3	123	2.6	1.2	98.8	-32.2	66.6	74.2
24-Aug-14	5.6	10.5	8.3	5.4	11.2	8.2	0.8	1.1	109	5.8	2.1	60.6	-33.6	27.0	73.7
25-Aug-14	4.5	15.2	8.4	4.1	17.1	9.3	1.7	1.2	104	4.5	1.9	106.5	-32.5	73.9	81.9
26-Aug-14	3.5	9.3	5.7	4.9	10.0	6.9	14.8	1.3	250	4.1	3.0	72.8	-25.3	47.5	86.3
27-Aug-14	3.5	14.0	8.4	2.4	17.1	8.9	0.0	1.9	212	4.1	2.5	173.9	-77.8	96.0	65.7
28-Aug-14	3.2	11.5	7.0	3.0	14.2	8.0	0.0	1.8	190	3.9	2.7	121.6	-61.4	60.2	66.5
29-Aug-14	4.3	10.5	6.5	4.6	13.6	8.1	1.0	1.7	71	2.6	1.3	93.7	-32.9	60.8	73.5
30-Aug-14	3.1	8.5	5.5	3.0	12.9	7.2	0.0	3.5	105	4.3	1.7	122.1	-32.1	90.0	83.3
31-Aug-14	1.8	7.4	4.5	4.6	10.9	7.0	2.8	3.5	75	3.1	1.6	76.4	-11.0	65.4	87.5
01-Sep-14	-0.2	7.4	3.3	0.6	9.2	4.7	0.1	3.9	212	3.6	1.7	105.9	-52.2	53.6	65.6
02-Sep-14	1.6	12.9	6.4	0.2	13.8	6.3	0.0	3.4	213	3.6	2.3	112.1	-56.9	55.2	60.1
03-Sep-14	0.4	6.9	2.6	1.6	8.0	4.6	0.7	3.4	209	3.9	2.0	84.0	-35.8	48.2	79.3
04-Sep-14	-0.1	10.7	4.9	-0.9	12.8	5.9	0.0	2.5	183	3.1	1.7	127.8	-59.6	68.2	62.1
05-Sep-14	1.2	6.3	2.8	2.7	6.8	4.0	10.3	2.2	89	4.2	3.0	28.7	-5.5	23.2	92.3
06-Sep-14	1.0	3.3	2.0	2.1	5.1	3.1	9.3	3.1	35	5.9	3.4	42.1	-3.7	38.4	94.7
07-Sep-14	0.3	5.3	2.5	1.3	7.0	3.5	2.5	1.5	56	6.1	3.5	75.5	-19.5	56.0	79.2
08-Sep-14	0.2	6.2	2.8	0.2	8.9	4.1	0.0	4.4	58	3.1	2.2	143.2	-65.0	78.3	71.7
09-Sep-14	0.1	8.4	3.8	-0.9	9.1	3.3	0.0	5.5	87	5.1	2.7	120.3	-74.0	46.3	59.8
10-Sep-14	3.1	12.5	6.6	1.5	13.2	6.2	0.0	5.0	143	3.2	1.5	100.8	-41.0	59.8	56.6
11-Sep-14	4.3	12.5	7.7	3.9	13.1	7.4	0.0	5.1	190	2.7	1.7	84.6	-42.0	42.6	66.5
12-Sep-14	4.0	9.7	6.6	3.0	10.7	6.4	0.5	5.0	186	3.7	1.4	59.6	-33.3	26.3	79.4
13-Sep-14	7.2	17.5	11.2	5.3	16.7	10.2	0.0	2.5	215	3.7	2.2	104.4	-44.4	60.1	68.0

Date	Air Temperature			Ground Temperature			Rain (mm)	Snow Depth (cm)	Wind Direction (degrees)	Wind Speed (m/s)		Radiative Fluxes (W/m^2)			Relative Humidity (%)
	Min	Max	Mean	Min	Max	Mean	Sum	Max		Max Gust	Mean	Mean SW	Mean LW	Mean Net Rad	
14-Sep-14	6.2	18.0	10.8	4.1	17.2	9.7	0.0	4.2	217	4.3	2.4	117.8	-70.0	47.8	61.0
15-Sep-14	6.4	14.2	9.9	4.1	15.3	9.3	0.0	4.1	201	6.1	3.6	101.6	-68.2	33.4	60.8
16-Sep-14	4.1	12.1	7.5	4.5	13.6	7.7	2.6	5.0	177	3.3	2.0	98.4	-42.7	55.7	64.3
17-Sep-14	2.0	9.0	5.5	1.0	10.7	5.4	0.0	4.9	205	5.5	2.9	102.1	-72.2	30.0	61.6
18-Sep-14	1.5	9.5	5.7	0.1	10.7	5.4	0.0	4.6	138	4.6	2.4	79.4	-48.5	30.9	67.1
19-Sep-14	3.4	11.0	6.6	2.5	11.8	6.6	0.0	5.5	145	8.5	4.1	90.2	-58.2	32.0	69.7
20-Sep-14	2.0	7.2	4.4	0.6	8.5	4.3	1.6	6.1	163	4.1	2.0	48.8	-38.5	10.4	73.2
21-Sep-14	0.7	3.4	2.1	0.1	3.8	1.8	9.8	6.9	140	4.6	2.3	24.9	-22.2	2.6	90.1
22-Sep-14	-0.9	2.4	0.5	-0.2	3.0	1.3	4.6	5.3	242	5.6	3.1	46.1	-19.5	26.6	93.2
23-Sep-14	-2.9	6.6	1.1	-2.1	7.0	1.4	0.1	1.7	170	2.4	1.3	107.9	-67.1	40.8	76.3
24-Sep-14	-1.4	4.8	1.7	-1.6	5.7	1.7	0.0	2.3	232	2.4	1.6	85.1	-57.9	27.2	60.6
25-Sep-14	-3.4	4.8	0.3	-3.6	4.2	0.0	0.0	1.8	169	2.7	1.4	97.2	-77.3	20.0	63.3
26-Sep-14	-2.1	4.2	0.9	-2.5	2.6	0.2	0.7	4.1	51	5.0	3.5	76.3	-56.8	19.5	59.1
27-Sep-14	0.8	7.8	4.3	0.7	7.0	3.8	2.3	5.7	84	4.2	2.2	39.4	-4.2	35.2	89.1
28-Sep-14	-1.5	4.6	2.4	0.3	4.6	3.4	11.0	4.8	191	4.0	1.8	24.6	-3.2	21.4	96.7
29-Sep-14	-2.5	-0.4	-1.6	-0.5	1.2	0.1	1.2	2.0	256	5.3	2.5	42.2	-9.4	32.8	92.5
30-Sep-14	-5.2	-2.1	-4.3	-2.2	-0.4	-1.3	0.0	11.4	257	5.0	3.1	8.7	-12.1	-3.4	84.7

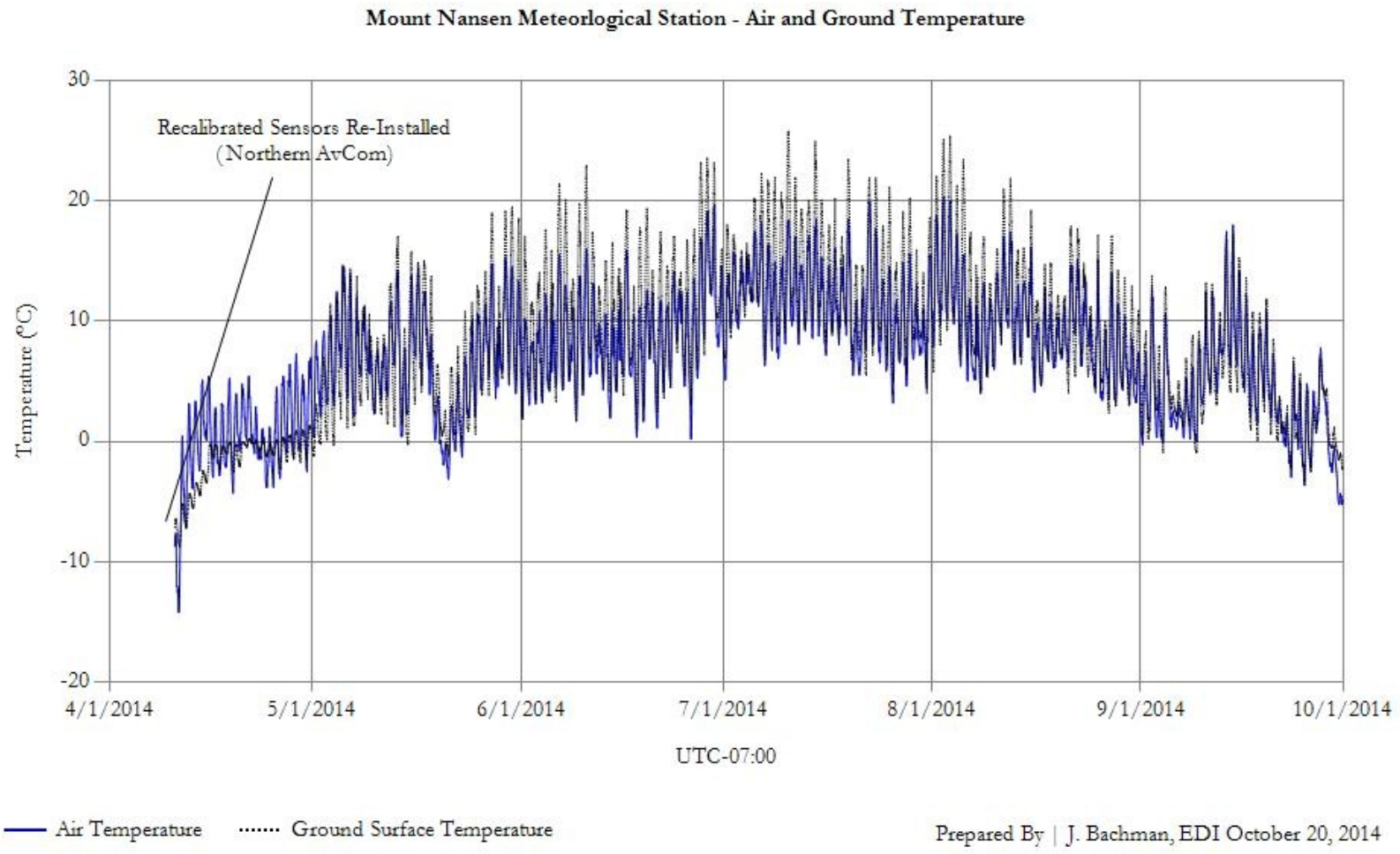


Figure F-1. Mount Nansen mean hourly air and ground temperature, April 1 to September 30, 2014

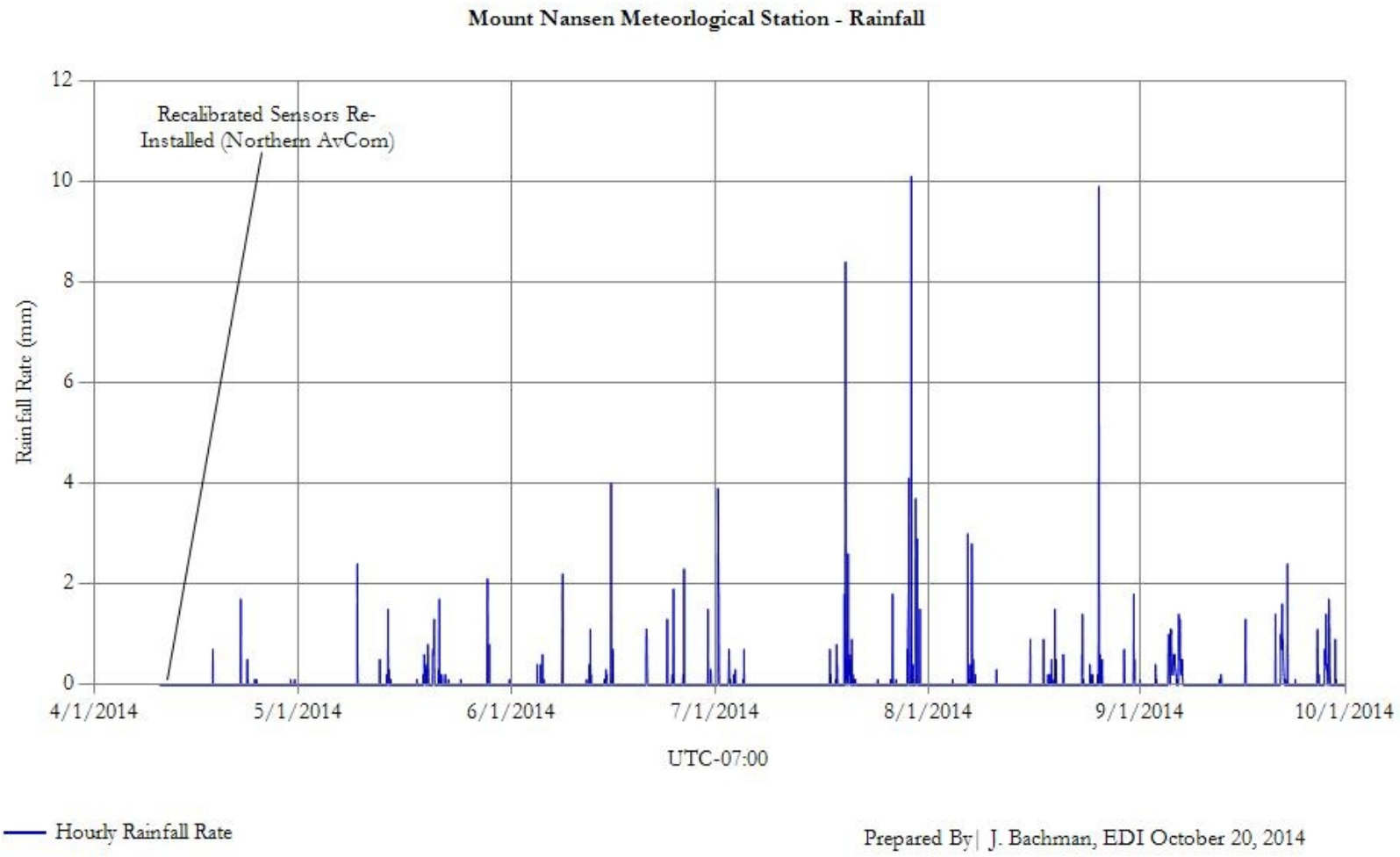


Figure F-2. Mount Nansen cumulative hourly precipitation as rainfall, April 1 to September 30, 2014.

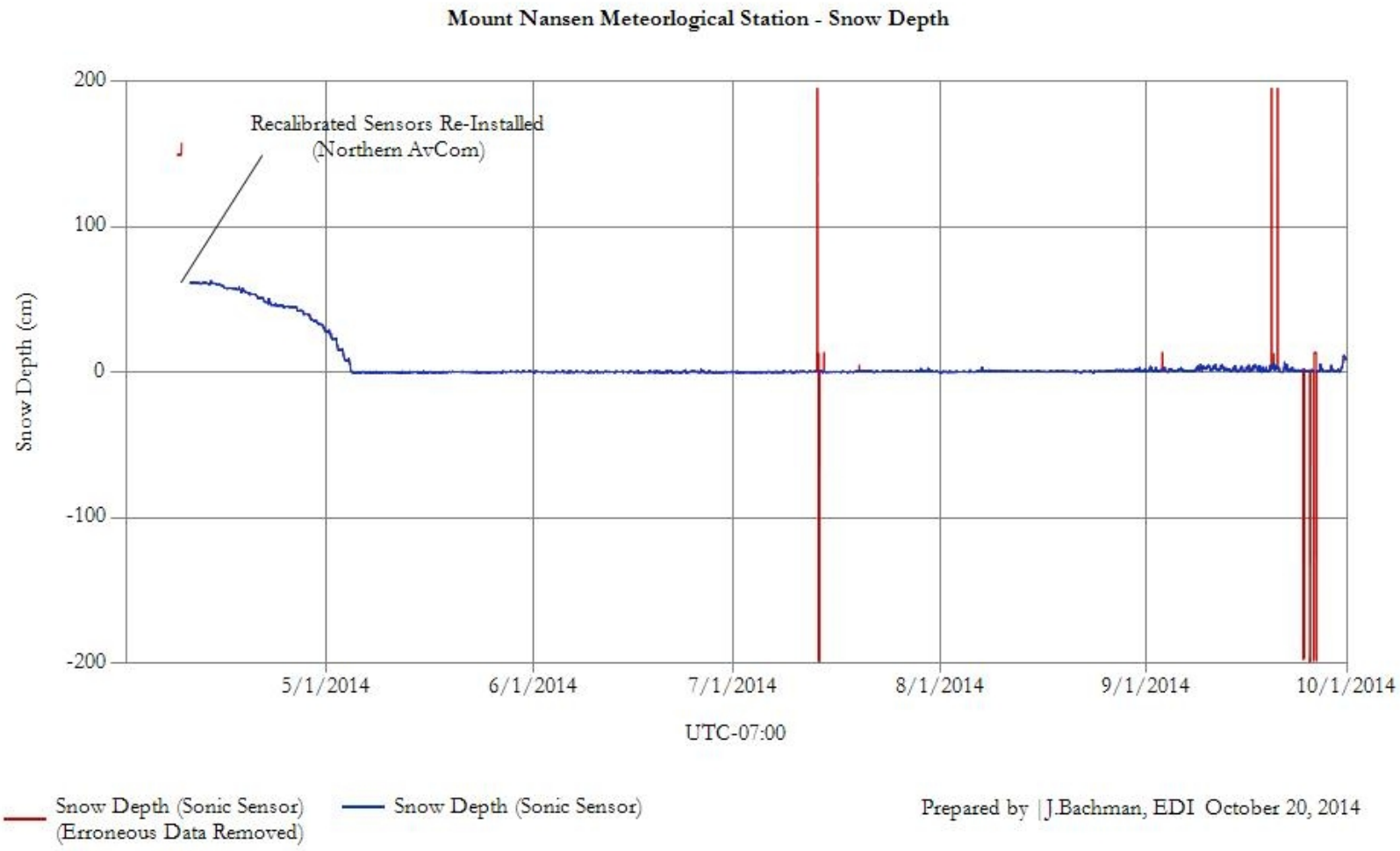


Figure F-3. Mount Nansen cumulative daily snow depth, April 1 to September 30, 2014.

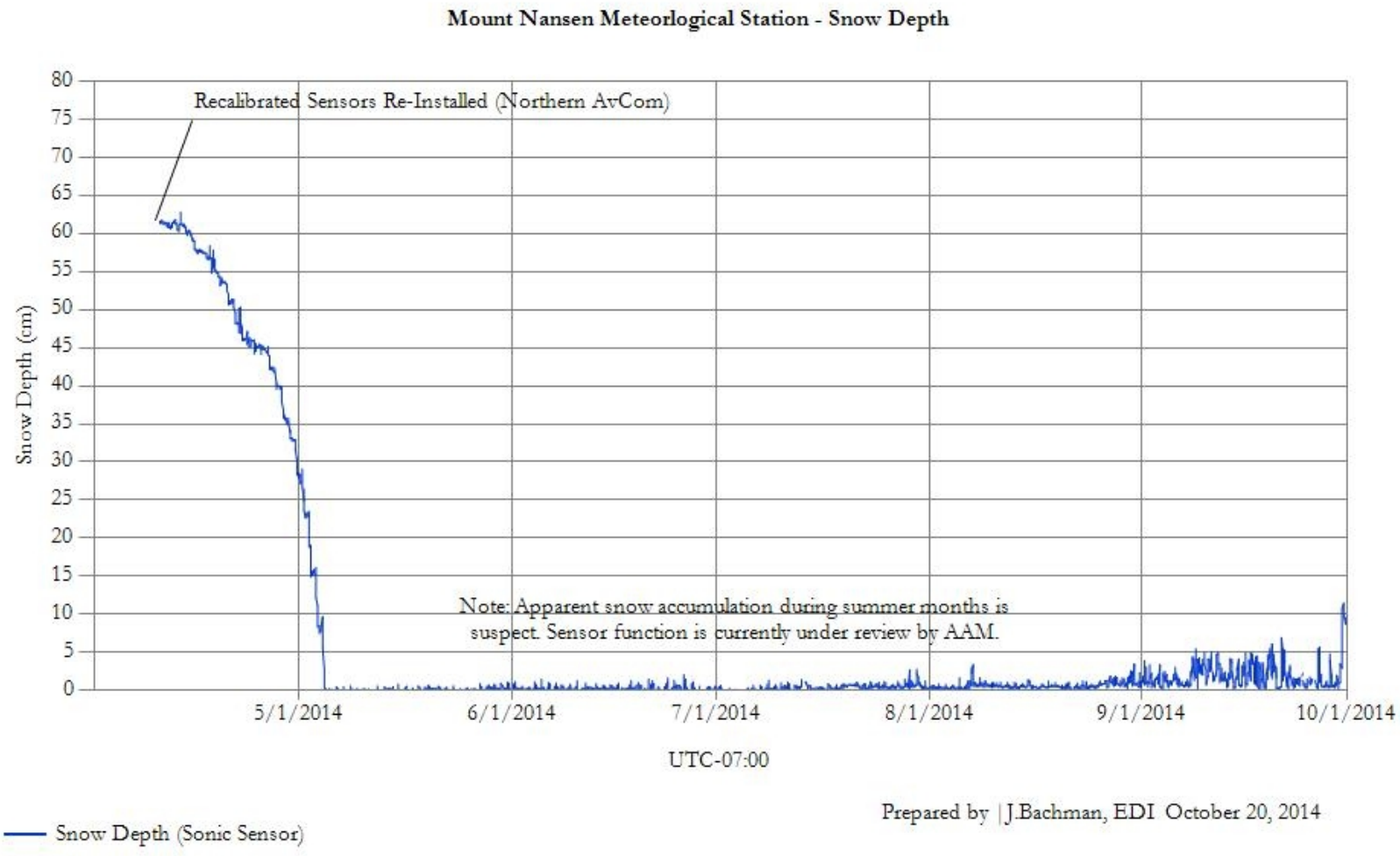


Figure F-4. Mount Nansen cumulative daily snow depth (errors removed), April 1 to September 30, 2014.

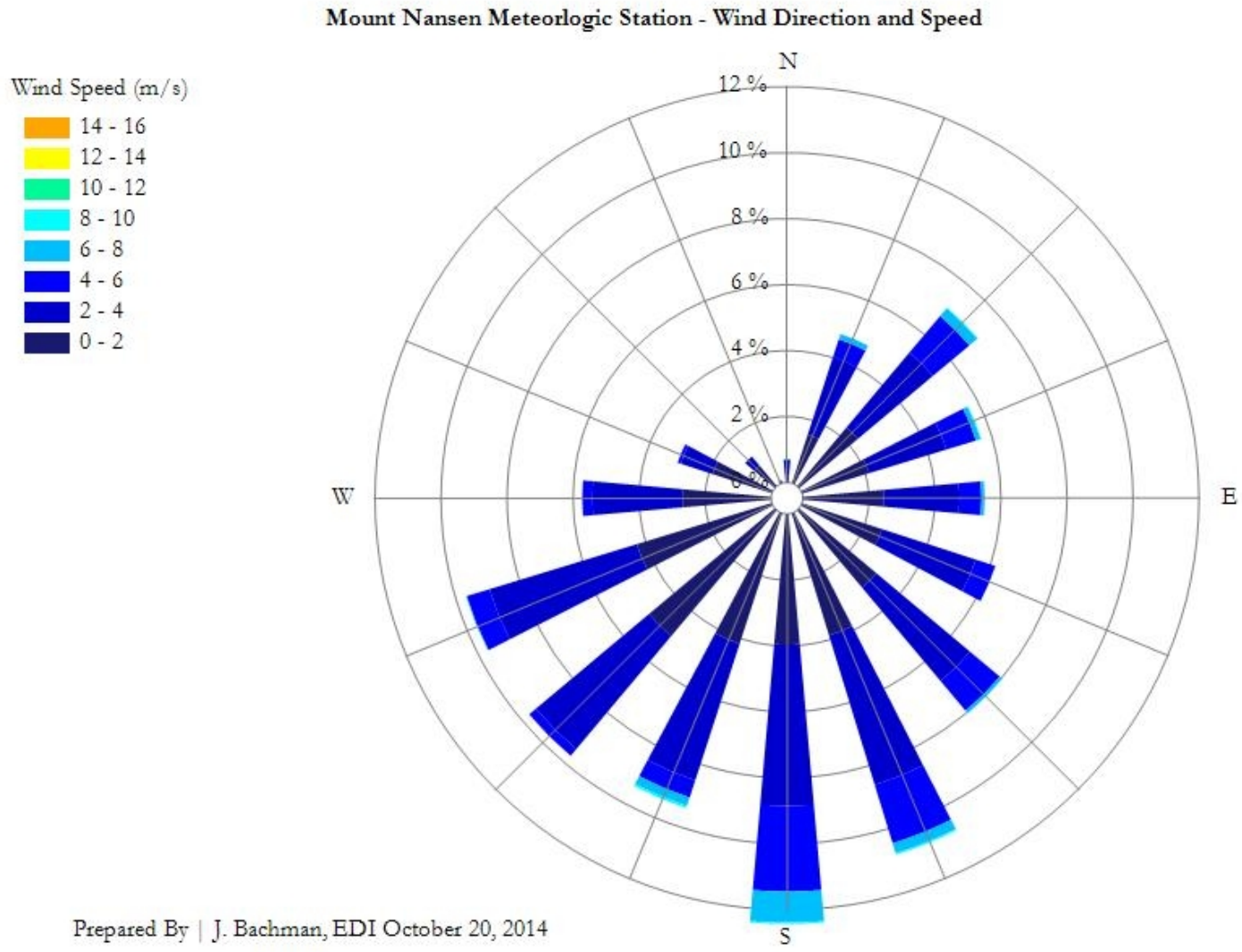


Figure F-5. Mount Nansen mean hourly wind speed (m/s) and direction (wind rose diagram), April 1 to September 30, 2014.

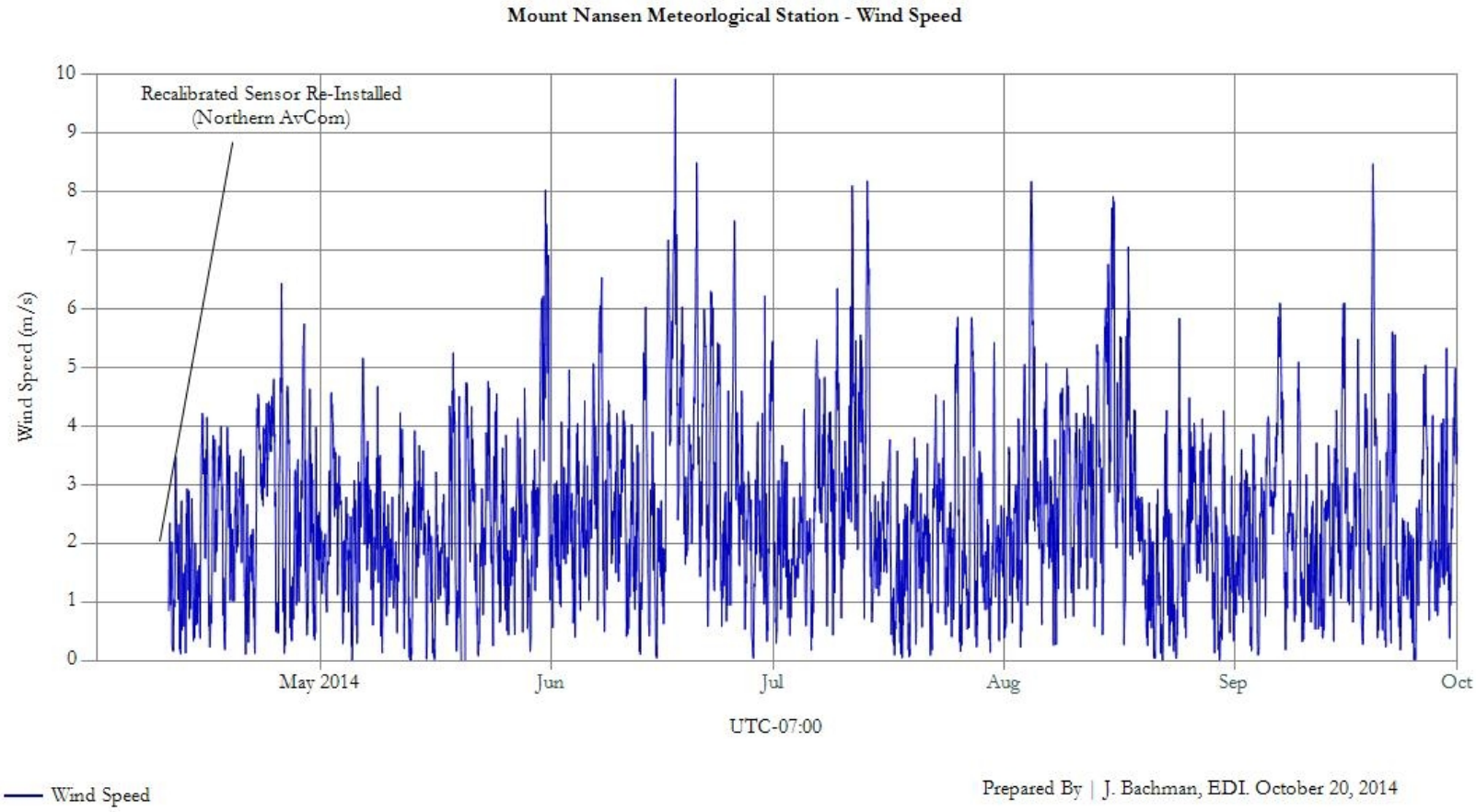


Figure F-6. Mount Nansen mean hourly wind speed, April 1 to September 30, 2014.

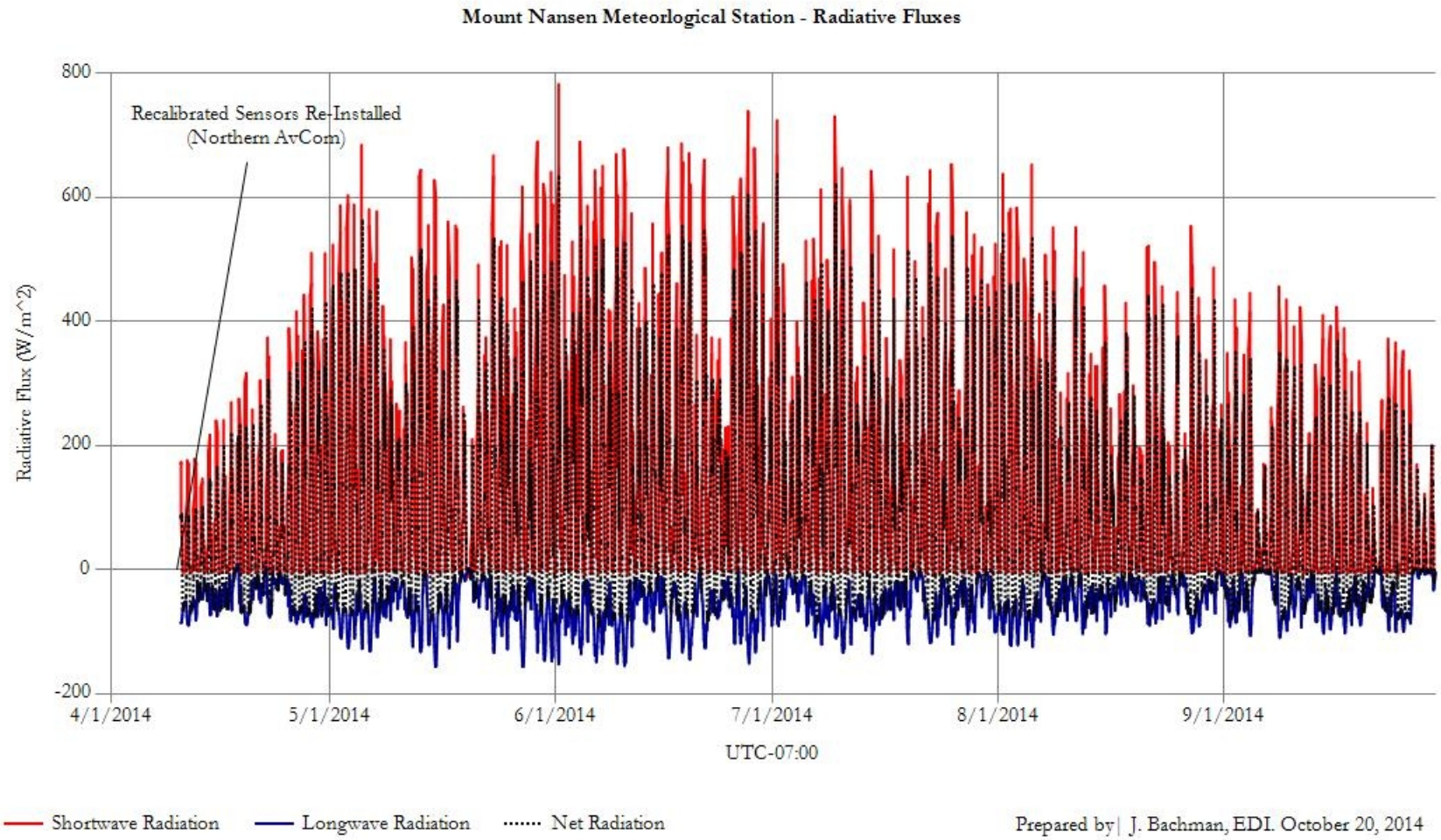


Figure F-7. Mount Nansen mean hourly net shortwave, long wave and total radiation, April 1 to September 30, 2014.

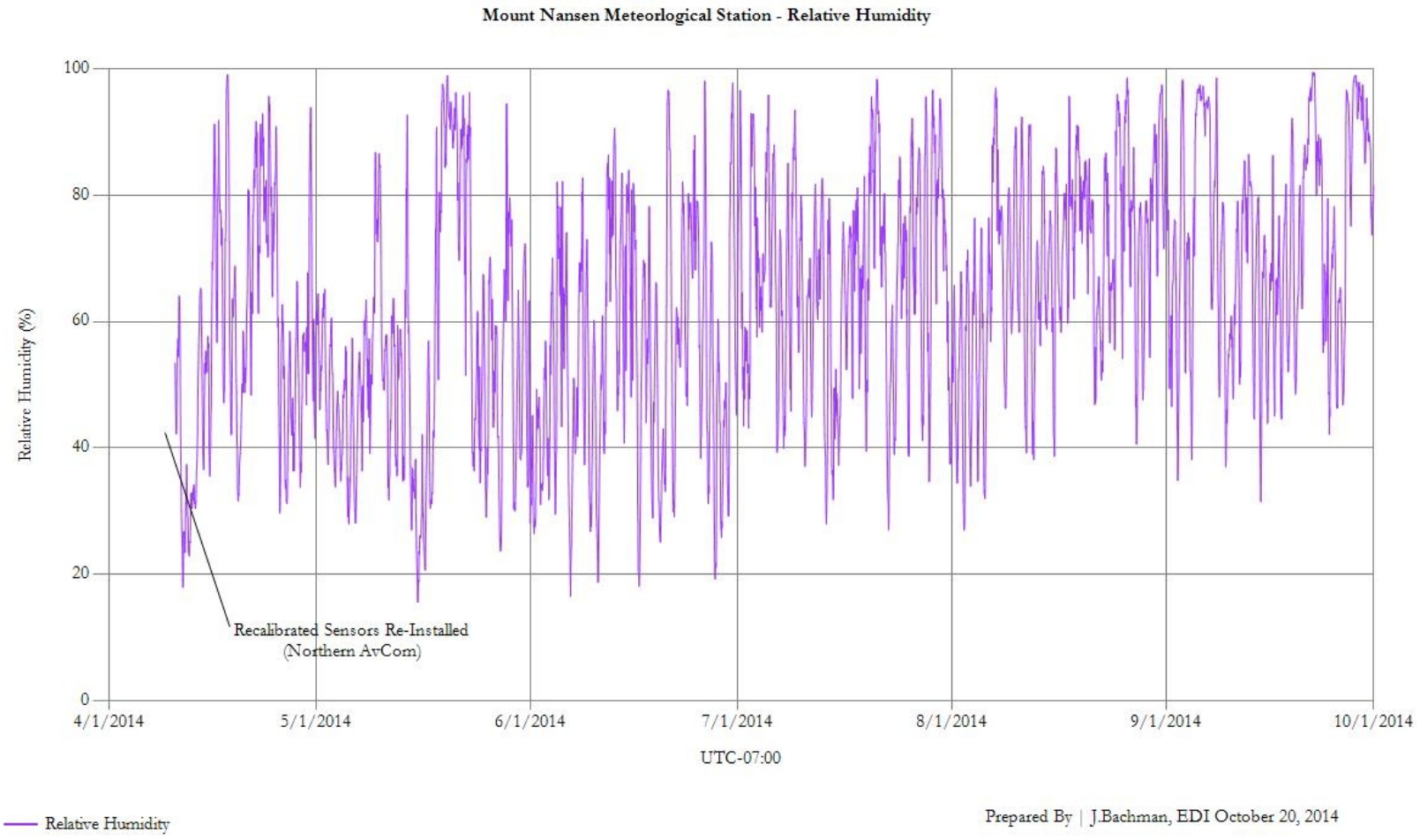


Figure F-8. Mount Nansen mean hourly relative humidity, April 1 to September 30, 2014.