Mount Nansen
Water Resources Investigations
Quarterly Report
October-December 2013

Prepared for:

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20 YEARS
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EXECUTIVE SUMMARY

EDI Environmental Dynamics Inc. (EDI) was retained by Yukon Government, Assessment and Abandoned Mines (AAM) in 2013 to conduct the Water Resource Investigations 2013/14 program at the Mount Nansen Site. This program involves surface water hydrometric and water quality monitoring, and meteorology for five watersheds at the Mount Nansen Site. The data presented in this report comprises the third quarter of the program (Q3), from October 1, 2013 to December 31, 2013.

Over the course of the Q3 period, three monitoring events took place:

- October 14-16, 2013
- November 12-14, 2013
- December 16-18, 2013

The monitoring objectives during this period were to collect surface water data through the early winter period. Hydrometric monitoring was completed at 19 hydrometric stations. Monitoring at each station included discharge measurements, water level surveys where continuous stage elevations are installed, and winterization and maintenance of selected stations for the winter period. Four of the 19 stations have continuous water level loggers installed for the winter period, while the remaining stations serve as instantaneous discharge measurement locations. Stream gauging methods included the velocity-area method (mid-section method), salt dilution gauging and volumetric method.

Water quality sampling was completed at 22 water quality sites. Water samples were collected at each site along with *in situ* water quality parameters such as water temperature, specific conductivity, pH and turbidity. Water samples were analyzed for total and dissolved metals, anions and nutrients, routine parameters, and cyanides, in addition to a drinking water samples from a drinking water well.

This report summarizes the site conditions between October 1, 2013 and December 31, 2013 and presents the collected data for the same time period. A description of the methodologies used for each component is also provided. Hydrometric results include stream discharge measurements, updated rating curve expressions for each station (where possible) and hydrographs. Water quality results include a summary of parameters that exceed the Canadian Council of Ministers of Environment (CCME) guidelines and/or the Mount Nansen Effluent Quality Standards, *in situ* water quality parameters. A brief description of the daily and hourly meteorological data for the Q3 period is also presented. A copy of the updated hydrometric, water quality and meteorological databases, containing all raw data, accompanies this report.

AUTHORSHIP

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

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1 INTRODUCTION

Yukon Government Assessment and Abandoned Mines (AAM) retained the services of EDI Environmental Dynamics Inc. (EDI) in 2013 to conduct the Water Resource Investigations 2013/14 program at the Mount Nansen Site. This program involves three monitoring components: surface water hydrology, surface water quality, and meteorology. This report represents the data report for the third quarter (Q3) of the program, from October 1, 2013 to December 31, 2013.

The Q3 period consisted of a single monthly monitoring event for each month in the quarter. The dates of each monitoring event were:

- October 14-16, 2013
- November 12-14, 2013
- December 16-18, 2013

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 Table 1-1, below.

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

Monitoring Component	Data Included	Section
Meteorology	• Summary of meteorological data by day • Hourly meteorological plots	• 3.1 • Appendix F
Hydrology	• Rating curve data summary tables • Database tables • Field data sheets	• 3.2 • Appendix D • Appendix C
Water Quality	• Summary of guideline exceedances tables • *In situ* water quality data summary tables • Lab results table and QA/QC analysis • Field data sheets	• 3.3 • 3.3 • Appendix E • Appendix C

1.1 SITE CONDITIONS

Site conditions during the Q3 period were typical of the early to mid-winter period with cold ambient air temperatures and precipitation falling as snow. The following specific observations were made during each trip to the Mount Nansen Site:

- **October 14-16, 2013** – Seasonally low air temperatures at or below 0°C. Snow cover was nearly continuous across the site, with greater snow accumulation at higher elevations. Semi-continuous ice cover was present on smaller water courses, with continuous ice cover at higher elevations (*i.e.,* Dome Creek and Pony Creek).
- **November 12-14, 2013** – Air temperatures were cold and generally below -10°C dropping to -30°C overnight. Continuous ice cover was present on all watercourses. Several sites and stations were frozen to substrate or dry below the ice surface and are expected to remain so until spring 2014 (*i.e.,* Pony Creek, Back Creek, and portions of Dome Creek).
- **December 16-18, 2013** – Air temperatures were seasonally cold, with persistently very cold (< -30°C) temperatures for the duration of the site visit. Continuous snow and ice cover was present across the site. Significant quantities of overflow ice were also present within the Dome Creek watercourse and other small watercourses (*i.e.,* Minnesota Creek).

2 METHODOLOGY

The Mount Nansen surface water and meteorological monitoring network consists of several discrete components: meteorology, surface water hydrology, and surface water quality. The following sections describe the monitoring network and the various methods used. The third quarter (Q3) report consists of data collected between October 1, 2013 and December 31, 2013.

The Q3 report is a continuation of the Q1 & Q2 program. Methods are identical to those outlined in the Q1 report (EDI 2013a) and results are presented as a continuation of findings from the Q2 period (July 1 to September 30, 2013; EDI 2013b). Since the Q3 period extends into the mid-winter period, hydrometric measurements were made in the presence of ice cover and associated backwater effects. The description and discussion of the results presented in this document is limited to the data collected in the Q3 period, with some comparisons to previous quarterly results.

2.1 MONITORING NETWORK DESCRIPTION

The Mount Nansen Site lies within the Victoria Creek drainage which is a tributary to the Nisling River. Several smaller water courses 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 and 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.

As of October 1, 2013, there were a total of 19 hydrometric stations and 22 surface water quality sites positioned throughout the five watersheds on-site and within Dry Creek, a reference watershed south of the site. The WQ-MS-S-08 and WQ-ADIT-SEEP were temporarily removed from the program during the Q3 period, following discussions with AAM. The list and location of hydrometric stations is summarized in Table 2-1, below and identified in Figure 2.

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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

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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
- Drainage Areas (Local)

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).

Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. (2013) was obtained using Garmin GPS technology.

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

0 200 400 600 800 1,000

metres

Map Scale = 1:22,000 (printed on 11 x 17)
Map Projection: North American Datum 1983 UTM Zone 8N

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Mount Nansen Map Area

Carmacks

Yukon

EDI

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Table 2-1. List of hydrometric stations and water quality sites at the Mount Nansen Site as of October 1, 2013.

Station/Site Name	Hydrology	Water Quality	Station/Site ID
Upper Pony Creek	X	X	H/WQ-PC-U
Pony Creek Downstream of Pit	X	X	H-PC-DSP/WQ-PC-D
Dome Creek at DX	X	X	H/WQ-DC-DX
Dome Creek at DX+105	X	X	H/WQ-DC-DX+105
Dome Creek at D1b	X	X	H/WQ-DC-D1b
Upper Dome Creek 1	X	X	H/WQ-DC-U1
Upper Dome Creek 2	X	X	H/WQ-DC-U2
Diversion Channel at Bridge	X		H-DC-B
Middle Dome Creek	X	X	H-DC-M/WQ-DC-U
Dome Creek at Road	X	X	H/WQ-DC-R
Seepage Pond Outflow	X	X	H/WQ-SEEP
Tailings Pond	X	X	H/WQ-TP
Brown-McDade Pit Lake		X	WQ-PIT-1,2,3
Mill Site Seep 03		X	WQ-MS-S-03
Back Creek	X	X	H/WQ-BC
Minnesota Creek	X	X	H/WQ-MN
Victoria Creek Reference Site[1]	X	X	H/WQ-VC-REF
Upper Victoria Creek	X	X	H/WQ-VC-U
Victoria Creek Downstream of Back Creek	X	X	H/WQ-VC-DBC
Victoria Creek Upstream of Minnesota Creek	X	X	H/WQ-VC-UMN
Victoria Creek at Road	X	X	H/WQ-VC-R
Pump House Well		X	WQ-PW
Dry Creek Reference		X	WQ-DRY

2.2 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). This new station replaced the HOBO Onset weather station that was located near the camp kitchen (ATM-CAMP AAM), which operated from 2009 to 2011. The ATM-ROAD AAM station is administered by Northern Avcom and data is accessible via an internet download. EDI is responsible for downloading and compiling these raw data. 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 AAM station records air temperature, ground temperature, humidity, rainfall, snow depth, net shortwave and long-wave radiation, total radiation, wind speed, wind direction and battery voltage (Table 2-2). Barometric pressure (mbar) data collection at the station began on August 30, 2012.

Table 2-2. 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.
Precipitation	mm	Total precipitation recorded hourly.
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 sampling began August 30, 2012 at 15:00

2.3 HYDROLOGY

The methods used for the 2013 hydrometric monitoring program closely follow that outlined by EDI (2013c) in the *'Mount Nansen Site Hydrologic Monitoring: 2012-2013'* report including data management and data processing methodology. Hydrometric data presented in this report spans the monitoring period October 1 to December 31, 2013. Discharge and/or stage were measured at 19 different hydrometric stations either continuously with water level loggers or instantaneously during each site visit. There were 14 combined continuous/instantaneous hydrometric stations and five instantaneous hydrometric stations (Table 2-2).

Four stations are used to record water levels during the winter period with instantaneous discharge measurements collected during each visit (H-DC-M, H-VC-U, H-VC-DBC, and H-VC-R). The loggers from the remaining ten continuous hydrometric stations were removed for the winter period due to some sites freezing to substrate during this period. Logger removals were completed during the October 2013 trip. During each monitoring event, instantaneous discharge measurements were conducted at all sites (continuous/instantaneous) if conditions allowed.

A detailed description of each hydrometric station is found in Appendix D. Table 2-3 summarizes the hydrometric station information for the Mount Nansen Site.

Methods employed for discharge measurement in 2013 included:

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

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 or narrow). 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 were 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 the periglacial environment, shifting mediums are common and require post-collection data adjustments.

Table 2-3. Mount Nansen hydrometric station information, October 1 to December 31, 2013 (continues on next page).

HID[1]	Hydrometric Station Name	Type[2]	Location [3] Easting	Northing	Drainage Area (km^2)	Elevation [4] (m)
ATM-DC2	Barometric at Diversion Channel	ATM	389476	6880792	-	1099
ATM-DC3	Barometric at Diversion Channel	ATM	389476	6880792	-	1099
ATM-DC4	Barometric at Diversion Channel	ATM	389476	6880792	-	1100
H-PC-U	Upper Pony Creek	I	388709	6881930	0.8	1227
H-PC-DSP	Pony Creek Downstream of Pit	I	388986	6881734	1.0	1191
H-DC-DX	Dome Creek at DX	I	387674	6881127	0.2	1215
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-U1	Upper Dome Creek 1	I	388919	6880772	2.1	1115
H-DC-U2	Upper Dome Creek 2	I	388937	6880819	2.1	1102
H-DC-B	Diversion Channel at Bridge	I	389480	6880780	3.0	1095
H-DC-M	Middle Dome Creek	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	I	392540	6879249	4.5	1020
H-BC	Back Creek	I	391626	6880901	10.4	1021
H-MN	Minnesota Creek	I	392540	6879249	12.7	989
H-VC-REF	Victoria Creek Reference Site	I	391650	6881113	64.0	1036
H-VC-U	Upper Victoria Creek	C/CW	391667	6880882	64.6	1019
H-VC-DBC	Victoria Creek Downstream of Back	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.

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 when moving parts tend to freeze.

2.3.1 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. Discharge uncertainty was estimated to be ±10% for measurements collected with the Swoffer current meter.

2.3.2 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 2004; 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 (2004, 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 (2004; 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 Q3 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 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 or YSI 556 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) was measured (logged) because the values are compensated for water temperature. A known mass of salt (NaCl) was dissolved into a graduated bucket of stream water at the injection site. Once fully dissolved, the salt slug was injected at the upstream site and the electrical conductivity of the salt wave was 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 was:

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

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

[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.

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 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 December 16-18 field visit. The estimated measurement accuracy for dry salt slug injection is ± 20%. However, the discharge uncertainty varies considerably between each station due to differences in channel conditions and stream water velocities.

2.3.3 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 and 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 were provided by AAM. EDI staff collects concurrent flow meter readings when volumetric measurements are made at the pipe outlet.

2.3.4 V- Notch Weir

Rated structures such as v-notch weirs are typically installed in streams where standard measurement methods cannot be employed. These structures are designed with a specific rating equation where discharge is directly related to the head distance above the v-notch. The 90° v-notch design is ideal for low flows such that large changes in head correspond with relatively small changes in discharge.

One hydrometric station at the Mount Nansen Site has a 90° thin plate v-notch weir. This station is in the upper Pony Creek watershed approximately 15 m upstream of the H-PC-U gauging station at an existing channel constriction. A v-notch weir was recommended as a discharge measurement approach due to poor metering sites along this small, shallow, vegetated channel. Design and installation guidelines followed those described in RISC (2009).

The head over the weir crest is measured and used to estimate discharge flowing through the structure. A concurrent volumetric discharge measurement is used to validate weir head measurements. Discharge from the weir is initially calculated using a standardized rating structure equation for a fully contracted v-notch weir using:

$$Q = 1.370\, h^{2.5} \qquad [6]$$

Where Q is discharge in m^3/s and h is the height of water above the v-notch (head) (RISC 2009).

Following high flows encountered at the start of the open water season of 2013, the channel where the weir was installed had moved. The channel was no longer flowing over the weir location, but maintained flow at the H-PC-U station. No weir head measurements were taken during the course of the Q3 monitoring period.

2.3.5 Ice-cover Hydrometrics

Hydrologic measurements completed during periods of channel ice-cover 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 must be carefully analyzed. 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 measurement becomes increasingly uncertain.

2.3.6 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 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.

2.3.7 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.

2.3.8 Rating Curve Development

Rating curves are based on open channel hydraulic relationships between stage (water level) and discharge. 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 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:

$$Q = C(h + a)^N \qquad [7]$$

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 and as such, multiple rating curves are often required to accurately represent the full range of flows in the stream.

By taking the log of both sides of the rating curve equation [7],

$$\log Q = logC + N\ log(h + a) \qquad [8]$$

the rating curve equation [6] takes the linear form $y=mx+b$ and can be fit to the discharge calibration 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 stage changes, and channel instabilities, each rating curves is developed by fitting by eye within the Aquarius Time-Series Software environment (Aquarius Informatics Inc. 2012).

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. For stations where there were no shifts to hydraulic controls or datum (due to benchmark repairs) between 2011 and 2013, previous years rating measurements were included in the revised 2013 rating curves.

The highest flows recorded for the Mount Nansen hydrometric program were measured in the spring of 2013. Successive monitoring events throughout the spring freshet period allow the capture of higher spring flows than previous monitoring years. 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. Formerly developed rating

curves have been revised and extended in this report only to approximate the high-flows captured during field measurements.

2.3.9 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. Measurement accuracy details for the pressure transducers is located in Appendix D.

The hydrostatic pressure data was compensated for atmospheric pressure using data from the barometric pressure loggers located at ATM-DC2. 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:

$$H = \frac{P}{\gamma} + z \qquad [9]$$

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):

$$\rho = 1000\left[1 - \frac{t+288.94}{508929.2(t+68.12963)}(t - 3.9863)^2\right] \qquad [10]$$

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 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.

2.3.10 Hydrometric Data Management

Hydrometric data is compiled into a MS Access database after each visit to the Mount Nansen Site (EDI 13-Y-0167 Hydrology Database 2013.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 also contains tracking information such that each stage of QA/QC can be checked for completion.

2.4 WATER QUALITY METHODS

Water samples were collected at each of the 22 water quality sites, if conditions allowed, along with *in situ* data, photo documentation, and general site comments during each field visit. A list of sites, locations and sampling information are provided in Table 2-4. During the Q3 period, sampling occurred on a monthly basis in October, November and December, 2013. Details on the field methodology, laboratory analysis, QA/QC program and data analysis are provided in the following sections.

Table 2-4 Mount Nansen water quality site and sampling information.

Water Quality Site Name	Site ID	Site Location [1]		Sampling Frequency	Parameters Included in Lab Analysis [2]
		Easting	Northing		
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
Upper Dome 1	WQ-DC-U1	388919	6880772	Monthly	Standard Package
Upper Dome 2	WQ-DC-U2	388938	6880812	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 03	WQ-MS-S-03	387884	6881121	Monthly	Standard Package
Back Creek	WQ-BC	391626	6880901	Monthly	Standard Package
Minnesota Creek	WQ-MN	392540	6879249	Monthly	Standard Package
Victoria Creek Reference	WQ-VC-REF	391650	6881113	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 Bacteriological Analysis
Dry Creek	WQ-DRY	387621	6880579	Seasonally	Standard Package

[1] NAD 83, UTM Zone 8.

[2] Parameters included in various sampling packages are explained in greater detail in Section 2.4.1, below.

[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.

2.4.1 Field Sampling Methods

An Oakton T100 turbidity meter was used to collect *in situ* turbidity (NTU). This meter was 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), and in some cases dissolved oxygen (mg/L, for the pit lake). Field crews calibrated the YSI meter on a daily basis prior to each field day. Field data was recorded on standard field datasheets including station name, sample identifier, sample date and time, water temperature, specific conductivity, pH, photo numbers and a record of site conditions including flow stage (low, moderate, high), turbidity (clear, low, moderate, high), and ice observations.

Laboratory-cleaned bottles were filled using clean techniques (*i.e.,* nitrile gloves, appropriate bottle handling) and samples were filtered and preserved on site, as directed by the lab (ALS). Samples from the pit lake were taken from the same general location on the lake at three different depths, from the surface, at mid depth and just off the bottom. There was ice cover over the pit lake during the Q3 quarter, and the surface sample was collected from just below the base of the ice surface. A Van Dorn sampler was used to collect all samples and is also used to measure the depth.

Samples were kept in coolers immediately following collection, and were kept from freezing by keeping inside truck, before being transferred to the Mount Nansen Site sample refrigerator. For chemical analysis, Chain of Custody forms were included in each sample cooler, and samples were delivered to ALS Laboratories upon arrival back in Whitehorse, YT to ensure lab holding times were met. For bacteriological analysis, the sample from each trip was submitted to Yukon Government Environmental Health Services (YG EHS).

2.4.2 Laboratory Analysis

All surface water quality laboratory analysis was conducted by ALS, except for the bacteriological sample collected from the pump house well which was analyzed by YG EHS. 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 2-5. A slight modification to the sample bottles was issued from ALS in November 2013, related to the requirement that separate bottles are used for mercury (total metals and dissolved metals). No changes to the actual analysis was made.

Table 2-5 Laboratory analysis parameters included in various 'packages' created for surface water quality sampling at Mount Nansen.

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

Analysis Package	Parameters Included
	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, 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.

2.4.3 QA/QC Program

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

- Duplicate 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. Duplicates were collected from two sites, randomly selected, during each trip. The duplicate samples were conducted to check the accuracy and precision of the laboratory analysis.

- The field blank sample was collected on site as well, where a set of sample bottles was filled with deionized water at some point during the sampling trip. Sampling methodology was 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 from the sampler or the supplies (filter, syringe, bottle, or preservative).
- The travel blank was a sample set provided by the laboratory to be carried by the staff to and from site during the field work. The travel blank was 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 was completed. This involved comparing the duplicate samples and the regular samples collected at the randomly selected replicate stations to ensure they were within acceptable limits of each other (within +/-10%). Field and travel blank sample data was also reviewed to ensure that concentrations of all potential contaminants were low to below detection limits.

2.4.4 Data Analysis

For the purpose of this data report, the data were reviewed and parameters of concern were graphed and compared with the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of freshwater aquatic life (CCME-AL; CCME 2013; Table 2-6), 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 2-7). Drinking water quality from the WQ-PW site was compared to the applicable Guidelines for Canadian Drinking Water Quality (Health Canada 2012; Table 2-8).

Table 2-6. CCME-AL Guidelines applicable to Mount Nansen surface water quality sampling program (CCME 2013).

Water Quality Parameter	CCME-AL Guideline	Units	Comments
Aluminum (Al)	0.1 mg/L	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	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.

Water Quality Parameter	CCME-AL Guideline	Units	Comments
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	-
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 2-7 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

Water Quality Parameter	Effluent Discharge Standard
Mercury (Total)	0.005 mg/L
Nickel (Total)	0.3 mg/L
Silver (Total)	0.10 mg/L
Zinc (Total)	0.30 mg/L

Table 2-8 Applicable Guidelines for Canadian Drinking Water Quality for WQ-PW (Health Canada 2012).

Water Quality Parameter	Effluent Discharge Standard
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
Cyanide	0.20 mg/L
Fluoride	1.5 mg/L
Lead	0.010 mg/L
Mercury	0.001
Nitrate	45 mg/L
Selenium	0.01 mg/L
Uranium	0.02 mg/L

3 RESULTS

Results are separated into the three program components: meteorological, hydrometric, and water quality results. Select field photographs for the second quarter period and for each site and station are provided in Appendix A. A record of which sites were sampled during each field visit during the first quarter period is available in Appendix B. All field datasheets for hydrology and water quality are provided in Appendix C. All hydrometric data is provided in Appendix D and water quality data in Appendix E. Meteorological data is provided in Appendix F.

3.1 METEOROLOGICAL RESULTS

Meteorological data from the ATM-ROAD AAM station is summarized below for the Q3 period (October 1, 2013 to December 31, 2013). All data is plotted in Appendix F, with selected summary statistics tabulated for air and ground temperature, rainfall, snow depth, wind direction and wind speed. A brief description of the meteorological conditions is presented in the following sections.

3.1.1 Air and Ground Temperature

Minimum mean daily air temperature for the Q3 period was -29.0°C on November 21, 2013. Maximum mean daily air temperature was 4.0°C on October 29, 2013. Mean air temperatures were generally declining through the early weeks of the Q3 period to minimum temperatures in December 2013.

During the Q3 period, mean daily ground temperatures reached a maximum of 1.8°C was on October 3, 2013. Minimum mean daily ground temperatures reached -10.9°C on November 22, 2013. Mean daily ground temperatures remained below 0° C beyond October 31, 2013.

3.1.2 Precipitation

Precipitation measured as rainfall occurred sporadically between October 1, 2013 and December 31, 2013. The highest daily rainfall rate occurred on October 29, 2013 at a rate of 0.458 mm/hour. Maximum daily rainfall also occurred on October 29, 2013 with a total daily rainfall of 11 mm. Precipitation events as rainfall are dominated by short, low-intensity rainfall events most often associated with convective systems moving over the region. Snow accumulation began on October 9 and steadily increased to 47 cm depth at the station.

3.1.3 Wind

Wind speeds are generally low, with maximum mean daily wind speed of 7.69 m/s (27.7 km/h) occurring on December 12, 2013. Dominant wind directions at the Mount Nansen Site are south, southwest and southeast. The instantaneous wind speed recorded during the Q3 period was 10.43 m/s (37.5 km/h) which also occurred on December 12, 2013.

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 and the surface of the earth. The balance of radiation fluxes exhibits the seasonal pattern typical of northern latitudes with similar vegetation cover. As ground surface attributes 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 to over 500 W/m^2 in the summer months. Net radiation exhibits a diurnal cycle associated with increases and decreases in received solar insolation. During the Q3 period, there is a tapering of net radiation vales to around 0 W/m^2 by mid-November 2013.

3.1.5 Relative Humidity

Relative humidity at Mount Nansen generally remains above 30%, and fluctuates up to 100%. Relative humidity remains elevated in the late fall and winter months. Persistently cooler temperatures and higher relative humidity is observed throughout the Q3 period, with minimum daily mean values of 34.2% and maximum daily mean relative humidity of 92.8%.

3.2 HYDROMETRIC RESULTS

Up to a total of three discharge measurement events were performed between October 1, 2013 and December 31, 2013 and are included in this quarterly report. A summary of each hydrometric measurement event is presented in Appendix D, in addition to the measured discharge, river stage elevations and hydrographs are presented for each station. Hydrometric data from the Q3 period is appended to the Q1 and Q2 monitoring and time-series data.

Some hydrometric stations in the upper reaches of the Dome Creek watershed have higher discharge estimate uncertainty or an absence of measurement because of environmental factors complicating field measurement. These environmental factors included limited discharge (*i.e.,* <0.001 m^3/s), the presence and accumulation of aufies, and extreme cold temperatures limiting the usage of electronic field equipment. Professional judgement was used to assess the limits of stream gauging instruments and appropriate methods for low-flow and ice-cover conditions.

A full summary of hydrometric monitoring records for the previous quarterly monitoring periods is recorded in Appendix D, Table D-3. Barometric pressure time-series, hydrographs, water surface stage elevations and rating curves are presented in Appendix D for all stations. 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. The following sections describe the results from each gauging station.

3.2.1 Dome Creek

3.2.1.1 H-DC-DX

The highest elevation hydrometric station in the Dome Creek watershed is H-DC-DX which has a small contributing basin. The drainage area of H-DC-DX is approximately 0.21 km^2. The station was originally established for water quality sampling (station WQ-DC-DX) as an upstream control site and not as a hydrometric station. The channel at H-DC-DX is a poorly defined, braided channel through willow shrub, moss and grass vegetation. Average wetted width of the station is approximately 0.10 m and average depth is 0.07 m. The station is unsuitable for standard discharge measurement methods and only instantaneous discharge is measured when possible.

H-DC-DX was visited during on all three sampling events during the Q3 monitoring period. No discharge measurement was completed during the Q3 period due prohibitively low flows (<0.001 m^3/s), or absence of flow in the channel or frozen channel conditions. The hydrograph of instantaneous measurements and associated discharge for H-DC-DX is shown in Appendix D.

3.2.1.2 H-DC-DX+105

Located 105 m downstream of H-DC-DX, station H-DC-DX+105 represents a drainage area of 0.52 km^2. The station typically has thinner ice or remains ice-free longer than H-DC-DX into the winter months. This is because the station receives slightly more groundwater contributions associated with the road and mill cut immediately upstream. 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. A total of three discharge measurements were completed at this station between October 1, 2013 and December 31, 2013. Very low discharges and ice cover were encountered at the station on all visits. Minimum flows were measured at 0.002 m^3/s in ice-covered conditions.

3.2.1.3 H-DC-D1b

H-DC-D1b was established in June of 2012 following discoveries that additional channels of Dome Creek were present in the vicinity of H-DC-D1. The channel at H-DC-D1b is approximately 0.35 m wide, 0.13 m deep, and is unsuitable for cross-section velocity and salt dilution gauging. Similar to other stations within the Dome Creek watershed, thick layers of overflow ice (commonly referred to as creek 'glaciation') develop through the winter period as a surface expression of winter-time flows. Complex, braided channels develop within the ice cover during the spring melt period, making hydrometric gauging nearly impossible. Two discharge measurements were collected from H-DC-D1b, each on October 16, 2013 (0.0014 m^3/s), and November 14, 2013 (<0.001 m^3/s) using the salt-dilution method. Significant ice accumulation and absence of channelized flow prohibited the measurement of flows during the December 2013 monitoring event.

3.2.1.4 H-DC-U1 and H-DC-U2

Stations H-DC-U1 and H-DC-U2 were measured on October 16, 2013 and November 14, 2013 using the salt-dilution method. Discharge at H-DC-U1 was 0.002 m^3/s on October 16, 2013 and below measurable discharge on November 14, 2013. Similarly, discharge at H-DC-U2 on October 16, 2013 was 0.007 m^3/s, but below measurable discharge limits on November 14, 2013. Discharge at H-DC-U1 and U2 was not measured on the December 17, 2013 visit due to significant ice accumulation and absence of measurable flows. Due to frozen conditions and ice accumulation in the Q3 period, discharge estimates should be assessed with the context of greater inherent uncertainty.

3.2.1.5 H-DC-B

The H-DC-B station is a continuous gauging station established at the downstream end of the Dome Creek diversion channel, downstream of the channel bridge. The channel is approximately 1.27 m wide and 0.15 m deep with significant quantities of sediment transport downstream as a result of channel disturbance through the winter period.

The stilling well at this station was removed for the 2012/2013 winter due to ongoing channel maintenance work to reduce icing issues at the bridge location. The continuous gauging station was re-established on May 27, 2013 when the channel was ice-free. Discharge conditions were generally unsuitable for measurements using the ADV. As a result, all discharge measurements were completed using the salt dilution measurement method. The station was removed following the October 15, 2013 site visit so that the station instruments would not be damaged as a result of winter maintenance work.

Station discharge measurements for H-DC-B during the Q3 period are presented in Appendix D. A single discharge measurement of 0.012 m^3/s was made on October 15, 2013. Generally low discharge measured at H-DC-B is consistent with generally low upstream Dome Creek discharges.

3.2.1.6 H-DC-M

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). Continuous stage measurements were collected over the 2012-2013 winter period (EDI 2013c) and continued into the third quarter of 2013-2014.

The channel is moderately well defined within fine grained substrate. Some cobble to boulder sized material persists upstream of the diversion channel confluence where stream gradients are greater. The channel averages 1.08 m in width and 0.16 m in depth. Salt dilution gauging was the primary discharge method measurement due to channel conditions unsuitable for the ADV.

Continuous water stage elevations and discharge measurements are presented in Appendix D which covers Q1, Q2 and Q3 monitoring periods. Discharge measurements during the Q3 period were collected on

October 15, 2013 (0.017 m^3/s), November 12, 2013 (0.014 m^3/s) and December 17, 2013 (0.007 m^3/s). H-DC-M stage time-series and hydrographs are presented in Appendix D.

A rating curve for H-DC-M was established for the station following the 2012-2013 monitoring year (EDI 2013c). This rating curve was subsequently updated with additional measurements collected during high flows and additional measurements obtained in Q1, Q2 and Q3 of 2013-2014. Table 3-1 summarizes the rating curve expressions presented for the 2012-2013 report and revised rating curve for the 2013-2014 Q3 report.

Table 3-1 Middle Dome Creek (H-DC-M) rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
1.556	0.005	1.5	-----	-----
1.701	0.060	1.5	1.986	$Q = 1.44074\ (h\text{-}1.5)^{1.98631}$
2.003	0.356	1.5	1.950	$Q = 1.35912\ (h\text{-}1.5)^{1.94996}$
Revised Rating Curve, April, 2013 to December, 2013				
1.550	0.001	1.52	-	-
1.891	0.771	1.52	2.558	$Q=9.74\ (h\text{-}1.52)^{2.56}$

3.2.1.7 H-DC-R

The station at H-DC-R was re-established on June 10, 2013. The station was 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. As a result of ice accumulation throughout the winter period, ice removal and maintenance occurs along the Dome Creek road crossing. Salt dilution gauging was used for each discharge measurement at H-DC-R in the Q3 period. Two discharge measurements were completed at H-DC-R. Discharge was 0.011 m^3/s on October 15, 2013, and declined to 0.004 m^3/s on November 12, 2013. The rating curve developed for the H-DC-R remains unchanged from the Q2 reporting period. The original 2012-2013 and revised 2013 rating curve equations for H-DC-R are shown in Table 3-2.

Table 3-2. Dome Creek at the Road (H-DC-R) rating equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
0.2747	0.002	0.16	-----	-----
0.6621	0.100	0.16	2.758	$Q = 0.666494\ (h\text{-}0.16)^{2.75760}$
1.062	0.477	0.16	2.671	$Q = 0.628053\ (h\text{-}0.16)^{2.67137}$
Revised Rating Curve, April, 2013 to December, 2013				
0.274	0.002	0.125	-	-
1.062	0.477	0.125	2.98	$Q = 0.579\ (h - 0.125)^{2.98}$

3.2.2 Back Creek

3.2.2.1 Back Creek (H-BC)

A station on Back Creek at H-BC was re-installed on May 16, 2013 when the channel was ice-free. The channel is stable and entrenched into alluvial sediments of both the Back Creek and Victoria Creek floodplains. Upstream placer activity increases the sediment load observed within the creek. 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 other discharge measurements were made using the salt dilution method.

A single discharge measurement was collected from H-BC on October 16, 2013, prior to the channel becoming in filled with ice. Discharge measured was 0.006 m^3/s. Previously reported rating curves in the second quarterly report remain unchanged for the Q3 reporting period. Rating curves are presented in Table 3-3. Time-series water stage and hydrographs are presented in Appendix D.

Table 3-3. Back Creek (H-BC) rating curve equations.

Stage (m)	Discharge (m3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
1.630	0.001	1.62	-----	-----
1.893	0.063	1.62	1.252	$Q = 0.319\ (h\text{-}1.62)^{1.252}$
2.168	0.602	1.62	3.244	$Q = 4.239\ (h\text{-}1.62)^{3.244}$
Revised Rating Curve, April, 2013 to December, 2013				
1.63	0.001	1.49	-	-
2.168	0.602	1.49	4.057	$Q = 2.91\ (h - 1.49)^{4.06}$

3.2.3 Minnesota Creek

3.2.3.1 Minnesota Creek (H-MN)

The station on Minnesota Creek was re-established on May 23, 2013. The station was removed on October 16, 2013 prior to the channel becoming frozen. Two discharge measurements were completed at the station during the Q3 monitoring period. Discharge on October 16, 2013 was 0.008 m^3/s and on November 13, 2013 discharge was 0.045 m^3/s.

The Minnesota Creek channel is well defined with nearly vertical banks near the station and a cobble/gravel bed. The channel averages 1.12 m in width and 0.41 m in depth. Maximum discharge recorded during the 2013 spring freshet was 0.443 m^3/s.

Preliminary rating curves for H-MN are presented in Table 3-4 in addition to the previously developed rating curves from the 2012-2013 monitoring period. Rating measurements collected during Q3 were appended to the data set. The rating curve for the H-MN station was revised using discharge measurements

collected using the ADV instrument and the cross-sectional area method. Station rating curves are still considered preliminary and should only be used as an estimate of discharge at the H-MN point. According to the station hydrograph, discharge at H-MN ranged from 0.015 m^3/s to 0.210 m^3/s, with average discharge for the period of 0.055 m^3/s.

Table 3-4. Minnesota Creek (H-MN) rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
0.9095	0.006	0.5	-----	-----
1.086	0.114	0.5	8.461	$Q = 10.4987\ (h-0.5)^{8.46114}$
1.231	0.820	0.5	8.918	$Q = 13.4031\ (h-0.5)^{8.91813}$
Revised Rating Curve, April, 2013 to December, 2013				
0.902	0.011	0.5	-	-
1.339	0.985	0.5	6.172	$Q = 2.910\ (h-0.5)^{6.172}$

3.2.4 Victoria Creek

3.2.4.1 Victoria Creek Reference (H-VC-REF)

The H-VC-REF station lies upstream of the Back Creek confluence and hydraulically upstream of Mount Nansen Site influences. A data logger was re-deployed at this station on May 16, 2013. Three discharge measurements were made during the Q3 monitoring period: in October 2013 using the velocity area method and the salt slug method in November and December 2013. Discharge was measured at 0.530 m^3/s on October 16, 0.357 m^3/s on November 13, and 0.256 m^3/s on December 17, 2013.

The rating curve for the H-VC-REF station applied to H-VC-REF water stage measurements recorded until October 16, 2013, at which time the logger was removed for the winter period. The applied rating curve equations for H-VC-REF are presented in Table 3-5, in addition to rating curve expressions used for the 2013-2013 monitoring period. Time-series stage and hydrograph data is presented in Appendix D. Based on the station hydrograph, a high-flow event associated with spring freshet occurred on May 27, 2013 at 6.9 m^3/s. A subsequent precipitation-induced high flow event occurred on July 22, 2013 at 1.38 m^3/s. Mean discharge for the Q3 period as recorded up to the time of data logger removal is 0.782 m^3/s.

Table 3-5. Victoria Creek Reference (H-VC-REF) rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
1.255	0.015	1.2	-----	-----
1.816	0.475	1.2	1.420	$Q = 0.945289\ (h-1.2)^{1.41949}$
2.12	1.933	1.2	3.498	$Q = 2.58760\ (h-1.2)^{3.49788}$
2.386	4.395	1.2	3.234	$Q = 2.53134\ (h-1.2)^{3.23424}$

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Revised Rating Curve, April, 2013 to December, 2013				
1.69	0.18	1.45		
2.386	4.395	1.45	2.348	$Q = 5.13\ (h - 1.45)^{2.35}$

3.2.4.2 Upper Victoria Creek (H-VC-U)

The Upper Victoria Creek gauging station (H-VC-U) continuously monitors creek stage elevations downstream of H-VC-REF, approximately 65 metres upstream of the Back Creek confluence. The station is known to receive groundwater contributions indicated by thin ice cover during the winter period. Three discharge measurements were collected during the Q3 period, using the ADV in October 2013, and the salt slug method in November and December 2013. Each of the discharge measurements were appended to the points used for rating curve development reported previously in the Q2 period. The 2013 rating curve for the H-VC-U station was optimized with the addition of new rating measurements taken in the Q3 period. The reported 2012-2013 rating curves and revised rating curve expressions used for the Q3 period are presented in Table 3-6.

The discharge measured was 0.405 m^3/s on October 16, 0.499 m^3/s on November 13, 2013 and 0.064 m^3/s on December 17, 2013. Continuous stage records and time-series hydrographs for April 1 through December 31, 2013 are presented in Appendix D. Based on these records, maximum discharge over the period of record was 5.165 m^3/s (May 27, 2013), with mean discharge of 0.566 m^3/s between April 1 and December 31, 2013.

Table 3-6. Upper Victoria Creek (H-VC-U) rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
1.986	0.038	1.85	-----	-----
2.385	2.632	1.85	3.098	$Q = 18.2757\ (h\text{-}1.85)^{3.09810}$
2.641	8.465	1.85	2.987	$Q = 17.0539\ (h\text{-}1.85)^{2.98748}$
Revised Rating Curve, April, 2013 to December, 2013				
2.018	0.109	1.86		
2.516	5.770	1.86	2.789	$Q = 18.702\ (h - 1.86)^{2.789}$

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

The continuous gauging station H-VC-DBC was visited three times during the Q3 period. The channel had an average width of 4.8 m and a depth 0.25 m at the discharge measurement location. Two measurements were collected using the ADV method (cross-section area) on October 16, 2013 (0.385 m^3/s) and November 13, 2013 (0.237 m^3/s). A single salt dilution method was used to collect discharge on December 17, 2013 and was measured at 0.204 m^3/s. Based on continuous measurements collected from the station,

mean discharge between April 1 and December 31, 2013 at H-VC-DBC was 0.571 m^3/s. Maximum discharge is estimated at 4.226 m^3/s.

Continuous stage measurements and hydrograph is presented in Appendix D. Revised and former rating curve expressions are shown in Table 3-7.

Table 3-7. Victoria Creek, downstream of Back Creek (H-VC-DBC) rating curve equations.

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

3.2.4.4 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. Originally established as an instantaneous discharge measurement location, a continuous station was deployed in 2012. In 2013, a logger and staff gauge were re-deployed at the same location on May 15, 2013. 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. Three discharge measurements were collected during the Q3 monitoring period using the ADV. Measured discharge was 0.538 m^3/s on October 16, 2013; 0.788 m^3/s on November 13, 2013; and 0.252 m^3/s on December 17, 2013.

Rating curve expressions were previously revised during the Q2 period and applied to stage measurements recorded at the H-VC-UMN station. Rating curve expressions for H-VC-UMN are presented in Table 3-8 and include previously reported rating curve expressions for the 2012-2013 monitoring period.

Table 3-8. Victoria Creek, upstream of Minnesota Creek (H-VC-UMN) rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
1.382	0.019	0.979	-----	-----
1.780	1.214	0.979	6.037	$Q = 4.63406\ (h\text{-}0.979)^{6.03671}$
1.954	3.684	0.979	5.647	$Q = 4.25022\ (h\text{-}0.979)^{5.64705}$
2.140	9.980	0.979	5.708	$Q = 4.25676\ (h\text{-}0.979)^{5.70783}$
Revised Rating Curve, April, 2013 to June, 2013				
1.411	0.049	0.98		
2.066	6.271	0.98	4.250	$Q = 4.066\ (h - 0.979)^{5.250}$

According to continuous logger records over the period of record, peak discharges associated spring freshet occurred on May 27, 2013 with maximum discharge of 6.023 m^3/s. Average discharge between April 1, 2013 and December 31, 2013 is 0.602 m^3/s. Continuous stage measurements were discontinued on October 16, 2013. The continuous stage and hydrograph records for H-VC-UMN are found in Appendix D.

3.2.4.5 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-grade, meandering section of the channel. Channel widths average 6.7 m and 0.25 m in depth at the discharge measurement location. Three discharge measurements were collected during the Q3 monitoring period using the ADV for the October and November 2013 monitoring events and the salt slug method of the December 2013 monitoring event. Maximum discharge measured in the Q3 monitoring period was 0.379 m^3/s on October 15, 2013, with less discharge measured on November 12, 2013 (0.296 m^3/s) and December 16, 2013 (0.253 m^3/s). Discharge measurements collected at the H-VC-R station do not appear to follow a systematic increase in flow as expected as the most down-stream station. We suspect that ice accumulation and ice effects were great enough to increase the uncertainty in discharge measurements completed. Rating curve expressions for the H-VC-R station are presented in Table 3-9 in addition to the 2012-2013 monitoring period rating curve expressions.

Table 3-9. Victoria Creek at Road (H-VC-R) rating curve equations.

Stage (m)	Discharge (m^3/s)	Offset (m)	Slope	Equation
Former Rating Curve, April, 2012 to March, 2013 (EDI 2013c)				
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	$Q = 39.5133\ (h\text{-}1.51)^{6.06722}$
Revised Rating Curve, April, 2013 to September, 2013				
2.010	0.149	1.90		
2.541	10.340	1.90	2.406	$Q = 30.139\ (h - 1.90)^{2.406}$

Continuous stage measurements are collected at H-VC-R. Stage time-series and hydrographs are presented in Appendix D. According to the continuous record, mean discharge between April 1 and December 31, 2013 is 0.847 m^3/s.

3.2.5 Pony Creek

3.2.5.1 Upper Pony Creek (H-PC-U)

The upper pony creek gauging station was established in 2009 to supplement a hydrogeological investigation (AECOM, 2010). Located in the upper reaches of Pony Creek, the station drains an area of 0.84 km^2 which has been historically disturbed by mineral exploration activities and more recently, by placer mining activities. The channel near the station is approximately 0.1 to 0.3 metres deep and 0.25 to 0.75 metres wide

and is dominated by shrubs, mosses and grasses along the banks of the channel. A v-notch weir was installed to measure discharges at the station and used for hydrometric measurements in 2012-2013. Following freshet in 2013, the channel at the H-PC-U gauging station had bifurcated around the weir structure and backwater pond, re-joining its original channel immediately downstream. A continuous monitoring station was established on May 16, 2013 using a stilling well, staff gauge and data logger in efforts to replace the non-functioning weir structure.

Two discharge measurements were collected at H-PC-U during the Q3 period using the salt dilution method, prior to the channel freezing completely. Discharge measurements on October 15, 2013 were just above reportable limits at 0.002 m^3/s, and at reportable limits on November 12, 2013 at 0.001 m^3/s.

No rating curves exist for the H-PC-U station apart from the weir structure that no longer has water flowing through it. This is due to the channel morphology and limited confidence in the rating discharge measurements to produce a robust estimate using a rating curve expression. Therefore, only continuous stage elevations and instantaneous discharge measurements collected at H-PC-U are presented in Appendix D.

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

A second hydrometric station is located downstream of H-PC-U below the Back Creek access road culvert and is named H-PC-DSP. The station was originally installed to supplement a hydrogeological investigation. Average widths for the channel at the station range from 0.15 to 0.50 m while depths range from 0.05 to 0.20 m. Due to channel morphology and conditions, only salt dilution gauging and volumetric methods are used to estimate discharge at H-PC-DSP. A small rock weir was installed as a control immediately downstream of the stilling well and appears to be functioning as an effective control. A single discharge measurement using the volumetric method was taken on October 16, 2013 at 0.002 m^3/s.

Due to the accuracy of the collected rating measurements and stage data, no rating curve is applied to water stage recordings at the H-PC-DSP station. Continuous time-series stage elevations and instantaneous discharge measurements are presented in Appendix D.

3.3 WATER QUALITY RESULTS

Water quality results for sampling within the Q3 period are discussed on a watershed basis in the sections below. These results include a summary of guideline and standard exceedances for each site and sampling trip as well as *in situ* water quality parameters. To provide some context, results are compared to CCME guideline for aquatic life as well as Nansen EQS values; however, not all drainages have equivalent levels of aquatic life. For example, only Victoria and Back creeks are fish bearing streams.

Copies of all water quality data with guideline and standard exceedances highlighted for each sampling trip are provided in Appendix E.

3.3.1 Dome Creek

There are a total of seven sites on Dome Creek, and all seven sites were sampled during the October 15-17, 2013 and November 12-14, 2013 trips, with only two sites sampled on the December 16-18, 2013 trip due to the remaining sites freezing to substrate for the winter. Numerous CCME-AL guideline and/or Mount Nansen EQS exceedances were found in Dome Creek for TSS, F, Al, As, Cd, Cu, Fe, Pb, Mn, and Zn. There was also one instance of Ag exceeding CCME-AL water quality guidelines at the WQ-DC-D1b site in November 2013. Note that TSS and Mn exceedances are based on the Mount Nansen EQS, as there are no CCME-AL guidelines for these parameters. Most other exceedances noted below are based on the CCME-AL guidelines; however, Fe and Zn frequently exceeded both the CCME-AL and EQS values. These results are similar to results from Q1 and Q2. See Table 3-10 and Table 3-11 for a summary of exceedances for each site during each visit and Appendix E for raw data. There were no cyanide exceedances during the Q3 investigation period.

Table 3-10. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for each site visit and site within the upper Dome Creek watershed for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	WQ-DC-DX	WQ-DC-DX+105	WQ-DC-D1b	WQ-DC-U1
Oct 15-17, 2013	Fe	F, As, Cd, Mn, Zn	Al, As, Cd, Fe, Pb, Mn, Zn	As, Fe
Nov 12-14, 2013	Al, As, Cd, Cu, Fe, Pb, Mn	F, As, Cd, Fe, Mn, Zn	TSS, Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	As, Cd, Fe
Dec 16-18, 2013	n/a	TSS, F, Al, As, Cd, Cu, Fe, Mn, Zn	n/a	n/a

Table 3-11. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for each site visit and site within the mid- to lower-Dome creek watershed for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	WQ-DC-U2	WQ-DC-U	WQ-DC-R
Oct 15-17, 2013	TSS, Al, As, Cd, Cu, Fe, Mn, Zn	Al, As, Cd, Cu, Fe, Mn	pH, NH_3, Al, As, Cd, Fe, Mn
Nov 12-14, 2013	Cd, Fe, Zn	NH_3, As, Cd, Cu, Fe, Mn	NH_3, Al, As, Cd, Cu, Fe, Mn
Dec 16-18, 2013	n/a	NH_3, F, As, Cd, Cu, Fe, Mn,	n/a

A summary of *in situ* water quality parameters for the Dome Creek sites are provided in Table 3-12. *In-situ* water quality data for sites within the Dome Creek watershed for the Q3 period (October 1 to December 31, 2013).. In general, water temperatures remained around zero degrees for the duration of the Q3 period, with the WQ-DC-DX+105 and WQ-DC-U sites having the highest temperatures. Specific conductivity showed a constant or increasing trend from October to December at most sites. Turbidity and pH were variable over the period.

Table 3-12. *In-situ* water quality data for sites within the Dome Creek watershed for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-DC-D1b	16-Oct-13	0.0	1,633.0	7.73	5.97
WQ-DC-D1b	14-Nov-13	0.0	1,717.0	6.91	59.50
WQ-DC-DX	16-Oct-13	0.8	570.3	7.56	1.21
WQ-DC-DX	14-Nov-13	0.0	740.0	6.90	58.90
WQ-DC-DX+105	16-Oct-13	0.6	1,193.0	7.00	1.47
WQ-DC-DX+105	14-Nov-13	0.6	1,187.0	6.69	2.62
WQ-DC-DX+105	17-Dec-13	0.4	1,195.0	7.22	2.30
WQ-DC-R	16-Oct-13	0.0	1,163.0	6.41	24.90
WQ-DC-R	13-Nov-13	0.1	1,228.0	6.56	17.02
WQ-DC-U	16-Oct-13	0.2	1,220.0	7.56	28.20
WQ-DC-U	13-Nov-13	0.0	1,540.0	6.80	22.30
WQ-DC-U	17-Dec-13	0.3	2,011.0	7.29	23.00
WQ-DC-U1	16-Oct-13	0.0	1,295.0	7.48	0.87
WQ-DC-U1	13-Nov-13	0.0	1,377.0	6.99	2.09
WQ-DC-U2	16-Oct-13	0.0	1,213.0	7.38	12.64
WQ-DC-U2	13-Nov-13	0.0	1,450.0	7.00	1.82

3.3.2 Brown-McDade Pit Lake

The Brown-McDade pit lake was sampled during two events over the Q3 investigation period, November 2013 and December 2013, as ice conditions were not yet safe for sampling in October 2013. From the November 2013 to December 2013 sampling event, ice thickness increased from 0.37 m to 0.60 m. Water depth at the sampling locations ranged from 6.5 m to 7.0 m below the ice surface. During both sampling events, the surface sample was collected just below the ice surface, the middle sample was collected at 3 m below the ice, and the bottom sample was collected at 6 m below the ice. Note in general, the sampling location remains consistent from trip to trip, and results are still expected to be comparable between months.

The water quality analysis results for WQ-PIT-1 and WQ-PIT-2 were similar during the November 12-14, 2013 and December 16-18, 2013 trips, with concentrations for F, As, Cd, and Cu exceeding the CCME-AL guidelines (Table 3-13; Appendix E). In November 2013, the WQ-PIT-3 samples exceeded the CCME guidelines for Al, As, Cd, Cu, and Fe and the EQS guideline for Mn. In December 2013, the WQ-PIT-3 sample also exceeded the CCME-AL guidelines for Al, As, Cd, Cu, Pb and Ag, while the Fe concentration exceeded both the CCME-AL and Mount Nansen EQS guidelines and the Mn concentration exceeded the EQS guideline. Zinc concentrations exceeded both the CCME-AL guideline and the EQS at all three depths during the two events of the Q3 period. Note this was the first time that Ag concentrations exceeded the guideline at this site during the Water Resources Investigations of 2013-14. Similar results for Ag have occurred in previous years' of the water quality investigations at Mount Nansen (EDI 2013c), and are likely associated with elevated TSS concentrations.

Table 3-13. Summary of parameters that exceeded CCME-AL guidelines for the Brown McDade Pit Lake for each sampling depth for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	WQ-PIT-1 (surface)	WQ-PIT-2 (mid-depth)	WQ-PIT-3 (bottom)
Nov 12-14, 2013	F, As, Cd, Cu, Zn	F, As, Cd, Cu, Zn	pH, Al, As, Cd, Cu, Fe, Mn, Zn
Dec 16-18, 2013	F, As, Cd, Cu, Zn	F, As, Cd, Cu, Zn	TSS, Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn

See Table 3-14. *In-situ* water quality data for the Brown McDade Pit Lake for the Q3 period (October 1 to December 31, 2013). for a summary of *in situ* water quality parameters. Water temperatures from below the ice surface of the pit lake ranged from 0.9 °C to 0.1 °C from November to December. Water temperatures at the bottom of the pit lake ranged from 4.8 °C to 5.6 °C from November to December. Specific conductivity was highest typically from the bottom sample depth (WQ-PIT-3) and dissolved oxygen was lowest from this depth.

Table 3-14. *In-situ* water quality data for the Brown McDade Pit Lake for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)	Dissolved Oxygen[1] (mg/L)
WQ-PIT-1	14-Nov-13	0.9	1,905.0	7.06	0.87	9.8
WQ-PIT-1	18-Dec-13	0.1	1,994.0	7.85	0.75	-
WQ-PIT-2	14-Nov-13	2.0	1,917.0	6.83	0.65	9.1
WQ-PIT-2	18-Dec-13	1.8	1,973.0	7.70	6.97	-
WQ-PIT-3	14-Nov-13	4.8	1,977.0	6.20	2.36	5.5
WQ-PIT-3	18-Dec-13	5.6	2,650.0	7.04	36.70	-

Note: [1] – dissolved oxygen could not be measured during the December 2013 event due to very cold temperatures and an equipment malfunction.

3.3.3 Tailings, Seepage Pond Discharge, and Mill Seeps

The tailings pond (WQ-TP) and seepage pond discharge site (WQ-SEEP) were sampled during every visit of the Q3 period. Water quality at the WQ-TP site consistently exceeded the CCME-AL guidelines and/or the Nansen EQS for As, Cd, Cu, Fe, Pb, and Zn, in addition to Al, Mn and Ag on a few occasions (Table 3-15; Appendix E). These results are similar to previous quarters; however, it was the first time Ag concentrations exceeded the CCME-AL guideline during the Water Resources Investigations of 2013-14 (Appendix E: Tables E-1, E-3). Similar results for Ag have occurred in previous years' of the water quality investigations at Mount Nansen (EDI 2013c), and are likely associated with elevated TSS concentrations.

The WQ-SEEP site consistently exceeded the CCME-AL guidelines and/or the EQS for NH_3, As, Cd, Cu, Fe, and Mn, as well as F on one occasion. These results are similar to results from Q1 and Q2. LT50 analysis at the WQ-SEEP site was scheduled on a bi-monthly basis, and during the Q2 period, one LT50 sample was collected (November 2013). All LT50 tests passed the 96-hr rainbow trout acute toxicity test (LT50 >96 hrs in all cases); no toxicity for rainbow trout was detected. Note Mn exceedances are based on the Mount Nansen EQS, as there are no CCME-AL guidelines for these parameters. Most other

exceedances noted were based on the CCME-AL guidelines; however, Fe frequently exceeded both the CCME-AL and EQS values.

The WQ-MS-S-03 seep was sampled during all site visits during the Q3 period. The site consistently exceeded guidelines and/or standards for F, As, Cd, Fe, Mn and Zn, as well as TSS, Al and Pb on some occasions (Table 3-15; Appendix E). Note TSS and Mn exceedances are based on the Mount Nansen EQS, as there are no CCME-AL guidelines for these parameters. Most other exceedances noted below are based on the CCME-AL guidelines; however, Fe frequently exceeded both the CCME-AL and EQS values.

Table 3-15. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for WQ-TP, WQ-SEEP and WQ-MS-S-03 for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	WQ-TP	WQ-SEEP	WQ-MS-S-03
Oct 15-17, 2013	F, As, Cd, Cu, Fe, Pb, Ag, Zn	NH_3, As, Cd, Cu, Fe, Mn	F, As, Cd, Fe, Mn, Zn
Nov 12-14, 2013	F, As, Cd, Cu, Fe, Pb, Mn, Zn	NH_3, As, Cd, Cu, Fe, Mn	TSS, F, Al, As, Cd, Fe, Pb, Mn, Zn
Dec 16-18, 2013	F, Al, As, Cd, Cu, Fe, Pb, Mn, Ag, Zn	NH_3, F, As, Cd, Cu, Fe, Mn	F, As, Cd, Fe, Pb, Mn, Zn

In situ water quality parameters for each trip and each site are summarized in Table 3-16. Water temperatures recorded in the tailings pond remained above zero degrees from October 2013 to December 2013 at all sites. Specific conductivity values increased at both the WQ-TP and WQ-SEEP sites from October to December; however, pH and turbidity values fluctuated. Turbidity values were highest at the WQ-SEEP site overall, which is a common result for the site. *In situ* water quality parameters at the WQ-MS-S-03 remained relatively stable through the investigation period, as this site originates from groundwater sources beneath the mill.

Table 3-16. *In situ* water quality data for WQ-TP, WQ-SEEP and WQ-MS-S-03 for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-SEEP	16-Oct-13	1.5	1,709.0	6.99	52.50
WQ-SEEP	13-Nov-13	0.7	1,799.0	6.70	37.80
WQ-SEEP	17-Dec-13	0.6	1,871.0	7.20	37.80
WQ-TP	16-Oct-13	2.7	1,382.0	7.88	6.75
WQ-TP	13-Nov-13	1.8	1,583.0	7.19	6.62
WQ-TP	16-Dec-13	0.9	1,972.0	7.32	8.07
WQ-MS-S-03	16-Oct-13	0.7	1,213.0	7.24	0.84
WQ-MS-S-03	14-Nov-13	0.6	1,255.0	6.64	1.86
WQ-MS-S-03	16-Dec-13	0.5	1,198.0	7.28	1.78

3.3.4 Victoria Creek

Victoria Creek was sampled at five sites upstream and downstream of the mine site. All sites were sampled on all trips of the Q3 investigation period. Note the WQ-VC-R site was sampled at the regular winter sampling site (150 m downstream of the culvert) starting on the December 16-18, 2013 trip, as thick ice conditions upstream of the culvert prevented sampling at the regular open water site. Water quality at most sites did not exceed any CCME-AL guidelines or Mount Nansen EQS. The exceptions were the upper sites, WQ-VC-REF and WQ-VC-U, which had Al and Fe concentrations that exceeded the CCME-AL guidelines on the October 15-17, 2013 trip. The WQ-VC-R site also had CCME-AL guideline exceedances for Fe on the October 15-17, 2013 trip. See Table 3-17 and Appendix E for a summary of exceedances for each trip.

Table 3-17. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for sites within the Victoria Creek watershed for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Dates	WQ-VC-REF	WQ-VC-U	WQ-VC-DBC	WQ-VC-UMN	WQ-VC-R[1]
Oct 15-17, 2013	Al, Fe	Al, Fe	none	none	Fe
Nov 12-14, 2013	none	none	none	none	none
Dec 16-18, 2013	none	none	none	none	none

Note: 1 – The WQ-VC-R site was sampled at the regular open water site during the October and November trips, but sampling switched to the winter sampling location (150 m downstream of the culvert) on the December 16-18, 2013 trip.

In situ water quality parameters for each trip are summarized in Table 3-18. Water temperatures remained near zero degrees at all Victoria Creek sites during the Q3 period. Specific conductivity and pH increased for most sites from October 2013 to December 2013. Turbidity at most sites remained relatively low, ranging from 0.01 NTU to 3.78 NTU.

Table 3-18. *In situ* water quality data for sites within the Victoria Creek watershed for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-VC-DBC	16-Oct-13	0.1	193.5	6.88	1.54
WQ-VC-DBC	13-Nov-13	0.0	214.9	7.16	0.53
WQ-VC-DBC	17-Dec-13	0.0	215.9	7.47	0.01
WQ-VC-R	16-Oct-13	0.0	216.6	6.72	2.20
WQ-VC-R	13-Nov-13	0.0	218.0	6.49	3.78
WQ-VC-R[1]	16-Dec-13	0.0	230.0	7.42	0.31
WQ-VC-REF	16-Oct-13	0.0	177.7	7.41	2.51
WQ-VC-REF	13-Nov-13	0.0	210.4	7.23	0.97
WQ-VC-REF	17-Dec-13	0.0	219.8	7.53	0.00
WQ-VC-U	17-Oct-13	0.0	185.6	6.61	0.66
WQ-VC-U	13-Nov-13	0.0	213.7	7.08	0.31
WQ-VC-U	17-Dec-13	0.0	217.3	8.04	0.13
WQ-VC-UMN	16-Oct-13	0.0	241.3	7.12	1.49
WQ-VC-UMN	13-Nov-13	0.0	228.8	6.63	0.59
WQ-VC-UMN	17-Dec-13	0.0	233.5	7.52	0.42

Note: 1 – The WQ-VC-R site was sampled at the regular open water site during the October and November trips, but sampling switched to the winter sampling location (150 m downstream of the culvert) on the December 16-18, 2013 trip.

3.3.5 Back Creek

The Back Creek site was only sampled during the October 15-17, 2013 trip, prior to the site freezing to substrate for the winter. The only CCME-AL guideline exceedance at this time was for Cd (Table 3-19; Appendix E). Water temperature during the October trip was at zero degrees, with a specific conductivity of 327.2 µS/cm, a pH of 7.64 and a turbidity of 3.24 NTU (Table 3-20).

Table 3-19. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for WQ-BC for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	WQ-BC
Oct 15-17, 2013	Cd

Table 3-20. I*n situ* water quality data for WQ-BC for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-BC	16-Oct-13	0.0	327.2	7.64	3.24

3.3.6 Minnesota Creek

Minnesota Creek was sampled on the October 15-17, 2013 trip and the November 12-14, 2013 trip, over the Q3 period, prior to freezing to substrate for the winter. Lab analysis results showed that all samples consistently exceeded the CCME guideline and Mount Nansen EQS for Fe (Table 3-21; Appendix E). The CCME guidelines for pH, Al, and Cu were also exceeded in the October 2013 samples. *In situ* water quality parameters for each trip are summarized in Table 3-22. Water temperatures remained at zero degrees for both trips, while specific conductivity and pH increased from October 2013 to November 2013. Turbidity ranged from 13.91 to 11.95 NTU from October 2013 to November 2013.

Table 3-21. Summary of parameters that exceeded CCME-AL guidelines and/or Mount Nansen EQS for WQ-MN for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	WQ-MN
Oct 15-17, 2013	pH (lab & field), Al, Cu, Fe
Nov 12-14, 2013	Fe

Table 3-22. *In situ* water quality data for WQ-MN for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-MN	16-Oct-13	0.0	75.5	6.29	13.91
WQ-MN	13-Nov-13	0.0	106.9	6.54	11.95

3.3.7 Pony Creek

Pony Creek was sampled at the WQ-PC-D site during both the October 15-17, 2013 trip and the November 12-14, 2013 trip, while WQ-PC-U could only be sampled during the October 15-17, 2013 trip. Water quality at the WQ-PC-U site did not exceed either the CCME guidelines or the Mount Nansen EQS (Table 3-23; Appendix E). The WQ-PC-D site exceeded the CCME guidelines for As, Cd, Cu, and Zn on both occasions, in addition to Al, Fe, Pb, and Ag during the November 2013 trip. Note this was the first time that Ag concentrations exceeded the guideline at this site during the Water Resources Investigations of 2013-14. The downstream site typically has a higher incidence of elevated metal concentrations than the upstream site, due to the fact that the lower portion of Pony Creek was historically covered by a waste rock pile during the period when the mine was active.

Table 3-23. Summary of parameters that exceeded CCME guidelines and/or Mount Nansen for sites within the Pony Creek watershed for the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	WQ-PC-U	WQ-PC-D
Oct 15-17, 2013	none	As, Cd, Cu, Zn
Nov 12-14, 2013	n/a	Al, As, Cd, Cu, Fe, Pb, Ag, Zn

In situ water quality parameters for each trip are summarized in Table 3-24. Water temperatures remained at or just above zero degrees during the October 2013 and November 2013 trips. Specific conductivity at the downstream site increased from October 2013 to November 2013, while pH decreased. Turbidity during the Q3 period remained low, ranging from 0.20 NTU to 1.04 NTU.

Table 3-24. *In situ* water quality data for sites within the Pony Creek watershed for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-PC-D	16-Oct-13	0.5	357.0	7.51	0.87
WQ-PC-D	13-Nov-13	0.3	465.8	7.08	1.04
WQ-PC-U	16-Oct-13	0.0	331.9	7.18	0.20

3.3.8 Pump House Well

The pump house well was sampled during all three visits of the Q3 period. Both bacteriological samples and drinking water package samples were collected. Total coliforms and E. coli were absent from all samples, and there were no chemical exceedances of either the Health Canada Guidelines for Canadian Drinking Water or the CCME-AL guidelines or Mount Nansen EQS. *In situ* water quality parameters for each trip are summarized in Table 3-25.

Table 3-25. *In situ* water quality data for WQ-PW for the Q3 period (October 1 to December 31, 2013).

Site ID	Date	Water Temp. (°C)	Specific Conductivity (µS/cm)	pH	Turbidity (NTU)
WQ-PW	17-Oct-13	0.6	367.8	6.29	0.56
WQ-PW	14-Nov-13	0.5	369.7	5.77	0.97
WQ-PW	18-Dec-13	0.1	391.7	7.87	0.00

3.3.9 QA/QC Program

Field blank and travel blank samples were included on every trip during the Q2 period. Two duplicate samples were also collected during each sampling event. Table 3-26 summarizes the sample trip dates and sites where duplicate samples were collected. All field blank and travel blank samples showed no contamination through field sampling methodologies, transportation or storage (Appendix E).

Duplicate 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 (Appendix E). Average percent differences for QA/QC sample sets ranged from 5% to 11%. Some of the duplicate sites had either relatively high TSS and/or large differences in TSS values within the duplicate sample set. These factors can lead to variability in metal concentrations as many metals bind more readily to sediment particles. Some differences may also be attributed to sampling conditions based on ice conditions. See Appendix E for parameters that were flagged as greater than +/-10%.

Table 3-26. Summary of sites randomly selected as duplicate samples for each sampling trip over the Q3 period (October 1 to December 31, 2013).

Sampling Trip Date	Duplicate #1	Duplicate #2
Oct 15-17, 2013	WQ-VC-UMN-r	WQ-VC-U-r
Nov 12-14, 2013	WQ-VC-DBC-r	WQ-DC-R-r
Dec 16-18, 2013	WQ-DC-U-r	WQ-SEEP-r

4 CONCLUSIONS & RECOMMENDATIONS

Based on results of the Q3 period of the Mount Nansen Water Resources Investigations Program from October 1, 2013 to December 31, 2013, EDI recommends that monitoring should continue as scheduled with added consideration of several recommendations outlined below. These recommendations attempt to improve the overall program data quality and efficiency.

- Volumetric measurements at H-SEEP are 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.

- We continue to recommend relocating the weir structure currently deployed at H-PC-U station to H-DC-DX+105 once the channels are ice-free. H-DC-DX+105 is located where the channel remains nearly ice-free over the winter period. The weir may function throughout the winter low-flow period and provide more robust station discharge data compared to salt tracer methods currently used.

Note based on instructions from AAM, several hydrometric stations and water quality sites have been removed from the program as of January 2014. EDI confirms that for the upcoming Q4 investigation period, no monitoring will be undertaken at the following sites/stations:

- Water Quality Sites: WQ-DC-U1, WQ-DC-U2, WQ-DRY, WQ-MN, WQ-VC-REF
- Hydrometric Stations: H-DC-U1, H-DC-U2, H-DC-DX, H-MN, H-VC-REF

One site was added to the scope, WQ-DC-B to replace water quality at WQ-DC-U1 and WQ-DC-U2. This site will be located at a similar location to the H-DC-B station.

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5.1 SPATIAL DATA

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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.

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APPENDIX A Q3 SITE AND STATION PHOTOGRAPHS

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Dome Creek Sites/Stations

Photo 1. H/WQ-DC-DX, looking upstream (October 16, 2013).

Photo 2. H/WQ-DC-DX+105, looking upstream (November 14, 2013).

Photo 3. H/WQ-DC-D1b, looking upstream (November 14, 2013).

Photo 4. H/WQ-DC-U1, looking upstream (October 16, 2013).

Photo 5. H/WQ-DC-U2, looking upstream (November 13, 2013).

Photo 6. H-DC-B, looking downstream (November 12, 2013).

Photo 7. H-DC-M/WQ-DC-U, right downstream bank (December 17, 2013).

Photo 8. H-DC-R, looking downstream towards station from road (December 17, 2013).

Photo 9. WQ-DC-R, looking downstream from road (December 17, 2013).

Victoria Creek Sites/Stations

Photo 1. WQ/H-VC-REF, looking upstream (November 13, 2013).

Photo 2. H-VC-U, looking upstream (November 13, 2013).

Photo 3. WQ-VC-U, looking downstream (December 17, 2013).

Photo 4. H-VC-DBC, looking at right downstream bank (November 13, 2013).

Photo 5. WQ-VC-DBC, looking upstream (November 13, 2013).

Photo 6. H/WQ-VC-UMN, looking downstream (December 17, 2013).

Photo 7. H-VC-R, looking at right downstream bank (December 16, 2013).

Photo 8. WQ-VC-R site, looking downstream (November 13, 2013).

Pit Lake/Tailings Pond/Seep Sites

Photo 1. H/WQ-SEEP (December 17, 2013).

Photo 2. WQ-PIT (October 16, 2013).

Photo 3. WQ-MS-S-03, looking upstream (October 15, 2013).

Photo 4. WQ-TP (October 16, 2013).

Pony Creek Sites/Stations

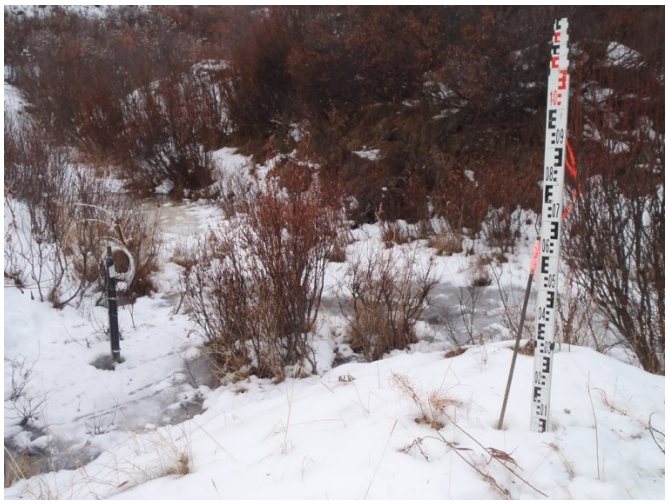

Photo 1. H-PC-U, looking at right downstream bank (October 15, 2013).

Photo 2. WQ-PC-U, looking downstream (October 16, 2013).

Photo 3. H-PC-DSP, looking upstream (October 16, 2013).

Photo 4. WQ-PC-D, looking downstream (November 13, 2013).

Minnesota Creek and Back Creek

Photo 1. H-MN, looking at left downstream bank (December 17, 2013).

Photo 2. H/WQ-BC, looking upstream (October 16, 2013).

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APPENDIX B Q3 MONITORING VISIT RECORD

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Table B-1. Record of sites sampled and stations monitored during each site visit during the Q3 period, October 1 to December 31, 2013.

Station/Site Name	October 15-17, 2013	November 12-14, 2013	December 16-18, 2013
H-PC-U/WQ-PC-U	Y	N	N
H-PC-DSP/WQ-PC-D	Y	Y	N
H-DC-DX/WQ-DC-DX	Y	Y	N
H-DC-DX+105/WQ-DC-DX+105	Y	Y	Y
H-DC-D1b/WQ-DC-D1b	Y	Y	N
H-DC-U1/WQ-DC-U1	Y	Y	N
H-DC-U2/WQ-DC-U2	Y	Y	N
H-DC-B	Y	N	N
H-DC-M/WQ-DC-U	Y	Y	Y
H-DC-R/WQ-DC-R	Y	Y	N
H-SEEP/WQ-SEEP	Y	Y	Y
H-TP/WQ-TP	Y	Y	Y
WQ-PIT-1,2,3	N	Y	Y
WQ-MS-S-03	Y	Y	Y
H-BC/WQ-BC	Y	N	N
H-MN/WQ-MN	Y	Y	N
H-VC-REF/WQ-VC-REF	Y	Y	Y
H-VC-U/WQ-VC-U	Y	Y	Y
H-VC-DBC/WQ-VC-DBC	Y	Y	Y
H-VC-UMN/WQ-VC-UMN	Y	Y	Y
H-VC-R/WQ-VC-R	Y	Y	Y
WQ-PW	Y	Y	Y
WQ-DRY	Samples not required for this period.		

Codes
N – site or station not sampled due to no observations of flow
Y – water sampling conducted and/or discharge measurement collected

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APPENDIX C Q3 EDI FIELD DATA SHEETS

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Project #: 12-Y-0129
Project Name: Mount Nansen - Hydrology

EDI ENVIRONMENTAL DYNAMICS INC.

Field Dates: Oct 15-17, 2013

General Site Tasks/ Communications

1)Download ALL data loggers present. Gather a surface water elevation whenever stream discharge is measured at stations.
2)Attempt to de-silt wells prior to moving data logger rod (JimmyRod).
3) If a measurement is not feasible, fully document why and take photos.
4) Fill in ALL data boxes & Site Comment boxes on field sheets to document site conditions (even if site is unchanged).
5) During salt slugs, minimum SPC rise is only +10x resolution of conductivity meter.

winterize loggers ?

#	Complete	HID	Station Name	Station Type	Site Tasks	Survey Required	Logger Type Serial #	Q Method	Additional Materials Required	Date	Time	SG	Logger	
						Yes/No				yy.mm.dd	HH:MM	(m)	(m)	
1	[✓]	ATM-DC2	Atmospheric at Diversion Channel	Continuous Baro Logger	1) HOBO download	NO	HOBO	None	None	13.10		n/a		X
2	[✓]	ATM-DC4	Atmospheric at Diversion Channel (Back-up)	Continuous Baro Logger	1) Solinst download	NO	Solinst Baro-logger	None	None	13.10		n/a		X
3	[✓]	H-PC-U	Upper Pony Creek	Instantaneous	1) Salt Tracer AND volumetric 2) Logger download.	YES	HOBO	Salt (0.01 kg) CF.T	None	13.10.15	18:07	0.288		✓ Logger & well pulled.
4	[✓]	H-PC-DSP	Pony Creek Downstream of Pit	Instantaneous	1) Salt Tracer AND Volumetric 2) Logger download.	YES	HOBO	Volumetric Salt (0.01 kg) CF.T	None	13.10.16	* 17:08	0.244		✓
5	[✓]	H-DC-DX	Dome Creek DX	Instantaneous	1) Volumetric from culvert 2) Remember photos at actual station	n/a	n/a	Volumetric	None	13.10	10:12	n/a		X
6	[✓]	H-DC-DX+105	Dome Creek DX+105	Instantaneous	1) Q measurement	n/a	n/a	Salt (0.01 kg) CF.T	None	13.10.16	19:26	n/a	—	✓
8	[✓]	H-DC-D1b	Dome Creek D1b	Instantaneous	1) Q measurement	n/a	n/a	Salt (0.02 kg) CF.T	None	13.10.16	18:21	n/a	—	✓
9	[✓]	H-DC-U1	Upper Dome Creek 1	Instantaneous	1) Q measurement	~~YES~~	~~HOBO~~	Salt (0.025 kg) CF.T	None	13.10.15	16:13	N/A	—	✓
10	[✓]	H-DC-U2	Upper Dome Creek 2	Instantaneous	1) Q measurement	n/a	n/a	Salt (0.025 kg) CF.T	None	13.10.15	16:55	n/a	—	✓
11	[✓]	H-DC-B	Diversion Channel at Bridge	Continuous	1) Q measurement 2) Logger download.	YES	HOBO	Salt (0.05 kg) CF.T	None	13.10.15	15:17	0.172		✓ Logger pulled. well pulled
12	[✓]	H-DC-M	Middle Dome Creek	Continuous	1) Q measurement 2) Logger download.	YES	Solinst 1050018	Salt (0.1 kg) CF.T	None	13.10.15	14:31	0.158		✓ winterized.
13	[✓]	H-DC-R	Dome Creek at Road	Continuous	1) Q measurement (salt tracer and volumetric at culvert if possible) 2) Logger Download	YES	Solinst	Volumetric - Salt (0.1 kg) CF.T	None	13.10.15	15:27	0.284		✓ Logger & well pulled

- 0.025 x 8 ✓
- 0.010 x 6 ✓
- 0.020 x 2 ✓
- 0.050 x 2
- 0.100 x 4

Field Staff: DH JH DS

Project #: 12-Y-0129
Project Name: Mount Nansen - Hydrology

Field Dates: _____

#	Complete	HID	Station Name	Station Type	Site Tasks	Survey Required	Logger Type Serial #	Q Method	Additional Materials Required	Date	Time	SG	Logger	
						Yes/No				yy.mm.dd	HH:MM	(m)	(m)	
14	[✓]	H-VC-REF	Victoria Creek Reference	Continuous	1) Q measurement 2) Logger download.	YES	HOBO	ADV	None	13.10.16	14:00	0.638		X
15	[✓]	H-VC-U	Upper Victoria Creek	Continuous	1) Q measurement 2) Logger download.	YES	Solinst 1049522	ADV	None	13.10.16	12:40	0.212		X
16	[✓]	H-VC-DBC	Victoria Creek D/S of Back Creek	Continuous	1) Q measurement 2) Logger download.	YES	Solinst 1049137	ADV	None	13.10.16	11:56	0.478		X
17	[✓]	H-BC	Back Creek	Continuous	1) Q measurement if water flowing. 2) Logger download.	YES	HOBO	Salt (0.025 kg) CF.T	None	13.10.16	13:48	0.425	/	✓
18	[✓]	H-VC-UMN	Victoria Creek U/S of Minnesota Creek	Continuous	1) Q measurement 2) Logger download.	YES	HOBO	ADV	None	13.10.16	10:20	0.658		X
19	[✓]	H-MN	Minnesota Creek	Instantaneous	1) Q measurement 2) Logger download.	YES	HOBO	Salt (0.025 kg) CF.T	None	13.10.16	9:16	0.448		✓
20	[✓]	H-VC-R	Victoria Creek at Road	Continuous	1) Q measurement 2) Logger download.	YES	Solinst 1041103	ADV	None	13.10.15	12:09	0.523		X winterized.
21	[✓]	H-SEEP	Seepage Pond Outlet	Instantaneous / Water Level	1) Q measurement at pipe outlet 2) Q measurement at flow meter in pumphouse 3) Staff Gauge Reading in Pond	NO	n/a	Volumetric	None	13.10.16	*	/		X
22	[✓]	H-TP	Tailings Pond	Water Level Only	1) Staff Gauge Reading	NO	n/a	None	None	13.10.16	15:30	~0.759		X

↳ See notes on WQ TP.

Field Staff: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: Cloudy, 4°C, light wind

HID	H-PC-U	Date	15-Oct.-2013	Discharge Measurement Instruments + Methods	
Station Name	Upper Pony Creek	Q Measurement Start Time:	18:07 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER	WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[✓] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial # 9896522	HOBO | Solinst | N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 234	[D/S] 235	[RDB] 236	[LDB] 237	[STAFF/WEIR] Staff 238 / Weir 239

Site Comments

Weir flow ~0.02 L/s, majority of flow under + around weir.
Majority of creek snow + ice covered.
~1-2m U/S of YSI site 2 3/4" stainless steel wells installed.
Site "GSI-PC-01B" on Pipe. BM1 shift -> appears to be pulled up (Photo 240)

Ice Thickness @ well: 0.113 m
Ice Below - Top of water: 0.094 m
Bed - Top of water: 0.310 m

Channel Measurements

Staff Gauge Height (m):	0.288
Weir Head (m):	
Water Temperature (°C):	0.0°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	SalT	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (18 : 07)	305.0 | 334.2	20m	0.01kg	20L	0.0005
2 (18 : 21)	306.9 | 336.0	20m	0.01kg	20L	0.0005
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	2000mL
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

See Sal = 500mL SS in 250mL CRK

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1. 0mL	306.6	0.0°C
2. 20mL	314.9	0.0°C
3. 10mL	321.7	0.0°C
4. 10mL	322.0	0.0°C
5. 10mL	325.4	0.0°C
6. 10mL	329.1	0.0°C
7. 10mL	332.5	0.0°C
8. 10mL	335.7	0.1°C
9. 10mL	338.8	0.1°C

Notes:

Volum. N/A

Volume (L) =				
Time (sec)	[1]	[2]	[3]	[4] [5]
Average Q (L/s) =				
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =	

Hydrometric Levels - Survey

YES | NO | REASON:

Survey Time (HH:MM): (WATER) BM Shift: Yes| No Logger Shift: Yes| No Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements
Station	A	B	C		Station	A	B	C	
BM1	5.411	2.411	3.000		BM1			3.000	Log'r Rod Length:
BM2		1.010	4.401		BM2				Log'r Rod to Botm:
BM3		1.487	3.924		BM3				
TOS		2.181	3.230		TOS				
WATER		2.882	2.529		WATER				
LOG'R ROD:		1.942	3.469		LOG'R ROD:				
HWM/CON					HWM/CON				
BANKFULL					BANKFULL				
BS (BM1)		2.411	3.000		BS (BM1)				

* BM 2 has been pulled out & is sitting ~ 30-40 cm higher - See photo 240
Removal either well w/ logger. Staff reading @ time of survey 0.296 m - rise due to Ice Jams
Caused by hole cutting for Salt Trial

1 of 2

Field Staff: JM, DH, DS
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: _____
Project Name: _____

EDI
ENVIRONMENTAL DYNAMICS INC.

Weather: _____

HID												Date (dd.mm.yyyy)					
Velocity-Area Method		SWOFFER | PYGMY | ADV		Salt Tracer Trial 1		LOGGED | MANUAL		Time: 18:07				Salt Tracer Trial 2		LOGGED | MANUAL		Time: 18:21	
Station	Distance (m)	Depth (m)	Velocity (m/s)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)			Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)
1				t_0 =	305.0	260	334.2	520	309.6			t_0 =	306.9	260	335.9	520	310.9
2				10	304.7	270	333.8	530	309.2			10	306.6	270	335.1	530	310.8
3				20	304.8	280	333.1	540	309.3			20	306.7	280	334.3	540	310.1
4				30	1305.0	290	332.3	550	308.4			30	307.0	290	333.3	550	309.9
5				40	305.2	300	330.7	560	308.2			40	307.1	300	331.7	560	309.3
6				50	305.7	310	329.0	570	308.4			50	307.0	310	330.0	570	308.9
7				60	305.0	320	327.5	580	308.2			60	306.7	320	329.2	580	308.6
8				70	305.4	330	326.1	590	307.6			70	306.6	330	328.1	590	308.5
9				80	305.4	340	324.9	600	307.5			80	306.9	340	327.1	600	308.3
10				90	304.8	350	323.5	610	307.5			90	306.7	350	325.2	610	308.4
11				100	304.9	360	321.8	620	307.4			100	306.6	360	323.5	620	307.8
12				110	305.2	370	320.4	630	307.3			110	307.6	370	322.3	630	307.6
13				120	305.3	380	319.2	640	307.1			120	307.1	380	321.1	640	307.3
14				130	306.6	390	318.3	650	306.9			130	307.7	390	320.2	650	307.5
15				140	307.3	400	316.7	660	306.8			140	308.9	400	318.8	660	307.3
16				150	307.9	410	316.2	670	306.7			150	310.9	410	317.4	670	307.2
17				160	310.9	420	315.3	680	306.7			160	313.8	420	316.5	680	307.0
18				170	313.6	430	314.7	690	306.6			170	316.8	430	315.7	690	307.1
19				180	317.0	440	314.1	700	306.3			180	320.3	440	314.7	700	306.9
20				190	320.2	450	313.4	710	306.3			190	324.9	450	314.0	710	306.9
21				200	323.4	460	312.1	720	306.3			200	328.2	460	313.1	720	307.1
22				210	326.8	470	311.7	730	306.5			210	331.4	470	313.0	730	
23				220	329.7	480	311.5	740				220	333.1	480	312.4	740	
24				230	331.9	490	311.0	750				230	334.5	490	312.2	750	
25				240	333.4	500	310.4	760				240	335.6	500	311.4	760	
25				250	333.8	510	309.7	770				250	336.0	510	311.2	770	

Comments:

Field Staff: _____
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13Y0167
Project Name: NANSEN

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: +5°C clear Calm

HID	14-PC-DSP	Date	16 OCT 2013	Discharge Measurement Instruments + Methods	
Station Name	Pong ck D/S of P.C	Q Measurement Start Time:	17:08 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial # 9896521	HOBO | Solinst | N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 316	[D/S] 317	[RDB] 316	[LDB] 319	[STAFF/WEIR] 032

Site Comments

Logger pulled for winter @ 17:15
Ice Thickness @ well 0.035 m

Channel Measurements

Staff Gauge Height (m):	0.244
Weir Head (m):	
Water Temperature (°C):	
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Vol.	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

N/A

Salt Tracer

SLUG | CONSTANT RATE | DRY LOGGED | MANUAL SPC | EC CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	≈1 / Css
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes:

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Volum.

Volume (L) =	19L	20L	19L	18L	19L
Time (sec)	[1] 9.34 s	[2] 8.90 s	[3] 9.07 s	[4] 8.57 s	[5] 8.91
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON: Survey Time (HH:MM): (WATER) BM Shift: Yes| No Logger Shift: Yes| No Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4.222	1.222	3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C	1.010	3.212		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C	0.571	3.651		BM3			A-B=		
TOS	A+B+C	1.043	3.179		TOS			A-B=		
WATER	A+B+C	1.800	2.422		WATER			A-B=		
LOG'R ROD:	A+B+C	0.794	3.428		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
BS (BM1)	A+B+C	1.222	3.000		BS (BM1)			A-B=		

Field Staff: DS DH JM
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Morgan

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: Clear, calm

HID	H-DC-DX+105/205	Date	16-Oct-2013	Discharge Measurement Instruments + Methods
Station Name		Q Measurement Start Time:	19:26 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV MID-SECT. | POINT
		Q Measurement End Time:	19:56 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger:	Serial #	HOBO | Solinst | N/A	GPS Waypoint	ZONE	EASTING NORTHING
Photo #	[U/S] 101-0059	[D/S] 101-0060	[RDB] 101-0066	[LDB] 101-0064	[STAFF/WEIR] NA

Site Comments

Ice on banks, ~2cm thick.

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.4°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt.	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T (YES) | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (19 : 26)	1164 | 1255	26	0.01 kg	20L	0.0005
2 (19 : 41)	1195 | 1234	26	0.01 kg	20L	0.0005
3 (:)	|				
V_1 for Sec. Mix (mL):	2000	Sec. Sol = 500mL SS into 250mL Crk.			
Csec (g/L):	1 g/L				
Vol. Calib. Tank (L):	1 L				
SPC_0 Calib. Tank					
CF.T =					
Qsalt =					

CF.T

Notes

Vol. Added (mL)	SPC (uS/cm)	Temp
1. 0	1201	0.2°C
2. 10mL	1207	0.2°C
3. 10mL	1215	0.1°C
4. 10mL	1220	0.0°C
5. 10mL	1226	0.0°C
6. 20mL	1237	0.0°C
7. 20mL	1248	0.0°C
8. 20mL	1259	0.0°C
9.		

Volum.

	[1]	[2]	[3]	[4]	[5]
Volume (L) =					
Time (sec)					
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| NO \| REASON: Survey Time (HH:MM): (WATER) BM Shift: Yes\| No Logger Shift: Yes\| No Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A+B+C		A-B=		TOS			A-B=		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM	A+B+C		A-B=		HWM			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
BS (BM1)	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: _____

Data Entry By: _____ Date: _____

Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: 2°C, clear, calm

HID	H-DC-D1B	Date	16-Oct-2013	Discharge Measurement Instruments + Methods	
Station Name		Q Measurement Start Time:	18:21 (HH:MM) PDT | PST	(YSI) SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	18:29 (HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial #	HOBO | Solinst | (N/A)		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 101-0042	[D/S] 101-0043	[RDB] 101-0046	[LDB] 101-0044	[STAFF/WEIR] N/A.

(SLUG) \| CONSTANT RATE \| DRY (LOGGED) \| MANUAL (SPC) \| EC CF.T (YES) \| NO

Site Comments

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	0.0°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt.	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_e (kg)	Volume (L)	Css (kg/L)
1 (18:21)	1632 | 1714	14	0.020	20L	0.001
2 (18:25)	1622 | 1703	14	0.020	20L	0.001
3 (:)	|				
V_1 for Sec. Mix (mL)	1000	Sec. Sol = 500mL SS into 500mL CRK.			
Csec (g/L):	1 g/L				
Vol. Calib. Tank (L):	1 L				
SPC_0 Calib. Tank					
CF.T =					
Qsalt =					

Notes:

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0	1612	0.0
2.	10mL	1621	0.1
3.	20mL	1638	0.0
4.	20mL	1655	0.0
5.	20mL	1672	0.0
6.	20mL	1687	0.0
7.	20mL	1703	0.0
8.	20mL	1718	0.0
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| NO \| REASON — Survey Time (HH:MM): (WATER) — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3	A+B+C		A-B =		BM3			A-B =		
TOS	A+B+C		A-B =		TOS			A-B =		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
BS (BM1)	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: _____

Data Entry By: _____ Date: _____

Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

16:18:43 1262
16:19:02 1256
16:20:06 1248

Weather: Sunny, 6°C, light wind.

HID	H-DC-U1	Date	15-Oct-2013	Discharge Measurement Instruments + Methods	
Station Name	Upper Dome Creek 1	Q Measurement Start Time:	16:13 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	16:46 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial #	HOBO | Solinst N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 230	[D/S] 231	[RDB] 232	[LDB] 233	[STAFF/WEIR]

Site Comments

log memory full @ 16:16
to 2nd Trial on back.

Channel Measurements

Staff Gauge Height (m):	/
Weir Head (m):	/
Water Temperature (°C):	0.0°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

* Trial 2 done manually.

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T (YES) NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_e (kg)	Volume (L)	Css (kg/L)
1 (16:13)	1243 | 1367	20	0.025	20L	0.00125
*2 (16:30)	1244 | 1374	20	0.025	20L	0.00125
3 (17:27)	1248 | 1376				
V_1 for Sec. Mix (mL)	800	Sec sol = 400mL SS in 500mL Crk.			
Csec (g/L):	1 g/L				
Vol. Calib. Tank (L):	1 L				
SPC_0 Calib. Tank					
CF.T =					
Qsalt =					

Notes:

Vol. Added (mL)	SPC (uS/cm)	Temp
1. 0mL	1247	0.0
2. 20mL	1268	0.0
3. 20mL	1289	0.0
4. 30mL	1317	0.0
5. 30mL	1345	0.1
6. 30mL	1370	0.1
7. 30mL	1397	0.1
8.		
9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON:

Survey Time (HH:MM): (WATER) BM Shift: Yes| No Logger Shift: Yes| No Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements
Station	A	B	C		Station	A	B	C	
BM1			3.000		BM1			3.000	Log'r Rod Length:
BM2			A-B =		BM2			A-B =	Log'r Rod to Botm:
BM3			A-B =		BM3			A-B =	
TOS			A-B =		TOS			A-B =	
WATER			A-B =		WATER			A-B =	
LOG'R ROD:			A-B =		LOG'R ROD:			A-B =	
HWM/CON			A-B =		HWM/CON			A-B =	
BANKFULL			A-B =		BANKFULL			A-B =	
BS (BM1)			A-B =		BS (BM1)			A-B =	

Field Staff: JM, DH, DS
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: _____
Project Name: _____

EDI T3 End: 17:32

Weather: _____

16:30

HID																Date (dd.mm.yyyy)	15-Oct-2013
Velocity-Area Method		SWOFFER | PYGMY | ADV		Salt Tracer Trial 1		LOGGED | MANUAL		Time: ___:___		Salt Tracer Trial 2		LOGGED | MANUAL		Time: 17:27.			
Station	Distance (m)	Depth (m)	Velocity (m/s)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)		
1				t_0 =	1244	260	1293	520		t_0 =	1248	260	1284	520	1250		
2				10	1244	270	1284	530		10	1249	270	1279	530	1250		
3				20	1244	280	1279	540		20	1249	280	1274	540			
4				30	1244	290	1271	550		30	1248	290	1271	550			
5				40	1244	300	1268	560		40	1250	300	1269	560			
6				50	1244	310	1263	570		50	1249	310	1265	570			
7				60	1244	320	1260	580		60	1249	320	1261	580			
8				70	1244	330	1257	590		70	1249	330	1259	590			
9				80	1244	340	1253	600		80	1249	340	1257	600			
10				90	1244	350	1252	610		90	1249	350	1257	610			
11				100	1245	360	1250	620		100	1254	360	1257	620			
12				110	1252	370	1248	630		110	1271	370	1254	630			
13				120	1268	380	1249	640		120	1290	380	1254	640			
14				130	1293	390	1248	650		130	1320	390	1252	650			
15				140	1317	400	1247	660		140	1350	400	1253	660			
16				150	1348	410	1247	670		150	1369	410	1252	670			
17				160	1367	420	1248	680		160	1376	420	1251	680			
18				170	1373	430	1246	690		170	1374	430	1251	690			
19				180	1374	440	1246	700		180	1368	440	1251	700			
20				190	1369	450	1246	710		190	1355	450	1250	710			
21				200	1357	460		720		200	1344	460	1250	720			
22				210	1346	470		730		210	1332	470	1250	730			
23				220	1332	480		740		220	1320	480	1249	740			
24				230	1322	490		750		230	1311	490	1249	750			
25				240	1311	500		760		240	1302	500	1250	760			
25				250	1301	510		770		250	1293	510	1250	770			

Comments:

Field Staff: _____
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: Cloudy, 5°C, light wind

HID	H-DC-U2	Date	15-Oct.-2013	Discharge Measurement Instruments + Methods
Station Name	Upper Dome Creek 2	Q Measurement Start Time:	16:55 (HH:MM) RDT | PST	(YSI) SWOFFER | PYGMY | ADV MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger:	Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE	EASTING NORTHING
Photo #	[U/S]	[D/S]	[RDB]	[LDB]	[STAFF/WEIR]

Site Comments

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0 °C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt.	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) \| CONSTANT RATE \| DRY LOGGED \| (MANUAL) (SPC) \| EC CF.T (YES) \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (16 : 55)	1202 | 1289	18m	0.025kg	20L	0.00125
2 (17 : 04)	1200 | 1291	18m	0.025kg	20L	0.00125
3 (:)	|				

V_1 for Sec. Mix (mL)	=1/Css
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes:

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0mL	1209	0.0
2.	30mL	1238	0.1
3.	30mL	1269	0.1
4.	30mL	1299	0.1
5.			
6.			
7.			
8.			
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| NO \| REASON: Survey Time (HH:MM): (WATER) BM Shift: Yes\| No Logger Shift: Yes\| No Staff Gauge Shifted? Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1			3.000		BM1			3.000	Log'r Rod Length:	
BM2			A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3			A-B =		BM3			A-B =		
TOS			A-B =		TOS			A-B =		
WATER			A-B=		WATER			A-B=		
LOG'R ROD:			A-B=		LOG'R ROD:			A-B=		
HWM/CON			A-B=		HWM/CON			A-B=		
BANKFULL			A-B=		BANKFULL			A-B=		
BS (BM1)			A-B=		BS (BM1)			A-B=		

Field Staff: JM, DS, DH
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: _____
Project Name: _____

End: 16:59:33 T1
End: 17:11 T2

Weather: _____

HID																	
Velocity-Area Method		SWOFFER | PYGMY | ADV		Salt Tracer Trial 1 LOGGED | MANUAL Time: 16:55						Salt Tracer Trial 2 LOGGED | MANUAL Time: 17:04						Date (dd.mm.yyyy)	
Station	Distance (m)	Depth (m)	Velocity (m/s)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)	Time (sec)	SPC (uS/cm)		
1				t_o =	1202	260	1210	520		t_o =	1200	260	1210	520			
2				10	1202	270	1208	530		10	1202	270	1209	530			
3				20	1201	280	1204	540		20	1201	280	1208	540			
4				30	1201	290	1203	550		30	1201	290	1206	550			
5				40	1201	300	1203	560		40	1202	300	1204	560			
6				50	1200	310	1202	570		50	1201	310	1203	570			
7				60	1201	320	1201	580		60	1202	320	1204	580			
8				70	1202	330	1201	590		70	1201	330	1204	590			
9				80	1201	340	1200	600		80	1202	340	1204	600			
10				90	1200	350	1200	610		90	1202	350	1203	610			
11				100	1200	360	1201	620		100	1205	360	1202	620			
12				110	1204	370	1200	630		110	1213	370	1204	630			
13				120	1214	380		640		120	1232	380	1204	640			
14				130	1232	390		650		130	1255	390	1202	650			
15				140	1256	400		660		140	1273	400	1203	660			
16				150	1274	410		670		150	1288	410	1203	670			
17				160	1287	420		680		160	1291	420	1203	680			
18				170	1284	430		690		170	1285	430		690			
19				180	1283	440		700		180	1271	440		700			
20				190	1271	450		710		190	1262	450		710			
21				200	1259	460		720		200	1249	460		720			
22				210	1247	470		730		210	1239	470		730			
23				220	1236	480		740		220	1229	480		740			
24				230	1227	490		750		230	1222	490		750			
25				240	1220	500		760		240	1217	500		760			
25				250	1214	510		770		250	1212	510		770			

Comments:

Field Staff: _____
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

Weather: Cloudy, 7°C, light wind.

HID	H-DC-B	Date	15-Oct.-2013	Discharge Measurement Instruments + Methods	
Station Name	Diversion CH @ Bridge	Q Measurement Start Time:	15:17 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	15:25 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	15:34 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[✓ downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial # 9908154	~~HOBO~~ | Solinst | N/A	GPS Waypoint		ZONE	EASTING	NORTHING
Photo #	[U/S] 222	[D/S] 223	[RDB] 224	[LDB] 225	[STAFF/WEIR] 226 / 227		

Site Comments *Pulled logger + well.

water level shift when cutting ice to view staff gauge
Level settled to 0.172m @ time of survey
Atmo #2&4 DL @ 13:22 Pic u/s 229 D/s 228
Mostly ice covered channel ~ 5cm Thick See Photos

Channel Measurements

Staff Gauge Height (m):	~~0.180~~ 0.172
Weir Head (m):	
Water Temperature (°C):	0.0°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (15 : 17)	1269 | 1439	18	0.05	20	0.0025
2 (15 : 21)	1268 | 1444	18	0.05	20	0.0025
3 (:)	|				

V_1 for Sec. Mix (mL)	400
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes: Sec Sol = 200mL SS in 500mL crik

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0 mL	1265	0.1
2.	10 mL	1279	0.1
3.	20 mL	1305	0.2
4.	30 mL	1344	0.2
5.	30 mL	1379	0.3
6.	30 mL	1414	0.3
7.	30 mL	1445	0.4
8.			
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON:

Survey Time (HH:MM): (WATER) 15:30 — BM Shift: Yes | No — Logger Shift: Yes | No — Staff Gauge Shifted?: Yes | No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4218	1.218	3.000		BM1			3.000	Log'r Rod Length:	
BM2		0863	3.355		BM2				Log'r Rod to Botm:	
BM3		1.224	2.994		BM3					
TOS		1874	2.344		TOS					
WATER		2700	1.518		WATER					
LOG'R ROD:		1363	2.855		LOG'R ROD:					
HWM/CON					HWM/CON					
BANKFULL					BANKFULL					
BS (BM1)		1.218	3.000		BS (BM1)					

Field Staff: SM DS DH
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: Sunny, 7°C, light cloud, light breeze

HID	H-DC-M	Date	15-Oct-2013	Discharge Measurement Instruments + Methods
Station Name		Q Measurement Start Time:	14:31 (HH:MM) PDT | PST	(YSI) SWOFFER | PYGMY | ADV MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	14:29 (HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[✓] downloaded	NONE | (ICE) BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger:	Serial # 1050018	HOBO | (Solinst) N/A	GPS Waypoint	ZONE	EASTING	NORTHING

Photo #	[U/S] 217	[D/S] 218	[RDB] 219	[LDB] 220	[STAFF/WEIR] 0221

Site Comments

Small amounts of shore ice, open channel, flowing.

Winterize logger
@ 14:40 pulled logger out.

logger rod put back at same elevation.

Channel Measurements

Staff Gauge Height (m):	0.158
Weir Head (m):	
Water Temperature (°C):	0.6°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) | CONSTANT RATE | DRY (LOGGED) | MANUAL (SPC) | EC CF.T (YES) | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_0(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (14:31)	1326 | 1476	38	0.100 kg	20L	0.005
2 (14:42)	13:23 | 1472	38	0.100kg	20L	0.005
3 (:)	____ | ____				
V_1 for Sec. Mix (mL)					
Csec (g/L):	1 g/L				
Vol. Calib. Tank (L):	1 L				
SPC_0 Calib. Tank					
CF.T =					
Qsalt =					

Notes:
100mL ss to 500mL CRK for secondary solution

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0	1325	0.7
2.	20mL	1358	0.7
3.	20mL	1388	0.7
4.	20mL	1419	0.7
5.	20mL	1449	0.7
6.	20mL	1477	0.7
7.			
8.			
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) | NO | REASON: Survey Time (HH:MM): (WATER) 14:35 BM Shift: Yes | (No) Logger Shift: Yes | (No) Staff Gauge Shifted?: Yes | (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4418	1418	3.000		BM1			3.000	Log'r Rod Length:	1.161
BM2		2076	2342		BM2				Log'r Rod to Botm:	1.240
BM3		1697	2721		BM3					
TOS		1924	2294		TOS					
WATER		2767	1651		WATER					
LOG'R ROD:		1691	2727		LOG'R ROD:					
HWM/CON					HWM/CON					
BANKFULL					BANKFULL					
BS (BM1)		1418	3000		BS (BM1)					

line above hole.

4418

Field Staff: SM, DH, DS
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13-Y-0167
Project Name: Mount Nansen

EDI

Weather: Sun, 1°C, calm

HID	H-DC-R	Date	15-Oct-2013	Discharge Measurement Instruments + Methods
Station Name	Dome Creek @ Road.	Q Measurement Start Time:	13:27 (HH:MM) PDT | PST	(YSI) | SWOFFER | PYGMY | ADV MID-SECT | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED
Logger:	Serial # 9858715	(HOBO) | Solinst | N/A		GPS Waypoint — ZONE EASTING NORTHING

SH Photo #	[U/S] 0212	[D/S] 0213	[RDB] 0214	[LDB] 0215	[STAFF/WEIR] 0216

Site Comments

Shore Ice present – channel still open & flowing.
Logger pulled for winter season @ 13:35
suspect well shift @ 13:20 During attempt to DL logger – Log rod frozen in well, survey was done after (Minimal Movement)

Channel Measurements

Staff Gauge Height (m):	0,284
Weir Head (m):	/
Water Temperature (°C):	0.0
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	/
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) \| CONSTANT RATE \| DRY — (LOGGED) \| MANUAL — (SPC) \| EC — CF.T (YES) \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_s (kg)	Volume (L)	Css (kg/L)
1 (13:27)	1123 | 1270	18	0.1	20	0.005
2 (13:35)	1122 | 1264	18	0.1	20	0.005
3 (:)	|				

		CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	200 mL (1169 uS)		1. 0	1128	0.1
Csec (g/L):	1 g/L		2. 10 mL	1142	0.1
Vol. Calib. Tank (L):	1 L		3. 20 mL	1169	0.2
SPC_0 Calib. Tank			4. 20 mL	1197	0.2
CF.T =			5. 20 mL	1224	0.2
Qsalt =			6. 20 mL	1249	0.2
Notes:			7. 20 mL	1275	0.3
			8.		
			9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) \| NO \| REASON — Survey Time (HH:MM): (WATER) 13:25 — BM Shift: Yes\| (No) — Logger Shift: Yes\| (No) — Staff Gauge Shifted?: Yes\| (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	3.758	0.758	3.000		BM1			3.000	Log'r Rod Length:	
BM2	A-B+C	0.799	2.959		BM2			A-B=	Log'r Rod to Botm:	
BM3	A-B+C	1.453	2.305		BM3			A-B=		
TOS	A-B+C	2.461	1.297		TOS			A-B=		
WATER	A-B+C	3.176	.582		WATER			A-B=		
LOG'R ROD:	A-B+C	2.065	1.693		LOG'R ROD:			A-B=		
HWM/CON	A-B+C	/	A-B=		HWM/CON			A-B=		
BANKFULL	A-B+C		A-B=		BANKFULL			A-B=		
BS (BM1)	A-B+C	0.758	3.000		BS (BM1)			A-B=		

3.758
2.461
1.297

Field Staff: DH JM DS
Data Entry By: __________ Date: __________
Reviewed By: __________ Date: __________

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

Weather: +2°C, Sunny, calm

HID	H-VC-REF	Date	16-Oct-2013	Discharge Measurement Instruments + Methods
Station Name		Q Measurement Start Time:	14:00 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | (ADV) MID-SECT. | POINT
		Q Measurement End Time:	14:33 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | (ROD)
		Logger Download/Inst Time:	14:31 (HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[✓ downloaded]	NONE | (CE) BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger:	Serial # 9908152	(HOBO) | Solinst | N/A	GPS Waypoint	ZONE	EASTING / NORTHING
Photo #	[U/S] 284	[D/S] 285	[RDB] 287	[LDB] 286	[STAFF/WEIR] 288

Site Comments

Pulled logger @ 14:31, left rod in for next year.

Ice on both banks.

Channel Measurements

Staff Gauge Height (m):	0.638
Weir Head (m):	
Water Temperature (°C):	-0.1
Water Surface Slope (%):	
Average Width (m):	4.4
Average Depth (m):	0.235

Measurement Summary	Primary	Secondary
Meas. Type:	ADV	
Measurment ID (MID):		
Average Q (m^3/s):	0.25297	
Q Meas. Accuracy +/- [%]:	2.4%	
Average Velocity (m/s):	0.513	
Cross-Sectional Area (m^2):	1.032	

Salt Tracer

SLUG \| CONSTANT RATE \| DRY LOGGED \| MANUAL SPC \| EC CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

			Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	=1 / Css	CF.T	1.		
Csec (g/L):	1 g/L		2.		
Vol. Calib. Tank (L):	1 L		3.		
SPC_0 Calib. Tank			4.		
CF.T =			5.		
Qsalt =			6.		
Notes:			7.		
			8.		
			9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) NO \| REASON: Survey Time (HH:MM): (WATER) 14:37 BM Shift: Yes \| (No) Logger Shift: Yes \| (No) Staff Gauge Shifted?: Yes \| (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4379	1379	3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C	1385	2994		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C	1343	3036		BM3			A-B=		
TOS	A+B+C	2047	2332		TOS			A-B=		
WATER	A+B+C	2439	1940		WATER			A-B=		
LOG'R ROD:	A+B+C	1742	2637		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
BS (BM1)	A+B+C	1378	3001		BS (BM1)			A-B=		

Field Staff: DH, SM, DS

Data Entry By: _____ Date: _____

Reviewed By: _____ Date: _____

Project #: 0167
Project Name: NAMEN

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: 0°C, Sunny, calm.

HID	H-VC-U	Date	16-Oct-2013	Discharge Measurement Instruments + Methods	
Station Name		Q Measurement Start Time:	12:40 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY (ADV)	MID-SECT. | POINT
		Q Measurement End Time:	13:18 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | (ROD)	
		Logger Download/Inst Time:	13:08 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	downloaded	(NONE) | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial # 1049522	HOBO (Solinst) | N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 265	[D/S] 266	[RDB] 267	[LDB] 268	[STAFF/WEIR] 270

Site Comments

Winterized logger. Pulled @ 13:15 Back in @
Little - No Snow Ice.

Channel Measurements

Staff Gauge Height (m):	0.212
Weir Head (m):	/
Water Temperature (°C):	~0.0°C
Water Surface Slope (%):	/
Average Width (m):	5.203
Average Depth (m):	0.203

Measurement Summary	Primary	Secondary
Meas. Type:	ADV	
Measurment ID (MID):		
Average Q (m^3/s):	0.4047	
Q Meas. Accuracy +/- [%]:	2.5	
Average Velocity (m/s):	0.383	
Cross-Sectional Area (m^2):	1.057	

Salt Tracer N/A

SLUG \| CONSTANT RATE \| DRY LOGGED \| MANUAL SPC \| EC CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

		CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	= 1 / Css		1.		
Csec (g/L):	1 g/L		2.		
Vol. Calib. Tank (L):	1 L		3.		
SPC_0 Calib. Tank			4.		
CF.T =			5.		
Qsalt =			6.		
Notes:			7.		
			8.		
			9.		

Volumetric N/A

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) \| NO \| REASON Survey Time (HH:MM): (WATER) BM Shift: Yes \| (No) Logger Shift: Yes \| (No) Staff Gauge Shifted?: Yes \| (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4.188	1.188	3.000		BM1			3.000	Log'r Rod Length:	116.0 cm
BM2		0.829	3.359		BM2			A-B=	Log'r Rod to Botm:	127.5 cm
BM3		0.946	3.242		BM3			A-B=		
TOS		1.291	2.897		TOS			A-B=		
WATER		2.071	2.117		WATER			A-B=		
LOG'R ROD:		1.045	3.143		LOG'R ROD:			A-B=		
HWM			A-B=		HWM			A-B=		
BANKFULL			A-B=		BANKFULL			A-B=		
BS (BM1)		1.188	3.000		BS (BM1)			A-B=		

First line above hole.

Field Staff: DH DS JM
Data Entry By: Date:
Reviewed By: Date:

Project #: 0167
Project Name: NANSEN

EDI

Weather: 0°c calm, clear

HID	H VC DBC	Date	16 Oct 2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Cr D/S of Beck Crk	Q Measurement Start Time:	11:56 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | (ADV) MID-SECT. | POINT	
		Q Measurement End Time:	12:34 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT (ROD)	
		Logger Download/Inst Time:	12:06 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[✓ downloaded]	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial # 1049137	HOBO (Solinst) | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 260	[D/S] 261	[RDB] 262	[LDB] 263	[STAFF/WEIR] 264	

Site Comments

Winterized logger. Pulled @ 12:19
Little to No Shore Ice

Channel Measurements

Staff Gauge Height (m):	0.478
Weir Head (m):	/
Water Temperature (°C):	0.0°c
Water Surface Slope (%):	/
Average Width (m):	4.950
Average Depth (m):	0.175

Measurement Summary	Primary	Secondary
Meas. Type:	ADV	
Measurment ID (MID):		
Average Q (m^3/s):	0.3845	
Q Meas. Accuracy +/- [%]:	2.1	
Average Velocity (m/s):	0.444	
Cross-Sectional Area (m^2):	0.867	

Salt Tracer

SLUG \| CONSTANT RATE \| DRY LOGGED \| MANUAL SPC \| EC CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_o (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	=1 / Css
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes:

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) \| NO \| REASON: Survey Time (HH:MM): (WATER) BM Shift: Yes \| No Logger Shift: Yes \| No Staff Gauge Shifted?: Yes \| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4.388	1.388	3.000		BM1			3.000	Log'r Rod Length:	117.1 cm
BM2	A+B+C	1.364	3.024		BM2			A-B=	Log'r Rod to Botm:	119.5 cm
BM3	A+B+C	1.482	2.906		BM3			A-B=		
TOS	A+B+C	2.052	2.336		TOS			A-B=		
WATER	A+B+C	2.573	1.815		WATER			A-B=		
LOG'R ROD:	A+B+C	1.834	2.554		LOG'R ROD:			A-B=		
HWM/CON	A+B+C	1.387	3.001		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
BS (BM1)	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: JM DS BH
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

Weather: 0°C, Sunny, calm.

HID	H-BC	Date	16-Oct.-2013	Discharge Measurement Instruments + Methods	
Station Name	Back Creek	Q Measurement Start Time:	13:48 (HH:MM) PDT | PST	(YSI) SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	14:05 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	Y/downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial # 9896531	(HOBO) | Solinst | N/A	GPS Waypoint	ZONE	EASTING NORTHING
Photo #	[U/S] 274	[D/S] 275	[RDB] 276	[LDB] 277	[STAFF/WEIR] 278

Site Comments

Creek covered in ice, water flowing overtop (more than underneath).

Pulled logger. left rod in place for next year.

Channel Measurements

Staff Gauge Height (m):	0.425
Weir Head (m):	
Water Temperature (°C):	0.0
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt.	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) CONSTANT RATE | DRY (LOGGED) | MANUAL (SPC) | EC CF.T (YES) | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (13 : 48)	325.7 | 331.0	29	0.025	20L	0.00125
2 (13 : 56)	325.6 | 331.4	29	0.025	20L	0.00125
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	800
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes:

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0	322.7	0.1°C
2.	2mL	324.7	0.1°C
3.	2mL	327.2	0.0°C
4.	2mL	329.7	0.0°C
5.	2mL	332.0	0.0°C
6.			
7.			
8.			
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) NO | REASON:

Survey Time (HH:MM): (WATER) 13:51 BM Shift: Yes| (No) Logger Shift: Yes| (No) Staff Gauge Shifted?: Yes| (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4.234	1.234	3.000		BM1			3.000	Log'r Rod Length:	
BM2	A-B+C	1.231	3.003		BM2			A-B+C	Log'r Rod to Botm:	
BM3	A-B+C	1.177	3.057		BM3			A-B+C		
TOS	A-B+C	1.569	2.665		TOS			A-B+C		
WATER	A-B+C	2.141	2.093		WATER			A-B+C		
LOG'R ROD:	A-B+C	1.335	2.899		LOG'R ROD:			A-B+C		
HWM/CON	A-B+C		A-B+C		HWM/CON			A-B+C		
BANKFULL	A-B+C		A-B+C		BANKFULL			A-B+C		
BS (BM1)	A-B+C	1.233	3.001		BS (BM1)			A-B+C		

Field Staff: DH, JM, DS.
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

Weather: -7, Clear, calm

HID	H- VC - DMN	Date	16-Oct-2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Creek U/S of Minnesota Creek.	Q Measurement Start Time:	10:20 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | (ADV)	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | (ROD)	
		Logger Download/Inst Time:	10:36 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[✓] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial # 9896527	(HOBO) | Solinst | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2466	[D/S] 2464	[RDB] 2468	[LDB] 2460	[STAFF/WEIR] 2461	

Site Comments

Pulled logger @ 10:30, left rod in well for next year.
↳Downloaded @ 10:34
ADV Did Not work @ time of site visit.

Channel Measurements

Staff Gauge Height (m):	0658
Weir Head (m):	
Water Temperature (°C):	0.0
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	ADV	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY LOGGED | MANUAL SPC | EC CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	=1 / Css
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes:

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) | NO | REASON Survey Time (HH:MM): (WATER) 10:16 BM Shift: Yes (No) Logger Shift: Yes (No) Staff Gauge Shifted?: Yes (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4023	1.023	3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B=C	1.020	3.003		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B=C	1.347	2.676		BM3			A-B=		
TOS	A+B=C	2.033	1.990		TOS			A-B=		
WATER	A+B=C	2.392	1.651		WATER			A-B=		
LOG'R ROD:	A+B=C	1.817	2.206		LOG'R ROD:			A-B=		
HWM/CON	A+B=C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B=C		A-B=		BANKFULL			A-B=		
BS (BM1)	A+B=C	1.023	3.000		BS (BM1)			A-B=		

Field Staff: DH, JM, DS
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13Y0167
Project Name: [illegible]

EDI

Weather: clear -7c Calm

HID	H -MN		Date	Oct 16 2013	Discharge Measurement Instruments + Methods
Station Name	Minisola crk		Q Measurement Start Time:	9:16 (HH:MM) PDT | PST	(YSI) | SWOFFER | PYGMY | ADV MID-SECT. | POINT
			Q Measurement End Time:	(HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD
			Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions
			Logger Reading (m)	[ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.
Logger:	Serial # 990 8128	(HOBO) | Solinst | N/A			GPS Waypoint — ZONE — EASTING — NORTHING
Photo #	[U/S] 247	[D/S] 248	[RDB] 249	[LDB] 250	[STAFF/WEIR] 0251

Site Comments

Logger Pulled @ 09:20 cHannel Ice covered
Pulled Logger & well

Channel Measurements

Staff Gauge Height (m):	0.448
Weir Head (m):	
Water Temperature (°C):	0.0°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) | CONSTANT RATE | DRY — (LOGGED) | MANUAL — (SPC) | EC — CF.T (YES) | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (9 : 16)	75.6 | 91.2	28	0.025	20L	0.00125
2 (9 : 22)	75.6 | 89.7	28	0.025	20L	0.00125
3 (:)	|				

V_1 for Sec. Mix (mL)	800
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0	77.2	0.0
2.	10 mL	92.4	0.0
3.	2nd Test:		
4.	0 mL	76.4	0.0
5.	2 mL	78.9	0.0
6.	2 mL	82.1	0.0
7.	2 mL	83.7	0.0
8.	2 mL	87.0	0.0
9.	2 mL	92.2	0.0

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) | NO | REASON: — Survey Time (HH:MM): (WATER) 09:27 — BM Shift: Yes | (No) — Logger Shift: Yes | (No) — Staff Gauge Shifted?: Yes | No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003
Station	A	B	C	
BM1	3.440	0.440	3.000	
BM2	A+B-C	1.143	2.297	
BM3	A+B-C	0.738	2.702	
TOS	A+B-C	1.871	1.569	
WATER	A+B-C	2.431	1.009	
LOG'R ROD:	A+B-C	1.351	2.089	
HWM/CON	A+B-C		A-B=	
BANKFULL	A+B-C		A-B=	
BS (BM1)	A+B-C	0.440	3.000	

Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		
BM1			3.000	Log'r Rod Length:	
BM2			A-B=	Log'r Rod to Botm:	
BM3			A-B=		
TOS			A-B=		
WATER			A-B=		
LOG'R ROD:			A-B=		
HWM/CON			A-B=		
BANKFULL			A-B=		
BS (BM1)			A-B=		

Field Staff: DH [illegible] DS
Data Entry By: Date:
Reviewed By: Date:

Project #: 13V0167
Project Name: NANUSEN

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: Sun & Calm

HID	HVC-R	Date	15 Oct 2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Crk @ Road	Q Measurement Start Time:	12:09 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV | MID-SEC | POINT	
		Q Measurement End Time:	12:43 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	12:02 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	✓ downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial # 1041103	HOBO | ~~POINT~~ | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2426	[D/S] 2427	[RDB] 2428	[LDB] 2429	[STAFF/WEIR] 2432/33	

Site Comments

- Ice on the shore.
- Winterized logger.
  - ↳ logger removed @ 12:45
- Well casing and staff gauge ~5cm above bed.

Channel Measurements

Staff Gauge Height (m):	0.523
Weir Head (m):	
Water Temperature (°C):	-0.1
Water Surface Slope (%):	
Average Width (m):	6.35
Average Depth (m):	0.199

Measurement Summary	Primary	Secondary
Meas. Type:	ADV	
Measurment ID (MID):		
Average Q (m^3/s):	0.3786	
Q Meas. Accuracy +/- [%]:	3.3%	
Average Velocity (m/s):	0.299	
Cross-Sectional Area (m^2):	1.266	

Salt Tracer — N/A

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

		CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	=1 / Css		1.		
Csec (g/L):	1 g/L		2.		
Vol. Calib. Tank (L):	1 L		3.		
SPC_0 Calib. Tank			4.		
CF.T =			5.		
Qsalt =			6.		
Notes:			7.		
			8.		
			9.		

Volum. — N/A

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON: — Survey Time (HH:MM) (WATER) 12:18 — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	3969	0969	3.000		BM1	3943	0943	3.000	Log'r Rod Length:	1.168
BM2	A+B-C	0546	3423		BM2		0518	3425	Log'r Rod to Botm:	1.260
BM3	A+B-C	0799	3170		BM3		0773	3170		
TOS	A+B-C	1400	2569		TOS	137	1374	2569		
WATER	A+B-C	1878	2091		WATER		1857	2086		
LOG'R ROD:	A+B-C	1178	2791		LOG'R ROD:		1152	2791		
HWM/CON	A+B-C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B-C		A-B=		BANKFULL			A-B=		
BS (BM1)	A+B-C	0968	3001		BS (BM1)		0943	3000		

To line above hole

↳ well casing + staff gauge ~5cm above bed.

Field Staff: DH DS JM

Data Entry By: _____ Date: _____

Reviewed By: _____ Date: _____

Project #: 13Y0167
Project Name: ANSER

EDI

Weather: ~~Over~~ Sun Cold +2°C

HID	H-SEEP	Date	16 Oct 2013	Discharge Measurement Instruments + Methods
Station Name	Seepage	Q Measurement Start Time:	18:58 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | ~~VOLUMETRIC~~ | FLOAT | ROD
		Logger Download/Inst Time:	/ (HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	/ [ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger:	Serial # /	HOBO | Solinst | ~~N/A~~	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S]	[D/S]	[RDB]	[LDB]	[STAFF/WEIR]	

Site Comments

Flow gauge image: 332, 333
Seepage pond staff gauge image: 331 reads 0.512
Seep overview: 330
Ice on Seepage Pond, water ~ 3cm on top

Channel Measurements

Staff Gauge Height (m):	/
Weir Head (m):	/
Water Temperature (°C):	1.5
Water Surface Slope (%):	/
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Vol.	
Measurment ID (MID):		
Average Q (m^3/s):		
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer — ~~N/A~~

SLUG | CONSTANT RATE | DRY LOGGED | MANUAL SPC | EC CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_e (kg)	Volume (L)	Css (kg/L)
1 (:)	___ | ___				
2 (:)	___ | ___				
3 (:)	___ | ___				

		CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	=1 / Css		1.		
Csec (g/L):	1 g/L		2.		
Vol. Calib. Tank (L):	1 L		3.		
SPC_0 Calib. Tank			4.		
CF.T =			5.		
Qsalt =			6.		
Notes:			7.		
			8.		
			9.		

Volum.

Volume (L) =	15	13	11	12	14
Time (sec)	[1] 2.86	[2] 2.76	[3] 2.18	[4] 2.20	[5] 2.64
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES (NO) | REASON: No Station — Survey Time (HH:MM): (WATER) — BM Shift: Yes| No — Logger Shift: Yes| No — Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A=B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A=B+C		A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3	A=B+C		A-B =		BM3			A-B =		
TOS	A=B+C		A-B =		TOS			A-B =		
WATER	A=B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A=B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A=B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A=B+C		A-B=		BANKFULL			A-B=		
BS (BM1)	A=B+C		A-B=		BS (BM1)			A-B=		

Field Staff: DH DS JM
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 12-Y-012
Project Name: Mount Nansen - Hydrology

Field Dates: 12, 13 + 14 Nov. 2013

General Site Tasks/ Communications

1)Download ALL data loggers present.
2)Attempt to de-silt wells prior to moving data logger rod (JimmyRod).
3) If a measurement is not feasible, fully document why and take photos.
*4) **Fill in ALL data boxes & Site Comment boxes on field sheets to document site conditions (even if site is unchanged).***
5) During salt slugs, minimum SPC rise is only +10x resolution of conductivity meter.

#	Complete	HID	Station Name	Station Type	Site Tasks	Survey Required	Logger Type Serial #	Q Method	Additional Materials Required	Date	Time	SG	Logger
						Yes/No				yy.mm.dd	HH:MM	(m)	(m)
1	[✓]	ATM-DC2	Atmospheric at Diversion Channel	Continuous Baro Logger	1) HOBO download	NO	HOBO	None	None	13.11.12	16:20	n/a	
2	[✓]	ATM-DC4	Atmospheric at Diversion Channel (Back-up)	Continuous Baro Logger	1) Solinst download 2) Clear Solinst logger data	NO	Solinst Baro-logger	None	None	13.11.12	16:20	n/a	
3	[✓]	H-PC-U	Upper Pony Creek	Instantaneous	1) Salt Tracer AND volumetric	NO	n/a	Salt (0.01 kg) CF.T	None	13.11.12	18:26		
4	[ ]	H-PC-DSP	Pony Creek Downstream of Pit	Instantaneous	1) Salt Tracer AND Volumetric 2) Logger download.	NO	n/a	Volumetric Salt (0.01 kg) CF.T	None	13.11.			
5	[ ]	H-DC-DX	Dome Creek DX	Instantaneous	1) Volumetric from culvert 2) Remember photos at actual station	n/a	n/a	Volumetric	None	13.11.		n/a	
6	[✓]	H-DC-DX+105	Dome Creek DX+105	Instantaneous	1) Q measurement	n/a	n/a	Salt (0.01 kg) CF.T	None	13.11.14	10:40	n/a	
8	[✓]	H-DC-D1b	Dome Creek D1b	Instantaneous	1) Q measurement	n/a	n/a	0.025kg + CFT	None	13.11.14	9:44	n/a	
9	[✓]	H-DC-U1	Upper Dome Creek 1	Instantaneous	1) Q measurement	n/a	n/a		None	13.11.12	16:45		
10	[✓]	H-DC-U2	Upper Dome Creek 2	Instantaneous	1) Q measurement	n/a	n/a		None	13.11.12	17:06	n/a	
11	[✓]	H-DC-B	Diversion Channel at Bridge	Continuous	1) Q measurement	NO	n/a	Salt (0.05 kg) CF.T	None	13.11.12	16:20		
12	[✓]	H-DC-M	Middle Dome Creek	Continuous	1) Q measurement 2) Logger download.	YES	Solinst 1050018	Salt (0.1 kg) CF.T	None	13.11.12	15:28		
13	[✓]	H-DC-R	Dome Creek at Road	Continuous	1) Q measurement (salt tracer and volumetric at culvert if possible)	n/a	n/a	Volumetric Salt (0.1 kg) CF.T	None	13.11.12	14:08		

Field Staff: DH, SM, DS

Project #: 12-Y-0129
Project Name: Mount Nansen - Hydrology

Field Dates: Nov 12+13

#	Complete	HID	Station Name	Station Type	Site Tasks	Survey Required	Logger Type Serial #	Q Method	Additional Materials Required	Date	Time	SG	Logger
						Yes/No				yy.mm.dd	HH:MM	(m)	(m)
14	[✓]	H-VC-REF	Victoria Creek Reference	Continuous	1) Q measurement (ADV + SS)	NO	n/a	ADV SS (0.2 kg)	None				
15	[✓]	H-VC-U	Upper Victoria Creek	Continuous	1) Q measurement (ADV + SS) 2) Logger download.	YES	Solinst 1049522	ADV SS (0.2 kg)	None				
16	[✓]	H-VC-DBC	Victoria Creek D/S of Back Creek	Continuous	1) Q measurement (ADV + SS) 2) Logger download.	YES	Solinst 1049137	ADV SS (0.2 kg)	None				
17	[ ]	H-BC	Back Creek	Continuous	1) Q measurement if water flowing.	NO	n/a	Salt (0.025 kg) CF.T	None				
18	[✓]	H-VC-UMN	Victoria Creek U/S of Minnesota Creek	Continuous	1) Q measurement (ADV + SS)	NO	n/a	ADV SS (0.2 kg)	None				
19	[✓]	H-MN	Minnesota Creek	Instantaneous	1) Q measurement	NO	n/a	Salt (0.025 kg) CF.T	None				
20	[✓]	H-VC-R	Victoria Creek at Road	Continuous	1) Q measurement 2) Logger download.	YES	Solinst 1041103	ADV	None				
21	[✓]	H-SEEP	Seepage Pond Outlet	Instantaneous / Water Level	1) Q measurement at pipe outlet 2) Q measurement at flow meter in pumphouse 3) Staff Gauge Reading in Pond	NO	n/a	Volumetric	None				
22	[ ]	H-TP	Tailings Pond	Water Level Only	1) Staff Gauge Reading	NO	n/a	None	None	13.11.			

H-BC → Dry. Photos: US: 2672 DS: 2673 LDB: 2675 RDB: 2674 Dry: 2676-2678.

H-PC-DSP → Dry Photos: 2716, 2719, 2720

Field Staff: _____ _____

Project #: 3-4-0167
Project Name: Mt. Nansen

Weather: -2°C, snow

HID	H-DC-DX+105	Date	14 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Dome Creek DX+105	Q Measurement Start Time:	10:40 (HH:MM) PDT | PST	(YSI) | SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	11:20 (HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	— (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	— [ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2746	[D/S] 2744	[RDB] 2747	[LDB] 2748	[STAFF/WEIR]	

Site Comments

Station location frozen & ice covered.
(B) flag for later

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	
Water Temperature (°C):	0.2°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	889	
Average Q (m^3/s):	0.0021	
Q Meas. Accuracy +/- [%]:	1%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) \| CONSTANT RATE \| DRY (LOGGED) \| MANUAL (SPC) \| EC CF.T (YES) \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (10 : 40)	1172 | 1425	23	0.01 kg	20L	0.0005
2 (11 : 00)	1182 | 1242	23	0.01 kg	20L	0.0005
3 (:)	— | —				

V_1 for Sec. Mix (mL)	2000
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	9.79×10^{-4}
Qsalt =	0.0021 ± 1%

500mL Bucket into 250mL Creek.

Notes: Salt tracer trial 1 had constant and significant fluctuations in SPC.

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1. 0mL	1193	-0.1°C
2. 30mL	1216	-0.1°C
3. 30mL	1233	-0.1°C
4. 30mL	1253	-0.1°C
5. 30mL	1265	-0.1°C
6.		
7.		
8.		
9.		

Volum. n/a

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| NO \| REASON: no station present

Survey Time (HH:MM): (WATER) BM Shift: Yes\| No Logger Shift: Yes\| No Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003
Station	A	B	C	
BM1			3.000	
BM2				
BM3				
TOS				
WATER				
LOG'R ROD:				
HWM/CON				
BANKFULL				

Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		
BM1			3.000	Log'r Rod Length:	
BM2				Log'r Rod to Botm:	
BM3					
TOS					
WATER					
LOG'R ROD:					
HWM/CON					
BANKFULL					
BS (BM1)					

Field Staff: JH, JM, DS
Data Entry By: CL Date: 18 Nov 13
Reviewed By: CL Date:

Project # -4-0167
Project Name: Mt. Nansen

Weather: -2°C overcast

HID	H-DC-D1b	Date	14 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Dome Creek D1b	Q Measurement Start Time:	9:44 (HH:MM) PDT | PST	(YSI) | SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	10:00 (HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | (CE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2733	[D/S] 2734	[RDB] 2736	[LDB] 2735	[STAFF/WEIR] N/A	

Site Comments

Excavator activity upstream with the removal of the building on the upstream pond. Salt tracer ineffective due to water flowing over + through ice. No CFT performed. (B) fly

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	-0.1°C
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	HHH SS	
Measurment ID (MID):	890	
Average Q (m^3/s):	—	
Q Meas. Accuracy +/- [%]:	—	
Average Velocity (m/s):	—	
Cross-Sectional Area (m^2):	—	

Salt Tracer

(SLUG) \| CONSTANT RATE \| DRY (LOGGED) MANUAL (SPC) EC CF.T YES (NO)

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (09:44)	172 | ✓		0.025	20	0.00125
2 (09:50)	1599.1 |		0.025	20	0.00125
3 (:)	|				

V_1 for Sec. Mix (mL)	800 CSE	400 SS int	Vol. Added (mL)	SPC (uS/cm)	Temp
Csec (g/L):	1 g/L	500 creek	1.		
Vol. Calib. Tank (L):	1 L		2.		
SPC_0 Calib. Tank			3.		
CF.T =	None	CF.T	4.		
Qsalt =	None		5.		
			6.		
			7.		
			8.		
			9.		

Notes: Trial one Not successful, moved YSI further up stream, water flowing through cages at Dam

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| (NO) \| REASON: No station present

Survey Time (HH:MM): (WATER) BM Shift: Yes\| No Logger Shift: Yes\| No Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A+B+C		A-B=		TOS			A-B=		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: JM DH, DS
Data Entry By: [signature] Date: 18 NOV 2013
Reviewed By: [signature] Date:

Project # 14-0167
Project Name: Mt. Nansen

Weather: -11, overcast, light snow.

HID	H-DC-U1	Date	12-NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Upper Dome Creek 1	Q Measurement Start Time:	16:45 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV MID-SECT. | POINT	
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER |WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial #	HOBO | Solinst | N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 2616	[D/S] 2619	[RDB] 2618	[LDB] 2617	[STAFF/WEIR]

Site Comments

Channel slowly flowing through multiple layers of ice, with slush. No visable obvious flow observed, overflow in slush + moving into veg. Conditions unsuitable for flow measurements.

Channel Measurements

Staff Gauge Height (m):	–
Weir Head (m):	–
Water Temperature (°C):	–
Water Surface Slope (%):	–
Average Width (m):	–
Average Depth (m):	–

Measurement Summary	Primary	Secondary
Meas. Type:	SV	
Measurment ID (MID):	900	
Average Q (m^3/s):	none	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY LOGGED | MANUAL SPC | EC CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_o Calib. Tank	
CF.T =	
Qsalt =	

Notes: No SS performed. Unsuitable conditions for Q measurement

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON: Survey Time (HH:MM): (WATER) BM Shift: Yes| No Logger Shift: Yes| No Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A+B+C		A-B=		TOS			A-B=		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: DH, JM, DS
Data Entry By: [illegible] Date: 18 NOV 2013
Reviewed By: [illegible] Date: 18 NOV 2013

Project #: -Y-0167
Project Name: -H. Nansen

Weather: -11°C, overcast.

HID	H-DC-U2	Date	12-NOV-2013	Discharge Measurement Instruments + Methods
Station Name	Upper Dome Creek 2	Q Measurement Start Time:	17:06 (HH:MM) PDT | PST	(YSI) | SWOFFER | PYGMY | ADV | MID-SECT | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger:	Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE	EASTING	NORTHING

Photo #	[U/S] 2620	[D/S] 2623	[RDB] 2621	[LDB] 2622	[STAFF/WEIR] N/A

Site Comments

Channel snow + ice covered, ~20cm of consolidated layers of ice. Effectiveness of salt slug may not be ideal due to water level @ salt slug entry site now higher and flowing over ice into trees + veg. Background SPC jumping from ~~1237~~ to 1257.

Channel Measurements

Staff Gauge Height (m):	–
Weir Head (m):	–
Water Temperature (°C):	0.0 °C
Water Surface Slope (%):	–
Average Width (m):	–
Average Depth (m):	–

Measurement Summary	Primary	Secondary
Meas. Type:	~~none~~ – SS	
Measurment ID (MID):	901	
Average Q (m^3/s):	None	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer — (SLUG) \| CONSTANT RATE \| DRY — (LOGGED) \| MANUAL — (SPC) \| EC — CF.T (YES) \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_e (kg)	Volume (L)	Css (kg/L)
1 (17:06)	1233 | 1286	24	0.010kg	20	0.0005
2 (17:16)	1260 | 1304	24	0.010kg	20	0.0005
3 (:)	|				

			CF.T Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	2000	500mL Bucket into 250mL Creek.	1. 0mL		0.1°C
Csec (g/L):	1 g/L		2.		
Vol. Calib. Tank (L):	1 L		3.		
SPC_0 Calib. Tank			4.		
CF.T =			5.		
Qsalt =			6.		
			7.		
			8.		
			9.		

Notes: Cal Tank SPC_o 1420+ & not stabilizing - suspect Ice/cold temps & salt from trials hung up in creek, salt inflating etc. CFT Not completed.

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | (NO) | REASON: No gauge. — Survey Time (HH:MM): (WATER) — BM Shift: Yes| No — Logger Shift: Yes| No — Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A + B + C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A - B = C		A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3	A + B + C		A-B =		BM3			A-B =		
TOS	A + B + C		A-B =		TOS			A-B =		
WATER	A + B + C		A-B=		WATER			A-B=		
LOG'R ROD:	A + B + C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A + B + C		A-B=		HWM/CON			A-B=		
BANKFULL	A + B + C		A-B=		BANKFULL			A-B=		
	A + B + C		A-B=		BS (BM1)			A-B=		

* SS did not work - no Q obtained @ station due to complex flow pathways → ice present in channel. Recommend discontinue meas. in winter.

Field Staff: DH, JM, DS
Data Entry By: CL — Date: 18 NOV 2013
Reviewed By: CL — Date: 18 NOV 2013

Project # 14-0167
Project Name: Mt. Nansen

Weather: ~11°C, light wind + overcast.

HID	H-DC-B	Date	12-NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Diversion Channel @ Bridge	Q Measurement Start Time:	16:20 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial #	HOBO | Solinst | N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 2606	[D/S] 2599	[RDB] 2601	[LDB] 2600	[STAFF/WEIR] N/A

Site Comments

Ice + snow covered.
Frozen through, no water. pics: 2607, 2604
Signs of re-trenching in diversion recently

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	—
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	899	
Average Q (m^3/s):	none	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer — n/a

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T | YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	=T / Css
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes:

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Volum. — n/a

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON: No staff gauge / flow.

Survey Time (HH:MM): (WATER) BM Shift: Yes| No Logger Shift: Yes| No Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B=C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B=C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B=C		A-B=		BM3			A-B=		
TOS	A+B=C		A-B=		TOS			A-B=		
WATER	A+B=C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B=C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B=C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B=C		A-B=		BANKFULL			A-B=		
	A+B=C		A-B=		BS (BM1)			A-B=		

Field Staff: DH, JM, DS
Data Entry By: CL Date: 18 NOV 2013
Reviewed By: CL Date: 18 NOV 2013

Project # -4-0167
Project Name: Mt. Nansen

Weather: -11°C, overcast to light snow.

HID	H-DC-M	Date	12 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Middle Dome Creek	Q Measurement Start Time:	15:28 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	15:19 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[✓ downloaded]	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial # 1050018	HOBO (Solinst) N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2594	[D/S] 2595	[RDB] 2596	[LDB] 2597	[STAFF/WEIR] 2598	

Site Comments

Snow + ice covered. Ice ~1cm to 4cm thick.

(B) Flag

Channel Measurements

Staff Gauge Height (m):	0.129
Weir Head (m):	—
Water Temperature (°C):	0.2°C
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	898	
Average Q (m^3/s):	0.0141	
Q Meas. Accuracy +/- [%]:	35%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) | CONSTANT RATE | DRY (LOGGED) | MANUAL (SPC) EC CF.T (YES) NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_o (kg)	Volume (L)	Css (kg/L)
1 (15:28)	1594 | 1993	28	0.100kg	20L	0.005
2 (15:41)	1593 | 1970	28	0.100kg	20L	0.005
3 (:)	|				

V_1 for Sec. Mix (mL)	200
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	1595
CF.T =	8.36×10^{-5}
Qsalt =	0.0141 ± 35%

Notes:

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0mL	1595	-0.1°C
2.	30mL	1651	-0.1°C
3.	30mL	1707	-0.1°C
4.	30mL	1759	-0.1°C
5.	30mL	1809	-0.1°C
6.	30mL	1854	-0.1°C
7.	30mL	1895	-0.1°C
8.	30mL	1941	-0.1°C
9.	30mL	1981	-0.1°C

Volum. n/a

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) NO | REASON:

Survey Time (HH:MM): (WATER) 15:47 BM Shift: Yes (No) Logger Shift: Yes (No) Staff Gauge Shifted?: Yes (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4278	1278	3.000		BM1			3.000	Log'r Rod Length:	
BM2		1933	2345		BM2				Log'r Rod to Botm:	
BM3		1554	2724		BM3					
TOS		1763	2495		TOS					
WATER		2651	1627		WATER					
LOG'R ROD:		1551	2727		LOG'R ROD:					
HWM/CON					HWM/CON					
BANKFULL					BANKFULL					
		1278	3.000		BS (BM1)					

Field Staff: DH, JM, DS
Data Entry By: CL Date: 18 NOV 2013
Reviewed By: CL Date: 18 NOV 2013

Project # -4-0167
Project Name: Nanson

Weather: -7°, overcast, light snow + gusts of wind,

HID	H-DC-R	Date	12-NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Dome Creek @ Road	Q Measurement Start Time:	14:08 (HH:MM) PDT | PST	(YSI) | SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	14:31 (HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	— (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	— [ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE	EASTING NORTHING
Photo #	[U/S] 2593	[D/S] 2590	[RDB] 2592	[LDB] 2591	[STAFF/WEIR] —

Site Comments

Snow + ice cover, starting to overflow downstream.
ice ~ 1cm to 5cm thick
(B) Flag

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	0°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	897	
Average Q (m^3/s):	0.0043	
Q Meas. Accuracy +/- [%]:	12%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG \| CONSTANT RATE \| DRY (LOGGED) \| MANUAL (SPC) \| EC CF.T (YES) \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (14:08)	1197 |	10m	0.100kg	20	0.005
2 (14:14)	1197 | 1716	10m	0.100kg	20	0.005
3 (14:22)	1197 |	10m	0.100kg	20	0.005

V_1 for Sec. Mix (mL)	200mL
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	~~11~~ 5000
SPC_0 Calib. Tank	1199
CF.T =	1.42×10^{-4}
Qsalt =	0.0043 ± 12%

Notes: Use file 2 + 3, No salt added for file 2

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0mL	1199	-0.1°C
2.	30mL	1250	-0.1°C
3.	30mL	1316	-0.1°C
4.	30mL	1374	0.0°C
5.	30mL	1411	-0.1°C
6.	30mL	1458	-0.1°C
7.	60mL	1540	-0.1°C
8.	60mL	1625	-0.1°C
9.	60mL	1698	-0.1°C
10.	30mL	1732	-0.1°C

Volum.

Volume (L) =				
Time (sec)	[1]	[2]	[3]	[4] [5]
Average Q (L/s) =				
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =	

Hydrometric Levels - Survey

YES \| NO \| REASON: No logger a Station present — Survey Time (HH:MM): — (WATER) — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	HI	Rod Read	Elevation (m)	± 0.003	Circuit #2	HI	Rod Read	Elevation (m)	Station Measurements
Station	A	B	C		Station	A	B	C	
BM1	A+B=C		3.000		BM1			3.000	Log'r Rod Length:
BM2	A+B=C		A-B=		BM2			A-B=	Log'r Rod to Botm:
BM3	A+B=C		A-B=		BM3			A-B=	
TOS	A+B=C		A-B=		TOS			A-B=	
WATER	A+B=C		A-B=		WATER			A-B=	
LOG'R ROD:	A+B=C		A-B=		LOG'R ROD:			A-B=	
HWM/CON	A+B=C		A-B=		HWM/CON			A-B=	
BANKFULL	A+B=C		A-B=		BANKFULL			A-B=	
	A+B=C		A-B=		BS (BM1)			A-B=	

Field Staff: DH, SM, DS
Data Entry By: CL Date: 18 NOV 2013
Reviewed By: CL Date: 18 NOV 2013

Project # 3-4-0167
Project Name: H. Nonsen

Weather: -13, overcast.

HID	H-VC-REF	Date	13 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Creek Reference.	Q Measurement Start Time:	15:40 (HH:MM) PDT | PST	(YSI) SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	16:20 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	— [ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE	EASTING NORTHING
Photo #	[U/S] 2584	[D/S] 2683	[RDB] 2682	[LDB] 2685	[STAFF/WEIR]

Site Comments

No logger present Flag (B).

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	—
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	893	
Average Q (m^3/s):	0.3569	
Q Meas. Accuracy +/- [%]:	61%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

(SLUG) \| CONSTANT RATE \| DRY (LOGGED) \| MANUAL (SPC) \| EC CF.T (YES) \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (15:53)	212.1 | 232.6		0.200kg	20L	0.01
2 (16:04)	212.0 | 230.7				
3 (:)	|				

V_1 for Sec. Mix (mL)	100	75mL leaked into 750mL Creek.	Vol. Added (mL)	SPC (uS/cm)	Temp
Csec (g/L):	1 g/L		1. 0mL	215.2	0.0
Vol. Calib. Tank (L):	1 L		2. 6mL	230.0	0.0
SPC_0 Calib. Tank	215.2		3. //////	//////	//////
CF.T =	2.82×10^{-5}		4. 0mL	204.2	0.0
Qsalt =	0.3569 ±61%		5. 2mL	219.6	0.0
Notes: High uncertainty. Due to ice cover			6. 2mL	222.3	-0.1
			7. 2mL	228.0	0.0
			8. 2mL	231.7	0.0
			9. 2mL	236.9	0.0

CF.T

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES (NO) REASON: No logger in water — Survey Time (HH:MM): (WATER) — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	HI	Rod Read	Elevation (m)	± 0.003	Circuit #2	HI	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3	A+B+C		A-B =		BM3			A-B =		
TOS	A+B+C		A-B =		TOS			A-B =		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: DH, SM, DS
Data Entry By: CL Date: 18 NOV 2013
Reviewed By: CL Date: 18 NOV 2013

Project #: -4-0167
Project Name: MH. Nansen

Weather: -12, cloudy

HID	H-V.C.-U	Date	13 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Creek Upper	Q Measurement Start Time:	14:30 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	14:45 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial # 1049522	HOBO | Solinst | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2664	[D/S] 2665	[RDB] 2666	[LDB] 2668	[STAFF/WEIR] 2667	

Site Comments

- uncertain SS results (B) flag.

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	SS	IDK?
Measurment ID (MID):	991	
Average Q (m^3/s):	0.4991	
Q Meas. Accuracy +/- [%]:	4.98	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (15:09)	212.9 | 246.6	23	0.200 kg	20L	0.01
2 (15:12)	213.5 | 253.1	" "	" "	" "	" "
3 (:)	|				

V_1 for Sec. Mix (mL)	100
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	218.0
CF.T =	3.27×10^{-5}
Qsalt =	0.4991 ± 0.24

Notes:
~6L SS spiked ~30sec before 1st and 2 started.

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0 mL	218.0	0.0
2.	10 mL	245.8	0.0
3.	2 mL	250.6	0.0
4.	2 mL	256.8	0.0
5.	2 mL	261.7	0.0
6.			
7.			
8.			
9.			

Volumetric

n/a

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON:

Survey Time (HH:MM): (WATER) 14:45 ± 0.003

BM Shift: Yes | No — Logger Shift: Yes | No — Staff Gauge Shifted?: Yes | No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003
Station	A	B	C	
BM1	4.274	1.274	3.000	
BM2	A+B-C	0.917	3.357	
BM3	A+B-C	1.033	3.241	
TOS	A+B-C	1.373	2.901	
WATER	A+B-C	2.158	2.116	
LOG'R ROD:	A+B-C	1.127	3.147	
HWM/CON	A+B-C		A-B=	
BANKFULL	A+B-C		A-B=	
	A+B+C	1.273	3.001	

Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		
BM1	4.242	1.242	3.000	Log'r Rod Length:	
BM2		0.884	3.358	Log'r Rod to Botm:	
BM3		1.001	3.241		
TOS		1.341	2.901		
WATER		2.123	2.119		
LOG'R ROD:		1.095	3.147		
HWM/CON			A-B=		
BANKFULL			A-B=		
BS (BM1)		4.242	3.000		

Field Staff: DH, JM, DS.
Data Entry By: _____ Date: 18 Nov 2013
Reviewed By: _____ Date: 18 NOV 2013

Project #: -V-0167
Project Name: Nansen

Weather: -12; sunny w clouds

HID	H-VC-DBC	Date	13 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Creek Downstream of Back Creek	Q Measurement Start Time:	12:57 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	13:43 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	13:11 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[Y downloaded]	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial # 104 9137	HOBO | Solinst | N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 2651	[D/S] 2652	[RDB] 2655	[LDB] 2653	[STAFF/WEIR]

Site Comments

ADV = Primary
Salt = Secondary
Channel snow + ice covered - with water flowing above ice
Ice ~ 1cm to 15cm thick.

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	~0.1°C
Water Surface Slope (%):	
Average Width (m):	4.70
Average Depth (m):	0.141

Measurement Summary	Primary	Secondary
Meas. Type:	ADV	SS
Measurment ID (MID):	894	895
Average Q (m^3/s):	0.2371	0.2004
Q Meas. Accuracy +/- [%]:	6.7	38%
Average Velocity (m/s):	0.359	
Cross-Sectional Area (m^2):	0.660	

Salt Tracer

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (13 : 43)	215.7 | 363.2	28	0.200 kg	20L	0.01
2 (13 : 49)	215.8 | 307.1	28	0.200 kg	20L	0.01
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	100
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	216.9
CF.T =	3.88×10^{-5}
Qsalt =	0.2004 ± 38%

Notes:

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0mL	216.9	0.0
2.	10mL	240.7	0.0
3.	10mL	262.9	0.0
4.	10mL	286.5	0.0
5.	10mL	306.6	0.0
6.	10mL	328.7	0.0
7.			
8.			
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON:

Survey Time (HH:MM): (WATER) 13:29 — BM Shift: Yes | No — Logger Shift: Yes | No — Staff Gauge Shifted?: Yes | No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4.408	1.408	3.000		BM1			3.000	Log'r Rod Length:	
BM2		1.383	3.025		BM2				Log'r Rod to Botm:	
BM3		1.499	2.909		BM3					
TOS		2.068	2.340		TOS					
WATER		1.854	2.554		WATER					
LOG'R ROD:		1.851	2.557		LOG'R ROD:					
HWM/CON					HWM/CON					
BANKFULL					BANKFULL					
		1.408	3.000		BS (BM1)					

Field Staff: DH, SM, DS
Data Entry By: [signature] Date: 18 NOV 2013
Reviewed By: [signature] Date: 18 NOV 2013

Project #: ANSEM
Project Name: Y0167

Weather: -26 [illegible] calm

HID	?? VC [illegible]	Date	13 NOV-2013
Station Name	Victoria Ck Upstream of Minnesota.	Q Measurement Start Time:	10:28 (HH:MM) PDT | PST
		Q Measurement End Time:	11:00 (HH:MM) PDT | PST
		Logger Download/Inst Time:	— (HH:MM) PDT | PST
		Logger Reading (m)	— [ ] downloaded
Logger:	Serial #	HOBO | Solinst | N/A	
Photo #	[U/S] 2643	[D/S] 2644	

Discharge Measurement Instruments + Methods

YSI | SWOFFER | PYGMY | ADV MID-SECT | POINT

SALT TRACER |WEIR | VOLUMETRIC | FLOAT | ROD

Channel Conditions

NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

GPS Waypoint	ZONE	EASTING	NORTHING

[RDB]	[LDB]	[STAFF/WEIR]
2645	2647	

Site Comments

Channel snow + ice covered w/ open section,
(8) flag

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):	403	
Average Q (m^3/s):	0.7879	
Q Meas. Accuracy +/- [%]:	47%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY   LOGGED | MANUAL   SPC |EC   CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (10:43)	228.5 | 263.0	65	0.200	20	0.01
2 (10:45)	229.2 | 272.4	65	0.200	20	0.01
3 (:)	|				

V_1 for Sec. Mix (mL)	100
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	232.1
CF.T =	3.35×10^{5}
Qsalt =	0.7879 ±47%

Notes: ↓ few CF.T measurements higher ± due to R^2.

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0 mL	232.1	0.0
2.	10 mL	259.4	0.0
3.	5 mL	270.1	0.0
4.	5 mL	286.1	0.0
5.			
6.			
7.			
8.			
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON: No Logger in Station   Survey Time (HH:MM): (WATER)   BM Shift: Yes | No   Logger Shift: Yes | No   Staff Gauge Shifted?: Yes | No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B=C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B=C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B=C		A-B=		BM3			A-B=		
TOS	A+B=C		A-B=		TOS			A-B=		
WATER	A+B=C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B=C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B=C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B=C		A-B=		BANKFULL			A-B=		
	A+B=C		A-B=		BS (BM1)			A-B=		

Field Staff: DH DS JM
Data Entry By: [illegible] Date: 18 NOV 2013
Reviewed By: [illegible] Date: 18 NOV 2013

Project #: 13-4-0167
Project Name: Mt. Hanson

Weather: -28 ~, clear sky

HID	H-MN	Date	13 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Minnesota Creek	Q Measurement Start Time:	9:40 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	10:00 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	HOBO | Solinst | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2639	[D/S] 2638	[RDB] 2642	[LDB] 2641	[STAFF/WEIR]	

Site Comments

Creek frozen, bed substrate is ice

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0°C
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	904	
Average Q (m^3/s):	0.0451	
Q Meas. Accuracy +/- [%]:	54%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer — SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T | YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (~~9:40~~)	~~106.9~~ | —	~~24~~	~~0.025kg~~	~~20L~~	~~0.00125~~
2 (9:45) used	~~107.1~~ | 123.4	"	"	"	"
3 (9:55)	107.3 | 124.5	"	"	"	"

V_1 for Sec. Mix (mL)	800
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	107.7
CF.T =	1.93×10^{-4}
Qsalt =	0.0451 ± 54

Notes: Use MN Folders 2+3, Folder 1 had no salt added.

400 mL bucket into 500 mL Creek.

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1. 0 mL	107.7	0.0°C
2. 10 mL	128.8	0.0°C
3. ////	////	////
4. 0 mL	107.2	0.0°C
5. 2 mL	109.3	0.0°C
6. 2 mL	115.0	0.0°C
7. 2 mL	119.7	0.0°C
8. 2 mL	124.0	0.0°C
9. 2 mL	129.0	0.0°C

Volum. N/A

Volume (L) =				
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =				
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =	

Hydrometric Levels - Survey

YES \| NO \| REASON: No station present — Survey Time (HH:MM): (WATER) — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1			3.000		BM1			3.000	Log'r Rod Length:	
BM2					BM2				Log'r Rod to Botm:	
BM3					BM3					
TOS					TOS					
WATER					WATER					
LOG'R ROD:					LOG'R ROD:					
HWM/CON					HWM/CON					
BANKFULL					BANKFULL					
					BS (BM1)					

Field Staff: DH, JM, DS
Data Entry By: CL — Date: 18 NOV 2013
Reviewed By: CL — Date: 19 NOV 2013

Project #: -4-0167
Project Name: Mt. Nansen

Weather: -10C, overcast with light snow.

HID	H-VC-R	Date	12 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Creek @ Road.	Q Measurement Start Time:	12:54 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | (ADV) MID-SECT | POINT	
		Q Measurement End Time:	13:41 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT (ROD)	
		Logger Download/Inst Time:	12:53 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[✓] downloaded	NONE (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	
Logger:	Serial # 1041103	HOBO | (Solinst) | N/A		GPS Waypoint	ZONE EASTING NORTHING
Photo #	[U/S] 2576	[D/S] 2577	[RDB] 2578	[LDB] 2581	[STAFF/WEIR] 102 - 2580

Site Comments

Solinst time is 1 hour ahead, so is ADV.
Ice ~2cm to 20cm thick.
Water above + below ice
Snow + ice covered a small open tracks in thalwag.

Channel Measurements

Staff Gauge Height (m):	0.586
Weir Head (m):	—
Water Temperature (°C):	-0.1°C
Water Surface Slope (%):	—
Average Width (m):	2.950
Average Depth (m):	0.350

Measurement Summary	Primary	Secondary
Meas. Type:	ADV	
Measurment ID (MID):	896	
Average Q (m^3/s):	0.2959	
Q Meas. Accuracy +/- [%]:	6.8%	
Average Velocity (m/s):	0.287	
Cross-Sectional Area (m^2):	1.033	

Salt Tracer — n/A

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	=1 / Css
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	
Qsalt =	

Notes:

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Volumetric — n/A

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) | NO | REASON:

Survey Time (HH:MM) (WATER) 13:06 — BM Shift: Yes (No) — Logger Shift: Yes (No) — Staff Gauge Shifted?: Yes (No)

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003
Station	A	B	C	
BM1	3.999	.999	3.000	
BM2	A+B+C	0.579	3.420	
BM3	A+B+C	0.833	3.166	
TOS	A+B+C	1.434	2.565	
WATER	A+B+C	1.847	2.152	
LOG'R ROD:	A+B+C	1.194	2.805	
HWM/CON	A+B+C		A-B=	
BANKFULL	A+B+C		A-B=	
	A+B+C	0.999	3.000	

Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		
BM1			3.000	Log'r Rod Length:	
BM2			A-B=	Log'r Rod to Botm:	
BM3			A-B=		
TOS			A-B=		
WATER			A-B=		
LOG'R ROD:			A-B=		
HWM/CON			A-B=		
BANKFULL			A-B=		
BS (BM1)			A-B=		

Field Staff: DH, JM, DS
Data Entry By: CL Date: 18 NOV 2013
Reviewed By: CL Date: 18 NOV 2013

Project #: 3-4-0167
Project Name: Mt. Nansen

Weather: ~15, overcast

HID	H- Serp	Date	13NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Seepage Pond Outlet	Q Measurement Start Time:	17:05 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT | POINT
		Q Measurement End Time:	17:10 (HH:MM) PDT | PST	SALT TRACER |WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	HOBO | Solinst | N/A	GPS Waypoint	ZONE	EASTING NORTHING
Photo #	[U/S] 2693	[D/S]	[RDB]	[LDB]	[STAFF/WEIR]

Site Comments

Volumetric taken. 183.496 LPM on meter.
Instrument Flow Meter Reading

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	0.7 °C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	V	
Measurment ID (MID):	892	
Average Q (m^3/s):	0.00328	
Q Meas. Accuracy +/- [%]:	10%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY LOGGED | MANUAL SPC |EC CF.T YES| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	____ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

		CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	=1 / Csc		1.		
Csec (g/L):	1 g/L		2.		
Vol. Calib. Tank (L):	1 L		3.		
SPC_0 Calib. Tank			4.		
CF.T =			5.		
Qsalt =			6.		
Notes:			7.		
			8.		
			9.		

Volum.

Volume (L) =	16	16	16	16	16
Time (sec)	[1] 04:87 sec.	[2] 4:84	[3] 4:57	[4] 5:03	[5] 5:06
Average Q (L/s) =	3.28	3.30	3.50	3.18	3.16
Avg. Q_{vol} (L/s) =	3.28		Avg Q_{vol} (m^3/s) =	0.00328	

Hydrometric Levels - Survey

YES | NO | REASON: No Station Survey Time (HH:MM): (WATER) BM Shift: Yes| No Logger Shift: Yes| No Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1			3.000		BM1			3.000	Log'r Rod Length:	
BM2					BM2				Log'r Rod to Botm:	
BM3					BM3					
TOS					TOS					
WATER					WATER					
LOG'R ROD:					LOG'R ROD:					
HWM/CON					HWM/CON					
BANKFULL					BANKFULL					
					BS (BM1)					

Field Staff: DH, JM, DS
Data Entry By: CL Date: 18NOV2013
Reviewed By: CL Date: 18 NOV 2013

Project: 13-4-0167
Project Name: H. Nanson

Weather: -12, overcast, light wind.

HID	H-PC-U	Date	12 NOV-2013	Discharge Measurement Instruments + Methods	
Station Name	Upper Pony Creek.	Q Measurement Start Time:	18:26 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	19:00 (HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	— (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	— [ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	HOBO | Solinst | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 2625	[D/S] 2629	[RDB] 2626	[LDB] 2627	[STAFF/WEIR] N/A	

Site Comments

Channel snow + ice covered.
Ice ~20cm thick. → Pic. 2630 + 2631
(B) flag

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0 °C
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	902	
Average Q (m^3/s):	0.0066	
Q Meas. Accuracy +/- [%]:	29%	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (18:26)	438.6 | 586.9	12	0.010 kg	20L	0.0005
2 (18:40)	460.1 | 607.1	12	0.010 kg	20L	0.0005
3 (:)	____ | ____				

V_1 for Sec. Mix (mL)	2000
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_o Calib. Tank	435.0
CF.T =	8.71×10^{-4}
Qsalt =	0.0006 I 298

Notes: 500mL bucket 250mL Creek

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0mL	435.0	0.0°C
2.	20mL	460.0	0.0°C
3.	30mL	473.4	0.0°C
4.	30	496.4	0.0°C
5.	30	518.3	0.0°C
6.	60	553.9	0.0°C
7.	60	583.0	0.0°C
8.	60	602.9	0.0°C
9.	30	628.8	~0.1°C

Volum. n/a

Volume (L) =				
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =				
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO | REASON: — Survey Time (HH:MM): (WATER) — BM Shift: Yes| No — Logger Shift: Yes| No — Staff Gauge Shifted?: Yes| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A+B+C		A-B=		TOS			A-B=		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: DH, JM, DS.
Data Entry By: CL Date: 18 NOV 2013
Reviewed By: CL Date: 18 NOV 2013

Project #: 12-Y-0129
Project Name: Mount Nansen - Hydrology

Field Dates: Dec. 16, 17 2013

General Site Tasks/ Communications

1)Download ALL data loggers present.
2) If a measurement is not feasible, fully document why and take photos.
*3) **Fill in ALL data boxes & Site Comment boxes on field sheets to document site conditions (even if site is unchanged).***
4) During salt slugs, minimum SPC rise is only +10x resolution of conductivity meter.
5) Salt slug calibration tests can be done at the end of the day at the bunkhouse.

#	Complete	HID	Station Name	Station Type	Site Tasks	Survey Required	Logger Type Serial #	Q Method	Additional Materials Required	Date	Time	SG	Logger
						Yes/No				yy.mm.dd	HH:MM	(m)	(m)
1	[✓]	ATM-DC2	Atmospheric at Diversion Channel	Continuous Baro Logger	1) HOBO download	NO	HOBO	None	None	2013-DEC-16	18:46	n/a	
2	[✓]	ATM-DC4	Atmospheric at Diversion Channel (Back-up)	Continuous Baro Logger	1) Solinst download 2) Clear Solinst logger data	NO	Solinst Baro-logger	None	None	2013-DEC-16	18:46	n/a	
3	[ ]	~~H-PC-U~~	Upper Pony Creek	Instantaneous	1) Salt Tracer AND volumetric	NO	n/a	Salt (0.01 kg) CF.T	None	2013-DEC-			
4	[ ]	~~H-PC-DSP~~	Pony Creek Downstream of Pit	Instantaneous	1) Salt Tracer AND Volumetric	NO	n/a	Volumetric Salt (0.01 kg) CF.T	None	2013-DEC-			
5	[ ]	~~H-DC-DX~~	Dome Creek DX	Instantaneous	1) Volumetric from culvert 2) Salt Tracer if channel present. 3) Remember photos at actual station	n/a	n/a	Salt (0.01 kg) CF.T	None	2013-DEC-		n/a	
6	[✓]	H-DC-DX+105	Dome Creek DX+105	Instantaneous	1) Q measurement	n/a	n/a	Salt (0.01 kg) CF.T	None	2013-DEC-	11:18	n/a	
8	[ ]	~~H-DC-D1b~~	Dome Creek D1b	Instantaneous	1) Q measurement (if possible)	n/a	n/a	Salt (0.01 kg) CF.T	None	2013-DEC-		n/a	
9	[ ]	~~H-DC-U1~~	Upper Dome Creek 1	Instantaneous	1) Q measurement (if possible)	n/a	n/a	Salt (0.01 kg) CF.T	None	2013-DEC-			
10	[ ]	~~H-DC-U2~~	Upper Dome Creek 2	Instantaneous	1) Q measurement (if possible)	n/a	n/a	Salt (0.01 kg) CF.T	None	2013-DEC-		n/a	
11	[ ]	~~H-DC-B~~	Diversion Channel at Bridge	Continuous	1) Q measurement	NO	n/a	Salt (0.05 kg) CF.T	None	2013-DEC-			
12	[✓]	H-DC-M	Middle Dome Creek	Continuous	1) Q measurement 2) Logger download.	YES	Solinst 1050018	Salt (0.1 kg) CF.T	None	2013-DEC-	09:12		
13	[ ]	~~H-DC-R~~	Dome Creek at Road	Continuous	1) Q measurement (salt tracer)	n/a	n/a	Volumetric Salt (0.1 kg) CF.T	None	2013-DEC-			

Field Staff: JM, DH

Project #: 12-Y-0129
Project Name: Mount Nansen - Hydrology

Field Dates: Dec 16-17 2013

#	Complete	HID	Station Name	Station Type	Site Tasks	Survey Required	Logger Type Serial #	Q Method	Additional Materials Required	Date	Time	SG	Logger
						Yes/No				yy.mm.dd	HH:MM	(m)	(m)
14	[x]	H-VC-REF	Victoria Creek Reference	Continuous	1) Q measurement (ADV if possible, SS)	NO	n/a	ADV SS (0.2 kg)	None	2013-DEC-	18:00		
15	[x]	H-VC-U	Upper Victoria Creek	Continuous	1) Q measurement (ADV + SS) 2) Logger download.	YES	Solinst 1049522	~~ADV~~ SS (0.2 kg)	None	2013-DEC-	17:01		
16	[x]	H-VC-DBC	Victoria Creek D/S of Back Creek	Continuous	1) Q measurement (ADV + SS) 2) Logger download.	YES	Solinst 1049137	~~ADV~~ SS (0.2 kg)	None	2013-DEC-	15:15		
17	[ ]	~~H-BC~~	Back Creek	Continuous	1) Q measurement if water flowing.	NO	n/a	Salt (0.025 kg) CF.T	None	2013-DEC-			
18	[x]	H-VC-UMN	Victoria Creek U/S of Minnesota Creek	Continuous	1) Q measurement (ADV + SS)	NO	n/a	~~ADV~~ SS (0.2 kg)	None	2013-DEC-	13:30		
19	[ ]	~~H-MN~~	Minnesota Creek	Instantaneous	1) Q measurement	NO	n/a	Salt (0.025 kg) CF.T	None	2013-DEC-			
20	[x]	H-VC-R	Victoria Creek at Road	Continuous	1) Q measurement (ADV + SS) 2) Logger download.	YES	Solinst 1041103	ADV SS (0.2 kg) CF.T	None	2013-DEC-	15:03		
21	[x]	H-SEEP	Seepage Pond Outlet	Instantaneous / Water Level	1) Q measurement at pipe outlet 2) Q measurement at flow meter in pumphouse 3) Staff Gauge Reading in Pond	NO	n/a	Volumetric	None	2013-DEC-	10:00		
22	[ ]	~~H-TP~~	Tailings Pond	Water Level Only	1) Staff Gauge Reading (if possible).	NO	n/a	None	None	2013-DEC-			

Field Staff: JM+DH

Project #: 13Y0167
Project Name: ____________

EDI

Weather: −31 °C (low wind)

HID	H SEEP	Date	17 DECEMBER-2013	Discharge Measurement Instruments + Methods
Station Name	Seepage Pond Outlet	Q Measurement Start Time:	10:00 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV MID-SECT | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | (VOLUMETRIC) | FLOAT | ROD
		Logger Download/Inst Time:	— (HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger:	Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE	EASTING	NORTHING

Photo #	[U/S] 0050 + 0051	[D/S]	[RDB]	[LDB]	[STAFF/WEIR]

Site Comments

Vol. approx volumes (Bucket not graduated), ice accumulation on bucket as test progressed, flow meter reading 189.090 L/min photo 052-053

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	0.6 °C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Vol	FLOW METER
Measurment ID (MID):	912	
Average Q (m^3/s):	2.6×10^{-3}	3.15×10^{-3}
Q Meas. Accuracy +/- [%]:	10 %	—
Average Velocity (m/s):	—	—
Cross-Sectional Area (m^2):	—	—

Salt Tracer

SLUG \| CONSTANT RATE \| DRY LOGGED \| MANUAL SPC \| EC CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (:)	~~1877~~ | ____				
2 (:)	____ | ____				
3 (:)	____ | ____				

		CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	V1 / Css		1.		
Csec (g/L):	1 g/L		2.		
Vol. Calib. Tank (L):	1 L		3.		
SPC_0 Calib. Tank			4.		
CF.T =			5.		
Qsalt =			6.		
Notes:			7.		
			8.		
			9.		

Volum.

Volume (L) =	10L	7L	7L	8L	7L
Time (sec)	[1] 3.60	[2] 2.62	[3] 2.63	[4] 3.11	[5] 3.06
Average Q (L/s) =	2.7	2.7	2.7	2.6	2.3
Avg. Q_{vol} (L/s) =	2.6		Avg Q_{vol} (m^3/s) =	2.6×10^{-3}	

Hydrometric Levels - Survey

YES \| (NO) \| REASON: No Station 5 LEVEL — Survey Time (HH:MM): (WATER) — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A + B = C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A + B = C		A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3	A + B = C		A-B =		BM3			A-B =		
TOS	A + B = C		A-B =		TOS			A-B =		
WATER	A + B = C		A-B =		WATER			A-B =		
LOG'R ROD:	A + B = C		A-B =		LOG'R ROD:			A-B =		
HWM/CON	A + B = C		A-B =		HWM/CON			A-B =		
BANKFULL	A + B = C		A-B =		BANKFULL			A-B =		
	A + B = C		A-B =		BS (BM1)			A-B =		

Field Staff: JM + DH
Data Entry By: ____________ Date: ____________
Reviewed By: ____________ Date: ____________

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

Weather: -29°C clear + calm.

HID	H-VC-REF	Date	16 DECEMBER-2013	Discharge Measurement Instruments + Methods	
Station Name	Victoria Creek Road	Q Measurement Start Time:	1605 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	15:03 (HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[✓] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED	

Logger:	Serial # 104103	HOBO | Solinst | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 101-0017	[D/S] 101-0016	[RDB] 101-0019	[LDB] 101-0018	[STAFF/WEIR] *see 101-0019	

Site Comments

See Jm notes.
Ice thickness 86cm
Bed - Ice 1.15cm
Bed - water 0.540cm

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):	911	
Average Q (m^3/s):	0.253	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG \| CONSTANT RATE (DRY) (LOGGED) \| MANUAL SPC \| EC CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (16:05)	228.2 | 236.0	2 m	0.250	Dry slug	
2 (:)	228.2 |				
3 (:)	|				

V_1 for Sec. Mix (mL)	
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	364.0
CF.T =	2.8×10^{-1}
Qsalt =	0.252741

Notes:
10g salt into 500mL Creek water. 490uStream to have 5mL of salt mix added in twice.

CF.T

	Vol. Added (mL)	SPC (uS/cm)	Temp
1.	0mL	364.0	0.7°C
2.	5mL	785.5	1.2°C
3.	5mL	1192	1.3°C
4.			
5.			
6.			
7.			
8.			
9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

(YES) \| NO \| REASON: Survey Time (HH:MM): (WATER) 17:26 BM Shift: Yes \| No Logger Shift: Yes \| No Staff Gauge Shifted?: Yes \| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	4.136	1.136	3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B-C	0.711	3.425		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B-C	0.963	3.173		BM3			A-B=		
TOS	A+B-C		A-B=		TOS			A-B=		
WATER	A+B-C	2.066	2.070		WATER			A-B=		
LOG'R ROD:	A+B-C	1.323	2.813		LOG'R ROD:			A-B=		
HWM/CON	A+B-C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B-C		A-B=		BANKFULL			A-B=		
	A+B-C	1.136	3.000		BS (BM1)			A-B=		

Field Staff: DH, JM
Data Entry By: _____ Date: _____
Reviewed By: _____ Date: _____

Project #: 13Y0167
Project Name: NAMSEN

EDI

Weather: -30 Lt wind clear

HID	4 VC UMN	Date	17 DECEMBER-2013	**Discharge Measurement Instruments + Methods**
Station Name	Victoria Creek U/S of Minnesota Creek.	Q Measurement Start Time:	13:30 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV MID-SECT | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	(SALT TRACER) | WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	**Channel Conditions**
		Logger Reading (m)	[ ] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger: Serial #	HOBO | Solinst | (N/A)	GPS Waypoint	ZONE EASTING NORTHING
Photo # [U/S] 0078	[D/S] 0079	[RDB] 0084	[LDB] 0080 [STAFF/WEIR]

Site Comments

Open lead u/s of weir site. Ice thickness ice thickness ~10cm

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):	910	
Average Q (m^3/s):	0.252	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG \| CONSTANT RATE \| (DRY) (LOGGED) \| MANUAL (SPC) \| EC CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_s (kg)	Volume (L)	Css (kg/L)
1 (11:34)	233.8 | 295	38	0.200	Dry	
2 (13:40)	234.0 | 297.7	38	0.200	Dry	
3 (:)	|				

		CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	—	1.	0mL	255.7	0.8
Csec (g/L):	1 g/L	2.	5mL	706.1	0.2
Vol. Calib. Tank (L):	1 L	3.	5mL	1097	0.1
SPC_0 Calib. Tank	255.7	4.			
CF.T =	2.40×10^{-1}	5.			
Qsalt =	0.2519	6.			
Notes:		7.			
		8.			
		9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| (NO) \| REASON No logger @ site — Survey Time (HH:MM) (WATER) — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	HI	Rod Read	Elevation (m)	± 0.003	Circuit #2	HI	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3	A+B+C		A-B =		BM3			A-B =		
TOS	A+B+C		A-B =		TOS			A-B =		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: JM DH
Data Entry By: Date:
Reviewed By: Date:

Project #: 13Y0167
Project Name: NANSEN

EDI ENVIRONMENTAL DYNAMICS INC.

Weather: -33°C Litecloud Clear

HID	H VC DBC	Date	17 DECEMBER-2013	Discharge Measurement Instruments + Methods
Station Name	Victoria Creek D/S of Back Creek.	Q Measurement Start Time:	1500 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	— (HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[✓] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.
Logger:	Serial #	HOBO | Solinst | N/A		GPS Waypoint ZONE EASTING NORTHING

Photo #	[U/S] 0096	[D/S] 0099	[RDB] 0098	[LDB] 0097	[STAFF/WEIR]

Site Comments

Ice Thickness < 5cm Snow & Ice Covered channel. PH 7.47

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0°c
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):	909	
Average Q (m^3/s):	0.204	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG \| CONSTANT RATE \| DRY   LOGGED \| MANUAL   SPC \| EC   CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (15:15)	217.5 | 317	36	0.200	Dry	
2 (15:28)	222.1 |	36	0.200	Dry	
3 (:)	|				

			CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	—	Used 20 g/L Standard Sol'n	1.	0mL	248.9	0.8
Csec (g/L):	1 g/L		2.	5mL	731.9	0.8
Vol. Calib. Tank (L):	1 L		3.	5mL	1184	0.9
SPC_0 Calib. Tank	248.9		4.			
CF.T =	2.13×10^{-1}		5.			
Qsalt =	0.203744		6.			
Notes: first Trial spc did not return to spc° (220)			7.			
			8.			
			9.			

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| NO \| REASON: Not Required at this site   Survey Time (HH:MM):   (WATER)   BM Shift Yes\| No   Logger Shift Yes\| No   Staff Gauge Shifted? Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A+B+C		A-B=		TOS			A-B=		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: DH JM
Data Entry By: Date:
Reviewed By: Date:

Project #: 13 Y 0167
Project Name: NAHGA

EDI

Weather: -37°C Calm Clear Ice crystals in the air

HID	H VC U	Date	17 DECEMBER-2013	Discharge Measurement Instruments + Methods
Station Name	Upper Victoria Creek.	Q Measurement Start Time:	17:01 (HH:MM) PDT | PST	(YSI) | SWOFFER | PYGMY | ADV MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	~~SALT TRACER~~ |WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[✓] downloaded	NONE | (ICE) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.
Logger:	Serial #	HOBO | (Solinst) | N/A		GPS Waypoint ZONE EASTING NORTHING
Photo #	[U/S] 0110	[D/S] 0111	[RDB] No pic. Not safe to cross.	[LDB] 0112 [STAFF/WEIR]

Site Comments

Solinst Leveloader stuck to Base of water Ifc

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):	908	
Average Q (m^3/s):	0.0637	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG \| CONSTANT RATE \| ~~DRY~~ → \| (LOGGED) \| MANUAL \| (SPC) \| EC CF.T YES\| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_s (kg)	Volume (L)	Css (kg/L)
1 (17:01)	182.5 | 225.3	34	0.200	Dry	
2 (17:15)	195.7 | 243.3	34	0.200	Dry	
3 (:)	|				

			Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	=1 / Css	Used 20g/L Standard Salt			
Csec (g/L):	1 g/L		1. 0 mL	251.0	1.3
Vol. Calib. Tank (L):	1 L		2. 5 mL	749.3	1.3
SPC_0 Calib. Tank			3. 5 mL	1196	1.3
CF.T =	~~0.0~~ 2.09x10⁻¹	CF.T	4.		
Qsalt =	0.063666		5.		
Notes: 181 - 186 SPC Fluctuation. SPC Did Not Return to Base stayed @ 196-198 Dry			6.		
			7.		
			8.		
			9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| (NO) \| REASON: Not Required   Survey Time (HH:MM): (WATER)   BM Shift: Yes\| No   Logger Shift: Yes\| No   Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A=B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A=B+C		A-B=		TOS			A-B=		
WATER	A=B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: DH JM
Data Entry By:________ Date:________
Reviewed By:________ Date:________

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

Weather: -36, clear + calm, ice crystals in air.

HID	HVC REF	Date	17 DECEMBER-2013
Station Name	Victoria Creek Reference.	Q Measurement Start Time:	18:00 (HH:MM) PDT | PST
		Q Measurement End Time:	(HH:MM) PDT | PST
		Logger Download/Inst Time:	(HH:MM) PDT | PST
		Logger Reading (m)	[ ] downloaded

Discharge Measurement Instruments + Methods

YSI (circled) | SWOFFER | PYGMY | ADV | MID-SECT. | POINT
SALT TRACER (circled) | WEIR | VOLUMETRIC | FLOAT | ROD

Channel Conditions

NONE | ICE (circled) | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.

Logger: Serial # | HOBO | Solinst | N/A (circled)

GPS Waypoint | ZONE | EASTING | NORTHING

Photo # [U/S] 0118 | [D/S] 0116 | [RDB] 0115 | [LDB] 0117 | [STAFF/WEIR]

Site Comments

Ice Thickness > 30cm

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	0.0°C
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	SS	
Measurment ID (MID):	907	
Average Q (m^3/s):	0.256208	
Q Meas. Accuracy +/- [%]:		
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG | CONSTANT RATE | DRY — LOGGED | MANUAL — SPC | EC — CF.T YES | NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (18:01)	219.6 | 247.6	30	0.200	0 m	
2 (18:06)	219.2 |	30	0.200	0 m	
3 (:)	|				

			Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)		Used 20 g/L Standard Soln	1. 0mL	245.6	0.7
Csec (g/L):	1 g/L		2. 5mL	732.4	0.4
Vol. Calib. Tank (L):	1 L		3. 5mL	1181	0.3
SPC_0 Calib. Tank			4.		
CF.T =	2.12x10⁻¹		5.		
Qsalt =	0.256208		6.		
Notes:			7.		
			8.		
			9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES | NO (circled) | REASON: Too cold - no Station | Survey Time (HH:MM): | (WATER) | BM Shift: Yes\| No | Logger Shift: Yes\| No | Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A+B+C		A-B=		TOS			A-B=		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: JM, DH
Data Entry By: ________ Date: ________
Reviewed By: ________ Date: ________

Project #: 13-4-0167
Project Name: Mt. Nansen

EDI

Weather: -29, clear, gusts of wind.

HID	H DC M	Date	17 DECEMBER-2013	Discharge Measurement Instruments + Methods	
Station Name	Middle Dome Creek.	Q Measurement Start Time:	09:12 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV	MID-SECT. | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER | WEIR | VOLUMETRIC | FLOAT | ROD	
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions	
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.	

Logger:	Serial #	0018	HOBO | Solinst | N/A	GPS Waypoint	ZONE	EASTING	NORTHING
Photo #	[U/S] 0047	[D/S] 0043	[RDB] 0048	[LDB] 0044	[STAFF/WEIR]		

Site Comments

Ice Thickness ~ 12 cm Thick

Channel Measurements

Staff Gauge Height (m):	
Weir Head (m):	
Water Temperature (°C):	
Water Surface Slope (%):	
Average Width (m):	
Average Depth (m):	

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):	906	
Average Q (m^3/s):	0.006755	
Q Meas. Accuracy +/- [%]:	-	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG \| CONSTANT RATE \| DRY LOGGED \| MANUAL SPS \| EC CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_0(uS/cm) | EC_{pk}(uS/cm) |	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (09:12)	1940 | 2130	21	0.100 kg	Dry	
2 (09:30)	1942 |	21			
3 (:)	|				

V_1 for Sec. Mix (mL)	=1 / Css
Csec (g/L):	1 g/L
Vol. Calib. Tank (L):	1 L
SPC_0 Calib. Tank	
CF.T =	2.71×10^{-1}
Qsalt =	0.006755

Notes:

Spec Hydrometer

CF.T

Vol. Added (mL)	SPC (uS/cm)	Temp
1. 0mL	1924	1.2
2. 5mL	2806	1.1
3. 5mL	2653	1.1
4.		
5.		
6.		
7.		
8.		
9.		

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES (NO) REASON: Too cold / not required

Survey Time (HH:MM): (WATER) BM Shift: Yes \| No Logger Shift: Yes \| No Staff Gauge Shifted?: Yes \| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A+B+C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A+B+C		A-B=		BM2			A-B=	Log'r Rod to Botm:	
BM3	A+B+C		A-B=		BM3			A-B=		
TOS	A+B+C		A-B=		TOS			A-B=		
WATER	A+B+C		A-B=		WATER			A-B=		
LOG'R ROD:	A+B+C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A+B+C		A-B=		HWM/CON			A-B=		
BANKFULL	A+B+C		A-B=		BANKFULL			A-B=		
	A+B+C		A-B=		BS (BM1)			A-B=		

Field Staff: JM, DH
Data Entry By: CL Date: 16/01/2014
Reviewed By: Date:

Project #: 13Y0167
Project Name: NANSEN

EDI

Weather: -31°C lite wind, clear

HID	H DC DX+105	Date	17-DECEMBER-2013	Discharge Measurement Instruments + Methods
Station Name	Dome Creek at DX-105	Q Measurement Start Time:	11:18 (HH:MM) PDT | PST	YSI | SWOFFER | PYGMY | ADV MID-SECT | POINT
		Q Measurement End Time:	(HH:MM) PDT | PST	SALT TRACER |WEIR | VOLUMETRIC | FLOAT | ROD
		Logger Download/Inst Time:	(HH:MM) PDT | PST	Channel Conditions
		Logger Reading (m)	[ ] downloaded	NONE | ICE | BACKWATER | > BANKFULL | ZERO FLOW | HIGH SUSP. SED.
Logger:	Serial #	HOBO | Solinst | N/A		GPS Waypoint ZONE EASTING NORTHING
Photo #	[U/S] 0064	[D/S] 0062	[RDB] 0063	[LDB] 0065 [STAFF/WEIR]

Site Comments

Significant snow cover.
Open lead at measnt. location

Channel Measurements

Staff Gauge Height (m):	—
Weir Head (m):	—
Water Temperature (°C):	0.0
Water Surface Slope (%):	—
Average Width (m):	—
Average Depth (m):	—

Measurement Summary	Primary	Secondary
Meas. Type:	Salt	
Measurment ID (MID):	905	
Average Q (m^3/s):	0.002141	
Q Meas. Accuracy +/- [%]:	8	
Average Velocity (m/s):		
Cross-Sectional Area (m^2):		

Salt Tracer

SLUG \| CONSTANT RATE \| DRY — LOGGED \| MANUAL — SPC \| EC — CF.T YES \| NO

Trial Time	SPC_B | SPC_P	Mix Length	Mass of Salt	Mix Vol.	[Salt Slug]
	EC_o(uS/cm) | EC_{pk}(uS/cm)	L_m (m)	Ms_a (kg)	Volume (L)	Css (kg/L)
1 (11:18)	1185 | 1273	14	0.01	Dry	
2 (11:32)	1184 |	14	0.04	Dry	
3 (:)	|				

			CF.T	Vol. Added (mL)	SPC (uS/cm)	Temp
V_1 for Sec. Mix (mL)	=1 / Css	20 g/L standard solution				
Csec (g/L):	1 g/L		1.	0 mL	1196	1.4
Vol. Calib. Tank (L):	1 L		2.	5 mL	1553	1.7
SPC_0 Calib. Tank			3.	5 mL	1923	1.7
CF.T =	2.81x10⁻¹		4.			
Qsalt =	0.002141		5.			
			6.			
			7.			
			8.			
			9.			

what conductivity?

Notes: USED DRY SALT SLUG
CF.T CALCULATED AT BUNKHOUSE

Volum.

Volume (L) =					
Time (sec)	[1]	[2]	[3]	[4]	[5]
Average Q (L/s) =					
Avg. Q_{vol} (L/s) =			Avg Q_{vol} (m^3/s) =		

Hydrometric Levels - Survey

YES \| NO REASON: No Station — Survey Time (HH:MM) (WATER) — BM Shift: Yes\| No — Logger Shift: Yes\| No — Staff Gauge Shifted?: Yes\| No

Circuit #1	H I	Rod Read	Elevation (m)	± 0.003	Circuit #2	H I	Rod Read	Elevation (m)	Station Measurements	
Station	A	B	C		Station	A	B	C		
BM1	A = B + C		3.000		BM1			3.000	Log'r Rod Length:	
BM2	A = B + C		A-B =		BM2			A-B =	Log'r Rod to Botm:	
BM3	A = B + C		A-B =		BM3			A-B =		
TOS	A = B + C		A-B =		TOS			A-B =		
WATER	A = B + C		A-B=		WATER			A-B=		
LOG'R ROD:	A = B + C		A-B=		LOG'R ROD:			A-B=		
HWM/CON	A = B + C		A-B=		HWM/CON			A-B=		
BANKFULL	A = B + C		A-B=		BANKFULL			A-B=		
	A = B + C		A-B=		BS (BM1)			A-B=		

Field Staff: JM DH
Data Entry By: GL Date: 16/01/14
Reviewed By: Date:

Project #: 13-Y-0167
Project Name: Mount Nansen - Water Quality

Field Dates: Oct. 16+17, 2013

General Site Tasks/ Communications

Pay special attention to new bottles and associated preservatives (some changes with ALS)

#	Complete	Lab Sample Identifier	WQ ID	Station Name	Site Tasks	Date	Time
						yy.mm.dd	HH:MM
1	[✓]	0167-1310 16 - 200	WQ-SEEP	Seepage		13.10.16	18:58
2	[✓]	0167-1310 16 - 015	WQ-TP	Tailings Pond		13.10.16	15:30
3	[✓]	0167-1310 16 - 010	WQ-DC-DX+105	Dome Creek at DX+105		13.10.16	19:05
4	[✓]	0167-1310 16 - 021	WQ-DC-DX	Dome Creek at DX		13.10.16	19:49
5	[✓]	0167-1310 16 - 009	WQ-DC-U	Upper Dome		13.10.16	15:10
6	[✓]	0167-1310 16 - 018	WQ-DC-D1b	Dome Creek D1b		13.10.16	18:04
7	[✓]	0167-1310 16 - 012	WQ-DC-U1	Upper Dome Creek 1		13.10.16	16:19
8	[✓]	0167-1310 16 - 014	WQ-DC-U2	Upper Dome Creek 2		13.10.16	16:24
9	[✓]	0167-1310 16 - 003	WQ-DC-R	Dome Creek at Road		13.10.16	11:03
~~10~~	[ ]	~~0167-1310 -~~	~~WQ-ADIT SEEP~~	~~Adit seep~~		~~13.10.~~	
11	[✓]	0167-1310 16 - 019	WQ-MS-S-03	Mill Seep 03		13.10.16	19:05
~~12~~	[ ]	~~0167-1310 -~~	~~WQ-MS-S-08~~	~~Mill Seep 08~~		~~13.10.~~	
13	[✓]	0167-1310 17 - 024	WQ-VC-U	Upper Victoria Creek		13.10.17	08:52
14	[✓]	0167-1310 16 - 013	WQ-VC-REF	Victoria Creek Reference		13.10.16	14:30

Field Staff: _____

Project #: 13-Y-0167
Project Name: Mount Nansen - Water Quality

Field Dates: _____

#	Complete	Lab Sample Identifier	WQ ID	Station Name	Site Tasks	Date	Time
						yy.mm.dd	HH:MM
15	[✓]	0167-1310 16- 002	WQ-VC-R	Victoria Creek at Road		13.10. 16	08:34
16	[✓]	0167-1310 16 -005	WQ-VC-DBC	Victoria Creek D/S Back Creek		13.10. 16	12:31
17	[✓]	0167-1310 16- 008	WQ-VC-UMN	Victoria Creek U/S Minnesota Creek		13.10. 16	09:45
18	[✓]	0167-1310 16 - 004	WQ-BC	Back Creek		13.10. 16	13:30
19	[✓]	0167-1310 16- 006	WQ-MN	Minnesota Creek		13.10. 16	09:06
20	[✓]	0167-1310 17- 030	WQ-PW	Pumphouse Well	Drinking Water Package + YG Bottle	13.10. 17	08:40
21	[✓]	0167-1310 16 - 016	WQ-PC-U	Pony Creek upstream		13.10. 16	16:45
22	[✓]	0167-1310 16 - 011	WQ-PC-D	Pony Creek downstream		13.10. 16	16:46
~~23~~	[ ]	~~0167-1310~~	~~WQ-DRY~~	~~Dry Creek Reference~~		~~13.10.~~	
~~24~~	[ ]	~~0167-1310~~	~~WQ-PIT-1~~	~~pit top~~	~~record DO in mg/L~~	~~13.10.~~	
~~25~~	[ ]	~~0167-1310~~	~~WQ-PIT-2~~	~~pit middle~~	~~record DO in mg/L~~	~~13.10.~~	
~~26~~	[ ]	~~0167-1310~~	~~WQ-PIT-3~~	~~pit bottom~~	~~record DO in mg/L~~	~~13.10.~~	
27	[✓]	0167-1310 16 008	Field Replicate 1	Victoria Creek U/S Minnesota Creek.		13.10. 16	09:35
28	[✓]	0167-1310 17- 023	Field Replicate 2	Upper Victoria Creek		13.10. 17	08:52
29	[✓]	0167-1310 17- 020	Field Blank			13.10. 17	07:51
30	[✓]	TRAVEL BLANK	Travel Blank			-	-
*	✓	New Site → 0167-131016 -100	One Time Sample (Seep)	One Time Sample (Seep)	will send instructions + directions! Reg. sample set.	13.10. 16	15:53

Field Staff: _____

Project No.: 13-Y-0167 Weather: -7°C, Clear, calm Field Samplers: DH, JM, DS

Project Name: Mount Nansen Water Quality

Page 1 of 6

YSI Calibrated? (Yes) / No Date / Time: 16-Oct.-2013, 7:54

Site Information	
Site Name:	WQ - VC - R
Sample Identifier:	0167-1310 16 - 002
Sample Date and Time:	131016 08:34
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	216.6
pH:	~~5.62~~ 6.72
Turbidity:	2.2
Site Conditions	
flow level:	Low - Med
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Some shore ice forming	Upstream: 241
another ice forming @ inlet	Downstream: 242
culvert.	Overview: 243
	Datasheet:

Site Information	
Site Name:	WQ MN
Sample Identifier:	0167-1310 16 - 006
Sample Date and Time:	131016 09:06
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	75.5
pH:	6.29
Turbidity:	13.91
Site Conditions	
flow level:	Low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	

Notes (if pit incl. DO and ice thickness)	Photo Numbers
channel ~ 90% ice covered	Upstream: 244
Thickness < 33cm	Downstream: 245
	Overview: 246
	Datasheet:

Site Information	
Site Name:	WQ - VC - UMN
Sample Identifier:	0167-1310 16 - 008 (09:45)
Sample Date and Time:	Time ↑
Replicate ID (if applicable)	0167-1310 16 - 007 (09:35)
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	241.3
pH:	7.12
Turbidity:	1.49 NTU
Site Conditions	
flow level:	low - Medium
turbidity (clear) light, mod, high):	
ice thickness (if applicable)	ice on edges.

Notes (if pit incl. DO and ice thickness)	Photo Numbers
DH Photos.	Upstream: 2458
	Downstream: 2459
	Overview: 2456
	Datasheet: 2457

Site Information	
Site Name:	WQ DC R
Sample Identifier:	0167-1310 16 - 003
Sample Date and Time:	131016 11:03
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	1163
pH:	6.41
Turbidity:	24.9
Site Conditions	
flow level:	Low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	~6cm or less

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Ice Covered	Upstream: 256
	Downstream: 257
	Overview: 258
	Datasheet:

Field Blank ID 0167-131017-020

Trip Blank ID

Project No.: 13-Y-0167 Weather: 0°C, Sunny, calm Field Samplers: DH, DS, J

Project Name: Mount Nansen Water Quality

Page 2 of 6

YSI Calibrated ? (Yes) / No Date / Time: 16-Oct-2013

Site Information	
Site Name:	WQ-VC-DBC
Sample Identifier:	0167-1310 16 - 005
Sample Date and Time:	12:31
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.1
Specific Conductivity (SPC):	193.5
pH:	6.88
Turbidity:	1.54
Site Conditions	
flow level:	Low - medium
turbidity (clear) light, mod, high):	
ice thickness (if applicable)	N/A.

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2472
DH Photos	Downstream:	2473 ||	Overview:	2474
	Datasheet:	2475
DO: 11.81		

Site Information	
Site Name:	WQ-VC-U
Sample Identifier:	0167-1310 16 - 001
Sample Date and Time:	12:54
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.1
Specific Conductivity (SPC):	181.7 *Resampled
pH:	6.06
Turbidity:	7.48
Site Conditions	
flow level:	Low - medium
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	NA

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2476
DH Photos	Downstream:	2477
	Overview:	2481
	Datasheet:	2488
DO%: 81.7		
Mg/L: 11.89		

Site Information	
Site Name:	WQ-BC
Sample Identifier:	0167-1309 16 - 004
Sample Date and Time:	13:30
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	327.2
pH:	7.64
Turbidity:	3.24
Site Conditions	
flow level:	Moderate.
turbidity (clear) light, mod, high):	
ice thickness (if applicable)	22cm (on avg Flow is 4cm deep about ice).

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	271
JM Photos	Downstream:	272
	Overview:	273
	Datasheet:	

Site Information	
Site Name:	WQ-VC-REF
Sample Identifier:	0167-1309 16 - 013
Sample Date and Time:	14:30 1330
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	177.7
pH:	7.41
Turbidity:	2.51
Site Conditions	
flow level:	med
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	279
Anchor Ice Present	Downstream:	280
Some sheet ice ~1-2cm thick	Overview:	281
	Datasheet:	282 283

Field Blank ID

Trip Blank ID

Project No.: 13-Y-0167

Project Name: Mount Nansen Water Quality

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YSI Calibrated ? (Yes) / No

Weather: 8°C, Sunny,

Field Samplers: JM, DS, DH

Date / Time: 16-Oct.-2013, 7:54

Site Information	
Site Name:	WQ-DC-U
Sample Identifier:	0167-13●1016-009
Sample Date and Time:	15:10 131016
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	0.2°C
Specific Conductivity (SPC):	1220
pH:	7.56
Turbidity:	28.2
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	Shore ice ~ 1cm thick

Notes (if pit incl. DO and ice thickness)	Photo Numbers	
	Upstream:	289
	Downstream:	290
	Overview:	291
	Datasheet:	

Site Information	
Site Name:	WQ TP
Sample Identifier:	0167-13●1016-015
Sample Date and Time:	131016 15:30
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	2.7
Specific Conductivity (SPC):	1382
pH:	7.88
Turbidity:	6.75
Site Conditions	
flow level:	N/A
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	0.083 m

Notes (if pit incl. DO and ice thickness)	Photo Numbers	
	Upstream:	~~293~~, 294 95
Staff gauge under Ice – 293 (Photo)	Downstream:	
Appeared to be @ 0.759, slight amount of over water around staff gauge	Overview:	0292
	Datasheet:	

Site Information	
Site Name:	One Time Sample (Seep)
Sample Identifier:	0167-13●1016-100
Sample Date and Time:	13/016 15:53
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	0.7
Specific Conductivity (SPC):	626.9
pH:	7.66
Turbidity:	11.3
Site Conditions	
flow level:	Low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	N/A

Notes (if pit incl. DO and ice thickness)	Photo Numbers	
	Upstream:	
WP DH NANSEN SEEP 1 Time	Downstream:	
Seep Through Moss along	Overview:	0296
Transmission line Between	Datasheet:	
Mill building & Tailings pond		
ERSC & AAM Showed us		

Site Information	
Site Name:	WQ-DC-U2
Sample Identifier:	0167-13●1016-014
Sample Date and Time:	131016 16:24
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	1213
pH:	7.38
Turbidity:	12.64
Site Conditions	
flow level:	Low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	up to 0.06 m Thick

Notes (if pit incl. DO and ice thickness)	Photo Numbers	
	Upstream:	297
Slush Ice Present	Downstream:	298
Snow & Ice covered	Overview:	299
Settlings	Datasheet:	

The exact site. Total Time 45 Min JM DS DH

Field Blank ID

Trip Blank ID

H Dc U2 Pic: U/S D/S RB LB
16 Oct 2013 16:25 300 301 302 303

J:\...\Projects\2013\13_Y_0167_AAM_Mount Nansen_Surface_Water\Data\Field Info\Data Sheets\Sept 23-25 Trip\WQ_Field Sheet_Mount Nansen_v 2.xlsx

Project No.: 13-Y-0167 Weather: Clear + 7° Cain Field Samplers: DS DH JM

Project Name: Mount Nansen Water Quality

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YSI Calibrated? Yes / No Date / Time: 131016 07:30

Site Information	
Site Name:	WQ DC U1
Sample Identifier:	0167-1309 1016 - 012
Sample Date and Time:	131016 16:19
Replicate ID (if applicable)	—
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	1295
pH:	7.48
Turbidity:	0.87
Site Conditions	
flow level:	Low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	up to 0.05 m Thick

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	304
Snow & Ice covered channel	Downstream:	305
	Overview:	0306
	Datasheet:	

Site Information	
Site Name:	WQ DC D
Sample Identifier:	0167-1309 1016 - 011
Sample Date and Time:	131016 16:46
Replicate ID (if applicable)	—
Field Measured Parameters	
Temperature:	0.5
Specific Conductivity (SPC):	357.0
pH:	7.51
Turbidity:	0.87
Site Conditions	
flow level:	Moderate
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	0.02m at most

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	307
Some sheet Ice	Downstream:	308
	Overview:	309
	Datasheet:	

Site Information	
Site Name:	WQ PC U
Sample Identifier:	0167-1309 1016 - 016
Sample Date and Time:	131016 16:45
Replicate ID (if applicable)	—
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	331.9
pH:	7.16
Turbidity:	0.20
Site Conditions	
flow level:	Mod
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	0.03m at most

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	313
Some Ice & snow covered	Downstream:	314
Section of channel	Overview:	315
	Datasheet:	

Field Blank ID _____

Trip Blank ID _____

WQ Adit SEEP - Frozen/Dry (zero flow)
U/S 310, D/S 311, overview 312
No Sample taken visited @ 131016, 16:50

Project No.: 13-Y-0167 Weather: 2°C, Clear, calm, Field Samplers: DH, DS, JM

Project Name: Mount Nansen Water Quality

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YSI Calibration Performed? Yes / No Date / Time:

Site Information	
Site Name:	WQ-DC-DIB
Sample Identifier:	018
Sample Date and Time:	18:04 16/10/13
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	1633
pH:	7.73
Turbidity:	5.97
Site Conditions	
flow level:	low-moderate.
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	1.5cm - 6cm.
Notes	
(if pit incl. DO and ice thickness)	
Photo Numbers	
Datasheet: 101-0050	Downstream: 101-0048
Upstream: 101-0047	Overview: 101-0049

Site Information	
Site Name:	WQ-MS-03
Sample Identifier:	019 16-Oct.-13
Sample Date and Time:	19:05
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.7°C
Specific Conductivity (SPC):	1213
pH:	7.24
Turbidity:	0.84
Site Conditions	
flow level:	Low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	ice on banks,
Notes	
(if pit incl. DO and ice thickness)	
Photo Numbers	
Datasheet: 101-0056+0057	Downstream: 101-0055
Upstream: 101-0053	Overview: 101-0054

Site Information	
Site Name:	WQ-DC-DX + 105/205
Sample Identifier:	010
Sample Date and Time:	19:05 16-Oct.-2013
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.6°C
Specific Conductivity (SPC):	1193
pH:	7.00
Turbidity:	1.47
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	Ice on banks ~2cm thick.
Notes	
(if pit incl. DO and ice thickness)	
Photo Numbers	
Datasheet: 101-0074+75	Downstream: 101-0068
Beam: 101-0067	Overview: 101-0073

Site Information	
Site Name:	WQ-DC-DX
Sample Identifier:	0167-131016-021
Sample Date and Time:	Oct 16, 2013 19:49
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.8
Specific Conductivity (SPC):	576.3
pH:	7.56
Turbidity:	1.21
Site Conditions	
flow level:	low-mid
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	
Notes	
(if pit incl. DO and ice thickness)	
Photo Numbers	
Datasheet:	Downstream: 339-340
Upstream:	Overview:

Field Blank ID

Trip Blank ID

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Project No.: 13-Y-0167
Project Name: Mount Nansen Water Quality
Page 6 of 6
YSI Calibration Performed? (Yes) No
Weather: 1°C, clear, calm
Field Samplers: DH, SM, DS
Date / Time: 17-Oct-2013 07:00 -SM

Site Information	
Site Name:	WQ-VC-U
Sample Identifier:	0167-131017 024
Sample Date and Time:	17-Oct-2013 08:52
Replicate ID (if applicable)	0167 131017 023
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	185.6
pH:	6.61
Turbidity:	0.66
Site Conditions	
flow level:	Mod
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	Small amounts of Shelf Ice <1cm
Notes	
(if pit incl. DO and ice thickness)	
Photo Numbers	
Datasheet:	— Downstream: 213
Upstream: 212	Overview: 214

Site Information	
Site Name:	WQ-PW
Sample Identifier:	030
Sample Date and Time:	17-Oct-2013 08:40
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	~~2.8~~ 0.6
Specific Conductivity (SPC):	~~732.0~~ 367.8
pH:	6.29
Turbidity:	0.56
Site Conditions	
flow level:	Normal
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	—
Notes	
(if pit incl. DO and ice thickness)	
Ice forming @ edge	
Bac T Sample Id 541083	
Photo Numbers	
Datasheet:	Downstream:
Upstream:	Overview:

Site Information	
Site Name:	WQ-SEEP
Sample Identifier:	0167-131016-200
Sample Date and Time:	131016 18:58
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	1.5
Specific Conductivity (SPC):	1709
pH:	6.99
Turbidity:	52.5
Site Conditions	
flow level:	
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	
Notes	
(if pit incl. DO and ice thickness)	
Photo Numbers	
Datasheet:	Downstream:
Upstream:	Overview:

Site Information	
Site Name:	WQ-PIT
Sample Identifier:	
Sample Date and Time:	
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	Not Sampled due
Specific Conductivity (SPC):	to ice
pH:	conditions
Turbidity:	NOT SAMPLED
Site Conditions	
flow level:	
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	
Notes	
(if pit incl. DO and ice thickness)	
Photo Numbers	
Datasheet:	Downstream:
Upstream:	Overview:

Field Blank ID _____
Trip Blank ID _____

Project #: 13-Y-0167
Project Name: Mount Nansen - Water Quality

Field Dates: 13+14 Nov. 2013

General Site Tasks/ Communications

Pay attention to new bottles - Regular sites now have 9 bottles, 2 bottles need to be filtered, and there should be 8 preserved. Pit samples now have 6 bottles, 2 needing filtering, and 5 being preserved.

#	Complete	Lab Sample Identifier	WQ ID	Station Name	Site Tasks	Date	Time
						yy.mm.dd	HH:MM
1	[✓]	0167-1311 13- 011	WQ-SEEP	Seepage	LT50	13.11. 13	17:05
2	[✓]	0167-1311 13-013	WQ-TP	Tailings Pond		13.11. 13	17:40
3	[✓]	0167-1311 14- 021	WQ-DC-DX+105	Dome Creek at DX+105		13.11. 14	10:20
4	[✓]	0167-1311 14- 016	WQ-DC-DX	Dome Creek at DX		13.11. 14	10:50
5	[✓]	0167-1311 13- 009	WQ-DC-U	Upper Dome		13.11. 13	16:55
6	[✓]	0167-1311 14- 015	WQ-DC-D1b	Dome Creek D1b		13.11. 14	09:28
7	[✓]	0167-1311 13- 014	WQ-DC-U1	Upper Dome Creek 1		13.11. 13	18:05
8	[✓]	0167-1311 13 - 008	WQ-DC-U2	Upper Dome Creek 2		13.11. 13	18:05
9	[✓]	0167-1311 13- 007	WQ-DC-R	Dome Creek at Road		13.11. 13	11:40
10	[-]	0167-1311 -	WQ-ADIT SEEP	Adit seep	Dry	13.11. 13	
11	[✓]	0167-1311 14- 019	WQ-MS-S-03	Mill Seep 03		13.11. 14	10:12
~~12~~	~~[ ]~~	~~0167-1311~~	~~WQ-MS-S-08~~	~~Mill Seep 08~~		~~13.11.~~	
13	[✓]	0167-1311 13- 012	WQ-VC-U	Upper Victoria Creek		13.11. 13	14:30
14	[✓]	0167-1311 13- 010	WQ-VC-REF	Victoria Creek Reference		13.11. 13	15:40

Field Staff: DH, JM, DS,

Project #: 13-Y-0167
Project Name: Mount Nansen - Water Quality

ENVIRONMENTAL DYNAMICS INC.

Field Dates: 13 + 14 November 2013

#	Complete	Lab Sample Identifier	WQ ID	Station Name	Site Tasks	Date	Time
						yy.mm.dd	HH:MM
15	[✓]	0167-1311 13 - 003	WQ-VC-R	Victoria Creek at Road		13.11. 13	08:40
16	[✓]	0167-1311 13 - 004	WQ-VC-DBC	Victoria Creek D/S Back Creek		13.11. 13	13:58
17	[✓]	0167-1311 13 - 001	WQ-VC-UMN	Victoria Creek U/S Minnesota Creek		13.11. 13	10:28
18	[-]	0167-1311 -	WQ-BC	Back Creek	Dry	13.11. 13	
19	[✓]	0167-1311 13 - 002	WQ-MN	Minnesota Creek		13.11. 13	09:30
20	[✓]	0167-1311 14 - 026	WQ-PW	Pumphouse Well	Drinking Water Package + YG Bottle	13.11. 14	12:18
21	[-]	0167-1311 -	WQ-PC-U	Pony Creek upstream	Dry	13.11. 13	
22	[✓]	0167-1311 13 - 018	WQ-PC-D	Pony Creek downstream		13.11. 13	18:40
~~23~~	~~[-]~~	~~-~~	~~WQ-DRY~~	~~Dry Creek Reference~~	~~-~~	~~13.11.~~	~~-~~
24	[✓]	0167-1311 14 - 025	WQ-PIT-1	pit top	record DO in mg/L	13.11. 14	08:45
25	[✓]	0167-1311 14 - 024	WQ-PIT-2	pit middle	record DO in mg/L	13.11. 14	08:35
26	[✓]	0167-1311 14 - 023	WQ-PIT-3	pit bottom	record DO in mg/L	13.11. 14	08:30
27	[✓]	0167-1311 13 - 006	Field Replicate 1	Dome Creek @ Road,		13.11. 13	11:40
28	[✓]	0167-1311 13 005	Field Replicate 2	Victoria Creek D/S Back Creek.		13.11. 13	14:10
29	[✓]	0167-1311 13 - Field Blank	Field Blank	DI water		13.11. 13	20:00
30	[✓]	TRAVEL BLANK	Travel Blank			-	-

Field Staff: DH, JM, DS

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Project No.: 13-Y-0167 **Weather:** -28°C, clear **Field Samplers:** DH, SM, DS

Project Name: Mount Nansen Water Quality

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YSI Calibrated? (Yes) No **Date / Time:** Nov. 13/2013 6:30

Site Information	
Site Name:	WQ-VC-R
Sample Identifier:	0167-1311 13 - 003
Sample Date and Time:	Nov 13/2013 8:40
Replicate ID (if applicable)	✓
Field Measured Parameters	
Temperature:	0.00°C
Specific Conductivity (SPC):	218.0
pH:	6.49
Turbidity:	3.78
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	Clear
ice thickness (if applicable)	~40 cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2635
	Downstream:	2633
	Overview:	2634
	Datasheet:	2636

Site Information	
Site Name:	WQ-MN
Sample Identifier:	0167-1311 13 - 002
Sample Date and Time:	13 Nov 2013 9:30
Replicate ID (if applicable)	✓
Field Measured Parameters	
Temperature:	~~0.1°C~~ 0.0°C
Specific Conductivity (SPC):	~~107.9~~ 106.9
pH:	~~6.5~~ 6.54
Turbidity:	11.95
Site Conditions	
flow level:	Moderate
turbidity (clear, (light), mod, high):	
ice thickness (if applicable)	1cm to 10cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2639
	Downstream:	2638
	Overview:	2640
	Datasheet:	

Site Information	
Site Name:	WQ VC UM
Sample Identifier:	0167-~~1309~~ 13113 001
Sample Date and Time:	13113 10:28
Replicate ID (if applicable)	✓
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	228.8
pH:	6.63
Turbidity:	0.59
Site Conditions	
flow level:	Moved
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	0-5 cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2643
Sampled at open lead.	Downstream:	2644
	Overview:	2646
	Datasheet:	

Site Information	
Site Name:	WQ-DCR
Sample Identifier:	0167-13~~09~~11 13 - 007
Sample Date and Time:	13-Nov. 2013 11:40
Replicate ID (if applicable)	006
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	1228
pH:	6.56
Turbidity:	17.02
Site Conditions	
flow level:	low
turbidity (clear, (light) mod, high):	
ice thickness (if applicable)	~25 cm, multiple compressed layers.

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2649
	Downstream:	2648
	Overview:	2650
	Datasheet:	

Field Blank ID _____

Trip Blank ID _____

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ENVIRONMENTAL DYNAMICS INC.

Project No.: 13-Y-0167 **Weather:** -12°C, cloudy **Field Samplers:** DH, JM, DS

Project Name: Mount Nansen Water Quality

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YSI Calibrated ? (Yes) / No **Date / Time:** Nov. 13/2013 6:30

Site Information	
Site Name:	WQ VC-DBC
Sample Identifier:	0167-1311 13 - 004 @ 13:58
Sample Date and Time:	13:58 Nov. 13/2013
Replicate ID (if applicable)	005 @ 14:10
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	214.9
pH:	7.16
Turbidity:	0.53
Site Conditions	
flow level:	Moderate
turbidity (clear, light, mod, high):	0.53
ice thickness (if applicable)	1cm to 10cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2657
	Downstream:	2658
	Overview:	2660
	Datasheet:	

Site Information	
Site Name:	WQ - VC - U
Sample Identifier:	0167-1311 13 - 012
Sample Date and Time:	14:30 Nov. 13/2013
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	213.7
pH:	7.08
Turbidity:	0.31
Site Conditions	
flow level:	Moderate
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	5cm to 15cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2661
	Downstream:	2663
	Overview:	2662
	Datasheet:	

Site Information	
Site Name:	WQ - VC - REF
Sample Identifier:	0167-1311 13 - 010
Sample Date and Time:	15:40 Nov. 13/2013
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	210.4
pH:	7.23
Turbidity:	0.97
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	~35cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2679
	Downstream:	2680
	Overview:	2681
	Datasheet:	

Site Information	
Site Name:	WQ - DC - U
Sample Identifier:	0167-1311 13 - 009
Sample Date and Time:	16:55 13-Nov-2013
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	1540
pH:	6.80
Turbidity:	22.3
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	1cm to 6cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2689
	Downstream:	2688
	Overview:	2690
	Datasheet:	

Field Blank ID _____

Trip Blank ID _____

EDI
ENVIRONMENTAL DYNAMICS INC.

Project No.: 13-Y-0167 **Weather:** -15, overcast. **Field Samplers:** DH, JM, DS

Project Name: Mount Nansen Water Quality

Page 3 of 6

YSI Calibrated? (Yes) No **Date / Time:** Nov. 13/2013 6:30

Site Information	
Site Name:	WQ Seep 1
Sample Identifier:	0167-1311 13 - 011
Sample Date and Time:	17:05 Nov. 13/2013
Replicate ID (if applicable)	N/A
Field Measured Parameters	
Temperature:	0.7
Specific Conductivity (SPC):	1799
pH:	6.70
Turbidity:	37.8
Site Conditions	
flow level:	N/A
turbidity (clear, light, (mod), high):	
ice thickness (if applicable)	Ice Buildup around Diffuser

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2693
LI50 ✓	Downstream:	
	Overview:	
Pump photos: 2694 + 2695	Datasheet:	

Site Information	
Site Name:	WQ - TP
Sample Identifier:	0167-1311 13 - 013
Sample Date and Time:	Nov. 13/2013 17:40
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	1.8
Specific Conductivity (SPC):	1583
pH:	7.19
Turbidity:	6.62
Site Conditions	
flow level:	N/A
turbidity (clear, (light), mod, high):	
ice thickness (if applicable)	~12 cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2698
	Downstream:	
	Overview:	2698 + 2699
	Datasheet:	

Site Information	
Site Name:	WQ - DCU1
Sample Identifier:	0167-1311 13 - 014
Sample Date and Time:	Nov. 13/2013 18:05
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	1377
pH:	6.99
Turbidity:	2.09
Site Conditions	
flow level:	N/A
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	
No Channel reached, water	Downstream:	
Flowing through ice.	Overview:	2703 - 2702
WQ sampling done at hydrology	Datasheet:	
salt input site.		

Site Information	
Site Name:	WQ - DCU2
Sample Identifier:	0167-1311 13 - 008
Sample Date and Time:	Nov. 13/2013 18:05
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	1450
pH:	7.00
Turbidity:	1.82
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	~30 cm

Notes	Photo Numbers	
(if pit incl. DO and ice thickness)	Upstream:	2705
	Downstream:	2706
	Overview:	2704
	Datasheet:	

Field Blank ID _____

Trip Blank ID _____

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ENVIRONMENTAL DYNAMICS INC.

Project No.: 13-Y-0167
Project Name: Mount Nansen Water Quality
Page 4 of 6
YSI Calibrated ? (Yes) No

Weather: -8°C, light wind, overcast.
Field Samplers: DH, JM, DS
Date / Time: Nov. 13/2013 6:30

Site Information		Site Information	
Site Name:	WQ-PC-D	Site Name:	WQ-PC-U
Sample Identifier:	0167-1311 13-018	Sample Identifier:	0167-1311 -
Sample Date and Time:	18:40 Nov. 13/2013	Sample Date and Time:	
Replicate ID (if applicable)		Replicate ID (if applicable)	
Field Measured Parameters		**Field Measured Parameters**	
Temperature:	0.3 °C	Temperature:	NO SAMPLE
Specific Conductivity (SPC):	465.8	Specific Conductivity (SPC):	
pH:	7.08	pH:	
Turbidity:	1.04	Turbidity:	
Site Conditions		**Site Conditions**	
flow level: low		flow level:	
turbidity (clear, light, mod, high):		turbidity (clear, light, mod, high):	
ice thickness (if applicable) ~2 cm		ice thickness (if applicable)	

Notes	Photo Numbers	Notes	Photo Numbers
(if pit incl. DO and ice thickness)	Upstream: 2709	(if pit incl. DO and ice thickness)	Upstream: 2723
Minimal flow, almost could be considered standing	Downstream: 2707	Dry / frozen to substrate	Downstream: 2725
	Overview: 2708		Overview: 2724
	Datasheet:		Datasheet:

Site Information		Site Information	
Site Name:	WQ-Adit-Seep.	Site Name:	
Sample Identifier:	0167-1309 -	Sample Identifier:	0167-1309 -
Sample Date and Time:		Sample Date and Time:	
Replicate ID (if applicable)		Replicate ID (if applicable)	
Field Measured Parameters		**Field Measured Parameters**	
Temperature:	NO SAMPLE	Temperature:	
Specific Conductivity (SPC):		Specific Conductivity (SPC):	
pH:		pH:	
Turbidity:		Turbidity:	
Site Conditions		**Site Conditions**	
flow level:		flow level:	
turbidity (clear, light, mod, high):		turbidity (clear, light, mod, high):	
ice thickness (if applicable)		ice thickness (if applicable)	

Notes	Photo Numbers	Notes	Photo Numbers
(if pit incl. DO and ice thickness)	Upstream: 2711	(if pit incl. DO and ice thickness)	Upstream:
Dry frozen to substrate	Downstream: 2712		Downstream:
	Overview: 2710		Overview:
	Datasheet:		Datasheet:

Field Blank ID _____
Trip Blank ID _____

EDI
ENVIRONMENTAL DYNAMICS INC.

Project No.: 13-Y-0167 **Weather:** -2°C, overcast, light wind. **Field Samplers:** DH, JM, DS

Project Name: Mount Nansen Water Quality

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YSI Calibrated? (Yes) / No **Date / Time:** 14/Nov/2013 7:00

Site Information	
Site Name:	WQ-PIT-1
Sample Identifier:	0167-1311 14 - 025
Sample Date and Time:	14 Nov. 2013 8:45
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.9
Specific Conductivity (SPC):	1905
pH:	7.06
Turbidity:	0.87
Site Conditions	
flow level:	
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	37 cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Total depth: 6.5 m.	Upstream:
DO%: 69.0	Downstream:
DO mg/L: 9.84	Overview: 2728 + 2730
level lower than usual	Datasheet:
Sampled at surface.	

Site Information	
Site Name:	WQ-PIT-2
Sample Identifier:	0167-1311 14 - 024
Sample Date and Time:	14 Nov. 2013 8:35
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	2.0
Specific Conductivity (SPC):	1917
pH:	6.83
Turbidity:	0.65
Site Conditions	
flow level:	
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	37cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Total depth: 6.5 m	Upstream:
DO%: 66.6	Downstream:
DO mg/L: 9.09	Overview: 2728+ 2730
Pit level lower than usual.	Datasheet:
Sampled at: 3m	

Site Information	
Site Name:	WQ-PIT-3
Sample Identifier:	0167-1311 14 -023
Sample Date and Time:	14 Nov. 2013 8:30
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	4.8°C
Specific Conductivity (SPC):	1977
pH:	6.20
Turbidity:	2.36
Site Conditions	
flow level:	
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	37cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Total depth: 6.5 m	Upstream:
DO%: 44.8	Downstream:
DO mg/L: 5.49	Overview: 2728 + 2730
Pond level lower than usual	Datasheet:
sampled at: 6m	

Site Information	
Site Name:	WQ-DC-D2b
Sample Identifier:	0167-1311 14 - 015
Sample Date and Time:	14-Nov.-2013 9:28
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.0°C
Specific Conductivity (SPC):	1717
pH:	6.91
Turbidity:	59.5
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	Over flow ice 12 cm*

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Excavator activity upstream with the removal of the building on the upstream pond - Suspect disturbed bed when cutting hole in ice, did not clear up over time.	Upstream: 2733
	Downstream: 2734
	Overview: 2737
	Datasheet:

Field Blank ID _____

Trip Blank ID _____

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Project No.: 13-Y-0167
Project Name: Mount Nansen Water Quality
Page 6 **of** 6
YSI Calibrated ? (Yes) / No

Weather: -2°C, snow
Date / Time: 14-Nov-13 7:00

Field Samplers: DH, JM, DS

Site Information		Site Information	
Site Name:	WQ-MS-S-03	Site Name:	WQ DC DX+105/205
Sample Identifier:	0167-1311 14-019	Sample Identifier:	0167-1311 14-021
Sample Date and Time:	14 Nov. 2013 10:12	Sample Date and Time:	14 Nov. 2013 10:20
Replicate ID (if applicable)		Replicate ID (if applicable)	
Field Measured Parameters		**Field Measured Parameters**	
Temperature:	0.6°C	Temperature:	0.6°C
Specific Conductivity (SPC):	1255 → Jumping around ~50 points ±	Specific Conductivity (SPC):	1187
pH:	6.64	pH:	6.69
Turbidity:	1.86	Turbidity:	2.62
Site Conditions		**Site Conditions**	
flow level:	moderate	flow level:	Moderate
turbidity (clear, light, mod, high):	clear (circled)	turbidity (clear, light, mod, high):	clear (circled)
ice thickness (if applicable)	1cm to 2cm	ice thickness (if applicable)	1cm to 3cm.

Notes (if pit incl. DO and ice thickness)	Photo Numbers	Notes (if pit incl. DO and ice thickness)	Photo Numbers
	Upstream: 2738		Upstream: 2743
	Downstream: 2740		Downstream: 2742
	Overview: 2739		Overview: 2741
	Datasheet:		Datasheet:

Site Information		Site Information	
Site Name:	WQ-DC-DX	Site Name:	WQ-PW
Sample Identifier:	0167-1309 1114-016	Sample Identifier:	0167-1309 1114-026
Sample Date and Time:	10:50 14 Nov. 2013	Sample Date and Time:	14-Nov-2013 12:18
Replicate ID (if applicable)		Replicate ID (if applicable)	
Field Measured Parameters		**Field Measured Parameters**	
Temperature:	0.0°C	Temperature:	~~1.0~~ 0.5
Specific Conductivity (SPC):	740.0	Specific Conductivity (SPC):	~~[illegible]~~ 369.7
pH:	6.9	pH:	5.77
Turbidity:	58.9	Turbidity:	0.97
Site Conditions		**Site Conditions**	
flow level:		flow level:	
turbidity (clear, light, mod, high):		turbidity (clear, light, mod, high):	clear (circled)
ice thickness (if applicable)	22.5cm	ice thickness (if applicable)	

Notes (if pit incl. DO and ice thickness)	Photo Numbers	Notes (if pit incl. DO and ice thickness)	Photo Numbers
Joel has notes + pics	Upstream:		Upstream:
	Downstream:		Downstream:
	Overview:		Overview: 2757-2759
	Datasheet:		Datasheet:

Field Blank ID ______________

Trip Blank ID ______________

Project #: 13-Y-0167
Project Name: Mount Nansen - Water Quality

Field Dates: Dec 16-18/2013

General Site Tasks/ Communications

Pay attention to new bottles - Regular sites = 9 bottles (2 bottles need to be filtered & there should be 8 preserved). Pit samples now have 6 bottles (2 needing filtering, & 5 total being preserved).

#	Complete	Lab Sample Identifier	WQ ID	Station Name	Site Tasks	Date	Time
						yy.mm.dd	HH:MM
1	[✓]	0167-1312 17- 007	WQ-SEEP	Seepage		13.12.17	10:15
2	[✓]	0167-1312 16 - 013	WQ-TP	Tailings Pond		13.12.16	18:10
3	[✓]	0167-1312 17- 011	WQ-DC-DX+105	Dome Creek at DX+105		13.12.17	11:15
4	[ ]	~~0167-1312 -~~	~~WQ-DC-DX~~	~~Dome Creek at DX~~	frozen to substrate unsuitable for sampling.	~~13.12.~~	
5	[✓]	0167-1312 17- 012	WQ-DC-U	Upper Dome		13.12.17	09:15
6	[ ]	~~0167-1312 -~~	~~WQ-DC-D1b~~	~~Dome Creek D1b~~	unsuitable for sampling	~~13.12.~~	
7	[ ]	~~0167-1312 -~~	~~WQ-DC-U1~~	~~Upper Dome Creek 1~~	unsuitable for sampling	~~13.12.~~	
8	[ ]	~~0167-1312 -~~	~~WQ-DC-U2~~	~~Upper Dome Creek 2~~	unsuitable for sampling	~~13.12.~~	
9	[ ]	~~0167-1312 -~~	~~WQ-DC-R~~	~~Dome Creek at Road~~	unsuitable for sampling	~~13.12.~~	
10	[ ]	Dry	WQ-ADIT SEEP	Adit seep	Dry.	n/a	n/a
11	[✓]	0167-1312 16 - 014	WQ-MS-S-03	Mill Seep 03		13.12.16	19:08
12	[✓]	0167-1312 17- 001	WQ-VC-U	Upper Victoria Creek		13.12.17	15:50
13	[✓]	0167-1312 17- 016	WQ-VC-REF	Victoria Creek Reference		13.12.17	17:57
14	[✓]	0167-1312 16 - 010	WQ-VC-R	Victoria Creek at Road		13.12.16	17:00

Field Staff: JM, DH

Project #: 13-. 0167
Project Name: Mount Nansen - Water Quality

EDI ENVIRONMENTAL DYNAMICS INC.

Field Dates: Dec. 16 – 18, 2013

#	Complete	Lab Sample Identifier	WQ ID	Station Name	Site Tasks	Date	Time
						yy.mm.dd	HH:MM
15	[✓]	0167-131217- 003	WQ-VC-DBC	Victoria Creek D/S Back Creek		13.12.17	15:40
16	[✓]	0167-1312 17- 004	WQ-VC-UMN	Victoria Creek U/S Minnesota Creek		13.12.17	13:21
17	[ ]	Frozen to Substrate/Dry	~~WQ-BC~~	~~Back Creek~~		n/a	n/a
18	[ ]	~~0167-1312 -~~	~~WQ-MN~~	~~Minnesota Creek~~	unsuitable for sampling	~~13.12.~~	
19	[✓]	0167-1312 - 023	WQ-PW	Pumphouse Well	Drinking Water Package + YG Bottle	13.12.18	09:30
20	[ ]	Frozen to Substrate/Dry	~~WQ-PC-U~~	~~Pony Creek upstream~~		~~n/a~~	~~n/a~~
21	[ ]	0167-1312 -	WQ-PC-D	Pony Creek downstream	Check, but likely frozen to substrate/dry	~~13.12.18~~	
22	[ ]	Not required this time	~~WQ-DRY~~	~~Dry Creek Reference~~		~~n/a~~	n/a
23	[✓]	0167-1312 - 022	WQ-PIT-1	pit top	record DO in mg/L	13.12.18	8:47
24	[✓]	0167-1312 - 021	WQ-PIT-2	pit middle	record DO in mg/L	13.12.18	8:55
25	[✓]	0167-1312 - 020	WQ-PIT-3	pit bottom	record DO in mg/L	13.12.18	09:01
26	[✓]	0167-131217- 009	Field Replicate 1	WQ-SEEP		13.12.17	10:15
27	[✓]	0167-131217 008	Field Replicate 2	WQ-DC-U		13.12.17	09:15
28	[✓]	~~0167-1312 -~~	Field Blank	Field Blank.	filled in Bunk House	13.12.17	19:58
29	[✓]	TRAVEL BLANK	Travel Blank			-	-

Field Staff: JM, DH, DS

Project No.: 13-Y-0167 Weather: Clear Calm -33°C Field Samplers: DH, JM

Project Name: Mount Nansen Water Quality

Page 1 of 4

YSI Calibrated ? Yes / No Date / Time: 13:00 Dec. 16/2013

Site Information	
Site Name:	WQ VC R
Sample Identifier:	0167-1312 16 - 010
Sample Date and Time:	13 12 16 17:00
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0,0
Specific Conductivity (SPC):	230
pH:	7,42
Turbidity:	0,31
Site Conditions	
flow level:	Low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	30-60 cm

Notes (if pit Incl. DO and ice thickness)	Photo Numbers
	Upstream: 101-0025
Samples taken at regulars winter	Downstream: 101-0027
WQ sampling site ~150m	Overview: 101-0028
downstream of culvert.	Datasheet:
Photo 101-0031 : upstream of culvert in overflow.	

Site Information	
Site Name:	WQ-TP
Sample Identifier:	0167-1312 16 - 013
Sample Date and Time:	13 12 16 18:10
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.9
Specific Conductivity (SPC):	1972
pH:	7.32
Turbidity:	8.07
Site Conditions	
flow level:	N/A
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	60 cm

Notes (if pit Incl. DO and ice thickness)	Photo Numbers
	Upstream:
	Downstream:
	Overview: 101-0037
	Datasheet:

Site Information	
Site Name:	WQ MS-S-03
Sample Identifier:	0167-1312 16 - 014
Sample Date and Time:	131216 19:08
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0,5°C
Specific Conductivity (SPC):	1198
pH:	7.28
Turbidity:	1.78
Site Conditions	
flow level:	Mod.
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	N/A Snow covered.

Notes (if pit Incl. DO and ice thickness)	Photo Numbers
	Upstream: 0056
	Downstream: 0058
	Overview: 0057
	Datasheet:

Site Information	
Site Name:	
Sample Identifier:	0167-1312 -
Sample Date and Time:	
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	
Specific Conductivity (SPC):	
pH:	
Turbidity:	
Site Conditions	
flow level:	
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	

Notes (if pit Incl. DO and ice thickness)	Photo Numbers
	Upstream:
	Downstream:
	Overview:
	Datasheet:

Field Blank ID _____

Trip Blank ID _____

Project No.: 13-Y-0167

Project Name: Mount Nansen Water Quality

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YSI Calibrated? (Yes) / No

Weather: -29, clear, gusts of wind

Field Samplers: DH, JM

Date / Time: Dec. 17/2013 06:45

Site Information	
Site Name:	WQ DC U
Sample Identifier:	0167-1312 17 - 012
Sample Date and Time:	09:10 Dec. 17/2013
Replicate ID (if applicable)	008 @ 09:15
Field Measured Parameters	
Temperature:	0.3
Specific Conductivity (SPC):	2011
pH:	7.29
Turbidity:	23.0
Site Conditions	
flow level:	Low ~~High~~
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	~ 12 cm

Notes	Photo Numbers
(if pit incl. DO and ice thickness)	Upstream: 0047
	Downstream: 0043
	Overview: 0042
	Datasheet:

Site Information	
Site Name:	WQ SEEP
Sample Identifier:	0167-1312 17 - 007
Sample Date and Time:	13/12/17 10:15
Replicate ID (if applicable)	0167 131217 009
Field Measured Parameters	
Temperature:	~~2.0~~ 0.6
Specific Conductivity (SPC):	1871
pH:	7.20
Turbidity:	37.8
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	N/A

Notes	Photo Numbers
(if pit incl. DO and ice thickness)	Upstream:
	Downstream:
	Overview: 0050 + 0051
	Datasheet:

Site Information	
Site Name:	WQ DX 105
Sample Identifier:	0167-1312 17 - 011
Sample Date and Time:	11:15 17 Dec 2013
Replicate ID (if applicable)	—
Field Measured Parameters	
Temperature:	~~0.4~~ 0.4
Specific Conductivity (SPC):	1195
pH:	7.22
Turbidity:	2.33
Site Conditions	
flow level:	Med
turbidity (clear, light, mod, high):	Light
ice thickness (if applicable)	No Ice Snow Covered Ice

Notes	Photo Numbers
(if pit incl. DO and ice thickness)	Upstream: 0060
	Downstream: 0059
	Overview: 0061
	Datasheet:

Site Information	
Site Name:	
Sample Identifier:	0167-1312 -
Sample Date and Time:	
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	
Specific Conductivity (SPC):	
pH:	
Turbidity:	
Site Conditions	
flow level:	
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	

Notes	Photo Numbers
(if pit incl. DO and ice thickness)	Upstream:
	Downstream:
	Overview:
	Datasheet:

Field Blank ID

Trip Blank ID

Project No.: 13-Y-0167

Project Name: Mount Nansen Water Quality

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YSI Calibrated ? Yes / No

Weather: -30° l.t. wind clear

Field Samplers: DH - JM

Date / Time: 131217 07:00

Site Information	
Site Name:	WQ VC UMN
Sample Identifier:	0167-1312 17 - 004
Sample Date and Time:	131217 13:21
Replicate ID (if applicable)	—
Field Measured Parameters	
Temperature:	0.0°c
Specific Conductivity (SPC):	233.5
pH:	7.52
Turbidity:	0.42
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	< 10cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
	Upstream: 0083
	Downstream: 0084
	Overview: 0082
	Datasheet:

Site Information	
Site Name:	WQ VC DBC
Sample Identifier:	0167-1312 17 - 003
Sample Date and Time:	131217
Replicate ID (if applicable)	— 15:40
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	215.9
pH:	7.47
Turbidity:	0.01
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	> 3cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
	Upstream: 0101
	Downstream: 0102
	Overview: 0100
	Datasheet:

Site Information	
Site Name:	WQ VC U
Sample Identifier:	0167-1312 17 - 001
Sample Date and Time:	131217 15:50
Replicate ID (if applicable)	—
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	217.3
pH:	8.04
Turbidity:	0.13
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	< 4cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
	Upstream: 0103
	Downstream: 0104
	Overview: 0105
	Datasheet:

Site Information	
Site Name:	WQ VC REF
Sample Identifier:	0167-1312 17 - 016
Sample Date and Time:	131217 17:57
Replicate ID (if applicable)	—
Field Measured Parameters	
Temperature:	0.0
Specific Conductivity (SPC):	219.8
pH:	7.53
Turbidity:	0.00
Site Conditions	
flow level:	low
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	> 30cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
	Upstream: 0119
	Downstream: 0117
	Overview: 0120
	Datasheet:

Field Blank ID _____

Trip Blank ID _____

Project No.: 13-Y-0167 Weather: -27, calm + clear Field Samplers: JM + DH

Project Name: Mount Nansen Water Quality

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YSI Calibrated ? (Yes / No) Date / Time: Dec. 18/2023 7:00 am

Site Information	
Site Name:	Pit 3
Sample Identifier:	0167-1312 18 - 020
Sample Date and Time:	08:47
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	5.6
Specific Conductivity (SPC):	2650
pH:	7.04
Turbidity:	36.7
Site Conditions	
flow level:	
turbidity (clear, (light), mod, high):	
ice thickness (if applicable)	60cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Total depth 7m	Upstream:
Sample depth 6m	Downstream:
	Overview:
	Datasheet:

Site Information	
Site Name:	Pit 2
Sample Identifier:	0167-1312 18 - 021
Sample Date and Time:	08:55
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	1.8
Specific Conductivity (SPC):	1973
pH:	7.70
Turbidity:	6.97
Site Conditions	
flow level:	
turbidity (clear, (light), mod, high):	
ice thickness (if applicable)	60cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Sample depth 3m	Upstream:
	Downstream:
	Overview:
	Datasheet:

Site Information	
Site Name:	WQ Pit 1
Sample Identifier:	0167-1312 18 - 022
Sample Date and Time:	09:02
Replicate ID (if applicable)	
Field Measured Parameters	
Temperature:	0.13
Specific Conductivity (SPC):	1994
pH:	7.85
Turbidity:	0.75
Site Conditions	
flow level:	/
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	60 cm

Notes (if pit incl. DO and ice thickness)	Photo Numbers
Sample depth = Just under ice	Upstream:
	Downstream:
	Overview: 0132, 0134, 0136
	Datasheet:

Site Information	
Site Name:	WQ - PW
Sample Identifier:	0167-1312 18 - 023
Sample Date and Time:	9:30
Replicate ID (if applicable)	/
Field Measured Parameters	
Temperature:	0.1°C
Specific Conductivity (SPC):	391.7
pH:	7.87
Turbidity:	0.00
Site Conditions	
flow level:	/
turbidity (clear, light, mod, high):	
ice thickness (if applicable)	/

Notes (if pit incl. DO and ice thickness)	Photo Numbers
	Upstream:
	Downstream:
	Overview: 0152, 0134, 0136
	Datasheet:

Field Blank ID _____

Trip Blank ID _____

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APPENDIX D Q3 SURFACE WATER HYDROLOGY DATA

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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	± .00005 kg

Table D-2. Hydrometric station monitoring record from Q1 (April 1) through Q3 (December 31), 2013.

HID	Monitoring Start	Q1 Measurements		Q2 Measurements		Q3 Measurements		Logger Type	Rating Curve Status[1]	Method
		# Discharge	# Rating	# Discharge	# Rating	# Discharge	# Rating			
ATM-DC-2	N/A	N/A	N/A	N/A	N/A			HOBO	N/A	N/A
ATM-DC-3	N/A	N/A	N/A	N/A	N/A			HOBO	N/A	N/A
ATM-DC-4	N/A	N/A	N/A	N/A	N/A			Solinst	N/A	N/A
H-PC-U	01-May-12	7	5	3	3			Solinst	P	SS,V
H-PC-DSP	07-Jun-11	6	5	3	3			HOBO	P	SS, V
H-DC-DX	01-May-12	5	N/A	3	N/A			HOBO	N/A	SS, V
H-DX+105	01-May-12	8	N/A	3	N/A			HOBO	N/A	SS, V
H-TP	21-Aug-12	N/A	N/A	N/A	N/A			HOBO	N/A	SG
H-SEEP	17-Apr-12	5	N/A	3	N/A			HOBO	N/A	V, Flow Meter
H-DC-B	17-Apr-12	6	3	3	3	3	0	Solinst	P	SS
H-DC-M	17-Apr-12	7	5	3	3	3	1	Solinst	P	SS
H-DC-R	01-May-12	3	2	3	3	3	0	Solinst	P	ADV, SS, V
H-BC	30-Apr-12	6	6	3	3	3	0	HOBO	P	ADV, SS
H-MN	17-Apr-12	7	6	3	3	3	1	HOBO	P	ADV, SS
H-VC-REF	17-Nov-11	6	6	3	3	3	1	HOBO	P	ADV, SS
H-VC-U	16-Apr-12	8	6	3	3	3	1	Solinst	P	ADV, SS
H-VC-DBC	11-Dec-12	9	7	3	3	3	2	Solinst	P	ADV, SS
H-VC-UMN	14-Apr-12	9	6	3	3	3	2	HOBO	P	ADV, SS
H-VC-R	02-May-12	8	6	3	3	3	2	Solinst	P	ADV, SS

P – preliminary

Table D-3 Hydrometric data summary for station visits between April 1 and December 31, 2013.

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
741	H-BC	16/05/2013	13:20	ADV	0.445	0.3395	2.082	
742	H-BC	16/05/2013	13:20	SS	0.18	0.18	2.082	
760	H-BC	22/05/2013	12:25	SS	0.298	0.616	1.926	
770	H-BC	28/05/2013	15:33	ADV	0.38	0.2916	2.009	
789	H-BC	11/06/2013	12:42	SS	0.26	0.1098	1.925	
810	H-BC	25/06/2013	11:54	SS	0.198	0.0173	1.849	
824	H-BC	16/07/2013	12:36	SS	0.172	0.0032	1.833	
835	H-BC	14/08/2013	10:45	SS	0.191	0.0153	1.68	
871	H-BC	24/09/2013	12:20	SS	0.27	0.053	1.931	
865	H-BC	16/10/2013	13:48	SS	0.425	0.006	2.093	B
719	H-DC-B	06/05/2013	17:00	SS		0.022		
732	H-DC-B	15/05/2013	11:20	SS		0.1192		B
750	H-DC-B	21/05/2013	14:44	SS		0.107		
766	H-DC-B	27/05/2013	15:40	SS	0.21	0.304	1.571	
784	H-DC-B	10/06/2013	16:31	SS	0.159	0.4269	1.52	
804	H-DC-B	24/06/2013	14:36	SS	0.108	0.0206	1.46	
816	H-DC-B	15/07/2013	15:21	SS	0.088	0.0158	1.432	
845	H-DC-B	13/08/2013	14:24	SS	0.09	0.0051	1.441	
880	H-DC-B	23/09/2013	15:18	SS	0.146	0.0276	1.503	
858	H-DC-B	15/10/2013	15:17	SS	0.172	0.0118	1.518	B
899	H-DC-B	12/11/2013	16:20	SS		0		B/X
761	H-DC-D1	29/05/2013	11:52	SS		0.0117		B
764	H-DC-D1B	29/05/2013	11:11	SS		0.0102		B
782	H-DC-D1B	10/06/2013	19:02	SS		0.0031		
801	H-DC-D1b	25/06/2013	16:20	SS		0.0067		
820	H-DC-D1b	16/07/2013	17:54	SS		0.0006		

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
840	H-DC-D1b	14/08/2013	14:58	SS		0.0032		
885	H-DC-D1b	23/09/2013	18:17	SS		0.0251		
855	H-DC-D1B	16/10/2013	18:21	SS		0.014		B
890	H-DC-D1b	14/11/2013	09:44	SS		0		B/X
758	H-DC-DX	21/05/2013	18:25	SS		0.003		
762	H-DC-DX	29/05/2013	13:44	SS		0.002		
779	H-DC-DX	12/06/2013	12:31	SS		0.0019		
780	H-DC-DX	12/06/2013	12:31	V		0.0016		
799	H-DC-DX	25/06/2013	17:40	V	0.00014	0.0016		
827	H-DC-DX	16/07/2013	18:00	V		0.000016		
888	H-DC-DX	23/09/2013	18:46	V		0.0013		
717	H-DC-DX+105	06/05/2013	17:42	SS		0.002		
729	H-DC-DX+105	15/05/2013	15:06	SS		0.0151		B
730	H-DC-DX+105	15/05/2013	15:06	V		0.0073		B
747	H-DC-DX+105	21/05/2013	17:41	SS		0.011		B
748	H-DC-DX+105	21/05/2013	17:41	V		0.002		B
763	H-DC-DX+105	29/05/2013	12:57	SS		0.0249		
781	H-DC-DX+105	11/06/2013	19:17	SS		0.0051		
800	H-DC-DX+105	25/06/2013	17:17	SS		0.0022		
832	H-DC-DX+105	16/07/2013	18:41	SS		0.0017		
850	H-DC-DX+105	13/08/2013	17:57	SS		0.003		
886	H-DC-DX+105	23/09/2013	18:46	SS		0.0023		
889	H-DC-DX+105	14/11/2013	10:40	SS		0.0021		B
905	H-DC-DX+105	17/12/2013	11:18	SS		0.002141		B/X
854	H-DC-DX+105/205	16/10/2013	19:26	SS		0.0005		B
706	H-DC-M	15/04/2013	16:18	SS		0.0004		B/E
720	H-DC-M	06/05/2013	15:53	NONE				

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
731	H-DC-M	15/05/2013	10:58	SS	0.1308	0.1308	1.762	B
749	H-DC-M	21/05/2013	13:55	SS	0.24	0.456	1.707	
767	H-DC-M	27/05/2013	14:30	SS	0.332	0.21		
785	H-DC-M	10/06/2013	15:48	SS	0.208	0.1039	1.667	
805	H-DC-M	24/06/2013	14:00	SS	0.181	0.0189	1.62	
815	H-DC-M	15/07/2013	14:25	SS	0.167	0.0094	1.628	
846	H-DC-M	13/08/2013	13:34	SS	0.15	0.0073	1.638	
879	H-DC-M	23/09/2013	14:41	SS	0.18	0.0733	1.67	
860	H-DC-M	15/10/2013	14:31	SS	0.158	0.0174	1.651	B
898	H-DC-M	12/11/2013	15:28	SS	0.129	0.0141	1.627	B
906	H-DC-M	17/12/2013	09:12	SS		0.0067		B/X
721	H-DC-R	06/05/2013	14:58	NONE				
786	H-DC-R	10/06/2013	14:41	SS	0.35	0.0641	0.696	
806	H-DC-R	24/06/2013	13:10	SS	0.146	0.024	0.44	
823	H-DC-R	15/07/2013	13:27	SS	0.085	0.0127	0.364	
847	H-DC-R	13/08/2013	12:50	SS	0.103	0.0122	0.401	
877	H-DC-R	23/09/2013	13:45	SS	0.285	0.0849	0.571	
861	H-DC-R	15/10/2013	13:27	SS	0.284	0.0113	0.582	B
897	H-DC-R	12/11/2013	14:08	SS		0.0043		B
802	H-DC-U1	24/06/2013	15:23	SS		0.004		
829	H-DC-U1	15/07/2013	16:22	SS		0.0015		
844	H-DC-U1	13/08/2013	15:21	SS		0.0018		
882	H-DC-U1	23/09/2013	16:06	SS		0.0131		
856	H-DC-U1	15/10/2013	16:13	SS		0.0018		B
900	H-DC-U1	12/11/2013	16:45	SS		0		B/X
765	H-DC-U2	27/05/2013	16:24	SS		0.06		B
783	H-DC-U2	10/06/2013	17:45	SS		0.0253		
803	H-DC-U2	24/06/2013	15:55	SS		0.0157		

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
830	H-DC-U2	15/07/2013	17:10	SS		0.0061		
843	H-DC-U2	13/08/2013	15:50	SS		0.0065		
881	H-DC-U2	23/09/2013	16:20	SS		0.0074		
857	H-DC-U2	15/10/2013	16:55	SS		0.0073		B
901	H-DC-U2	12/11/2013	17:06	SS		0		B/X
740	H-MN	16/05/2013	08:37	ADV		0.3526		B
739	H-MN	16/05/2013	08:37	SS		0.0761		B
759	H-MN	22/05/2013	08:44	SS	0.918	0.01	1.474	
773	H-MN	28/05/2013	09:56	ADV	0.526	0.0865	1.061	
774	H-MN	28/05/2013	09:56	SS	0.526	0.048	1.061	
792	H-MN	11/06/2013	09:37	SS	0.552	0.1559	1.087	
812	H-MN	25/06/2013	08:16	SS	0.424	0.0301	0.965	
818	H-MN	16/07/2013	08:49	SS	0.39	0.0182	0.938	
839	H-MN	14/08/2013	08:00	ADV	0.43	0.0383	0.985	
875	H-MN	24/09/2013	08:00	ADV	0.538	0.1229	1.098	
867	H-MN	16/10/2013	09:16	SS	0.448	0.0084	1.009	B
904	H-MN	13/11/2013	09:40	SS		0.0451		B
722	H-PC-DSP	08/05/2013	09:35	V		0.000335		
736	H-PC-DSP	15/05/2013	12:41	SS	0.328	0.019	2.524	
752	H-PC-DSP	21/05/2013	15:31	SS	0.28	0.004	2.472	
778	H-PC-DSP	28/05/2013	18:50	SS	0.304	0.016	2.499	
796	H-PC-DSP	12/06/2013	09:46	SS	0.234	0.0075	2.405	
798	H-PC-DSP	24/06/2013	17:45	V	0.165	0.00068	2.351	
826	H-PC-DSP	16/07/2013	16:51	V	0.13	0.0001	2.432	
842	H-PC-DSP	13/08/2013	16:25	V	0.149	0.0004	2.329	
883	H-PC-DSP	23/09/2013	16:51	V	0.268	0.00492	2.435	
853	H-PC-DSP	16/10/2013	17:08	V	0.244	0.002	2.422	B
734	H-PC-U	15/05/2013	13:33	SS		0.0191		B

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
735	H-PC-U	15/05/2013	13:33	V		0.0028		B
751	H-PC-U	21/05/2013	16:20	SS	0.292	0.011	2.465	
776	H-PC-U	27/05/2013	18:26	SS	0.355	0.023	2.526	
777	H-PC-U	27/05/2013	18:26	V	0.355	0.0014	2.526	
795	H-PC-U	12/06/2013	10:48	SS	0.239	0.008	2.577	
797	H-PC-U	24/06/2013	18:07	SS	0.173	0.0011	2.432	
817	H-PC-U	15/07/2013	18:15	V	0.152	0.00005	2.396	
841	H-PC-U	13/08/2013	17:10	SS	0.201	0.0019	2.45	
884	H-PC-U	23/09/2013	17:15	SS	0.27	0.0087	2.51	
852	H-PC-U	15/10/2013	18:07	SS	0.288	0.0017	2.529	B
902	H-PC-U	12/11/2013	18:26	SS		0.0006		B
712	H-SEEP	17/04/2013	12:04	V		0.003		B/E
718	H-SEEP	08/05/2013	09:47	V		0.0029		
733	H-SEEP	15/05/2013	11:00	V		0.0026		
794	H-SEEP	11/06/2013	16:53	V		0.0024		
814	H-SEEP	25/06/2013	15:07	V		0.00256		
821	H-SEEP	16/07/2013	15:45	V		0.0028		
833	H-SEEP	13/08/2013	13:05	V	0.4	0.003		
876	H-SEEP	24/09/2013	15:55	V		0.00387		
869	H-SEEP	16/10/2013	18:58	V		0.005		
892	H-Seep	13/11/2013	17:05	V		0.00328		B
912	H-SEEP	17/12/2013	10:00	V		0.0026		X
714	H-VC-DBC	16/04/2013	13:46	ADV		0.0611		B/E
709	H-VC-DBC	16/04/2013	13:45	SS		0.03		B/E
725	H-VC-DBC	07/05/2013	12:18	ADV	0.462	0.2095	1.815	
726	H-VC-DBC	07/05/2013	12:19	SS	0.426	0.15	1.815	
746	H-VC-DBC	16/05/2013	11:50	ADV	0.725	2.6119	2.085	
757	H-VC-DBC	22/05/2013	10:40	ADV	0.564	0.801	1.885	

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
771	H-VC-DBC	28/05/2013	14:05	ADV	0.79	2.0798	2.155	
790	H-VC-DBC	11/06/2013	11:10	ADV	0.528	0.5649	1.878	
809	H-VC-DBC	25/06/2013	10:30	ADV	0.432	0.2298	1.767	
828	H-VC-DBC	16/07/2013	11:00	ADV	0.381	0.1136	1.721	
837	H-VC-DBC	14/08/2013	09:53	ADV	0.455	0.3128	1.792	
873	H-VC-DBC	24/09/2013	10:50	ADV	0.568	0.7848	1.895	
864	H-VC-DBC	16/10/2013	11:56	ADV	0.478	0.3845	1.815	B
894	H-VC-DBC	13/11/2013	12:57	ADV		0.2371	2.554	B
895	H-VC-DBC	13/11/2013	12:58	SS		0.2004	2.554	B
909	H-VC-DBC	17/12/2013	15:00	SS		0.204		B/X
716	H-VC-R	15/04/2013	13:00	ADV		0.034		B/E
711	H-VC-R	15/04/2013	13:00	SS,		0.04		B/E
727	H-VC-R	06/05/2013	13:05	ADV	0.362	0.1218	1.928	
728	H-VC-R	06/05/2013	13:05	SS	0.362	0.1	1.928	
745	H-VC-R	15/05/2013	08:15	ADV	0.674	3.2075	2.314	
754	H-VC-R	21/05/2013	12:23	ADV	0.656	1.221	2.222	
775	H-VC-R	27/05/2013	12:53	ADV	0.71	3.5971	2.303	
793	H-VC-R	10/06/2013	13:23	ADV	0.55	0.7346	2.114	
813	H-VC-R	24/06/2013	12:02	ADV	0.488	0.2888	2.053	
831	H-VC-R	15/07/2013	12:23	ADV	0.457	0.1598	2.015	
848	H-VC-R	13/08/2013	11:45	ADV	0.5	0.3696	2.07	
878	H-VC-R	23/09/2013	12:30	ADV	0.575	0.949	2.136	
868	H-VC-R	15/10/2013	12:09	ADV	0.523	0.3786	2.091	B
896	H-VC-R	12/11/2013	12:54	ADV	0.586	0.2959	2.152	B
911	H-VC-R	16/12/2013	16:05	SS		0.253		B/X
707	H-VC-REF	16/04/2013	18:02	SS		0.08		B/E
744	H-VC-REF	16/05/2013	14:30	ADV	0.801	2.074	2.096	
755	H-VC-REF	22/05/2013	13:43	ADV	0.539	0.6792	1.848	

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
768	H-VC-REF	28/05/2013	16:33	ADV	0.87	2.0259	2.208	
787	H-VC-REF	11/06/2013	13:11	ADV	0.55	0.5403	1.846	
807	H-VC-REF	25/06/2013	12:01	ADV	0.395	0.186	1.696	
825	H-VC-REF	16/07/2013	12:43	ADV	0.351	0.1082	1.573	
834	H-VC-REF	14/08/2013	10:55	ADV	0.449	0.2789	1.758	
870	H-VC-REF	24/09/2013	12:50	ADV	0.604	0.7499	1.927	
862	H-VC-REF	16/10/2013	14:00	ADV	0.638	0.5297	1.94	B
893	H-VC-REF	13/11/2013	15:40	SS		0.3569		B
907	H-VC-REF	17/12/2013	18:00	SS		0.256208		B/X
713	H-VC-U	16/04/2013	15:59	ADV		0.0623		B/E
708	H-VC-U	16/04/2013	15:59	SS		0.02		B/E
724	H-VC-U	07/05/2013	14:12	ADV	0.145	0.1252	2.036	
743	H-VC-U	16/05/2013	12:33	ADV	0.448	2.136	2.329	
756	H-VC-U	22/05/2013	11:30	ADV	0.3	0.727	2.174	
769	H-VC-U	28/05/2013	14:51	ADV	0.495	2.7011	2.354	
788	H-VC-U	11/06/2013	11:43	ADV	0.238	0.4882	2.134	
808	H-VC-U	25/06/2013	11:11	ADV	0.169	0.208	2.066	
822	H-VC-U	16/07/2013	11:46	ADV	0.125	0.1145	2.028	
836	H-VC-U	14/08/2013	10:20	ADV	0.198	0.2783	2.086	
872	H-VC-U	24/09/2013	11:30	ADV	0.272	0.7413	2.172	
863	H-VC-U	16/10/2013	12:40	ADV	0.212	0.4047	2.117	B
891	H-VC-U	13/11/2013	14:30	SS		0.4991	2.116	B
908	H-VC-U	17/12/2013	17:01	SS		0.0637		B/X
715	H-VC-UMN	16/04/2013	10:44	ADV		0.0585		B/E
710	H-VC-UMN	16/04/2013	10:44	SS		0.12		B/E
723	H-VC-UMN	07/05/2013	10:11	ADV		0.162		
738	H-VC-UMN	16/05/2013	10:06	ADV	0.885	2.0619	1.877	
737	H-VC-UMN	16/05/2013	10:06	SS	0.885	1.97	1.877	

Mid	Measurement			Meas. Type	Staff Gauge (m, ± 2 mm)	Discharge (m^3/s)	Water Surface Elev. (m L.D., ± 5 mm)	Data Flag
	HID	Date (DD/MM/YYYY)	Time (HH:MM)					
753	H-VC-UMN	22/05/2013	09:15	ADV	0.685	0.4475	1.615	
772	H-VC-UMN	28/05/2013	10:45	ADV	0.965	3.2834	1.931	
791	H-VC-UMN	11/06/2013	09:56	ADV	0.711	0.6618	1.692	
811	H-VC-UMN	25/06/2013	08:31	ADV	0.634	0.2467	1.602	
819	H-VC-UMN	16/07/2013	09:11	ADV	0.594	0.1255	1.572	
838	H-VC-UMN	14/08/2013	08:26	ADV	0.65	0.3212	1.631	
874	H-VC-UMN	24/09/2013	10:07	ADV	0.745	0.7825	1.72	
866	H-VC-UMN	16/10/2013	10:20	ADV	0.658	0.5376	1.651	B
903	H-VC-UMN	13/11/2013	10:28	SS		0.7879		B
910	H-VC-UMN	17/12/2013	13:30	SS		0.252		B/X

Notes:
MID = Measurement ID , unique measurement identifier in the hydrometric database.
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 to December 31, 2013.

Station	Date	Time	BM 1 (m L.D.)	BM 2 (m L.D.)	BM 3 (m L.D.)	LoggerRod* (m L.D.)	TOS (m L.D.)	Water Surface (m L.D.)
H-BC	16/05/2013	13:50	3	3.002	3.036	2.879	2.644	2.082
H-BC	22/05/2013	13:05	3	3.002	3.037	2.88	2.644	1.924
H-BC	28/05/2013	16:00	3	3.004	3.037	2.881	2.645	2.009
H-BC	11/06/2013	13:03	3	2.947	3.038	2.879	2.644	1.925
H-BC	25/06/2013	12:00	3	3.015	3.05	2.886	2.651	1.849
H-BC	16/07/2013	13:10	3	3.012	3.063	2.898	2.663	1.833
H-BC	14/08/2013	10:55	3	3.005	3.059	2.9	2.665	1.86
H-BC	24/09/2013	12:40	3	3.005	3.055	2.9	2.666	1.93
H-BC	16/10/2013	13:51	3	3.003	3.057	2.899	2.665	2.093
H-DC-B	27/05/2013	17:45	3	3.358	2.996	2.526	2.349	1.577
H-DC-B	10/06/2013	16:41	3	3.357	2.996	2.525	1.773	1.52
H-DC-B	24/06/2013	14:40	3	3.356	2.994	2.934	2.344	1.46
H-DC-B	15/07/2013	15:30				2.934		1.432
H-DC-B	15/07/2013	15:38	3	3.357	2.995		2.351	
H-DC-B	13/08/2013	15:00	3	3.355	2.994	2.853	2.346	1.441
H-DC-B	23/09/2013	15:42	3		2.943	2.857	2.344	1.503
H-DC-B	15/10/2013	15:30	3	3.355	2.994	2.855	2.344	1.518
H-DC-M	06/05/2013	16:10	6	4.625			4.925	3.262
H-DC-M	15/05/2013	10:18	3	2.314			2.462	1.762
H-DC-M	21/05/2013	14:20	3	2.313	2.714	2.688	2.463	1.707
H-DC-M	10/06/2013	16:00	3	2.311	2.712	2.686	2.46	1.667
H-DC-M	24/06/2013	14:13	3	2.312	2.712	2.678	2.454	1.62
H-DC-M	15/07/2013	14:30	3	2.325	2.722	2.689	2.462	1.628
H-DC-M	13/08/2013	14:06	3	2.34	2.731	2.721	2.49	1.638
H-DC-M	23/09/2013	14:40	3	2.338	2.725	2.726	2.495	1.67
H-DC-M	15/10/2013	14:35	3	2.342	2.721	2.727	2.494	1.651
H-DC-M	12/11/2013	15:47	3	2.345	2.724	2.727	2.495	1.627

Station	Date	Time	BM 1 (m L.D.)	BM 2 (m L.D.)	BM 3 (m L.D.)	LoggerRod* (m L.D.)	TOS (m L.D.)	Water Surface (m L.D.)
H-DC-R	10/06/2013	14:55	3	2.936	2.323	1.693	1.296	0.696
H-DC-R	24/06/2013	13:26	3	2.939	2.322	2.061	1.284	0.44
H-DC-R	15/07/2013	13:27	3	2.948	2.317	1.675	1.28	0.364
H-DC-R	13/08/2013	13:21	3	2.965	2.323	1.697	1.299	0.401
H-DC-R	23/09/2013	13:45	3	2.95	2.308	1.691	1.294	0.571
H-DC-R	15/10/2013	13:25	3	2.959	2.305	1.693	1.297	0.582
H-MN	22/05/2013	09:15	3	2.322	2.726		1.548	1.474
H-MN	28/05/2013	09:30	3	2.331	2.725	2.088	1.546	1.061
H-MN	11/06/2013	10:05	3	2.332	2.717	2.064	1.55	1.087
H-MN	25/06/2013	08:30	3	2.328	2.711	2.068	1.548	0.965
H-MN	16/07/2013	08:55	3	2.309	2.708	2.069	1.548	0.938
H-MN	14/08/2013	08:10	3	2.308	2.705	1.875	1.555	0.985
H-MN	24/09/2013	08:32	3	2.303	2.704	2.082	1.55	1.098
H-MN	16/10/2013	09:27	3	2.297	2.702	2.088	1.569	1.009
H-PC-DSP	15/05/2013	12:41	3	3.216	3.686	3.449	3.2	2.524
H-PC-DSP	21/05/2013	16:06	3	3.247	3.686	3.448	3.2	2.472
H-PC-DSP	28/05/2013	19:02	3	3.217	3.675	3.451	3.202	2.499
H-PC-DSP	12/06/2013	10:06	3	3.216	3.643	3.436	3.186	2.405
H-PC-DSP	24/06/2013	17:56	3	3.218	3.65	3.43	3.18	2.351
H-PC-DSP	16/07/2013	17:00	3	3.216	3.651	2.316	3.181	3.432
H-PC-DSP	13/08/2013	16:45	3	3.214	3.649	3.429	3.181	2.329
H-PC-DSP	23/09/2013	15:52	3	3.215	3.655	3.429	3.182	2.435
H-PC-DSP	15/10/2013	17:15	3	3.212	3.651	3.428	3.179	2.422
H-PC-U	21/05/2013	17:00	3	3.56	3.86	3.477		2.465
H-PC-U	21/05/2013	17:30	3	3.559	3.86	3.421		2.471
H-PC-U	27/05/2013	18:26	3	3.565	3.866	3.428	3.188	2.526
H-PC-U	12/06/2013	11:05	3	3.56	3.91	3.479	3.239	2.477
H-PC-U	24/06/2013	18:30	3	3.574	3.923	3.499	3.257	2.988
H-PC-U	15/07/2013	18:50	3	3.577	3.926	2.331	3.244	2.396

Station	Date	Time	BM 1 (m L.D.)	BM 2 (m L.D.)	BM 3 (m L.D.)	LoggerRod* (m L.D.)	TOS (m L.D.)	Water Surface (m L.D.)
H-PC-U	13/08/2013	17:30	3	3.577	3.929	3.483	3.242	2.449
H-PC-U	23/09/2013	17:21	3	3.58	3.927	3.478	3.237	2.51
H-PC-U	15/10/2013	18:30	3	4.401	3.924	3.469	3.23	2.529
H-VC-DBC	16/04/2013	14:00	3.001	3.027	2.919		2.352	
H-VC-DBC	07/05/2013	13:10	6	6.054	5.836		4.701	3.626
H-VC-DBC	22/05/2013	11:00	3	3.027	2.917	2.561	2.343	1.885
H-VC-DBC	28/05/2013	14:05	3	3.027	2.911	2.855	2.335	2.146
H-VC-DBC	11/06/2013	11:13	3	3.027	2.916	2.556	2.338	1.878
H-VC-DBC	25/06/2013	10:35	3	3.026	2.912	2.557	2.337	1.767
H-VC-DBC	16/07/2013	11:15	3	3.026	2.912	2.557	2.338	1.721
H-VC-DBC	14/08/2013	09:53	3	3.025	2.908	2.555	2.338	1.792
H-VC-DBC	24/09/2013	11:15	3	3.027	2.903	2.559	2.341	1.894
H-VC-DBC	16/10/2013	12:00	3	3.024	2.906	2.554	2.336	1.815
H-VC-DBC	13/11/2013	13:29	3	3.025	2.909	2.557	2.34	2.554
H-VC-R	15/04/2013	12:00	3	3.422	3.168		2.56	
H-VC-R	06/05/2013	14:20	6	6.853	6.342		5.122	3.861
H-VC-R	15/05/2013	14:30	3	3.422	3.169		2.624	2.314
H-VC-R	16/05/2013	11:50	3	3.027	2.918		2.345	2.085
H-VC-R	21/05/2013	12:53	3	3.422	3.168		2.625	2.222
H-VC-R	21/05/2013	13:20	3			2.779	2.559	2.221
H-VC-R	27/05/2013	13:00	3	3.423	3.171	2.785	2.565	2.303
H-VC-R	10/06/2013	13:20	3	3.423	3.17	2.79	2.568	2.114
H-VC-R	24/06/2013	12:40	3	3.424	3.169	2.79	2.568	2.053
H-VC-R	15/07/2013	12:23	3	3.425	3.17	2.791	2.568	2.015
H-VC-R	13/08/2013	12:30	3	3.425	3.17	2.791	2.57	2.07
H-VC-R	23/09/2013	12:30	3	3.415	3.168	2.789	2.518	2.136
H-VC-R	15/10/2013	12:18	3	3.423	3.17	2.791	2.569	2.091
H-VC-R	12/11/2013	13:06	3	3.42	3.166	2.805	2.565	2.152
H-VC-REF	16/05/2013	14:30	3	2.968	3.047	2.504	2.31	2.096

Station	Date	Time	BM 1 (m L.D.)	BM 2 (m L.D.)	BM 3 (m L.D.)	LoggerRod* (m L.D.)	TOS (m L.D.)	Water Surface (m L.D.)
H-VC-REF	22/05/2013	13:30	3	2.967	3.046	2.502		1.848
H-VC-REF	28/05/2013	16:50	3	2.967	3.048	2.535	2.303	2.208
H-VC-REF	11/06/2013	13:25	3	2.966	3.043	1.829	2.303	2.258
H-VC-REF	25/06/2013	12:40	3	2.964	3.041	2.573	2.302	1.696
H-VC-REF	16/07/2013	13:29	3	2.973	3.045	1.664	2.307	1.573
H-VC-REF	14/08/2013	11:40	3	2.983	3.044	2.624	1.322	1.758
H-VC-REF	24/09/2013	13:17	3	2.988	3.039	2.636	2.33	1.927
H-VC-REF	16/10/2013	14:00	3	2.994	3.036	2.637	2.332	1.94
H-VC-U	16/04/2013	17:00	3	3.362	3.244		2.888	
H-VC-U	07/05/2013	15:05	3	3.364	3.245		2.887	2.036
H-VC-U	07/05/2013	15:06	3	3.363	3.243		2.888	2.036
H-VC-U	16/05/2013	12:33	3	3.363	3.244		2.889	2.329
H-VC-U	22/05/2013	12:20	3	3.362	3.244	3.135	2.889	2.174
H-VC-U	28/05/2013	15:28	3	3.363	3.24	3.134	2.889	2.304
H-VC-U	11/06/2013	12:41	3	3.16	3.243	3.137	2.892	2.134
H-VC-U	25/06/2013	11:20	3	3.361	3.247	3.144	2.897	2.066
H-VC-U	16/07/2013	12:20	3	3.363	3.248	3.146	2.9	2.028
H-VC-U	14/08/2013	10:27	3	3.36	3.243	3.145	2.899	2.086
H-VC-U	24/09/2013	11:35	3	3.357	3.243	3.143	2.897	2.172
H-VC-U	16/10/2013	13:00	3	3.359	3.242	3.143	2.897	2.117
H-VC-U	13/11/2013	14:45	3	3.357	3.241	3.147	2.901	2.116
H-VC-UMN	16/05/2013	10:06	3	3.007	2.678	2.199	1.983	1.877
H-VC-UMN	21/05/2013	09:51	3	3.006	2.679	2.198	1.99	1.615
H-VC-UMN	28/05/2013	11:45	3	3.006	2.677	2.201	1.986	1.931
H-VC-UMN	11/06/2013	10:30	3	3.007	2.678	2.203	1.983	1.692
H-VC-UMN	25/06/2013	09:18	3	3.007	2.678	2.203	1.984	1.602
H-VC-UMN	16/07/2013	09:48	3	3.008	2.677	1.203	1.986	1.572
H-VC-UMN	14/08/2013	08:30	3	3.005	2.676	2.209	1.989	1.631
H-VC-UMN	24/09/2013	10:07	3	2.999	2.642	2.203	2.035	1.72

Station	Date	Time	BM 1 (m L.D.)	BM 2 (m L.D.)	BM 3 (m L.D.)	LoggerRod* (m L.D.)	TOS (m L.D.)	Water Surface (m L.D.)
H-VC-UMN	16/10/2013	10:16	3	3.003	2.676	2.206	1.99	1.651

Notes:
L.D. = Local datum.
TOS = Top of Staff Guage
LoggerRod = Top of fixed-length data logger installation rod.
**Zero flow elevation estimates obtained from the 2012/13 surface water and meteorological monitoring report.

Table D-5. Seepage Pond discharge volumetric measurements, April 1 to December 31, 2013.

	Measurement Date			Discharge	
HID	Date	Time	Method	m^3/s	L/s
H-SEEP	17/04/2013	12:04	V	0.003	3
H-SEEP	08/05/2013	09:47	V	0.003	3
H-SEEP	15/05/2013	11:00	V	0.003	3
H-SEEP	11/06/2013	16:53	V	0.002	2
H-SEEP	25/06/2013	15:07	V	0.003	3
H-SEEP	16/07/2013	15:55	V	0.003	3
H-SEEP	13/08/2013	13:05	V	0.003	3
H-SEEP	24/09/2013	15:55	V	0.004	4
H-SEEP	16/10/2013	18:58	V	0.005	5
H-SEEP	13/11/2013	17:05	V	0.003	3
H-SEEP	17/12/2013	10:00	V	0.003	3

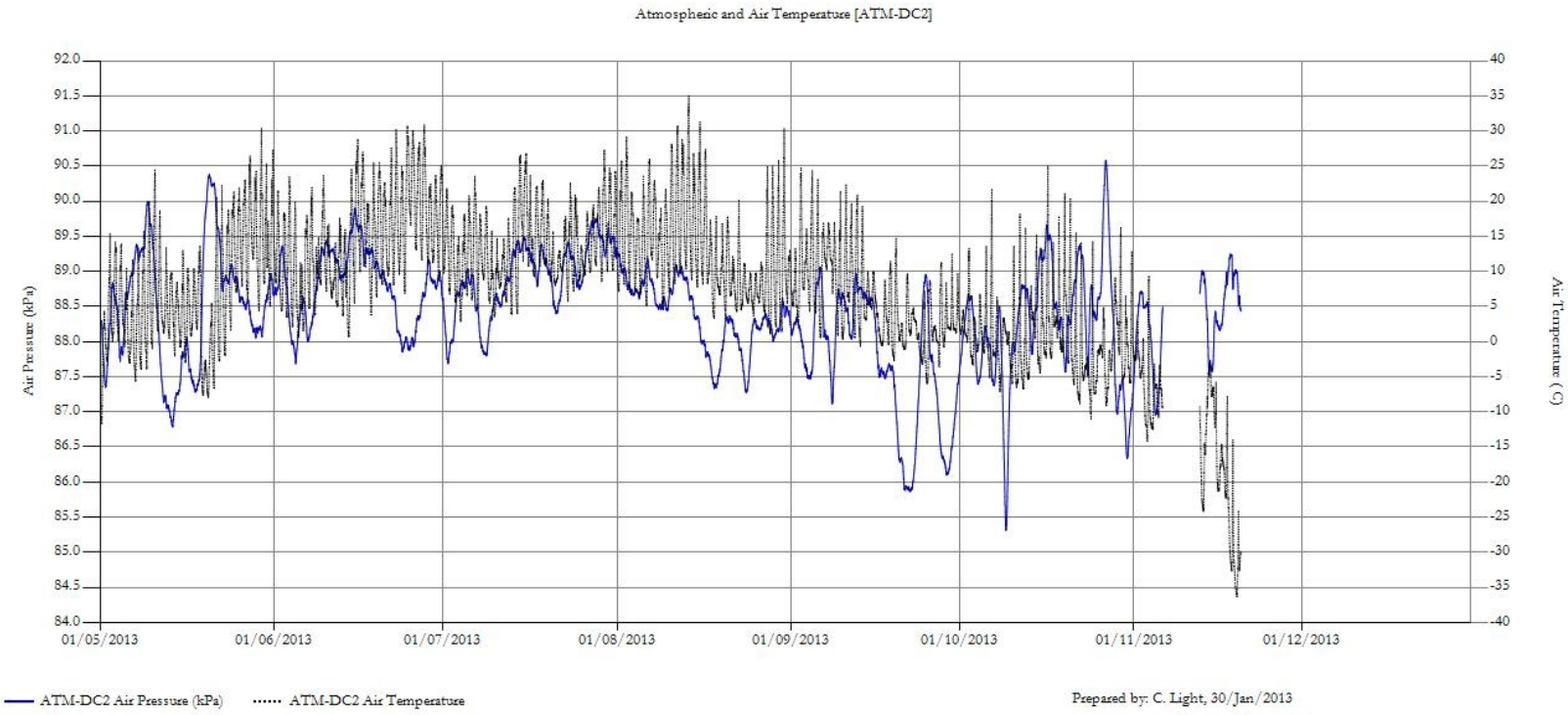

Figure D-1 ATM-DC2 atmospheric pressure and air temperature.

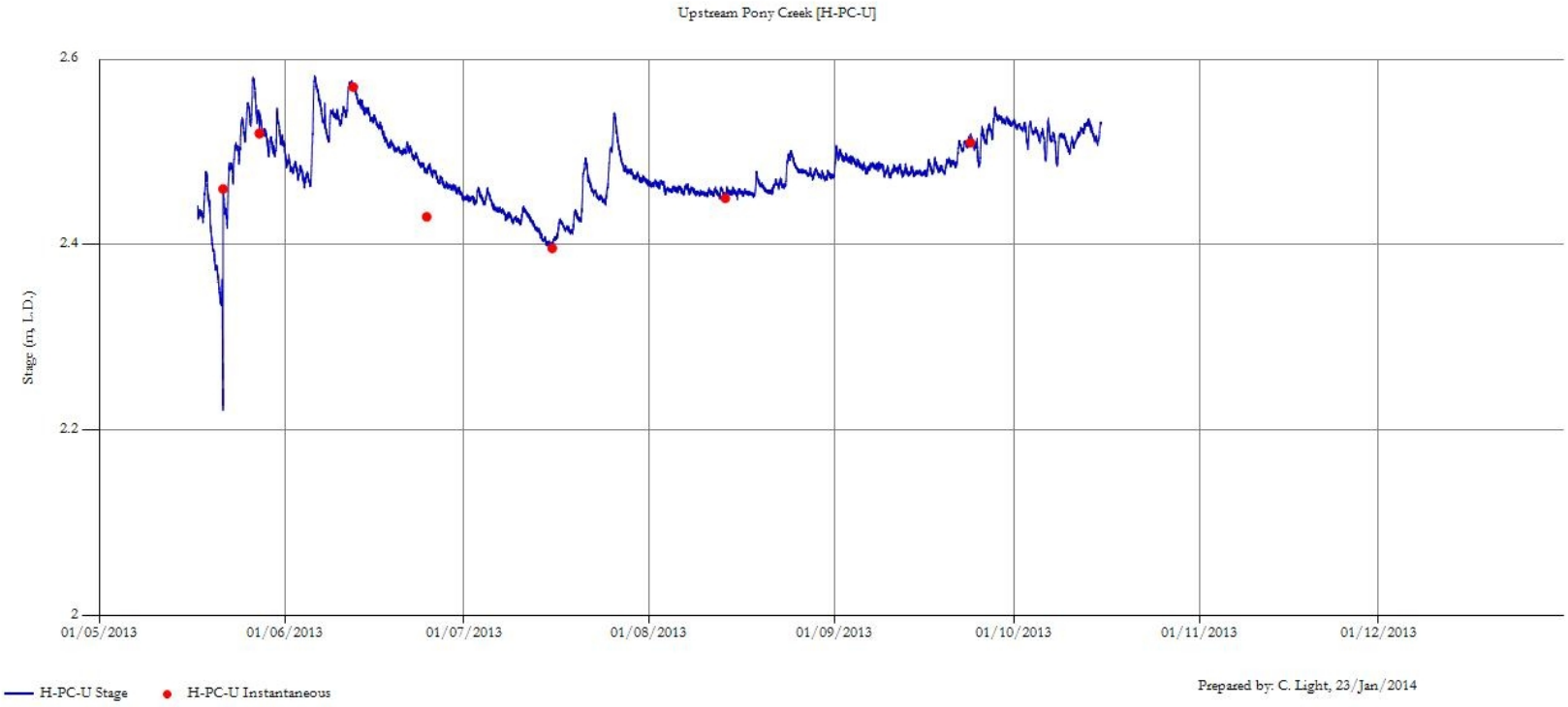

Figure D-2 H-PC-U Stage.

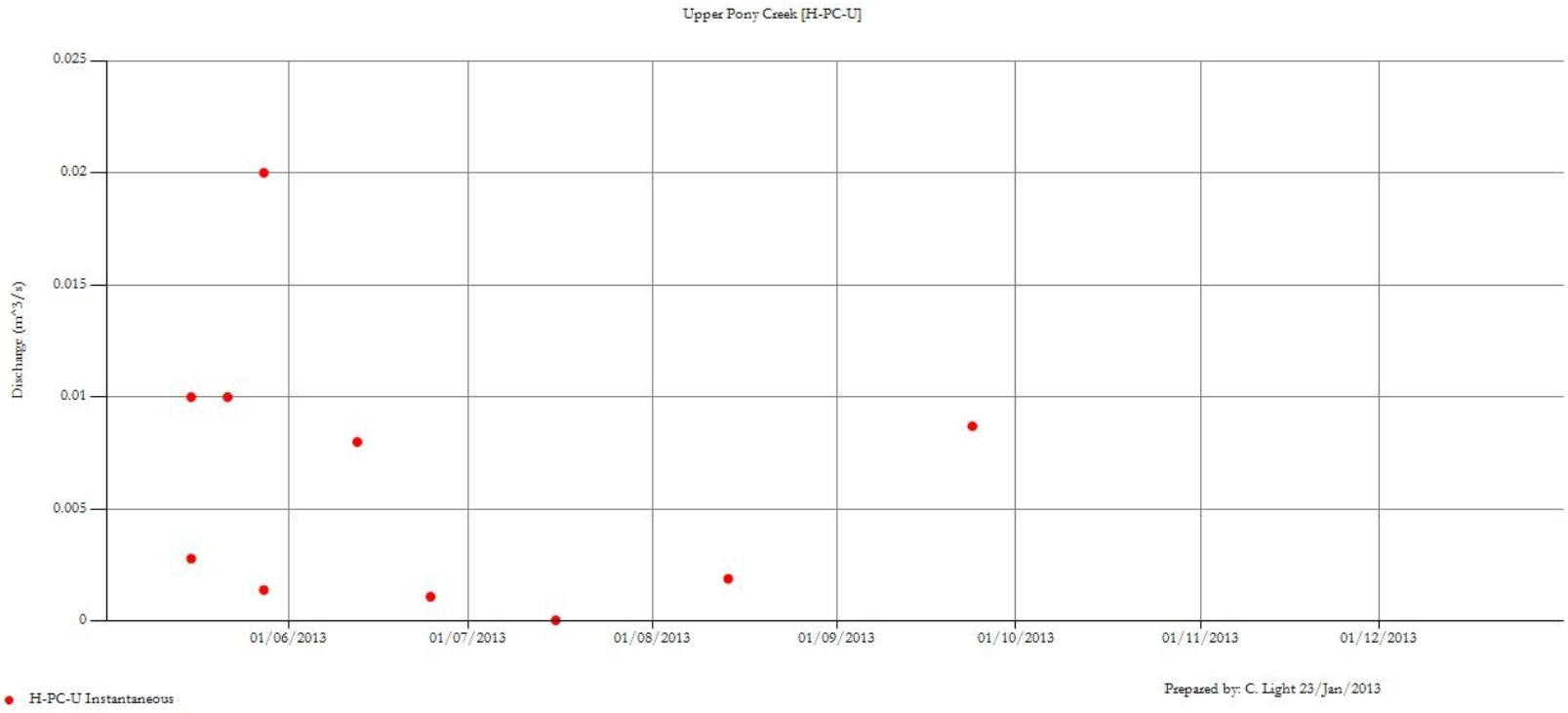

Figure D-3 H-PC-U Instantaneous Discharge.

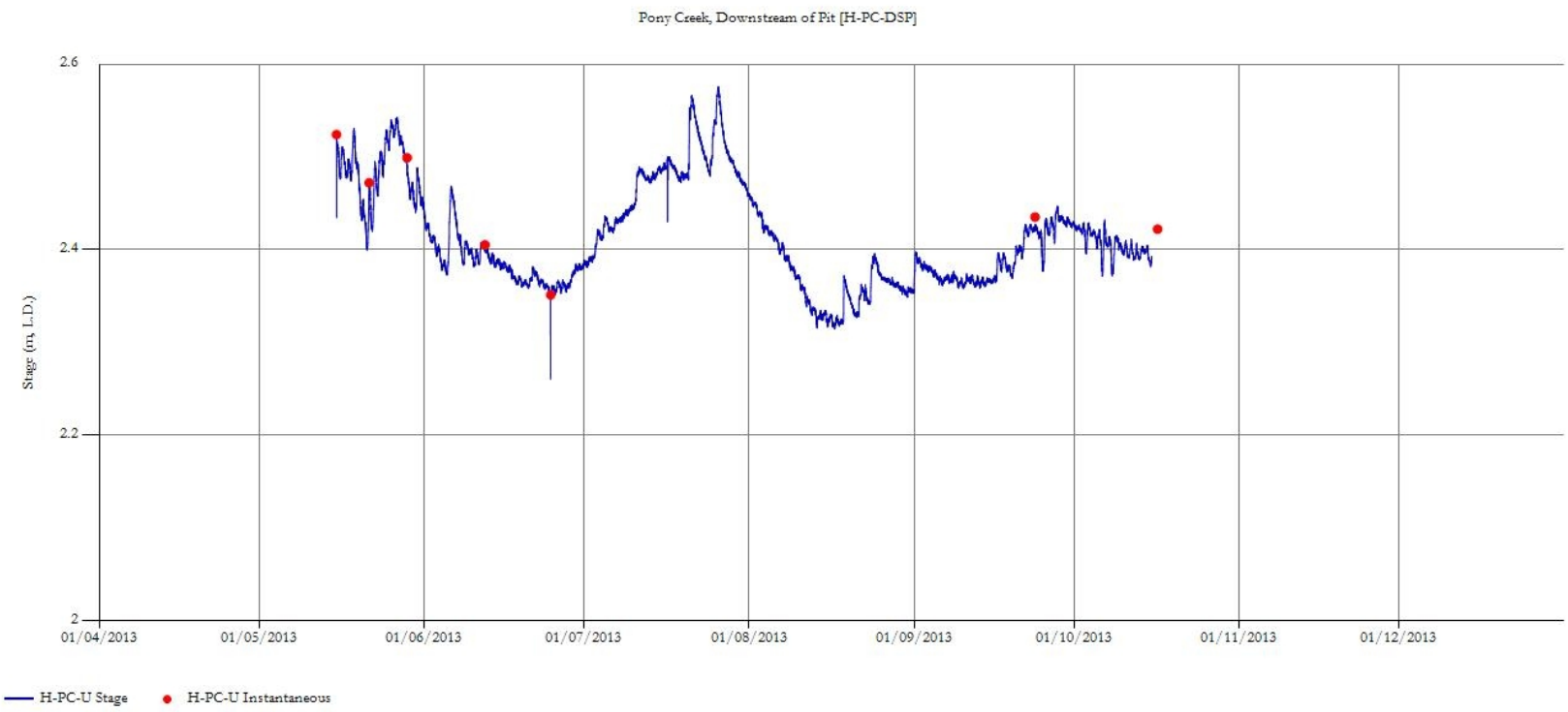

Figure D-4 H-PC-DSP Stage.

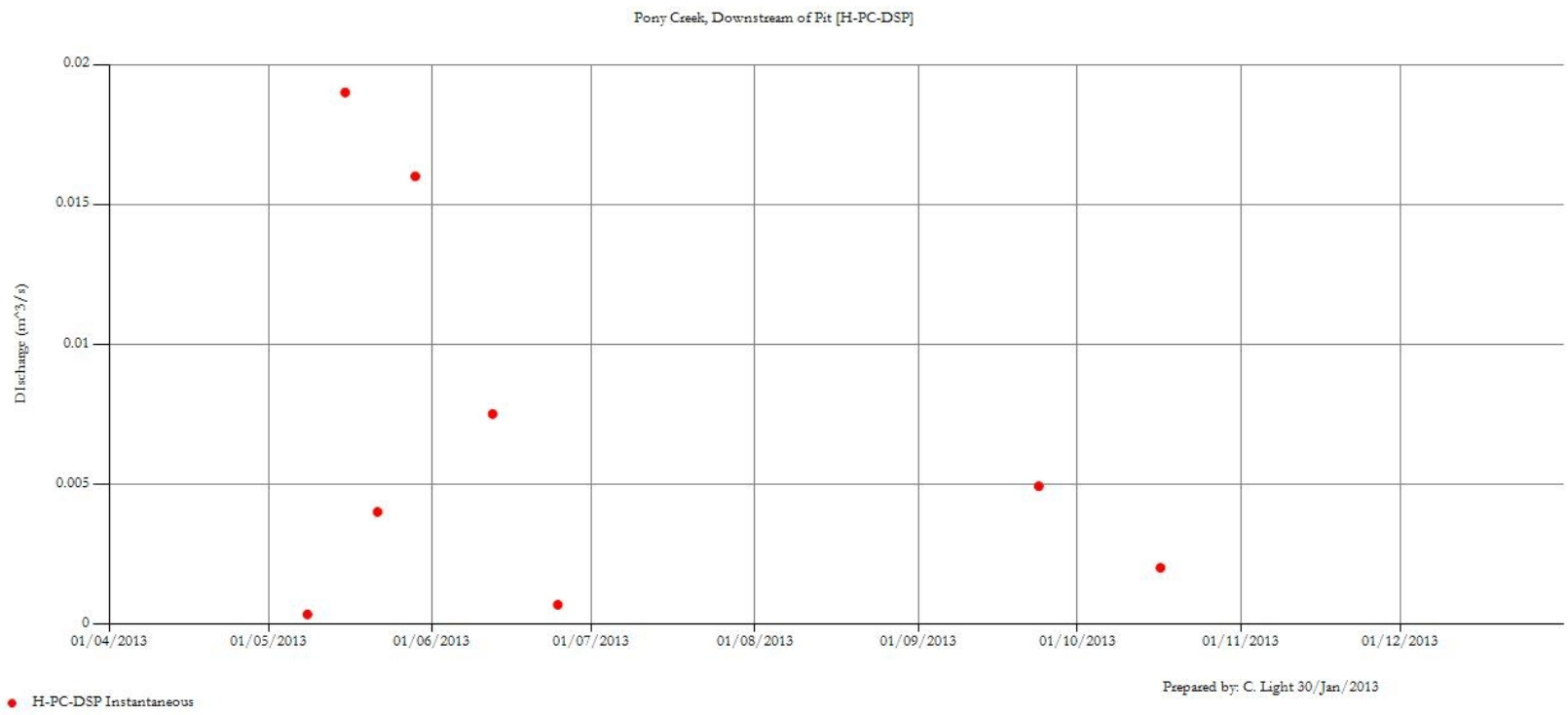

Figure D-5 H-PC-DSP Instantaneous Discharge.

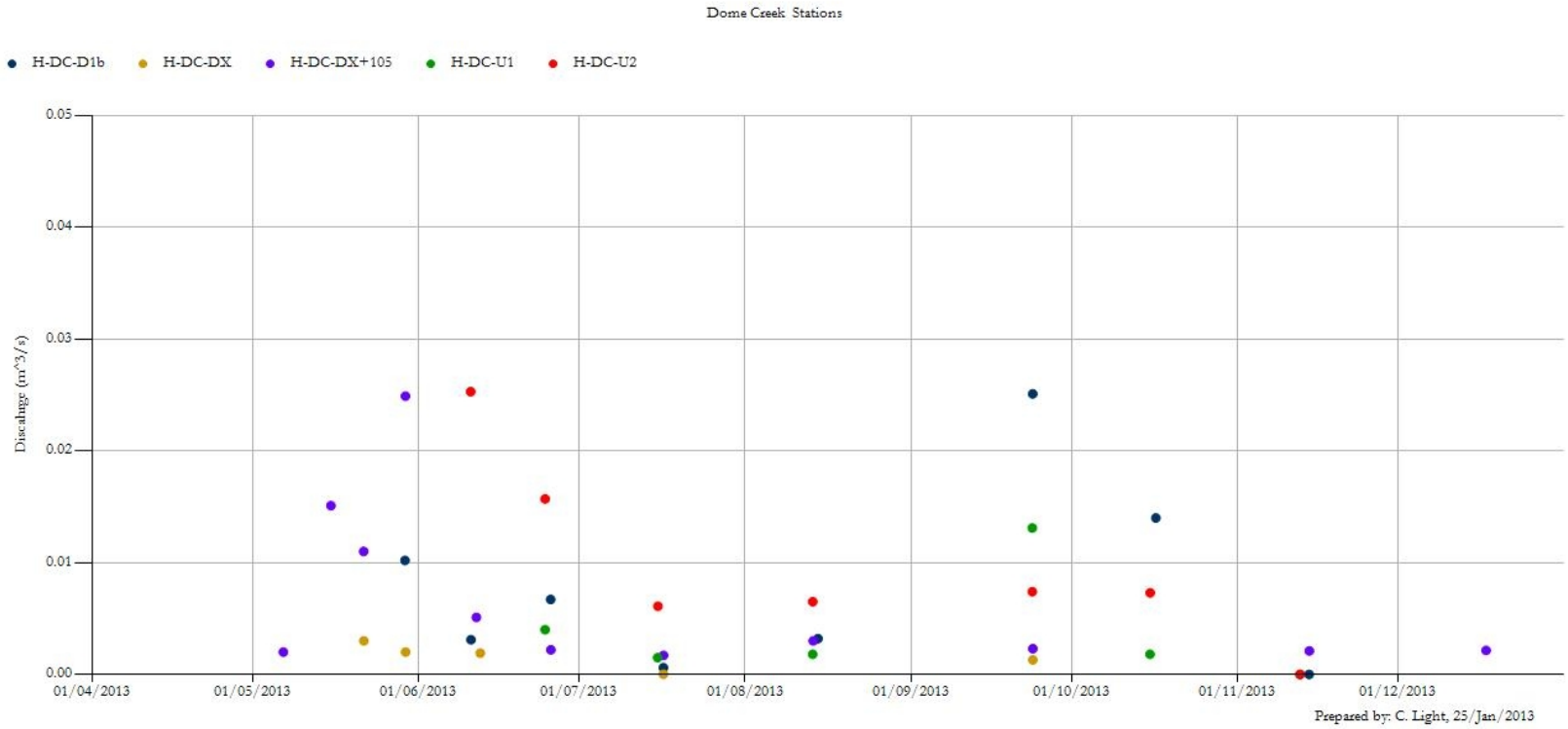

Figure D-6 Upper Dome Creek Instantaneous Discharge.

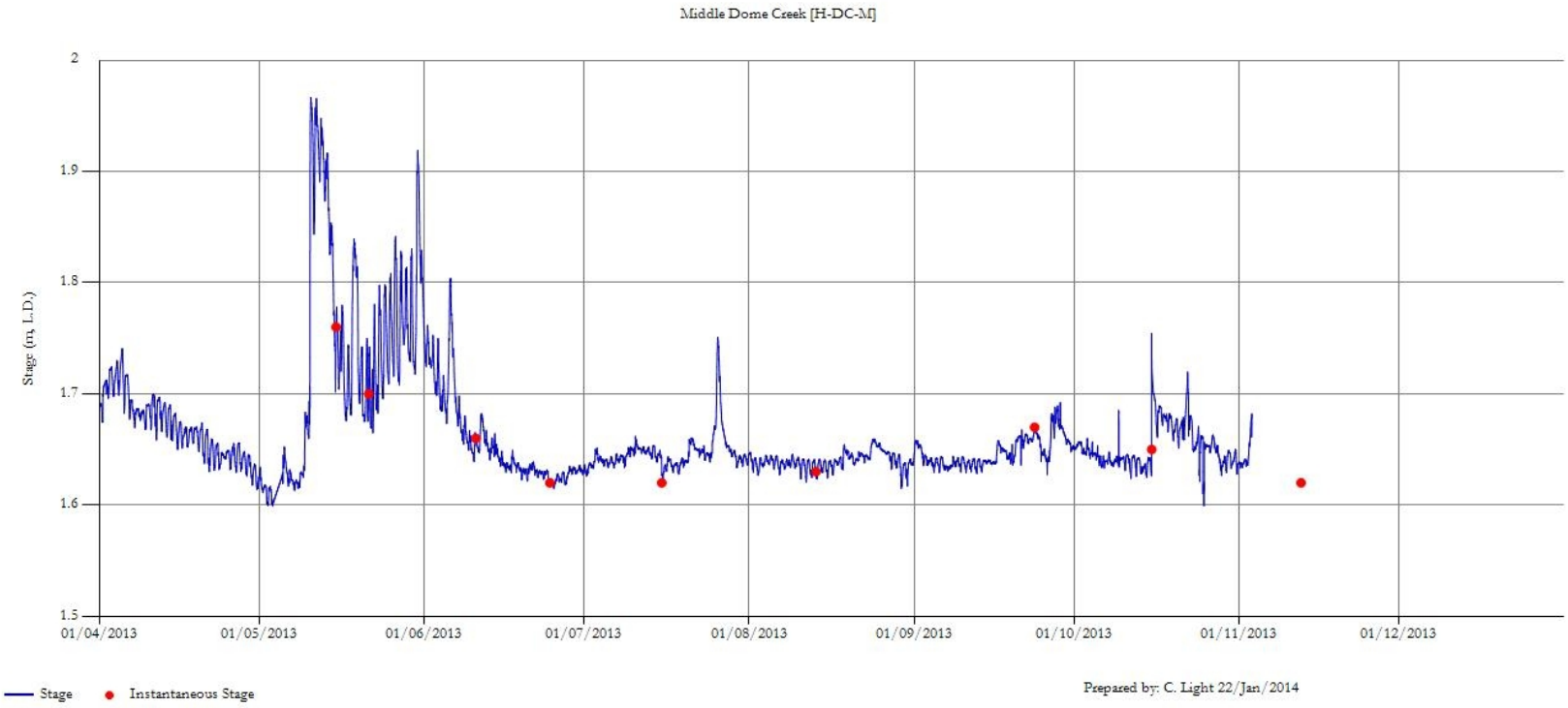

Figure D-7 H-DC-M Stage.

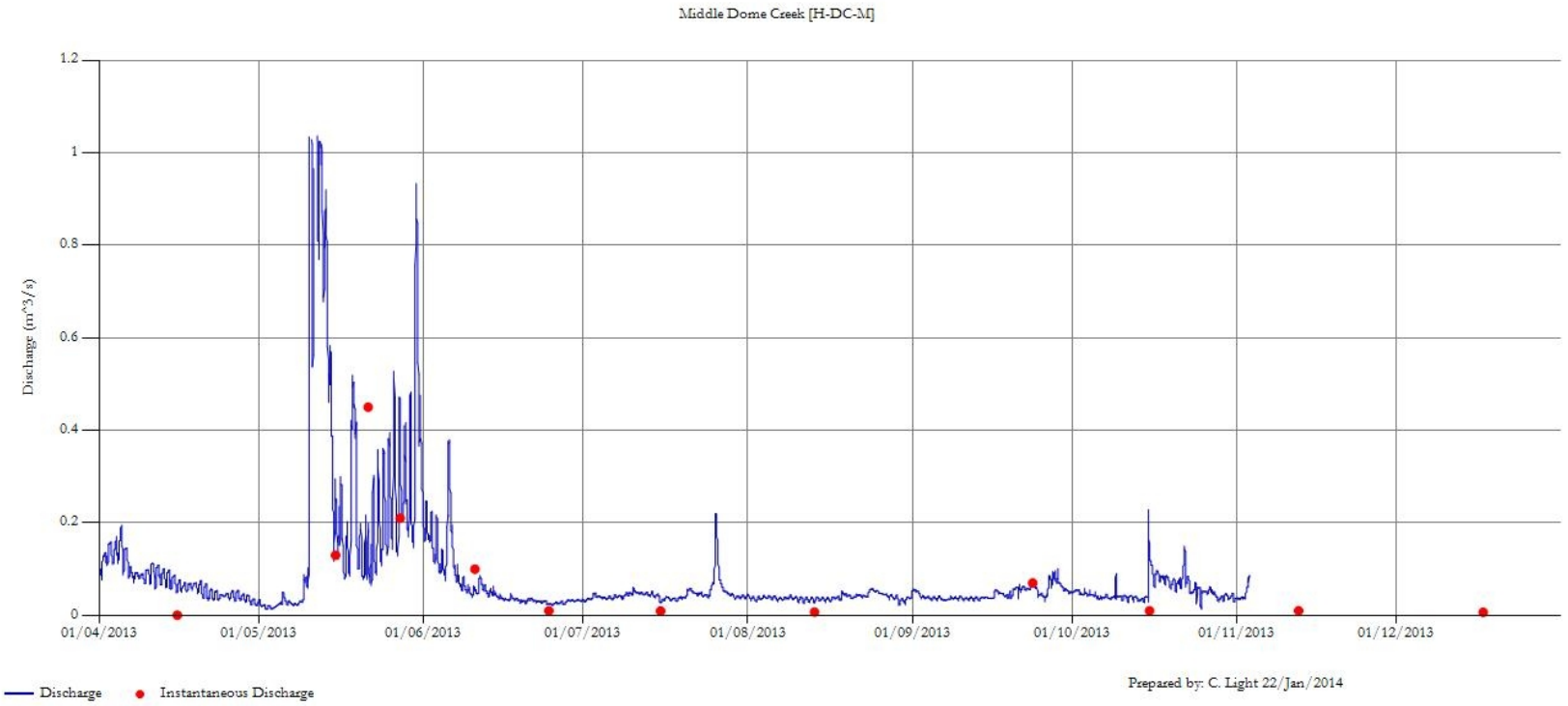

Figure D-8 H-DC-M Hydrograph.

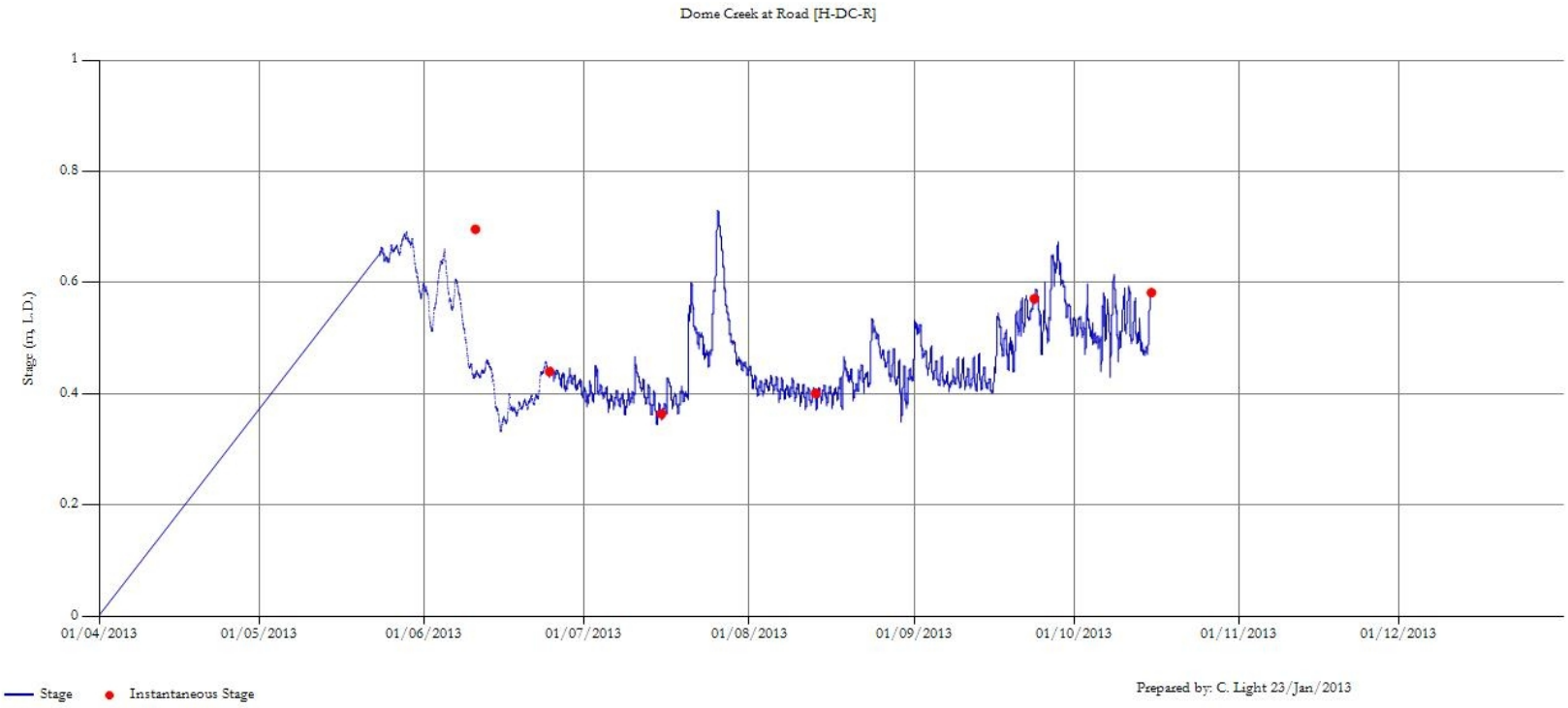

Figure D-9 H-DC-R Stage (note stage record started in May 2013, when continuous logger was installed).

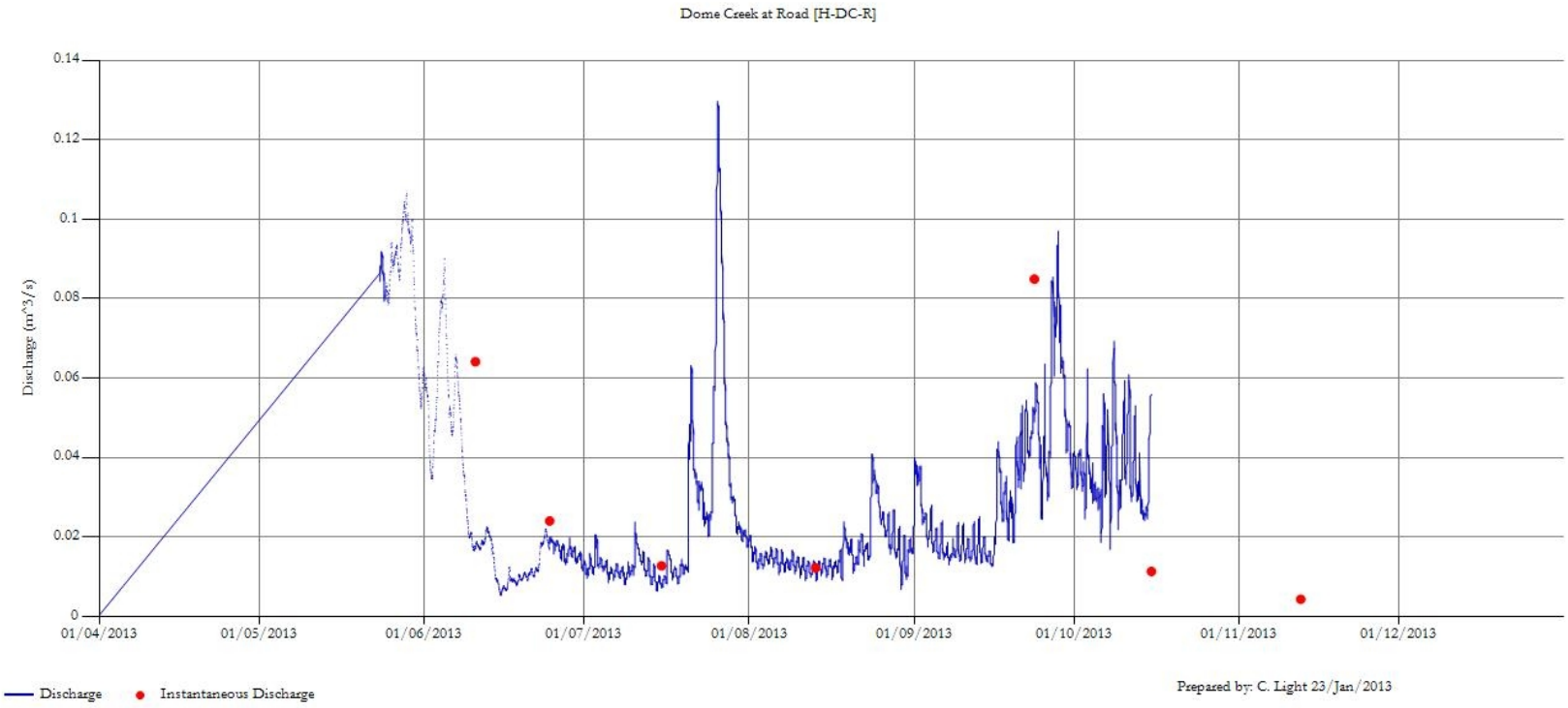

Figure D-10 H-DC-R Hydrograph (note stage record started in May 2013, when continuous logger was installed).

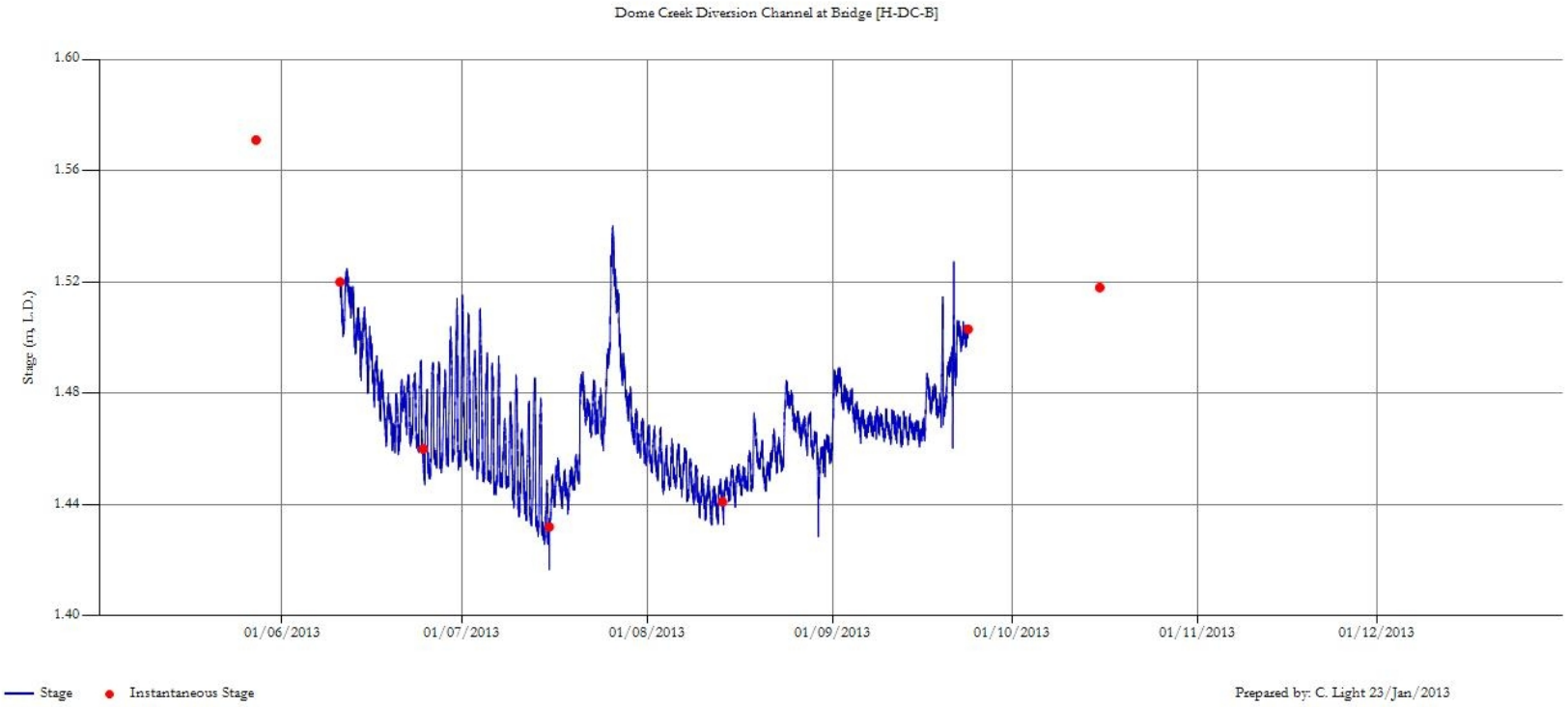

Figure D-11 H-DC-B Stage.

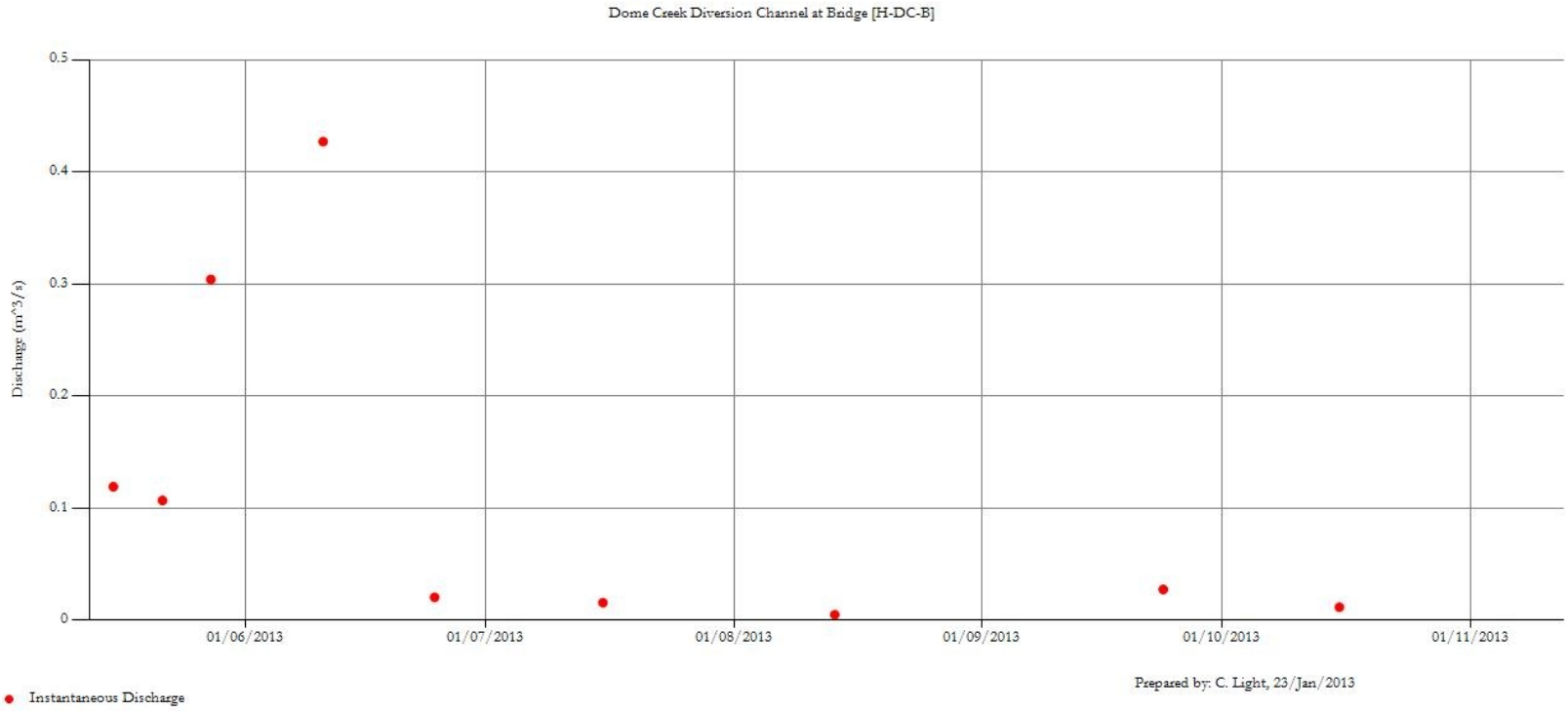

Figure D-12 H-DC-B Instantaneous Discharge.

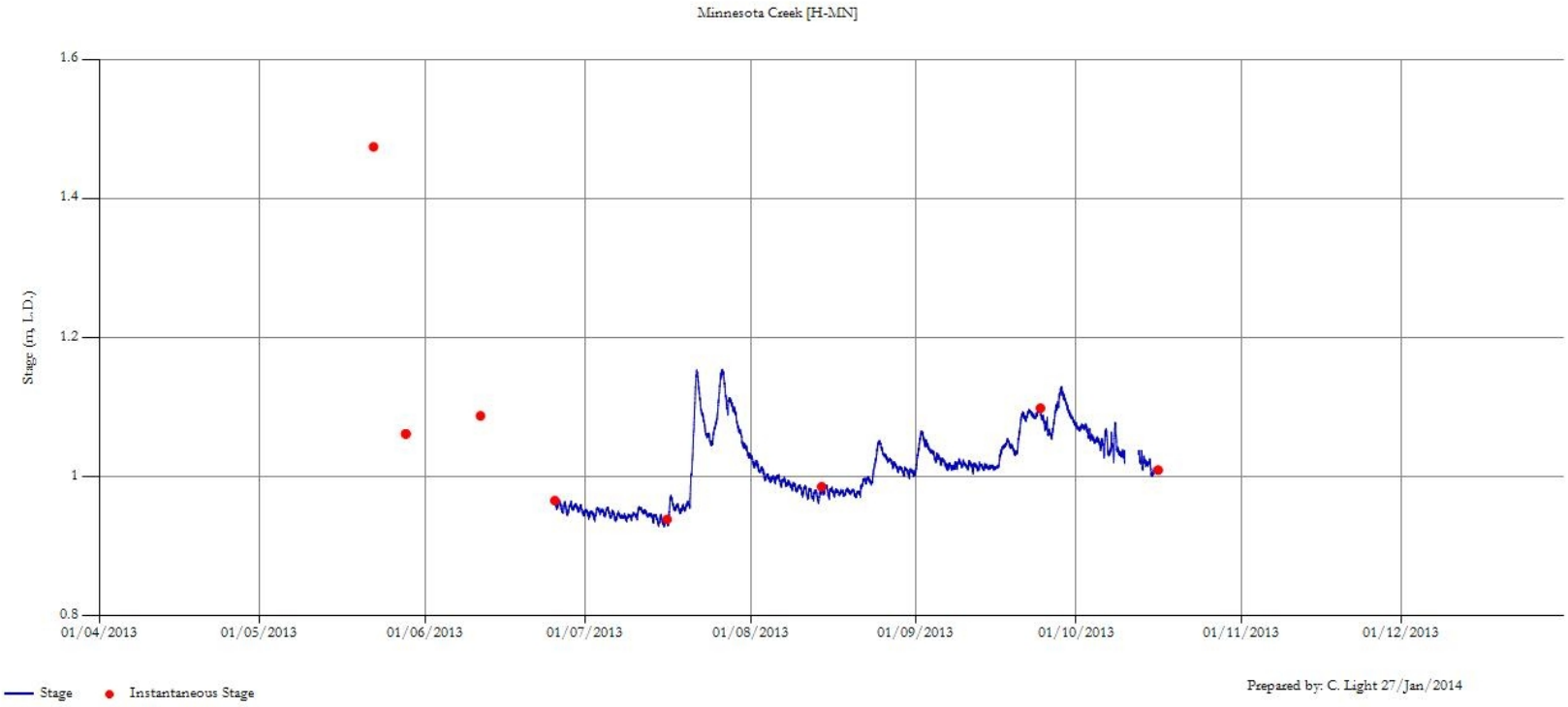

Figure D-13 H-MN Stage.

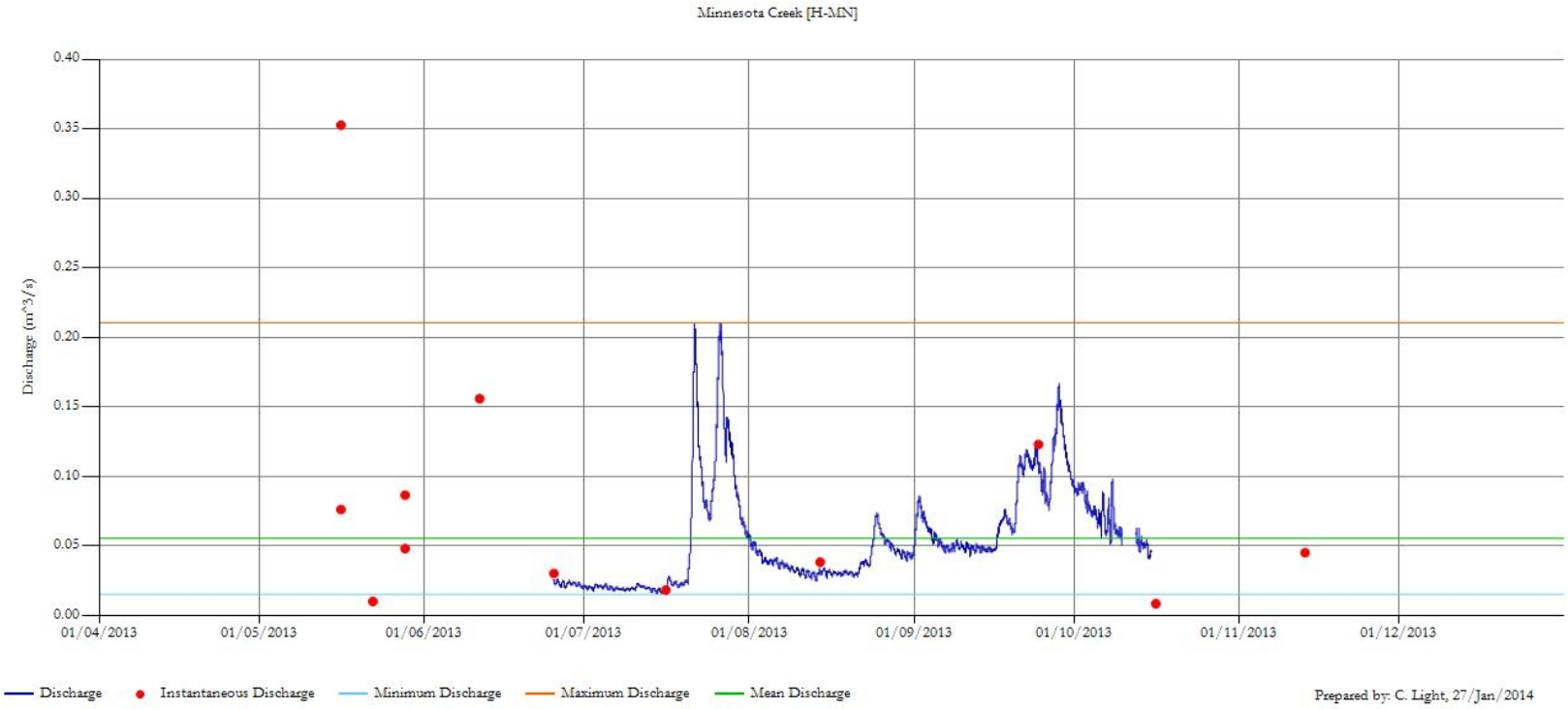

Figure D-14 H-MN Hydrograph.

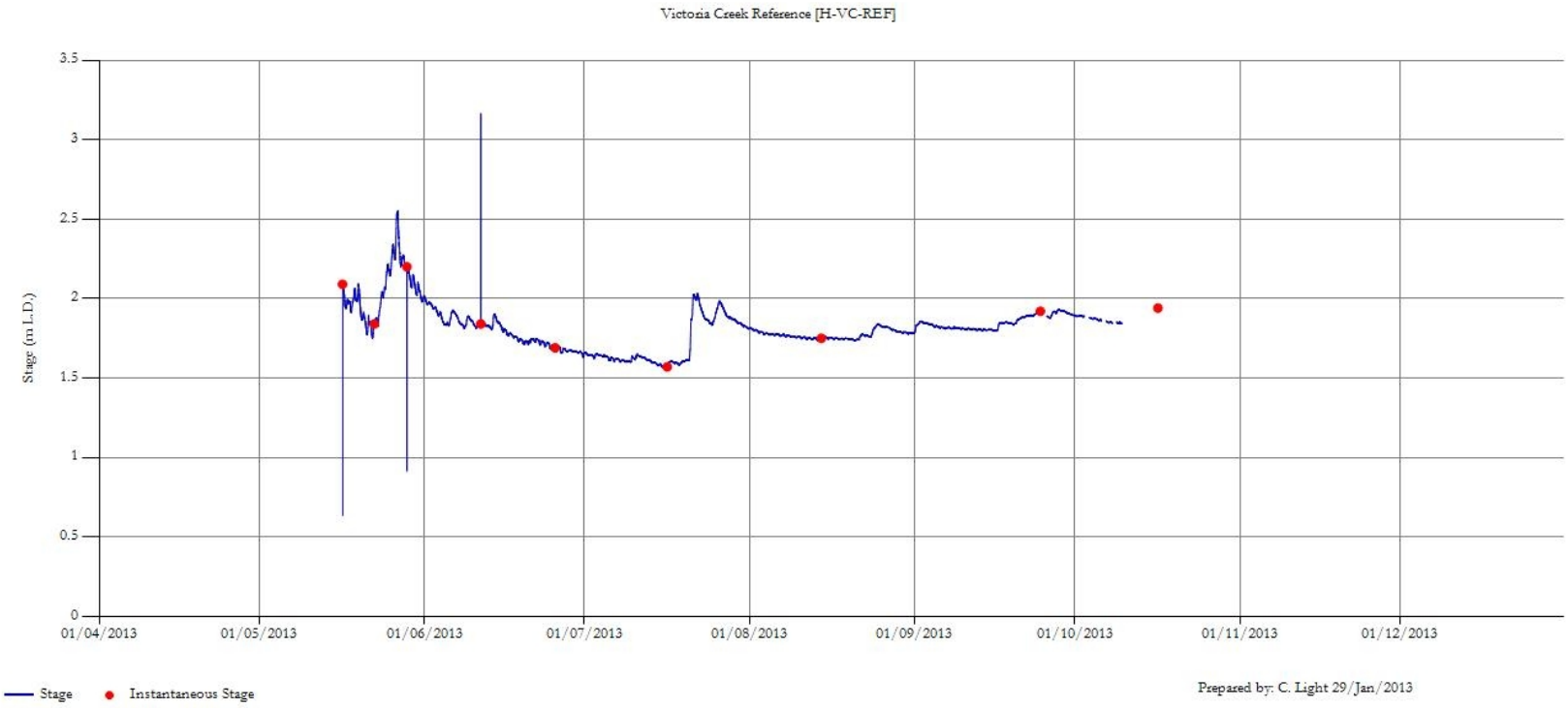

Figure D-15 H-VC-REF Stage

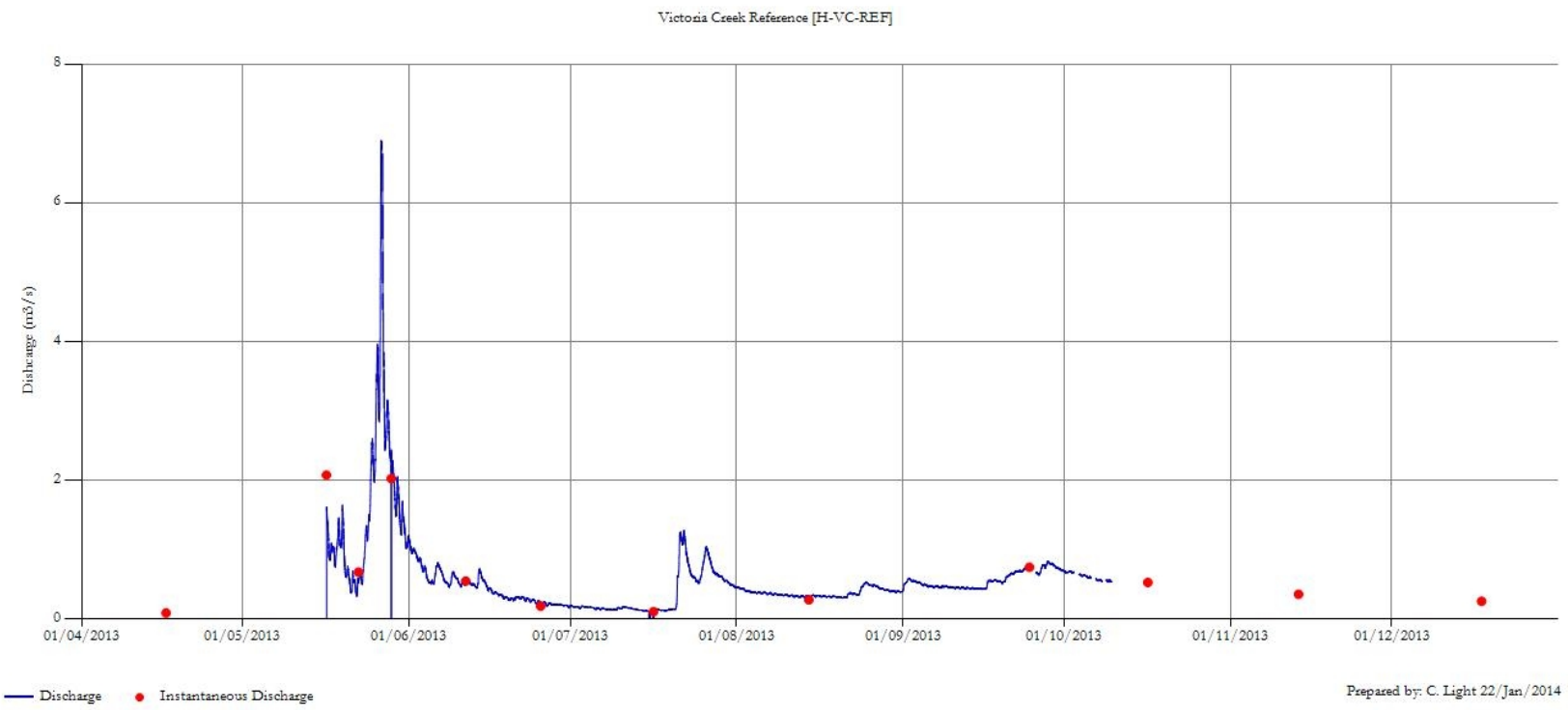

Figure D-16 H-VC-REF Hydrograph.

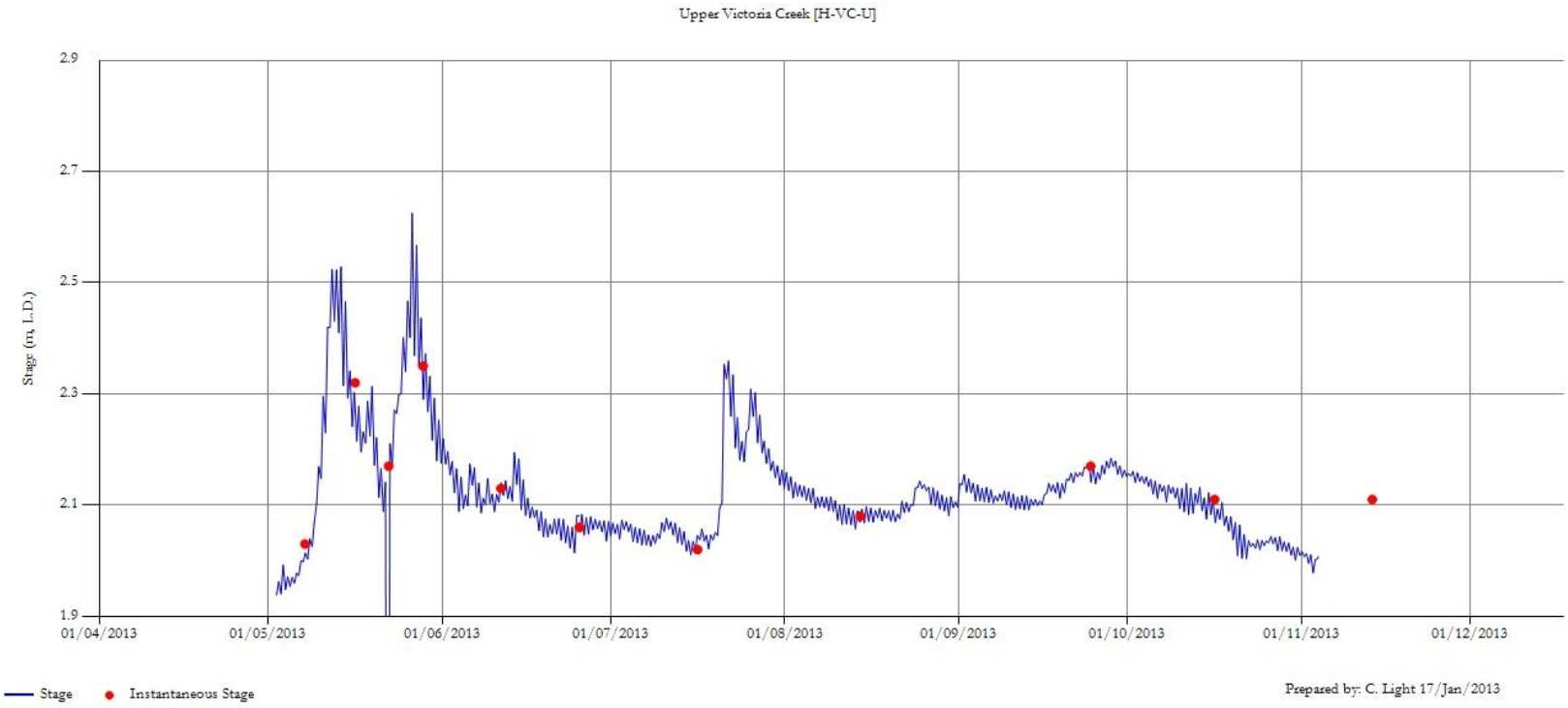

Figure D-17 H-VC-U Stage.

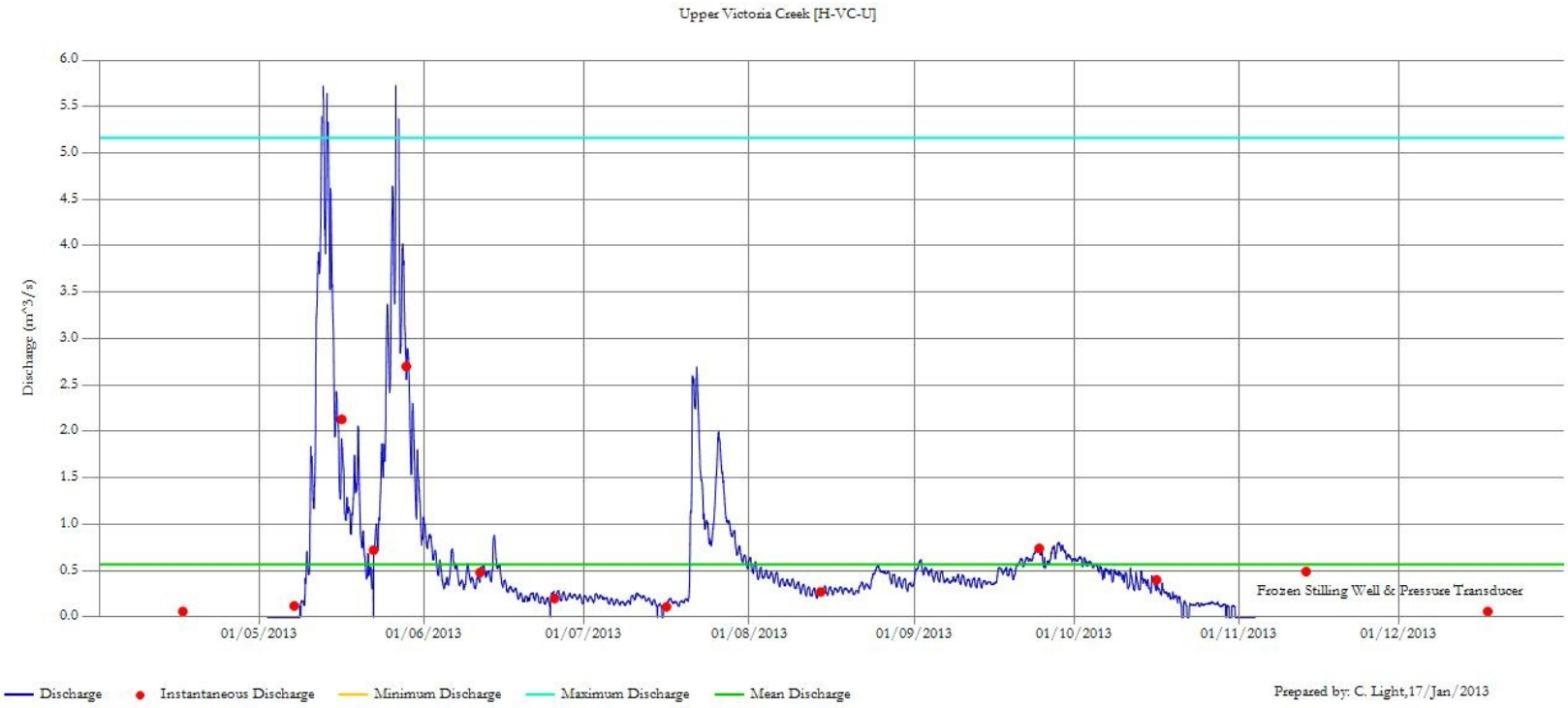

Figure D-18 H-VC-U Hydrograph.

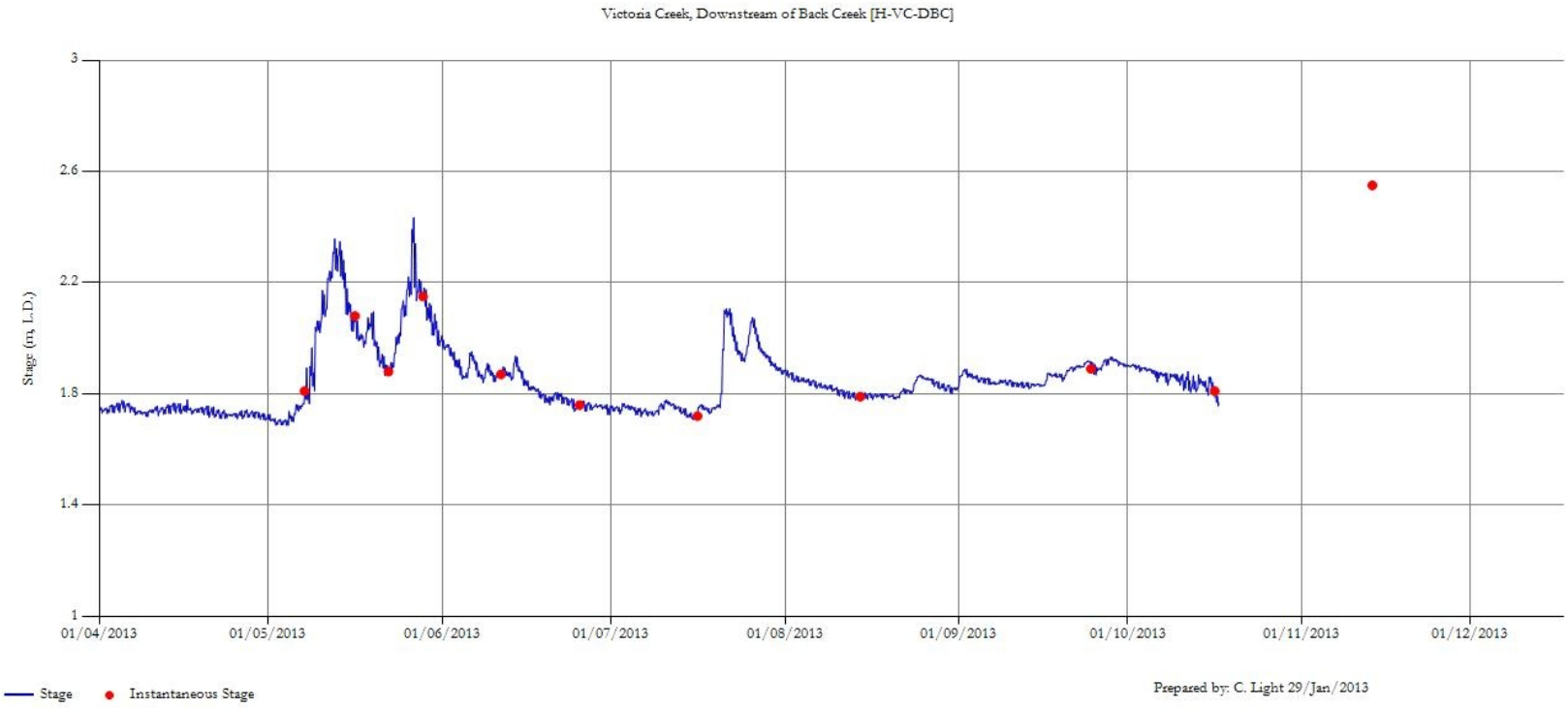

Figure D-19 H-VC-DBC Stage.

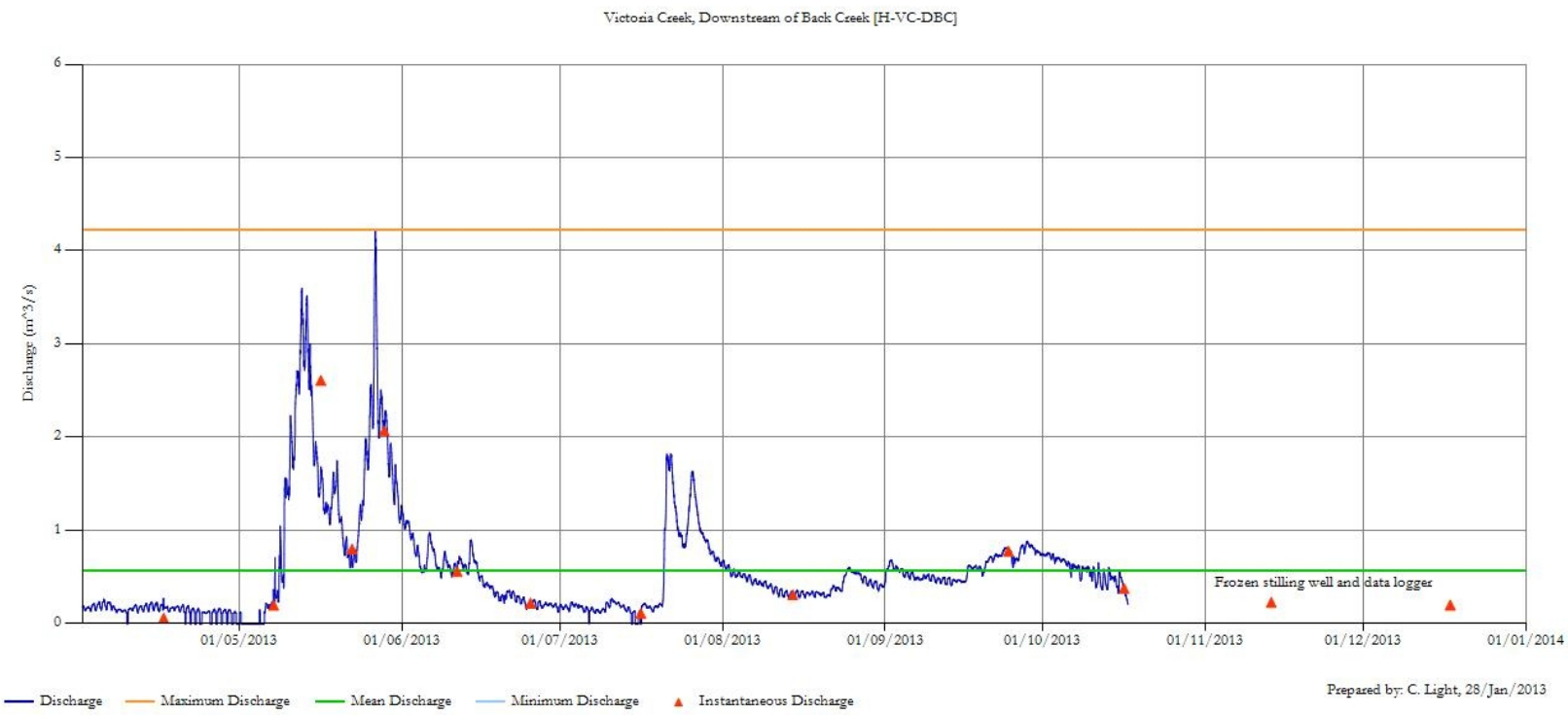

Figure D-20 H-VC-DBC Hydrograph.

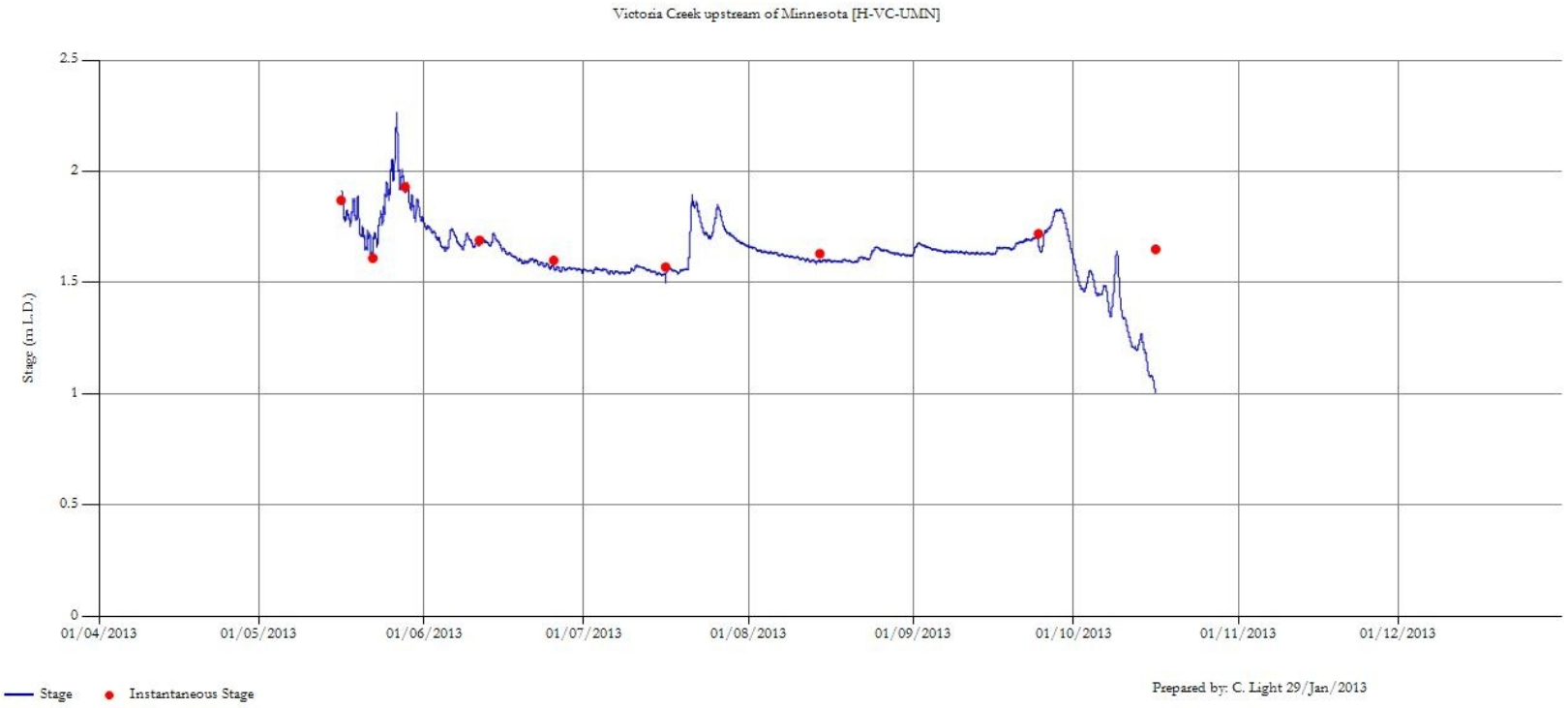

Figure D-21 H-VC-UMN Stage.

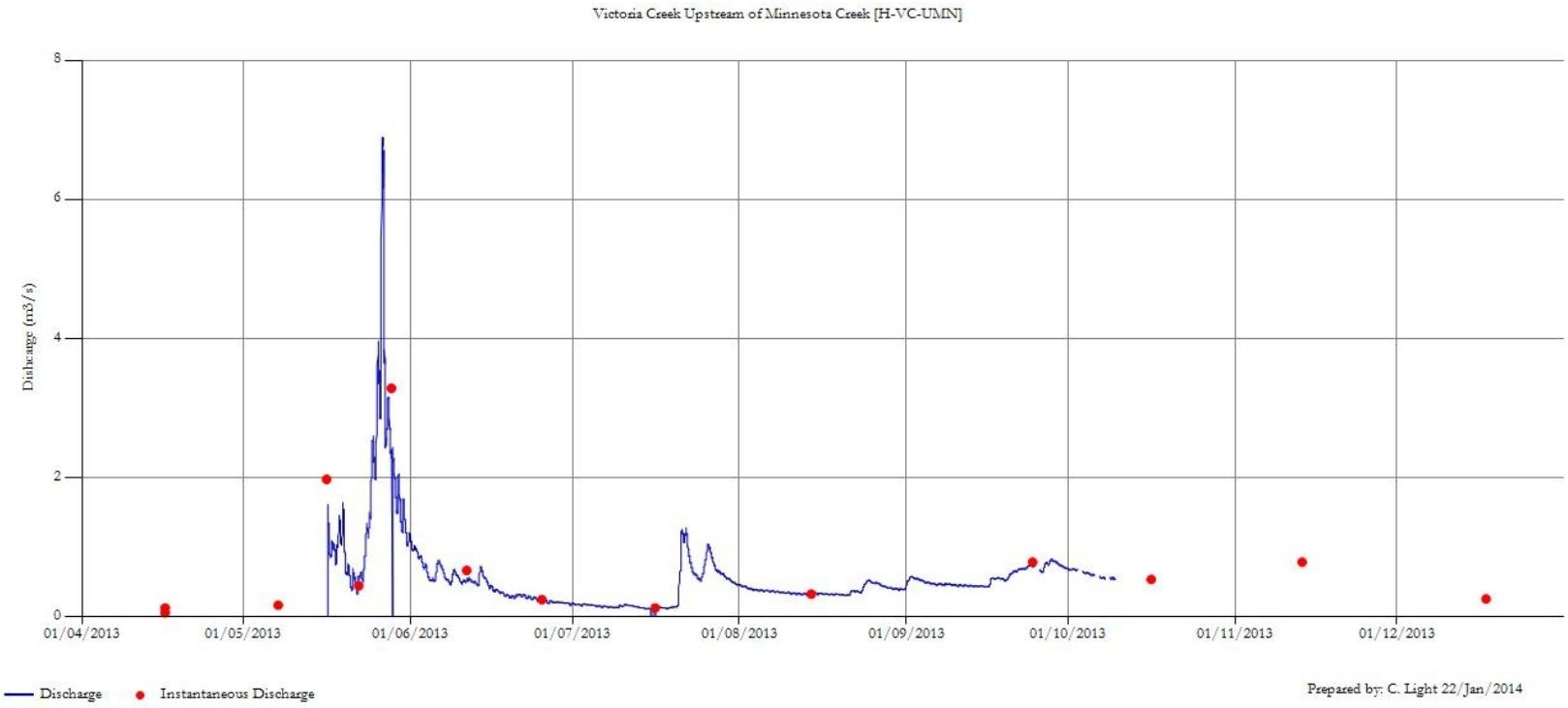

Figure D-22 H-VC-UMN Hydrograph.

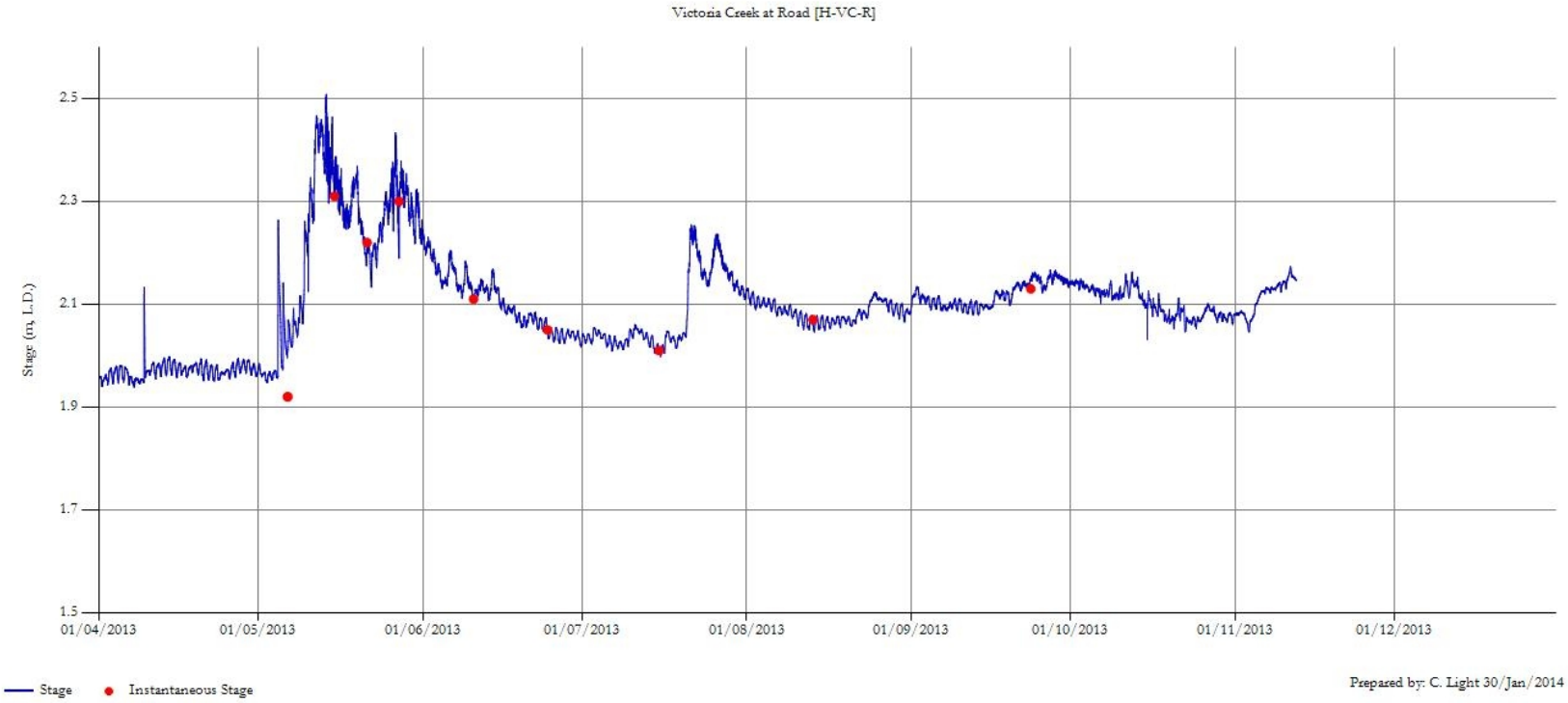

Figure D-23 H-VC-R Stage.

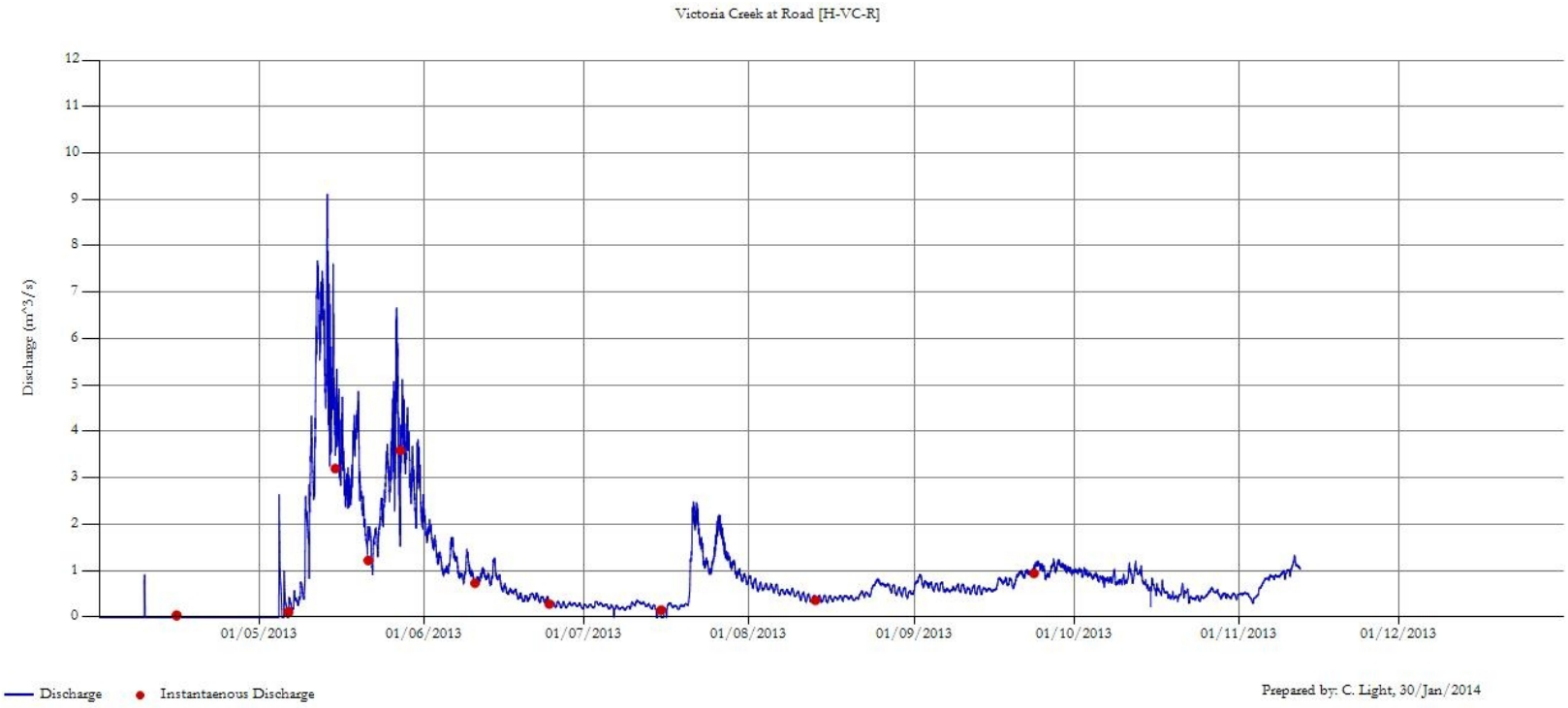

Figure D-24 H-VC-R Hydrograph.

APPENDIX E Q3 SURFACE WATER QUALITY DATA

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Table E1. Water Quality Results for the October 16-17, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID / WQ Site ID / Date Sampled / Detection Limit	0167-131016-008 WQ-VC-UMN 16-OCT-13 09:50	0167-131016-007 WQ-VC-UMN-r 16-OCT-13 09:35	QA/QC WQ-VC-UMN-r	0167-131016-002 WQ-VC-R 16-OCT-13 08:34	0167-131016-006 WQ-MN 16-OCT-13 09:06	0167-131016-200 WQ-SEEP 16-OCT-13 19:05	0167-131016-011 WQ-PC-D 16-OCT-13 16:45	0167-131016-015 WQ-TP 16-OCT-13 15:27	0167-131016-013 WQ-VC-REF 16-OCT-13 14:30	0167-131016-014 WQ-DC-U2 16-OCT-13 16:24	0167-131016-009 WQ-DC-U 16-OCT-13 15:10	0167-131016-016 WQ-PC-U 16-OCT-13 16:45
Temperature (in-situ)	°C	-	-	-	0.0	-	-	0.0	0.0	1.5	0.5	2.7	0.0	0.0	0.2	0.0
Specific Conductivity (in-situ)	µS/cm	-	-	-	241.3	-	-	216.6	75.5	17.1	357.0	1382.0	177.7	1213.0	1220.0	331.9
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	7.12	-	-	6.72	***6.29***	6.99	7.51	7.88	7.41	7.38	7.56	7.18
Turbidity (In-situ)	NTU	-	-	-	1.49	-	-	2.20	13.91	52.50	0.87	6.75	2.51	12.64	28.20	0.20
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	232	224	3%	206	79.8	1350	315	1150	179	913	904	320
Hardness (as CaCO3)	mg/L	-	-	0.5	128	118	8%	113	38.3	1010	182	803	88.3	706	716	173
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.99	7.97	0%	7.98	7.77	7.46	7.36	7.98	8	7.94	8.04	7.87
Total Suspended Solids	mg/L	-	50	3	<3.0	<3.0	n/a	3.3	<3.0	20	<3.0	<3.0	8	***62.7***	28	3.3
Total Dissolved Solids	mg/L	-	-	10	138	133	4%	122	38.1	1400	219	1130	95.8	886	905	216
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	85.4	83.7	2%	77.1	27.7	253	74.3	96.9	78.1	204	192	57.6
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	n/a	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	n/a	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	85.4	83.7	2%	77.1	27.7	253	74.3	96.9	78.1	204	192	57.6
Ammonia, Total (as N)	mg/L	0.75	-	0.005	0.0188	0.0235	25%	0.0206	0.0384	***4.4***	<0.0050	0.107	0.0056	0.121	0.261	0.0088
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	n/a	<0.50	<0.50	<5.0	<0.50	<5.0	<0.50	<5.0	<5.0	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	0.055	0.055	0%	0.05	0.052	<0.20	0.055	***0.3***	0.05	<0.20	<0.20	0.046
Nitrate (as N)	mg/L	13	-	0.005	0.131	0.131	0%	0.12	0.0645	1.7	0.0862	0.13	0.119	0.182	0.236	0.0333
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	n/a	<0.0010	<0.0010	0.029	<0.0010	<0.010	<0.0010	<0.010	<0.010	0.001
Sulfate (SO4)	mg/L	-	-	0.5	37.9	37.8	0%	32.3	3.6	815	104	751	15	516	535	116
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	n/a	<0.0050	<0.0050	0.0058	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	n/a	<0.0050	<0.0050	0.0462	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	<2.0	<0.20	n/a	<0.20	<0.20	2.01	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	n/a	<0.50	<0.50	2.67	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0411	0.0382	7%	0.0536	***0.144***	0.0227	0.0273	0.0353	***0.205***	***1.61***	***0.499***	0.0192
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00023	0.0002	13%	0.0002	0.00013	0.00058	0.003	0.0435	0.00014	0.00353	0.00233	0.00043
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00125	0.00122	2%	0.00131	0.00202	***0.0504***	***0.00543***	***0.179***	0.00073	***0.0159***	***0.0198***	0.00123
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0667	0.0656	2%	0.0643	0.0615	0.0717	0.0262	0.0108	0.0652	0.0699	0.0526	0.0477
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	n/a	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.010	<0.010	n/a	<0.010	<0.010	0.077	<0.010	0.106	<0.010	0.027	0.024	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	0.000028	0.000025	11%	0.000027	0.000033	***0.00063***	***0.0013***	***0.000769***	0.000029	***0.000162***	***0.000096***	0.00002
Calcium (Ca)-Total	mg/L	-	-	0.05	32.3	31.1	4%	29.5	10.6	292	53.4	236	23.1	158	164	49.7
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00031	0.00018	42%	0.00069	0.00072	0.00056	0.00028	0.00035	0.00059	0.00287	0.00126	0.00023
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.00017	0.00015	12%	0.00025	0.00092	0.00843	<0.00010	0.00085	0.00023	0.00168	0.00083	<0.00010
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.00149	0.00131	12%	0.00162	***0.00244***	***0.00535***	***0.0109***	***0.0192***	0.00164	***0.00481***	***0.00251***	0.00082
Iron (Fe)-Total	mg/L	0.3	1	0.01	0.186	0.177	5%	***0.392***	***1.87***	***11.8***	0.049	***0.433***	***0.423***	***3.94***	***3.29***	0.084
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.000077	0.000059	23%	0.000064	0.000057	0.000084	0.000764	***0.00542***	0.000314	0.00138	0.00162	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	0.00076	<0.00050	36%	0.00066	0.00074	0.00072	0.00057	0.00806	<0.00050	0.00485	0.00281	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	0.1	10.3	10.2	1%	9.38	2.78	67.7	11.9	51.2	7.84	71.8	67.1	11.6
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.108	0.104	4%	0.114	0.227	***5.83***	0.0447	0.317	0.041	***0.551***	***0.667***	0.00881
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000398	0.000379	5%	0.000468	0.000244	0.00108	0.000087	0.00186	0.000387	0.00032	0.000403	0.000065
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	<0.00050	<0.00050	n/a	0.00068	0.00216	0.00305	0.00065	0.00116	0.00061	0.0024	0.00156	<0.00050
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.13	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.71	0.68	4%	0.68	0.62	6.62	0.61	14	0.59	3.2	2.87	0.4
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00010	<0.00010	n/a	<0.00010	0.00012	0.00026	0.00011	<0.00010	<0.00010	0.00011	0.00011	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	6.32	6.29	0%	6.66	8.6	6.97	6.34	1.63	6.48	8.24	6.53	6.78
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	0.000034	0.000027	***0.00027***	<0.000010	0.000025	0.000046	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	3.11	2.85	8%	2.86	1.91	39.5	3.88	19.2	2.34	6.61	7.73	3.92
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.285	0.274	4%	0.247	0.055	0.849	0.334	0.626	0.264	0.462	0.492	0.343
Sulfur (S)-Total	mg/L	-	-	0.5	13.4	12.8	4%	11.6	1.55	281	35.2	237	5.27	159	163	38.9
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	0.000011	<0.000010	0.000193	<0.000010	0.000032	0.000013	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	0.01	0.09	0.024	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.000629	0.000602	4%	0.000547	0.000138	0.0037	0.000288	0.00117	0.000578	0.00216	0.00204	0.000221
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010	n/a	<0.0010	0.0012	0.0018	<0.0010	<0.0010	<0.0010	0.0058	0.0024	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	<0.0030	n/a	<0.0030	0.004	0.0112	***0.119***	***0.0804***	0.0039	***0.0538***	0.0199	0.0038

Table E1. Water Quality Results for the October 16-17, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131016-008 WQ-VC-UMN 16-OCT-13 09:50	0167-131016-007 WQ-VC-UMN-r 16-OCT-13 09:35	QA/QC WQ-VC-UMN-r	0167-131016-002 WQ-VC-R 16-OCT-13 08:34	0167-131016-006 WQ-MN 16-OCT-13 09:06	0167-131016-200 WQ-SEEP 16-OCT-13 19:05	0167-131016-011 WQ-PC-D 16-OCT-13 16:45	0167-131016-015 WQ-TP 16-OCT-13 15:27	0167-131016-013 WQ-VC-REF 16-OCT-13 14:30	0167-131016-014 WQ-DC-U2 16-OCT-13 16:24	0167-131016-009 WQ-DC-U 16-OCT-13 15:10	0167-131016-016 WQ-PC-U 16-OCT-13 16:45
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	n/a	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.017	0.0175	3%	0.0284	0.1	0.0106	0.0138	0.0043	0.0211	0.0078	0.0118	0.0096
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00019	0.00018	5%	0.00017	0.00012	0.00053	0.00281	0.0424	<0.00010	0.00351	0.00216	0.00039
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.00091	0.00098	8%	0.00097	0.00164	0.0322	0.00474	***0.112***	0.00033	0.00531	0.0118	0.0011
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0643	0.0642	0%	0.0639	0.0588	0.0667	0.0258	0.0101	0.06	0.0429	0.0464	0.0469
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	n/a	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	n/a	<0.010	<0.010	0.068	<0.010	0.094	<0.010	0.021	0.019	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	0.000024	0.000024	0%	0.000027	0.000024	***0.000397***	***0.00129***	***0.000588***	0.000015	***0.000045***	0.00003	0.000019
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	33.6	30.5	9%	29.9	10.7	296	53.6	235	22.7	163	171	49.8
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	0.00011	<0.00010	18%	0.00015	0.00055	0.00031	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00015	0.00014	7%	0.00022	0.00084	0.00813	<0.00010	0.00081	<0.00010	0.00036	0.00059	<0.00010
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00118	0.00113	4%	0.00125	***0.00201***	***0.00273***	***0.0098***	***0.0146***	0.00104	0.00048	0.00058	0.00052
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	0.083	0.076	8%	0.209	***1.15***	***6.99***	0.014	0.053	0.079	***0.876***	***0.908***	0.037
Lead (Pb)-Dissolved	mg/L	0.001	-	0.00005	<0.000050	<0.000050	n/a	<0.000050	<0.000050	<0.000050	0.000331	0.0005	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.00087	0.00063	28%	0.00075	0.00073	0.00052	0.00075	0.00801	<0.00050	0.00403	0.00281	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	10.7	10	7%	9.43	2.81	65.8	11.8	52.4	7.68	72.7	70.3	11.8
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.102	0.101	1%	0.112	0.218	5.68	0.0452	0.289	0.0275	0.422	0.676	0.00715
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	-	0.00005	0.000348	0.000355	2%	0.000325	0.000221	0.000991	0.000077	0.00175	0.000321	0.000254	0.000345	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.00050	<0.00050	n/a	0.00068	0.00204	0.00283	0.00062	0.001	<0.00050	0.00062	0.00079	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	0.75	0.64	15%	0.7	0.67	6.78	0.57	13.9	0.56	3.22	2.89	0.42
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	n/a	<0.00010	0.00011	0.00027	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	6.43	6.04	6%	6.61	8.59	6.89	6.25	1.49	5.94	5.88	5.79	6.79
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	<0.000010	<0.000010	0.000028	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	2.98	2.83	5%	2.83	1.88	38.7	3.68	18.3	2.21	6.49	8.09	3.81
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.255	0.268	5%	0.237	0.0523	0.817	0.324	0.608	0.247	0.459	0.512	0.322
Sulfur (S)-Dissolved	mg/L	-	-	0.5	13.5	12.2	10%	11.5	1.52	265	34.8	238	4.94	157	166	38.2
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	0.00001	<0.000010	0.000182	<0.000010	<0.000010	<0.000010	<0.000010
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.000572	0.000577	1%	0.000518	0.000122	0.00351	0.000274	0.00111	0.000509	0.002	0.00206	0.000199
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	n/a	<0.0010	<0.0010	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0022	0.0021	5%	0.0013	0.0023	0.0089	***0.116***	***0.0578***	<0.0010	***0.0331***	0.0093	0.0022

Table E1. Water Quality Results for the October 16-17, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID / WQ Site ID / Date Sampled / Detection Limit	0167-131016-012 WQ-DC-U1 16-OCT-13 16:19	0167-131016-018 WQ-DC-D1b 16-OCT-13 18:04	0167-131016-021 WQ-DC-DX 16-OCT-13 19:49	0167-131016-004 WQ-BC 16-OCT-13 13:30	0167-131016-019 WQ-MS-S-03 16-OCT-13 19:05	0167-131016-005 WQ-VC-DBC 16-OCT-13 12:31	0167-131016-003 WQ-DC-R 16-OCT-13 11:03	0167-131016-010 WQ-DC-DX+105 16-OCT-13 19:05	0167-131017-024 WQ-VC-U 17-OCT-13 08:52	0167-131017-023 WQ-VC-U-r 17-OCT-13 08:52	QA/QC WQ-VC-U-r
Temperature (in-situ)	°C	-	-	-	0.0	0.0	0.8	0.0	0.7	0.1	0.0	0.6	0.0	-	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	1295.0	1633.0	570.3	327.2	1213.0	193.5	1163.0	1193.0	185.6	-	-
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	7.48	7.73	7.56	7.64	7.24	6.88	***6.41***	7.00	6.61	-	-
Turbidity (In-situ)	NTU	-	-	-	0.87	5.97	1.21	3.24	0.84	1.54	24.90	1.47	0.66	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	948	1250	468	290	896	189	855	890	177	175	1%
Hardness (as CaCO3)	mg/L	-	-	0.5	772	965	278	161	716	96.1	668	719	93.7	93.8	0%
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.81	8.16	7.89	8.04	7.74	8.01	7.96	7.48	8.03	7.99	0%
Total Suspended Solids	mg/L	-	50	3	<3.0	6	<3.0	<3.0	6	<3.0	13.3	<3.0	<3.0	<3.0	n/a
Total Dissolved Solids	mg/L	-	-	10	961	1220	350	191	875	105	838	857	97.4	99.5	2%
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	201	279	96.5	99.5	275	80.3	162	274	75.3	79.4	5%
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	n/a
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	n/a
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	201	279	96.5	99.5	275	80.3	162	274	75.3	79.4	5%
Ammonia, Total (as N)	mg/L	0.75	-	0.005	0.0248	0.115	0.019	0.0117	0.0541	<0.0050	***0.92***	0.0274	<0.0050	<0.0050	n/a
Chloride (Cl)	mg/L	120	-	0.5	<5.0	<5.0	<0.50	<0.50	<5.0	<0.50	<5.0	<5.0	<0.50	<0.50	n/a
Fluoride (F)	mg/L	0.12	-	0.02	<0.20	<0.20	0.057	0.075	***0.24***	0.053	<0.20	***0.27***	0.053	0.051	4%
Nitrate (as N)	mg/L	13	-	0.005	0.148	0.167	0.07	0.066	<0.050	0.112	0.504	<0.050	0.124	0.121	2%
Nitrite (as N)	mg/L	0.06	-	0.001	<0.010	<0.010	<0.0010	<0.0010	<0.010	<0.0010	0.016	<0.010	<0.0010	<0.0010	n/a
Sulfate (SO4)	mg/L	-	-	0.5	575	720	186	68.6	452	19.9	489	435	16.5	16.1	2%
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	n/a
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0073	<0.0050	<0.0050	<0.0050	n/a
Cyanate	mg/L	-	-	0.2	<0.20	<2.0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	n/a
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	n/a
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0477	***0.141***	0.0216	0.0502	0.0159	0.0491	***0.111***	0.0042	***0.165***	0.0379	77%
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00316	0.0139	0.00118	0.00024	0.0136	0.00012	0.00155	0.0117	0.00011	<0.00010	18%
Arsenic (As)-Total	mg/L	0.005	-	0.0001	***0.00669***	***0.0261***	0.00287	0.00248	***0.089***	0.00057	***0.0228***	***0.0331***	0.00058	0.00036	38%
Barium (Ba)-Total	mg/L	-	1	0.00005	0.026	0.0222	0.056	0.0594	0.0191	0.0657	0.0576	0.0121	0.0684	0.0647	5%
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	n/a
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	n/a
Boron (B)-Total	mg/L	-	-	0.01	0.033	0.047	<0.010	<0.010	<0.010	<0.010	0.026	<0.010	<0.010	<0.010	n/a
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	0.000016	***0.00129***	0.000014	***0.000105***	***0.00231***	0.000032	***0.000091***	***0.00375***	0.000025	***0.000038***	52%
Calcium (Ca)-Total	mg/L	-	-	0.05	176	227	77.6	46.8	190	25.3	164	184	24.9	24.3	2%
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00031	0.0004	0.00017	0.00023	<0.00010	0.00018	0.00058	<0.00010	0.00029	0.00021	28%
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.00015	0.00031	0.00021	0.00027	0.0011	0.00013	0.0019	0.00052	0.00018	<0.00010	50%
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.00107	0.00169	0.00097	0.00163	0.00103	0.00132	0.00153	<0.00050	0.00163	0.00136	17%
Iron (Fe)-Total	mg/L	0.3	1	0.01	***0.545***	***0.958***	***0.327***	0.22	***2.59***	0.154	***3.7***	0.27	***0.33***	0.138	58%
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	<0.000050	***0.00551***	<0.000050	0.000207	0.000587	0.000061	0.000307	<0.000050	0.000231	<0.000050	79%
Lithium (Li)-Total	mg/L	-	-	0.0005	0.00417	0.00804	<0.00050	0.00085	0.00886	<0.00050	0.00191	0.00863	<0.00050	<0.00050	n/a
Magnesium (Mg)-Total	mg/L	-	-	0.1	84.3	102	20.8	11.3	62.7	8.25	59.2	61.4	8.33	8.22	1%
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.0888	***0.628***	0.167	0.478	***1.37***	0.0744	***1.6***	***1.12***	0.0465	0.0399	14%
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	n/a
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000276	0.000262	0.000052	0.000852	0.000346	0.000396	0.000463	0.000373	0.000363	0.000335	8%
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	0.00063	0.00096	<0.00050	0.0007	0.00184	<0.00050	0.00132	0.00166	0.00053	<0.00050	8%
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a
Potassium (K)-Total	mg/L	-	-	0.1	3.47	4.51	4.2	0.8	3.71	0.55	3.16	3.71	0.64	0.57	11%
Selenium (Se)-Total	mg/L	0.001	-	0.0001	0.00013	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	n/a
Silicon (Si)-Total	mg/L	-	-	0.05	6.13	6.34	4.87	6.96	6.76	6.33	6.65	6.72	6.79	6.45	5%
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000010	0.000064	<0.000010	<0.000010	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	n/a
Sodium (Na)-Total	mg/L	-	-	0.05	6.24	7.1	3.73	3.54	4.84	2.35	13	4.97	2.26	2.22	2%
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.448	0.582	0.25	0.308	0.449	0.268	0.508	0.438	0.266	0.261	2%
Sulfur (S)-Total	mg/L	-	-	0.5	190	231	63.8	23.3	149	7.1	159	141	5.75	5.55	3%
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	0.000037	<0.000010	<0.000010	0.000086	<0.000010	<0.000010	0.000112	<0.000010	<0.000010	n/a
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	n/a
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00218	0.00346	0.000215	0.00121	0.00397	0.000593	0.00192	0.00454	0.000542	0.000517	5%
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	n/a
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	0.0121	***0.352***	<0.0030	<0.0030	***0.783***	<0.0030	0.0103	***0.678***	0.0034	<0.0030	15%

Table E1. Water Quality Results for the October 16-17, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131016-012 WQ-DC-U1 16-OCT-13 16:19	0167-131016-018 WQ-DC-D1b 16-OCT-13 18:04	0167-131016-021 WQ-DC-DX 16-OCT-13 19:49	0167-131016-004 WQ-BC 16-OCT-13 13:30	0167-131016-019 WQ-MS-S-03 16-OCT-13 19:05	0167-131016-005 WQ-VC-DBC 16-OCT-13 12:31	0167-131016-003 WQ-DC-R 16-OCT-13 11:03	0167-131016-010 WQ-DC-DX+105 16-OCT-13 19:05	0167-131017-024 WQ-VC-U 17-OCT-13 08:52	0167-131017-023 WQ-VC-U-r 17-OCT-13 08:52	QA/QC WQ-VC-U-r
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	0.0216	0.0029	0.0067	0.0081	0.003	0.0188	0.015	0.001	0.0196	0.0185	6%
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00313	0.0123	0.00113	0.00022	0.0132	0.00011	0.00148	0.0113	<0.00010	<0.00010	n/a
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.00562	0.0113	0.0025	0.00209	0.0814	0.00044	0.0126	0.0159	0.00029	0.00032	10%
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0246	0.0192	0.0548	0.0582	0.0185	0.0639	0.0527	0.0117	0.0645	0.0641	1%
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	n/a
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	n/a
Boron (B)-Dissolved	mg/L	-	-	0.01	0.024	0.039	<0.010	<0.010	<0.010	<0.010	0.023	<0.010	<0.010	<0.010	n/a
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	0.000021	***0.000594***	0.000013	***0.000099***	***0.000537***	0.000025	***0.000051***	***0.00202***	0.000016	0.000018	13%
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	171	219	76.9	46.3	183	25	169	183	24.1	24.2	0%
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	<0.00010	0.00012	0.00012	0%
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00013	0.00022	0.00019	0.00025	0.00103	0.00011	0.00174	0.0005	<0.00010	<0.00010	n/a
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.0007	0.00068	0.00082	0.00132	<0.00020	0.00114	0.0008	<0.00020	0.00111	0.0011	1%
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	***0.367***	0.296	0.263	0.106	***2.33***	0.078	***1.57***	0.125	0.076	0.079	4%
Lead (Pb)-Dissolved	mg/L	0.001	-	0.00005	<0.000050	0.000056	<0.000050	<0.000050	0.000091	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	n/a
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.00398	0.00776	<0.00050	0.00101	0.00901	0.00059	0.0019	0.00858	0.00052	0.00052	0%
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	83.9	102	20.8	11.2	62.6	8.15	59.7	63.9	8.15	8.08	1%
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.0833	0.581	0.168	0.465	1.31	0.0686	1.54	1.08	0.0375	0.0373	1%
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	n/a
Molybdenum (Mo)-Dissolved	mg/L	0.073	-	0.00005	0.000258	0.000237	<0.000050	0.000802	0.000327	0.00036	0.000437	0.000344	0.000343	0.00033	4%
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	0.00054	0.00076	<0.00050	0.0006	0.00176	<0.00050	0.00115	0.00154	<0.00050	<0.00050	n/a
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a
Potassium (K)-Dissolved	mg/L	-	-	0.1	3.36	4.41	4.31	0.76	3.6	0.57	3.37	3.75	0.59	0.57	3%
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	n/a
Silicon (Si)-Dissolved	mg/L	-	-	0.05	5.82	5.75	4.82	6.78	6.41	6.2	6.51	6.65	6.32	6.31	0%
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	n/a
Sodium (Na)-Dissolved	mg/L	-	-	0.05	5.95	6.8	3.65	3.47	4.64	2.28	12.7	4.8	2.19	2.19	0%
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.422	0.558	0.242	0.296	0.434	0.258	0.492	0.419	0.255	0.256	0%
Sulfur (S)-Dissolved	mg/L	-	-	0.5	186	223	61	22.8	144	6.48	155	141	5.42	5.5	1%
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	0.000029	<0.000010	<0.000010	0.000074	<0.000010	<0.000010	0.000101	<0.000010	<0.000010	n/a
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	n/a
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.00206	0.00329	0.000202	0.00115	0.00378	0.000549	0.00186	0.00432	0.000495	0.000485	2%
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	n/a
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0097	***0.321***	<0.0010	0.0014	***0.775***	0.0024	0.0049	***0.662***	0.0014	0.0013	7%

Table E1. Water Quality Results for the October 16-17, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131017-TRAVEL-BLANK TRAVEL BLANK 17-OCT-13 12:35	0167-131017-FIELD-BLANK FIELD BLANK 17-OCT-13 07:51	0167-131017-030 WQ-PW 17-OCT-13 08:40
Temperature (in-situ)	°C	-	-	-	-	-	0.6
Specific Conductivity (in-situ)	µS/cm	-	-	-	-	-	367.8
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	-	-	***6.29***
Turbidity (In-situ)	NTU	-	-	-	-	-	0.56
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	<5.0
Conductivity	µS/cm	-	-	2	<2.0	<2.0	323
Hardness (as CaCO3)	mg/L	-	-	0.5	<0.50	<0.50	193
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	***5.84***	***6.39***	7.96
Total Suspended Solids	mg/L	-	50	3	<3.0	<3.0	-
Total Dissolved Solids	mg/L	-	-	10	<1.0	<1.0	203
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	<1.0	<1.0	167
Ammonia, Total (as N)	mg/L	0.75	-	0.005	0.0093	<0.0050	-
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	<0.020	<0.020	0.108
Nitrate (as N)	mg/L	13	-	0.005	<0.0050	<0.0050	0.146
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	<0.50	<0.50	32.4
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	<0.0030	<0.0030	<0.010
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	<0.00010	<0.00010	<0.00050
Arsenic (As)-Total	mg/L	0.005	-	0.0001	<0.00010	<0.00010	0.00038
Barium (Ba)-Total	mg/L	-	1	0.00005	<0.000050	<0.000050	0.085
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	<0.010	<0.010	<0.10
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	<0.000010	<0.000010	<0.00020
Calcium (Ca)-Total	mg/L	-	-	0.05	<0.050	<0.050	44.5
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	<0.00010	<0.00010	<0.0020
Cobalt (Co)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	-
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	<0.00050	<0.00050	<0.0010
Iron (Fe)-Total	mg/L	0.3	1	0.01	<0.010	<0.010	<0.030
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	<0.000050	<0.000050	0.0007
Lithium (Li)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	-
Magnesium (Mg)-Total	mg/L	-	-	0.1	<0.10	<0.10	20
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	<0.000050	<0.000050	<0.0020
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.00020
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	<0.10	<0.10	0.88
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.0010
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	<0.050	<0.050	4.7
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	<0.000010	<0.000010	0.00191
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010	-
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	<0.0030	<0.050

Applied Guidelines: **- Federal CCME Canadian Environmental Quality Guidelines, CCME: Freshwater Aquatic Life**
- Mount Nansen Effluent Quality Standards

Color Key:
- Exceeds CCME Guideline
- Exceeds MN Effluent Quality Standards (EQS)
- Exceeds both CCME and EQS
- QA/QC Assessment - highlighted if > +/- 10%

Note: For those guidelines that are hardness dependent, the most conservative guideline has been applied.

Table E1. Water Quality Results for the October 16-17, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131017-TRAVEL-BLANK TRAVEL BLANK 17-OCT-13 12:35	0167-131017-FIELD-BLANK FIELD BLANK 17-OCT-13 07:51	0167-131017-030 WQ-PW 17-OCT-13 08:40
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	-
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	0.001	-	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	0.073	-	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	-

Table E2. Water Quality Results for the November 12-14, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID / WQ Site ID / Date Sampled / Detection Limit	0167-131114-025 WQ-PIT-1 11/14/2013	0167-131114-024 WQ_PIT-2 11/14/2013	0167-131114-023 WQ-PIT-3 11/14/2013	0167-131114-026 WQ-PW 11/14/2013	0167-131113-001 WQ-VC-UMN 11/13/2013	0167-131113-002 WQ-MN 11/13/2013	0167-131113-004 WQ-VC-DBC 11/13/2013	0167-131113-005 WQ-VC-DBC-r 11/13/2013	QA/QC WQ-VC-DBC-r	0167-131113-006 WQ-DC-R-r 11/13/2013	0167-131113-007 WQ-DC-R 11/13/2013	QA/QC WQ-DC-R-r	0167-131113-003 WQ-VC-R 11/13/2013
Temperature (in-situ)	°C	-	-	-	0.9	2.0	4.8	0.5	0.0	0.0	0.0	-	-	-	0.1	-	0.0
Specific Conductivity (in-situ)	µS/cm	-	-	-	1905.0	1917.0	1977.0	369.7	228.8	106.9	214.9	-	-	-	1228.0	-	218.0
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	7.1	6.8	***6.2***	***5.8***	6.6	6.5	7.2	-	-	-	6.6	-	***6.5***
Turbidity (In-situ)	NTU	-	-	-	0.87	0.65	2.36	0.97	0.59	11.95	0.53	-	-	-	17.02	-	3.78
Dissolved Oxygen (in-situ)	mg/L	-	-	-	9.8	9.1	5.5	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	<5.0	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	1820	1650	2070	446	197	94	194	190	2%	915	901	2%	196
Hardness (as CaCO3)	mg/L	-	-	0.5	1200	1190	1620	196	114	51.7	105	107	2%	653	655	0%	107
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.97	7.91	7.36	7.79	7.73	7.42	7.70	7.77	1%	7.43	7.48	1%	7.70
Total Suspended Solids	mg/L	-	50	3	3.3	<3.0	4.7	-	<3.0	<3.0	<3.0	<3.0	n/a	16.7	24.7	48%	<3.0
Total Dissolved Solids	mg/L	-	-	10	1560	1550	2180	201	123	56.3	114	113	1%	891	890	0%	117
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	179	172	191	-	90.1	48.7	91.9	90.1	2%	197	197	0%	88.3
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	s	-	<1.0	<1.0	<1.0	<1.0	n/a	<1.0	<1.0	n/a	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	-	<1.0	<1.0	<1.0	<1.0	n/a	<1.0	<1.0	n/a	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	179	172	191	163	90.1	48.7	91.9	90.1	2%	197	197	0%	88.3
Ammonia, Total (as N)	mg/L	0.75	-	0.005	<0.0050	<0.0050	0.0196	-	<0.0050	0.0574	<0.0050	<0.0050	n/a	***1.93***	***1.99***	3%	0.0073
Chloride (Cl)	mg/L	120	-	0.5	<5.0	<5.0	<10	<0.50	<0.50	<0.50	<0.50	<0.50	n/a	<5.0	<5.0	n/a	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	***0.34***	***0.29***	<0.40	0.108	0.052	0.068	0.052	0.051	2%	<0.20	<0.20	n/a	0.053
Nitrate (as N)	mg/L	13	-	0.005	<0.050	<0.050	<0.10	0.143	0.136	0.0593	0.144	0.143	1%	0.644	0.65	1%	0.129
Nitrite (as N)	mg/L	0.06	-	0.001	<0.010	<0.010	<0.020	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	n/a	0.023	0.025	9%	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	1010	1010	1470	31.2	25.2	3.99	18.3	18.3	0%	503	501	0%	23.2
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	-	-	-	-	<0.0050	<0.0050	<0.0050	<0.0050	n/a	0.0054	<0.0050	9%	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	-	-	-	-	<0.0050	<0.0050	<0.0050	<0.0050	n/a	0.0157	0.0197	25%	<0.0050
Cyanate	mg/L	-	-	0.2	-	-	-	-	<2.0	<0.20	<0.20	<0.20	n/a	0.69	1.56	126%	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	-	-	-	-	<0.50	<0.50	<0.50	<0.50	n/a	0.73	0.73	0%	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0084	0.0082	0.0369	<0.010	0.0385	0.0924	0.0825	0.0551	33%	***0.205***	***0.29***	41%	0.0368
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00367	0.00358	0.00203	<0.00050	0.00022	0.00013	0.0001	0.00011	10%	0.00067	0.00068	1%	0.00022
Arsenic (As)-Total	mg/L	0.005	-	0.0001	***0.0115***	***0.0114***	***0.0411***	0.00048	0.0008	0.00233	0.00044	0.00038	14%	***0.0293***	***0.0314***	7%	0.00093
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0119	0.0118	0.00861	0.084	0.0722	0.0804	0.0765	0.0754	1%	0.0716	0.0746	4%	0.0725
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00020	<0.00020	<0.00020	-	<0.00010	<0.00010	<0.00010	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.0010	<0.0010	<0.0010	-	<0.00050	<0.00050	<0.00050	<0.00050	n/a	<0.00050	<0.00050	n/a	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.020	<0.020	<0.020	<0.10	<0.010	<0.010	<0.010	<0.010	n/a	0.042	0.043	2%	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	***0.00295***	***0.00292***	***0.00935***	<0.00020	0.00002	0.000027	0.000021	0.000022	5%	***0.000155***	***0.000172***	11%	0.00002
Calcium (Ca)-Total	mg/L	-	-	0.05	337	327	447	45.7	29.8	15.1	28.7	29.4	2%	185	186	1%	29.2
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	<0.00020	<0.00020	<0.00020	<0.0020	0.00015	0.00061	0.00022	0.00022	0%	0.00083	0.00081	2%	0.00024
Cobalt (Co)-Total	mg/L	-	-	0.0001	<0.00020	<0.00020	0.00103	-	<0.00010	0.00119	<0.00010	<0.00010	n/a	0.00423	0.00422	0%	0.00015
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	***0.0036***	***0.003***	***0.0046***	<0.0010	0.00116	0.00194	0.00116	0.00116	0%	0.00178	***0.00204***	15%	0.00133
Iron (Fe)-Total	mg/L	0.3	1	0.01	0.047	0.057	***0.366***	<0.030	0.081	***1.75***	0.142	0.099	30%	***5.34***	***5.55***	4%	0.213
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.00072	0.00063	0.00272	0.00068	0.000062	<0.000050	0.000115	0.000092	20%	0.00076	0.00107	41%	0.000061
Lithium (Li)-Total	mg/L	-	-	0.0005	0.0101	0.0095	0.0114	-	0.0008	0.00113	0.00084	0.00081	4%	0.00098	0.00106	8%	0.00084
Magnesium (Mg)-Total	mg/L	-	-	0.1	93.5	91.4	129	20	10.4	4.28	9.82	9.95	1%	48.7	48.9	0%	9.83
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.0705	0.0715	***2.03***	<0.0020	0.0439	0.36	0.0434	0.0412	5%	***3.8***	***3.78***	1%	0.067
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.000010	<0.00020	<0.000010	<0.000010	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.00019	0.00017	0.00015	-	0.000377	0.000319	0.000387	0.000403	4%	0.000628	0.000638	2%	0.000373
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	<0.0010	<0.0010	0.0013	-	<0.00050	0.00207	<0.00050	<0.00050	n/a	0.00181	0.00181	0%	0.00051
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050	n/a	0.057	0.057	0%	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	4.13	3.86	5.25	0.87	0.78	0.98	0.72	0.7	3%	4.54	4.54	0%	0.79
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00020	<0.00020	<0.00020	<0.0010	<0.00010	0.00011	<0.00010	<0.00010	n/a	0.00017	0.00015	12%	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	3.22	3.1	3.71	-	6.47	9.22	6.54	6.59	1%	7.44	7.55	1%	6.8
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000020	<0.000020	0.000049	-	<0.000010	<0.000010	<0.000010	<0.000010	n/a	0.000016	0.000018	13%	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	13.5	13	16.1	5.1	3.14	2.43	2.67	2.75	3%	24	23.8	1%	3.09
Strontium (Sr)-Total	mg/L	-	-	0.0002	1.1	1.07	1.26	-	0.313	0.0826	0.311	0.322	4%	0.609	0.581	5%	0.286
Sulfur (S)-Total	mg/L	-	-	0.5	345	335	482	-	8.7	1.61	6.39	6.48	1%	171	172	1%	8.15
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	0.000065	0.000071	0.000139	-	<0.000010	<0.000010	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00020	<0.00020	<0.00020	-	<0.00010	<0.00010	<0.00010	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.020	<0.020	<0.020	-	<0.010	<0.010	<0.010	<0.010	n/a	***0.016***	***0.02***	25%	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00425	0.00427	0.00407	0.00179	0.000619	0.000221	0.000647	0.000652	1%	0.00189	0.00189	0%	0.000608
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0020	<0.0020	<0.0020	-	<0.0010	0.0012	<0.0010	<0.0010	n/a	0.0018	0.0019	6%	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	***0.359***	***0.355***	***0.825***	<0.050	<0.0030	0.0034	<0.0030	<0.0030	n/a	0.0096	0.0103	7%	<0.0030
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	0.0021	<0.0020	<0.0020	-	0.0082	0.0737	0.0083	0.008	4%	0.0178	0.0176	1%	0.015
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00362	0.00349	0.00154	-	0.0002	0.00011	<0.00010	<0.00010	n/a	0.00051	0.00052	2%	0.00019
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.00929	0.00923	0.0141	-	0.00065	0.00173	0.00025	0.00028	12%	0.021	0.0211	0%	0.00073

Table E2. Water Quality Results for the November 12-14, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131114-025 WQ-PIT-1 11/14/2013	0167-131114-024 WQ_PIT-2 11/14/2013	0167-131114-023 WQ-PIT-3 11/14/2013	0167-131114-026 WQ-PW 11/14/2013	0167-131113-001 WQ-VC-UMN 11/13/2013	0167-131113-002 WQ-MN 11/13/2013	0167-131113-004 WQ-VC-DBC 11/13/2013	0167-131113-005 WQ-VC-DBC-r 11/13/2013	QA/QC WQ-VC-DBC-r	0167-131113-006 WQ-DC-R-r 11/13/2013	0167-131113-007 WQ-DC-R 11/13/2013	QA/QC WQ-DC-R-r	0167-131113-003 WQ-VC-R 11/13/2013
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0117	0.0116	0.00773	-	0.0714	0.077	0.0722	0.0752	4%	0.0667	0.0664	0%	0.0705
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00020	<0.00020	<0.00020	-	<0.00010	<0.00010	<0.00010	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.0010	<0.0010	<0.0010	-	<0.00050	<0.00050	<0.00050	<0.00050	n/a	<0.00050	<0.00050	n/a	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.020	<0.020	<0.020	-	<0.010	<0.010	<0.010	<0.010	n/a	0.038	0.039	3%	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	***0.00291***	***0.00284***	***0.00893***	-	0.000018	0.000026	0.000023	0.000017	26%	***0.000107***	***0.000111***	4%	0.00002
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	331	324	443	-	29.5	14.2	26.9	27.6	3%	181	182	1%	27.7
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00020	<0.00020	<0.00020	-	<0.00010	0.00051	<0.00010	<0.00010	n/a	0.00036	0.00037	3%	0.00012
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	<0.00020	<0.00020	0.00089	-	<0.00010	0.00109	<0.00010	<0.00010	n/a	0.00392	0.00388	1%	0.00014
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	***0.00245***	***0.00249***	***0.0022***	-	0.001	0.00166	0.00094	0.00093	1%	0.00101	0.00097	4%	0.00109
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	<0.010	<0.010	0.017	-	0.035	***0.887***	0.02	0.02	0%	***3.97***	***3.99***	1%	0.095
Lead (Pb)-Dissolved	mg/L	0.001	-	0.00005	<0.00010	<0.00010	<0.00010	-	<0.000050	<0.000050	<0.000050	<0.000050	n/a	<0.000050	<0.000050	n/a	<0.000050
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.0095	0.0094	0.0106	-	0.0007	0.00121	0.00098	0.00077	21%	0.0009	0.00103	14%	0.00081
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	91.6	92.6	125	-	9.81	3.93	9.29	9.33	0%	49.1	49	0%	9.12
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.0668	0.067	1.86	-	0.0398	0.345	0.0359	0.0353	2%	3.62	3.59	1%	0.0619
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	-	<0.000010	<0.000010	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	-	0.00005	0.00016	0.00016	<0.00010	-	0.00036	0.000277	0.000366	0.000356	3%	0.000587	0.000595	1%	0.000342
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.0010	<0.0010	0.0012	-	<0.00050	0.0018	<0.00050	<0.00050	n/a	0.00159	0.00157	1%	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	n/a	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	3.77	3.83	4.92	-	0.69	0.88	0.62	0.62	0%	4.45	4.29	4%	0.7
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00020	<0.00020	<0.00020	-	<0.00010	<0.00010	<0.00010	<0.00010	n/a	0.00015	0.00014	7%	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	3.07	3.08	3.44	-	6.31	8.78	6.27	6.27	0%	7.01	7.01	0%	6.5
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000020	<0.000020	<0.000020	-	<0.000010	<0.000010	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	13	12.8	15.2	-	2.9	2.34	2.6	2.59	0%	22.8	23	1%	2.92
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	1.05	1.05	1.13	-	0.305	0.076	0.309	0.308	0%	0.572	0.565	1%	0.282
Sulfur (S)-Dissolved	mg/L	-	-	0.5	324	323	450	-	8.39	1.49	6.02	6.1	1%	160	162	1%	7.68
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	0.000059	0.000059	0.000121	-	<0.000010	<0.000010	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00020	<0.00020	<0.00020	-	<0.00010	<0.00010	<0.00010	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.020	<0.020	<0.020	-	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	n/a	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.00408	0.00409	0.0038	-	0.000607	0.000206	0.000625	0.000596	5%	0.00182	0.00177	3%	0.000567
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0020	<0.0020	<0.0020	-	<0.0010	<0.0010	<0.0010	<0.0010	n/a	<0.0010	<0.0010	n/a	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	***0.35***	***0.346***	***0.788***	-	<0.0010	0.002	<0.0010	0.0014	n/a	0.0069	0.0067	3%	0.0011

Table E2. Water Quality Results for the November 12-14, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID / WQ Site ID / Date Sampled / Detection Limit	0167-131113-010 WQ-VC-REF 11/13/2013	0167-131113-018 WQ-PC-D 11/13/2013	0167-131113-011 WQ-SEEP 11/13/2013	0167-131113-014 WQ-DC-U1 11/13/2013	0167-131113-012 WQ-VC-U 11/13/2013	0167-131113-013 WQ-TP 11/13/2013	0167-131113-009 WQ-DC-U 11/13/2013	0167-131113-008 WQ-DC-U2 11/13/2013	0167-131114-016 WQ-DC-DX 11/14/2013	0167-131114-021 WQ-DC-DX+105 11/14/2013	0167-131114-015 WQ-DC-D1b 11/14/2013	0167-131114-019 WQ-MS-S-03 11/14/2013
Temperature (in-situ)	°C	-	-	-	0.0	0.3	0.7	0.0	0.0	1.8	0.0	0.0	0.0	0.6	0.0	0.6
Specific Conductivity (in-situ)	µS/cm	-	-	-	210.4	465.8	1799.0	1377.0	213.7	1583.0	1540.0	1450.0	740.0	1187.0	1717.0	1255.0
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	7.2	7.1	6.7	7.0	7.1	7.2	6.8	7.0	6.9	6.7	6.9	6.6
Turbidity (In-situ)	NTU	-	-	-	0.97	1.04	37.80	2.09	0.31	6.62	22.30	1.82	58.90	2.62	59.50	1.86
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	µS/cm	-	-	2	194	361	1420	1070	196	1310	1220	1140	557	935	1260	922
Hardness (as CaCO3)	mg/L	-	-	0.5	105	227	1030	848	106	941	886	881	394	713	1080	730
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.76	7.20	7.25	7.53	7.67	7.83	7.50	7.76	7.45	7.54	7.74	7.52
Total Suspended Solids	mg/L	-	50	3	6.7	8	28.7	6.7	<3.0	<3.0	14	8	23.3	<3.0	***55.3***	***142***
Total Dissolved Solids	mg/L	-	-	10	111	266	1450	1040	114	1310	1210	1080	482	846	1310	873
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	89.7	108	251	208	92.1	143	230	237	138	272	299	271
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<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	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	89.7	108	251	208	92.1	143	230	237	138	272	299	271
Ammonia, Total (as N)	mg/L	0.75	-	0.005	<0.0050	<0.0050	***3.7***	0.0612	<0.0050	0.31	***3.00***	0.078	0.0053	0.0222	0.211	0.0415
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<5.0	<5.0	<0.50	<5.0	<5.0	<5.0	<0.50	<5.0	<5.0	<5.0
Fluoride (F)	mg/L	0.12	-	0.02	0.054	0.059	<0.20	<0.20	0.051	***0.35***	<0.20	<0.20	0.061	***0.24***	<0.20	***0.29***
Nitrate (as N)	mg/L	13	-	0.005	0.15	<0.0050	1.24	0.061	0.143	0.19	0.831	0.155	0.048	<0.050	0.122	<0.050
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	0.026	<0.010	<0.0010	<0.010	0.02	<0.010	<0.0010	<0.010	<0.010	<0.010
Sulfate (SO4)	mg/L	-	-	0.5	17.5	115	863	617	18.2	839	705	630	250	427	760	447
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	0.0051	<0.0050	<0.0050	<0.0050	0.0105	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	0.0393	<0.0050	<0.0050	<0.0050	0.0287	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	0.25	<0.20	2.07	0.27	<0.20	<2.0	0.99	<0.20	<0.20	<0.20	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	3.25	<0.50	<0.50	<0.50	2.17	<0.50	<0.50	<0.50	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.057	***0.437***	0.0158	0.034	0.0374	0.0245	0.0194	0.0913	***1.31***	0.0306	***0.688***	***0.115***
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.0001	0.00656	0.00066	0.00433	0.00013	0.0454	0.0005	0.00341	0.00173	0.0118	0.0276	0.0146
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00042	***0.0221***	***0.0592***	***0.0132***	0.00035	***0.239***	***0.0456***	0.00472	***0.0382***	***0.0425***	***0.293***	***0.115***
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0765	0.0302	0.0671	0.0548	0.0772	0.0156	0.0658	0.058	0.0649	0.0122	0.0409	0.0197
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<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	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Total	mg/L	-	-	0.01	<0.010	<0.010	0.077	0.031	<0.010	0.123	0.06	0.033	<0.010	<0.010	0.052	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	0.000022	***0.00248***	***0.000707***	***0.000074***	0.00002	***0.00123***	***0.000397***	***0.000079***	***0.000114***	***0.00389***	***0.00286***	***0.00277***
Calcium (Ca)-Total	mg/L	-	-	0.05	28.7	68.8	301	191	29.1	282	256	207	103	185	236	192
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00018	0.00052	0.00051	0.00024	0.00019	0.00022	0.00042	0.00028	0.00203	<0.00010	0.00143	0.00017
Cobalt (Co)-Total	mg/L	-	-	0.0001	<0.00010	0.00026	0.00792	0.00038	<0.00010	0.00121	0.00589	0.00034	0.00085	0.00054	0.00077	0.00117
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.0012	***0.0282***	***0.00428***	0.00125	0.00121	***0.0237***	***0.00289***	0.00102	***0.00409***	<0.00050	***0.0101***	0.00178
Iron (Fe)-Total	mg/L	0.3	1	0.01	0.114	***0.794***	***11.9***	***1.43***	0.084	***0.504***	***6.05***	***0.922***	***5.63***	***0.343***	***8.22***	***2.84***
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.000087	***0.0137***	0.000063	0.000088	0.000059	***0.00367***	0.000057	0.000105	***0.00321***	0.000152	***0.0721***	***0.00477***
Lithium (Li)-Total	mg/L	-	-	0.0005	0.00082	0.00224	0.00109	0.00361	0.00075	0.0102	0.00078	0.00557	0.00118	0.00938	0.00893	0.00978
Magnesium (Mg)-Total	mg/L	-	-	0.1	10	15.7	73.7	92	10	60.4	65.2	96.7	28.6	62.7	112	64.7
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.0325	0.148	***6.25***	0.256	0.0411	***0.82***	***5.03***	0.338	0.339	***1.1***	***1.26***	***1.35***
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000011	<0.000010
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000398	0.00011	0.00117	0.000328	0.000396	0.00211	0.00094	0.000273	0.000103	0.000387	0.000323	0.000361
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	<0.00050	0.00094	0.00268	0.00089	<0.00050	0.00165	0.00213	0.00076	0.00115	0.00152	0.00152	0.00182
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.067	<0.050	0.069	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	0.69	1.01	7.39	4.16	0.71	18.9	6.33	4.51	5.61	4.05	5.32	4.07
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00010	<0.00010	0.00024	<0.00010	<0.00010	<0.00010	0.0002	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
Silicon (Si)-Total	mg/L	-	-	0.05	6.58	7.32	7.61	7	6.59	2.48	6.92	7.22	7.42	6.82	8.42	7.05
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000010	***0.000166***	0.000042	<0.000010	<0.000010	0.000095	0.000024	<0.000010	0.000088	<0.000010	***0.000968***	0.000054
Sodium (Na)-Total	mg/L	-	-	0.05	2.67	4.4	40.6	7.59	2.71	23.6	32.3	8.28	5.02	5.28	7.76	5
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.318	0.489	0.955	0.534	0.324	0.789	0.82	0.609	0.291	0.462	0.65	0.48
Sulfur (S)-Total	mg/L	-	-	0.5	6.25	40.8	299	213	6.52	285	245	219	81.1	146	245	152
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	0.000018	<0.000010	<0.000010	<0.000010	0.000224	<0.000010	<0.000010	0.000046	0.000108	0.000061	0.000095
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	***0.018***	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	***0.049***	<0.010	***0.03***	<0.010
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.000674	0.000744	0.00394	0.00246	0.000626	0.00138	0.00281	0.00285	0.00041	0.00452	0.00332	0.00401
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	0.0011	0.002	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	0.006	<0.0010	0.0033	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	***0.229***	0.0076	0.0298	<0.0030	***0.143***	0.0059	***0.0367***	0.0118	***0.684***	***0.517***	***0.812***
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0079	0.0083	0.0096	0.0155	0.0079	0.0024	0.0083	0.0035	0.0029	0.0013	0.0022	0.0011
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	<0.00010	0.00423	0.00056	0.00422	<0.00010	0.0445	0.00043	0.0033	0.00072	0.0115	0.0089	0.013
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.00026	0.0033	0.0426	0.0118	0.00025	***0.142***	0.0351	0.0033	0.00108	0.0164	0.016	0.0817

Table E2. Water Quality Results for the November 12-14, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131113-010 WQ-VC-REF 11/13/2013	0167-131113-018 WQ-PC-D 11/13/2013	0167-131113-011 WQ-SEEP 11/13/2013	0167-131113-014 WQ-DC-U1 11/13/2013	0167-131113-012 WQ-VC-U 11/13/2013	0167-131113-013 WQ-TP 11/13/2013	0167-131113-009 WQ-DC-U 11/13/2013	0167-131113-008 WQ-DC-U2 11/13/2013	0167-131114-016 WQ-DC-DX 11/14/2013	0167-131114-021 WQ-DC-DX+105 11/14/2013	0167-131114-015 WQ-DC-D1b 11/14/2013	0167-131114-019 WQ-MS-S-03 11/14/2013
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0696	0.0201	0.0621	0.0538	0.0726	0.0149	0.0604	0.0547	0.0415	0.0115	0.0262	0.017
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<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	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	0.068	0.026	<0.010	0.115	0.053	0.027	<0.010	<0.010	0.047	<0.010
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	0.000014	***0.00197***	***0.000378***	***0.000051***	0.00002	***0.00108***	***0.000218***	***0.000071***	<0.000010	***0.00196***	***0.000499***	***0.000435***
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	26.5	66.2	293	189	26.9	276	249	197	108	182	242	185
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00010	<0.00010	0.00036	0.00016	<0.00010	<0.00010	0.0003	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	0.00752	0.00037	<0.00010	0.00113	0.00571	0.00029	<0.00010	0.00048	0.00036	0.00109
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00089	***0.0125***	0.00189	0.00078	0.00092	***0.0195***	0.00139	0.00056	0.00069	<0.00020	0.00059	<0.00020
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	0.022	0.013	***8.63***	***1.27***	0.019	0.051	***4.07***	***0.546***	0.028	0.096	0.294	***2.07***
Lead (Pb)-Dissolved	mg/L	0.001	-	0.00005	<0.000050	0.000666	<0.000050	<0.000050	<0.000050	0.000351	<0.000050	<0.000050	<0.000050	<0.000050	0.000161	0.000077
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.0009	0.00212	0.00092	0.00353	0.00067	0.0105	0.00074	0.00505	0.00055	0.00941	0.00842	0.00998
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	9.28	14.8	72.2	91.5	9.31	61.3	64.3	94.7	30.2	62.7	115	64.9
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.0272	0.0974	5.89	0.237	0.0348	0.75	4.78	0.313	0.134	1.04	1.03	1.27
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	-	0.00005	0.000363	0.00008	0.00103	0.000338	0.000371	0.00194	0.000872	0.000245	<0.000050	0.000359	0.000238	0.000323
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.00050	0.00063	0.00263	0.00075	<0.00050	0.00152	0.00193	0.00058	<0.00050	0.00145	0.00086	0.00163
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	0.6	0.86	6.93	3.97	0.61	18.5	5.87	4.14	4.9	3.75	5.18	3.76
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	0.00022	<0.00010	<0.00010	<0.00010	0.00016	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Silicon (Si)-Dissolved	mg/L	-	-	0.05	6.26	6.55	7.17	6.9	6.31	2.37	6.62	6.73	5.26	6.6	6.81	6.62
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	0.000013	<0.000010	<0.000010	0.000027	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	-	0.05	2.56	4.1	38.2	7.23	2.59	22.8	31.2	7.75	4.95	5.16	7.9	4.98
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.309	0.466	0.865	0.492	0.318	0.74	0.792	0.586	0.316	0.435	0.653	0.445
Sulfur (S)-Dissolved	mg/L	-	-	0.5	5.78	38.5	274	200	6.06	273	227	202	82.6	137	239	142
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000221	<0.000010	<0.000010	<0.000010	0.000097	0.000017	0.000078
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<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	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.000612	0.000646	0.00371	0.0023	0.000584	0.00132	0.00272	0.00262	0.00035	0.0043	0.00336	0.00394
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	<0.0010	***0.192***	0.0065	0.0271	0.0014	***0.124***	0.005	***0.0326***	<0.0010	***0.657***	***0.312***	***0.781***

Table E2. Water Quality Results for the November 12-14, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131113-FIELD-BLANK FIELD BLANK 11/13/2013	0167-131114-TRAVEL-BLANK TRAVEL BLANK 11/14/2013
Temperature (in-situ)	°C	-	-	-	-	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	-	-
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	-	-
Turbidity (In-situ)	NTU	-	-	-	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-
Colour, True	CU	15	-	5	-	-
Conductivity	µS/cm	-	-	2	<2.0	<2.0
Hardness (as CaCO3)	mg/L	-	-	0.5	<0.50	-
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	***6.03***	***5.87***
Total Suspended Solids	mg/L	-	50	3	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	10	<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	<1.0	<1.0
Ammonia, Total (as N)	mg/L	0.75	-	0.005	<0.0050	0.0333
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	<0.020	<0.020
Nitrate (as N)	mg/L	13	-	0.005	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	<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	<0.0030	<0.0030
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	-	0.0001	<0.00010	<0.00010
Barium (Ba)-Total	mg/L	-	1	0.00005	<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	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	0.05	<0.050	<0.050
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	<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	<0.00050	<0.00050
Iron (Fe)-Total	mg/L	0.3	1	0.01	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	0.1	<0.10	<0.10
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<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	<0.10	<0.10
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<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	<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	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	<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	-

Applied Guidelines: **- Federal CCME Canadian Environmental Quality Guidelines (JUL, 2012), CCME: Freshwater Aquatic Life**
- Mount Nansen Effluent Quality Standards

Color Key:
- Exceeds CCME Guideline
- Exceeds MN Effluent Quality Standards (EQS)
- Exceeds both CCME and EQS
- QA/QC Assessment - highlighted if > +/- 10%

Note: For those guidelines that are hardness dependent, the most conservative guideline has been applied.

Table E2. Water Quality Results for the November 12-14, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131113-FIELD-BLANK FIELD BLANK 11/13/2013	0167-131114-TRAVEL-BLANK TRAVEL BLANK 11/14/2013
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	0.001	-	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	0.073	-	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	-

Table E3. Water Quality Results for the December 16-18, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131217-009 WQ-SEEP-r 12/17/2013	0167-131217-007 WQ-SEEP 12/17/2013	QA/QC WQ-SEEP-r	0167-131217-008 WQ-DC-U-r 12/17/2013	0167-131217-012 WQ-DC-U 12/17/2013	QA/QC WQ-DC-U	0167-131217-011 WQ-DC-DX+105 12/17/2013	0167-131216-014 WQ-MS-S-03 12/16/2013	0167-131216-013 WQ-TP 12/16/2013
Temperature (in-situ)	°C	-	-	-	-	0.6	-	-	0.3	-	0.4	0.5	0.9
Specific Conductivity (in-situ)	µS/cm	-	-	-	-	1871.0	-	-	2011.0	-	1195.0	1198.0	1972.0
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	-	7.20	-	-	7.29	-	7.22	7.28	7.32
Turbidity (In-situ)	NTU	-	-	-	-	37.80	-	-	23.00	-	2.3	1.78	8.07
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-		-	-	-
Conductivity	µS/cm	-	-	2	1780	1790	1%	1880	1870	1%	1160	1180	1920
Hardness (as CaCO3)	mg/L	-	-	0.5	1040	1010	3%	1140	1140	0%	703	704	1150
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.56	7.54	0%	7.82	7.88	1%	7.85	7.86	7.93
Total Suspended Solids	mg/L	-	50	3	26	22.7	13%	10	18	80%	***67.3***	13.3	16.7
Total Dissolved Solids	mg/L	-	-	1	1460	1450	1%	1540	1510	2%	849	850	1640
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	251	251	0%	275	275	0%	273	272	157
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	n/a	<1.0	<1.0	n/a	<1.0	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	n/a	<1.0	<1.0	n/a	<1.0	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	251	251	0%	275	275	0%	273	272	157
Ammonia, Total (as N)	mg/L	0.75	-	0.005	***4.14***	***4.12***	0%	***3.48***	***3.67***	5%	0.036	0.0371	0.32
Chloride (Cl)	mg/L	120	-	0.5	<5.0	<5.0	n/a	<5.0	<5.0	n/a	<5.0	<5.0	<5.0
Fluoride (F)	mg/L	0.12	-	0.02	***0.34***	***0.30***	12%	***0.21***	***0.21***	0%	***0.29***	***0.29***	***0.55***
Nitrate (as N)	mg/L	13	-	0.005	1.35	1.36	1%	0.849	0.822	3%	<0.050	<0.050	0.253
Nitrite (as N)	mg/L	0.06	-	0.001	0.038	0.039	3%	0.027	0.028	4%	<0.010	<0.010	<0.010
Sulfate (SO4)	mg/L	-	-	0.5	870	877	1%	931	904	3%	434	433	1080
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	0.0101	<0.0050	51%	0.0095	0.0096	1%	<0.0050	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	0.0614	0.0187	70%	0.0399	0.0386	3%	<0.0050	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	<2.0	<0.20	n/a	2.1	1.56	26%	<0.20	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	2.38	2.46	3%	1.06	1.07	1%	<0.50	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0143	0.0134	6%	0.0441	0.0456	3%	***0.34***	0.0733	***0.148***
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00067	0.00068	1%	0.00101	0.00098	3%	0.0116	0.0152	0.0567
Arsenic (As)-Total	mg/L	0.005	-	0.0001	***0.0449***	***0.0473***	5%	***0.0575***	***0.0476***	17%	***0.176***	***0.102***	***0.225***
Barium (Ba)-Total	mg/L	-	1	0.00005	0.0598	0.061	2%	0.0767	0.0743	3%	0.0148	0.0168	0.0205
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00020	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.0010	<0.00050	n/a	<0.00050	<0.00050	n/a	<0.00050	<0.00050	<0.0010
Boron (B)-Total	mg/L	-	-	0.01	0.071	0.076	7%	0.057	0.056	2%	<0.010	<0.010	0.14
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	***0.000778***	***0.000769***	1%	***0.00052***	***0.000442***	15%	***0.00951***	***0.0029***	***0.00196***
Calcium (Ca)-Total	mg/L	-	-	0.05	288	288	0%	293	290	1%	172	178	332
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.0004	0.00051	28%	0.00058	0.00048	17%	0.00053	0.00021	0.0003
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.00753	0.0076	1%	0.00525	0.00517	2%	0.00074	0.00108	0.00111
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	***0.0043***	***0.00427***	1%	***0.00329***	***0.00315***	4%	***0.00209***	0.00136	***0.0323***
Iron (Fe)-Total	mg/L	0.3	1	0.01	***9.64***	***9.78***	1%	***9.45***	***7.15***	24%	***2.13***	***2.46***	***0.952***
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	<0.00010	0.000079	14%	0.000089	0.000086	3%	0.00231	***0.00958***	***0.0366***
Lithium (Li)-Total	mg/L	-	-	0.0005	0.0016	0.00111	31%	0.002	0.00184	8%	0.00851	0.0091	0.0115
Magnesium (Mg)-Total	mg/L	-	-	0.1	71.3	70.7	1%	94.4	92.6	2%	59.9	61	72.8
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	***6.38***	***6.3***	1%	***4.66***	***4.7***	1%	***1.2***	***1.32***	***0.897***
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010	<0.000010	0.000014
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.00108	0.00111	3%	0.000873	0.000905	4%	0.000396	0.000361	0.00207
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	0.0027	0.00277	3%	0.00228	0.00231	1%	0.00182	0.00193	0.002
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	n/a	<0.050	<0.050	n/a	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	6.66	6.7	1%	6.18	6.13	1%	3.72	3.61	20.5
Selenium (Se)-Total	mg/L	0.001	-	0.0001	0.00023	0.00022	4%	0.00019	0.00022	16%	<0.00010	<0.00010	<0.00020
Silicon (Si)-Total	mg/L	-	-	0.05	6.7	6.71	0%	7.95	7.72	3%	6.93	6.38	2.98
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	0.000046	0.000041	11%	0.000025	0.000023	8%	0.000035	0.000085	***0.000657***
Sodium (Na)-Total	mg/L	-	-	0.05	36.8	35.7	3%	29.3	30.3	3%	4.81	4.78	27.6
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.845	0.865	2%	0.921	0.949	3%	0.408	0.432	0.879
Sulfur (S)-Total	mg/L	-	-	0.5	282	282	0%	300	296	1%	137	143	347
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000020	<0.000010	n/a	<0.000010	<0.000010	n/a	0.000126	0.00009	0.000287
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00020	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.020	<0.010	n/a	<0.010	<0.010	n/a	0.02	<0.010	<0.020
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.00353	0.00362	3%	0.00343	0.00342	0%	0.00431	0.00379	0.0017
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0020	0.0017	12%	0.0017	0.0015	12%	0.002	<0.0010	<0.0020
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	0.0072	0.0082	14%	0.0128	0.0125	2%	***0.681***	***0.866***	***0.204***
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	n/a	FIELD	FIELD	n/a	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0118	0.0092	22%	0.0078	0.0063	19%	<0.0010	0.0016	<0.0020
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00061	0.00062	2%	0.00093	0.00092	1%	0.011	0.0143	0.0494
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.033	0.0337	2%	0.0259	0.0252	3%	0.0112	0.0744	***0.117***
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0611	0.0627	3%	0.0713	0.0722	1%	0.0108	0.016	0.0175
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00020	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00020
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.0010	<0.00050	n/a	<0.00050	<0.00050	n/a	<0.00050	<0.00050	<0.0010
Boron (B)-Dissolved	mg/L	-	-	0.01	0.07	0.068	3%	0.052	0.048	8%	<0.010	<0.010	0.132
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	***0.0004***	***0.000381***	5%	***0.000263***	***0.000238***	10%	***0.00155***	***0.000472***	***0.00155***
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	295	285	3%	294	295	0%	177	179	335
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00020	<0.00010	n/a	0.00017	0.00013	24%	<0.00010	<0.00010	<0.00020
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00777	0.00758	2%	0.00523	0.00509	3%	0.00047	0.00101	0.00101
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00187	0.00186	1%	0.0018	0.00144	20%	<0.00020	<0.00020	***0.0219***
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	***6.99***	***6.74***	4%	***2.72***	***2.74***	1%	0.057	***2.09***	0.043
Lead (Pb)-Dissolved	mg/L	0.001	-	0.00005	<0.00010	<0.000050	n/a	<0.000050	<0.000050	n/a	<0.000050	0.000188	0.00041
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.0015	0.00101	33%	0.00186	0.00168	10%	0.00892	0.0094	0.0111
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	73.2	71.6	2%	98.1	97.3	1%	63.2	62.6	76.5
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	6.35	6.34	0%	4.8	4.73	1%	1.13	1.36	0.791
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	n/a	<0.000010	<0.000010	n/a	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	mg/L	0.073	-	0.00005	0.00106	0.000999	6%	0.000829	0.00075	10%	0.000406	0.000344	0.00203
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	0.0027	0.00289	7%	0.00229	0.0022	4%	0.00158	0.00182	0.0019
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	n/a	<0.050	<0.050	n/a	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	-	0.1	6.98	6.7	4%	6.4	6.26	2%	3.68	3.48	19.6

Table E3. Water Quality Results for the December 16-18, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131217-009 WQ-SEEP-r 12/17/2013	0167-131217-007 WQ-SEEP 12/17/2013	QA/QC WQ-SEEP-r	0167-131217-008 WQ-DC-U-r 12/17/2013	0167-131217-012 WQ-DC-U 12/17/2013	QA/QC WQ-DC-U	0167-131217-011 WQ-DC-DX+105 12/17/2013	0167-131216-014 WQ-MS-S-03 12/16/2013	0167-131216-013 WQ-TP 12/16/2013
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	0.00024	0.00021	13%	0.00017	0.00018	6%	<0.00010	<0.00010	<0.00020
Silicon (Si)-Dissolved	mg/L	-	-	0.05	6.9	6.71	3%	7.72	7.69	0%	6.41	6.27	2.36
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000020	0.000015	n/a	<0.000010	<0.000010	n/a	<0.000010	<0.000010	<0.000020
Sodium (Na)-Dissolved	mg/L	-	-	0.05	36.9	36.5	1%	31	29.8	4%	4.95	4.97	27.6
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.87	0.851	2%	0.945	0.883	7%	0.438	0.426	0.889
Sulfur (S)-Dissolved	mg/L	-	-	0.5	277	272	2%	294	295	0%	139	142	348
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000020	<0.000010	n/a	<0.000010	<0.000010	n/a	0.000095	0.000075	0.000263
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00020	<0.00010	n/a	<0.00010	<0.00010	n/a	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.020	<0.010	n/a	<0.010	<0.010	n/a	<0.010	<0.010	<0.020
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.00364	0.0035	4%	0.00344	0.00332	3%	0.00457	0.00378	0.00167
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0020	0.0011	73%	<0.0010	<0.0010	n/a	<0.0010	<0.0010	<0.0020
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0068	0.0079	16%	0.012	0.0099	18%	***0.624***	***0.867***	***0.165***

Table E3. Water Quality Results for the December 16-18, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131216-010 WQ-VC-R 12/16/2013	0167-131217-004 WQ-VC-UMN 12/17/2013	0167-131217-003 WQ-VC-DBC 12/17/2013	0167-131217-001 WQ-VC-U 12/17/2013	0167-131217-016 WQ-VC-REF 12/17/2013	0167-131218-020 WQ-PIT-3 12/18/2013	0167-131218-021 WQ-PIT-2 12/18/2013	0167-131218-022 WQ-PIT-1 12/18/2013	0167-131218-023 WQ-PW 12/18/2013
Temperature (in-situ)	°C	-	-	-	0.0	0.0	0.0	0.0	0.0	5.6	1.8	0.1	0.1
Specific Conductivity (in-situ)	µS/cm	-	-	-	230.0	233.5	215.9	217.3	219.8	2650.0	1973.0	1994.0	391.7
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	7.42	7.52	7.47	8.04	7.53	7.04	7.70	7.85	7.87
Turbidity (In-situ)	NTU	-	-	-	0.31	0.42	0.01	0.13	0.00	36.70	6.97	0.75	0.00
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	<5.0
Conductivity	µS/cm	-	-	2	228	231	217	218	217	2520	1960	1950	354
Hardness (as CaCO3)	mg/L	-	-	0.5	115	118	116	112	114	1710	1230	1250	181
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.81	7.83	7.84	7.88	7.91	7.66	8.03	8.03	8.13
Total Suspended Solids	mg/L	-	50	3	<3.0	<3.0	4	<3.0	<3.0	***56.7***	<3.0	4	-
Total Dissolved Solids	mg/L	-	-	1	124	127	120	119	120	2400	1650	1650	225
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	90.1	92.8	95	95.8	96.5	220	193	194	-
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<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	<1.0	<1.0	<1.0	<1.0	-
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	90.1	92.8	95	95.8	96.5	220	193	194	166
Ammonia, Total (as N)	mg/L	0.75	-	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.046	<0.0050	<0.0050	-
Chloride (Cl)	mg/L	120	-	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<10	<5.0	<5.0	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	0.052	0.051	0.05	0.05	0.05	<0.40	***0.44***	***0.34***	0.116
Nitrate (as N)	mg/L	13	-	0.005	0.116	0.118	0.119	0.119	0.124	<0.10	<0.050	<0.050	0.149
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.020	<0.010	<0.010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	26.2	26.3	19.2	19.3	18.6	1640	1090	1080	33.1
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-	-	-
Cyanide, Total	mg/L	-	0.3	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-	-	-
Cyanate	mg/L	-	-	0.2	<0.20	<0.20	<0.20	<0.20	<0.20	-	-	-	-
Thiocyanate (SCN)	mg/L	-	-	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	-	-	-	-
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0256	0.0238	0.0222	0.0205	0.0297	***0.862***	0.007	0.008	<0.010
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00036	0.00032	0.00013	0.00013	0.00012	0.00597	0.00391	0.00369	<0.00050
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.00127	0.00111	0.00049	0.00047	0.00044	***0.0845***	***0.0114***	***0.011***	0.00043
Barium (Ba)-Total	mg/L	-	1	0.00005	0.072	0.0724	0.0774	0.076	0.076	0.0208	0.012	0.0117	0.078
Beryllium (Be)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	-
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	-
Boron (B)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	<0.10
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	0.00002	0.00002	0.000023	0.000022	0.000017	***0.0082***	***0.00332***	***0.00342***	<0.00020
Calcium (Ca)-Total	mg/L	-	-	0.05	28.9	29	28.4	28	28	485	339	331	41.6
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00015	0.00016	0.00017	0.00014	0.00016	0.00069	<0.00020	0.00026	<0.0020
Cobalt (Co)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00219	<0.00020	<0.00020	-
Copper (Cu)-Total	mg/L	0.002	0.2	0.0005	0.00131	0.0012	0.00114	0.00106	0.001	***0.0269***	***0.003***	***0.0031***	<0.0010
Iron (Fe)-Total	mg/L	0.3	1	0.01	0.06	0.048	0.043	0.043	0.053	***2.38***	0.056	0.066	<0.030
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	0.00007	0.000068	0.000071	<0.000050	<0.000050	***0.0341***	0.00054	0.00068	0.0007
Lithium (Li)-Total	mg/L	-	-	0.0005	0.00131	0.00115	0.00075	0.00097	0.00111	0.0131	0.0096	0.0089	-
Magnesium (Mg)-Total	mg/L	-	-	0.1	9.85	9.88	9.62	9.56	9.72	127	93.2	93.6	18.8
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	0.0276	0.0408	0.0447	0.0436	0.0335	***2.21***	0.0979	0.113	<0.0020
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000016	<0.000010	<0.000010	<0.00020
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.000391	0.000373	0.000351	0.000351	0.000367	0.00013	0.00017	0.00016	-
Nickel (Ni)-Total	mg/L	0.1	0.3	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0018	<0.0010	<0.0010	-
Phosphorus (P)-Total	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Potassium (K)-Total	mg/L	-	-	0.1	0.74	0.72	0.65	0.66	0.63	5.71	3.83	3.83	0.85
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	<0.0010
Silicon (Si)-Total	mg/L	-	-	0.05	5.98	5.89	5.96	5.95	5.94	6.59	3.2	3.19	-
Silver (Ag)-Total	mg/L	0.0001	0.1	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	***0.000636***	<0.000020	<0.000020	-
Sodium (Na)-Total	mg/L	-	-	0.05	3.1	2.97	2.78	2.69	2.62	14.8	12.4	12.1	4.7
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.303	0.311	0.297	0.313	0.305	1.39	1.13	1.1	-
Sulfur (S)-Total	mg/L	-	-	0.5	8.64	8.6	6.4	6.38	6.18	505	348	349	-
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00013	0.00007	0.000071	-
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00040	<0.00020	<0.00020	-
Titanium (Ti)-Total	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	-
Uranium (U)-Total	mg/L	0.015	-	0.00001	0.000568	0.000603	0.000608	0.000576	0.000604	0.00441	0.00465	0.00457	0.00194
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0022	<0.0020	<0.0020	-
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	***0.838***	***0.402***	***0.397***	<0.050
Dissolved Metals Filtration Location		-	-	n/a	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	-
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.0086	0.0083	0.0072	0.0075	0.0083	<0.0020	<0.0020	<0.0020	-
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00034	0.00029	<0.00010	<0.00010	<0.00010	0.00069	0.00368	0.0037	-
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.0011	0.00091	0.00029	0.00029	0.00029	0.0254	0.00864	0.00833	-
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0737	0.0774	0.0817	0.081	0.0796	0.00805	0.0117	0.0121	-
Beryllium (Be)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	-
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0010	<0.0010	<0.0010	-
Boron (B)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	-
Cadmium (Cd)-Dissolved	mg/L	0.000033	-	0.00001	0.000022	0.00002	0.00002	0.000021	0.000019	***0.00376***	***0.00327***	***0.00328***	-
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	29.7	30.5	30	28.9	29.2	474	337	339	-
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	-
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00179	<0.00020	<0.00020	-
Copper (Cu)-Dissolved	mg/L	0.002	-	0.0002	0.00138	0.00127	0.00098	0.00104	0.00099	0.00054	***0.00217***	***0.00237***	-
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	0.023	0.017	0.014	0.016	0.018	***0.538***	<0.010	<0.010	-
Lead (Pb)-Dissolved	mg/L	0.001	-	0.00005	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00014	<0.00010	<0.00010	-
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	0.00118	0.00117	0.00109	0.0011	0.00129	0.0114	0.0092	0.0084	-
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	9.93	10.2	9.93	9.73	10	129	95.7	96.6	-
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	0.025	0.0377	0.0449	0.0435	0.0331	2.06	0.0919	0.11	-
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-
Molybdenum (Mo)-Dissolved	mg/L	0.073	-	0.00005	0.000359	0.000361	0.000358	0.000352	0.000381	<0.00010	0.00015	0.00015	-
Nickel (Ni)-Dissolved	mg/L	0.1	-	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0012	<0.0010	<0.0010	-
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	0.1	0.79	0.75	0.67	0.66	0.64	4.96	3.83	3.81	-

Table E3. Water Quality Results for the December 16-18, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131216-010 WQ-VC-R 12/16/2013	0167-131217-004 WQ-VC-UMN 12/17/2013	0167-131217-003 WQ-VC-DBC 12/17/2013	0167-131217-001 WQ-VC-U 12/17/2013	0167-131217-016 WQ-VC-REF 12/17/2013	0167-131218-020 WQ-PIT-3 12/18/2013	0167-131218-021 WQ-PIT-2 12/18/2013	0167-131218-022 WQ-PIT-1 12/18/2013	0167-131218-023 WQ-PW 12/18/2013
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	-
Silicon (Si)-Dissolved	mg/L	-	-	0.05	6.13	6.12	6.27	6.17	6.23	3.54	3.21	3.24	-
Silver (Ag)-Dissolved	mg/L	0.0001	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020	<0.000020	<0.000020	-
Sodium (Na)-Dissolved	mg/L	-	-	0.05	3.1	3.16	2.91	2.8	2.87	14.2	12.1	13.5	-
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.289	0.313	0.335	0.314	0.334	1.32	1.1	1.17	-
Sulfur (S)-Dissolved	mg/L	-	-	0.5	8.68	8.77	6.62	6.47	6.35	487	343	344	-
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00003	0.000067	0.000071	-
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00020	<0.00020	-
Titanium (Ti)-Dissolved	mg/L	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020	-
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.000571	0.000618	0.000608	0.000593	0.000653	0.004	0.0044	0.00468	-
Vanadium (V)-Dissolved	mg/L	-	-	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0020	<0.0020	<0.0020	-
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0031	0.0034	0.0012	0.0015	0.0024	***0.684***	***0.396***	***0.422***	-

Table E3. Water Quality Results for the December 16-18, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131217-TRAVEL-BLANK TRAVEL BLANK 11/06/2013	0167-131217-FIELD-BLANK FIELD BLANK 12/17/2013
Temperature (in-situ)	°C	-	-	-	-	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	-	-
pH (in-situ)	-	6.5 - 9.0	6.0 - 8.5	-	-	-
Turbidity (In-situ)	NTU	-	-	-	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	-
Colour, True	CU	15	-	5	-	-
Conductivity	µS/cm	-	-	2	<2.0	<2.0
Hardness (as CaCO3)	mg/L	-	-	0.5	<0.50	<0.50
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	***5.75***	***5.65***
Total Suspended Solids	mg/L	-	50	3	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	<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	<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
Fluoride (F)	mg/L	0.12	-	0.02	<0.020	<0.020
Nitrate (as N)	mg/L	13	-	0.005	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	-	0.001	<0.0010	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	<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	<0.0030	<0.0030
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.005	-	0.0001	<0.00010	<0.00010
Barium (Ba)-Total	mg/L	-	1	0.00005	<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	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.000033	0.02	0.00001	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	0.05	<0.050	<0.050
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	<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	<0.00050	<0.00050
Iron (Fe)-Total	mg/L	0.3	1	0.01	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.003	0.1	0.00005	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	-	-	0.0005	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	0.1	<0.10	<0.10
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	<0.000050	<0.000050
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<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	<0.10	<0.10
Selenium (Se)-Total	mg/L	0.001	-	0.0001	<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	<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	<0.000010	<0.000010
Vanadium (V)-Total	mg/L	-	-	0.001	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	<0.0030	<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
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	0.001	-	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	0.073	-	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

Applied Guidelines: - Federal CCME Canadian Environmental Quality Guidelines (JUL, 2012), CCME: Freshwater Aquatic Life
- Mount Nansen Effluent Quality Standards

Color Key:
Exceeds CCME Guideline
Exceeds MN Effluent Quality Standards (EQS)
Exceeds both CCME and EQS
QA/QC Assessment - highlighted if > +/- 10%

Note: For those guidelines that are hardness dependent, the most conservative guideline has been applied.

Table E3. Water Quality Results for the December 16-18, 2013 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	0167-131217-TRAVEL-BLANK TRAVEL BLANK 11/06/2013	0167-131217-FIELD-BLANK FIELD BLANK 12/17/2013
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

APPENDIX F Q3 METEOROLOGICAL DATA

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Table F-1. Mount Nansen Daily Meteorological Data (April 1 to December 31, 2013)

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
01/04/2013	-6.52	-1.58	-4.26	-3.72	-3.47	-3.6	0.2	0.0	67	2.04	1.16	203
02/04/2013	-8.58	-3.88	-6.56	-3.48	-3.28	-3.4	2.1	0.1	195	5.22	3.03	266
03/04/2013	-12.49	-3.38	-7.79	-3.30	-3.26	-3.3	0.2	0.0	70	4.24	1.95	225
04/04/2013	-17.72	-12.13	-14.96	-3.73	-3.28	-3.5	0.0	0.0	69	4.32	2.41	155
05/04/2013	-17.96	-11.67	-14.80	-4.31	-3.79	-4.1	0.0	0.0	68	4.38	3.11	75
06/04/2013	-17.90	-7.02	-12.72	-5.78	-4.31	-5.2	0.0	0.0	68	5.43	4.22	57
07/04/2013	-6.89	1.18	-1.93	-5.33	-3.47	-4.3	0.0	0.0	67	7.52	5.02	148
08/04/2013	-4.05	0.21	-1.93	-3.45	-2.97	-3.2	0.0	0.0	66	6.63	4.89	165
09/04/2013	-7.72	1.16	-2.37	-3.02	-2.62	-2.9	0.0	0.0	66	12.69	6.67	146
10/04/2013	-12.14	-5.30	-8.32	-2.80	-2.63	-2.7	0.0	0.0	64	7.03	3.90	210
11/04/2013	-13.61	-6.08	-10.30	-3.19	-2.82	-3.1	0.0	0.0	63	5.29	2.03	153
12/04/2013	-13.55	-8.90	-11.49	-3.87	-3.21	-3.6	0.0	0.0	63	5.99	4.84	84
13/04/2013	-14.48	-6.64	-10.73	-4.01	-3.83	-3.9	0.0	0.0	63	3.47	1.71	232
14/04/2013	-13.36	-5.85	-9.45	-3.98	-3.82	-3.9	0.0	0.0	63	3.39	1.46	266
15/04/2013	-10.64	-2.25	-6.99	-4.06	-3.77	-3.9	0.0	0.0	63	3.90	3.06	121
16/04/2013	-9.92	-4.48	-6.81	-3.77	-3.40	-3.6	0.0	0.0	69	3.64	1.69	122
17/04/2013	-8.84	-1.61	-6.02	-3.38	-3.07	-3.2	3.0	0.2	70	3.94	1.49	236
18/04/2013	-12.13	-7.67	-9.84	-3.07	-3.00	-3.0	0.6	0.0	70	4.10	2.77	282
19/04/2013	-13.75	-6.61	-10.79	-3.10	-3.00	-3.0	0.2	0.0	70	3.36	2.11	266
20/04/2013	-13.31	-3.12	-7.54	-3.22	-3.10	-3.2	0.3	0.0	69	3.56	1.68	198
21/04/2013	-9.80	0.15	-4.58	-3.26	-3.20	-3.2	0.0	0.0	69	3.86	1.83	215
22/04/2013	-6.65	2.03	-2.26	-3.24	-3.09	-3.2	0.0	0.0	68	3.73	1.83	227
23/04/2013	-5.58	2.63	-1.15	-3.09	-2.91	-3.0	0.0	0.0	67	4.20	2.30	228
24/04/2013	-6.26	-2.28	-3.42	-2.91	-2.62	-2.8	1.0	0.1	71	4.01	2.78	259
25/04/2013	-9.51	-3.81	-6.61	-2.62	-2.47	-2.5	0.1	0.0	71	5.19	2.71	223
26/04/2013	-13.88	-7.48	-10.34	-2.63	-2.45	-2.5	0.0	0.0	70	6.37	2.43	278

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
27/04/2013	-12.80	-6.70	-9.95	-2.88	-2.65	-2.8	0.0	0.0	69	2.61	1.56	276
28/04/2013	-17.27	-9.52	-13.11	-3.27	-2.88	-3.1	0.0	0.0	69	3.35	2.15	285
29/04/2013	-14.90	-4.49	-9.29	-3.34	-3.27	-3.3	0.0	0.0	69	3.82	2.32	270
30/04/2013	-10.06	-2.65	-6.13	-3.26	-3.03	-3.2	0.0	0.0	69	2.92	2.07	219
01/05/2013	-7.99	-1.91	-4.29	-3.02	-2.77	-2.9	0.2	0.0	70	4.16	1.90	136
02/05/2013	-2.57	5.57	1.62	-2.77	-0.11	-1.9	0.0	0.0	70	6.46	3.42	207
03/05/2013	-0.27	6.33	2.97	-0.50	0.04	-0.2	0.0	0.0	64	6.72	4.95	191
04/05/2013	0.51	6.15	3.38	0.01	0.17	0.1	0.0	0.0	59	9.68	5.17	182
05/05/2013	-2.12	1.78	0.08	-0.73	0.11	-0.2	0.0	0.0	45	8.99	3.19	225
06/05/2013	-4.60	2.02	-1.68	-0.67	0.14	-0.3	0.0	0.0	40	2.91	1.45	216
07/05/2013	-3.28	3.41	-0.18	-1.13	0.22	-0.4	0.0	0.0	37	2.51	1.47	240
08/05/2013	-1.51	4.97	1.88	-0.87	0.26	-0.2	0.0	0.0	34	1.87	1.13	228
09/05/2013	-2.66	6.74	2.73	-1.21	0.42	-0.2	0.0	0.0	33	2.93	2.01	174
10/05/2013	2.32	11.55	6.96	-0.32	1.06	0.4	0.0	0.0	30	2.72	1.69	101
11/05/2013	2.66	10.65	5.99	-0.03	1.86	0.8	0.9	0.2	26	3.31	1.76	190
12/05/2013	0.00	6.15	2.65	0.12	2.97	1.2	0.5	0.1	21	4.67	2.90	238
13/05/2013	0.77	6.48	3.40	-0.03	4.91	2.2	0.2	0.0	17	7.75	3.90	194
14/05/2013	-0.67	5.23	2.44	-1.07	4.72	1.6	0.0	0.0	13	6.36	4.04	197
15/05/2013	-2.19	4.05	1.19	-1.27	4.47	1.3	1.1	0.1	12	6.44	3.23	204
16/05/2013	-2.53	5.07	1.34	-1.76	5.18	1.3	0.0	0.0	11	7.44	3.79	194
17/05/2013	-0.30	6.93	3.07	-0.72	4.84	1.6	0.0	0.0	8	8.40	5.89	172
18/05/2013	-4.26	7.33	3.60	-1.45	7.69	3.1	0.0	0.0	5	7.89	5.86	180
19/05/2013	-9.25	-5.55	-7.28	-4.40	-2.02	-3.2	0.0	0.0	2	5.67	3.99	263
20/05/2013	-9.09	0.29	-4.50	-5.15	0.38	-2.2	0.1	0.0	1	3.50	2.19	229
21/05/2013	-3.84	5.62	1.33	-3.91	5.16	1.1	0.0	0.0	1	3.25	2.00	102
22/05/2013	0.51	8.17	4.19	-1.33	10.59	4.2	0.0	0.0	0	5.18	3.00	66
23/05/2013	0.17	11.65	6.36	-1.01	11.24	5.7	0.0	0.0	0	3.88	1.95	146
24/05/2013	5.51	13.27	9.95	1.87	12.66	8.1	0.0	0.0	0	4.62	3.11	55

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
25/05/2013	7.80	16.27	11.67	5.64	16.78	10.5	0.0	0.0	1	3.16	1.97	141
26/05/2013	8.21	17.43	12.98	6.61	18.66	12.9	0.0	0.0	1	6.63	3.89	188
27/05/2013	9.64	18.65	13.97	6.49	20.45	13.0	0.0	0.0	1	4.29	2.01	154
28/05/2013	9.09	16.77	13.33	9.79	17.60	13.0	0.1	0.0	0	4.71	2.65	192
29/05/2013	7.33	17.87	12.35	5.46	20.68	13.0	0.0	0.0	0	4.65	2.08	153
30/05/2013	9.39	17.11	12.12	8.72	21.66	13.0	6.0	0.3	0	3.48	1.99	183
31/05/2013	9.37	18.67	13.45	6.04	19.98	13.4	0.4	0.0	0	4.34	1.90	185
01/06/2013	5.86	14.80	10.65	8.12	17.44	11.9	0.6	0.0	0	3.84	1.79	175
02/06/2013	3.39	12.63	7.45	6.10	14.39	9.8	0.7	0.1	0	3.07	1.53	163
03/06/2013	4.07	13.90	9.06	4.27	18.06	11.3	0.0	0.0	1	6.82	3.58	178
04/06/2013	1.77	11.64	6.34	2.48	16.98	9.8	0.0	0.0	1	7.48	4.36	204
05/06/2013	-0.19	7.06	3.20	2.26	11.00	5.7	4.3	0.5	1	5.37	2.73	219
06/06/2013	1.93	11.34	7.33	2.33	13.83	8.4	0.1	0.0	1	3.46	2.47	157
07/06/2013	6.46	12.70	9.45	5.01	14.22	9.9	0.1	0.0	0	5.62	2.72	124
08/06/2013	5.88	11.44	8.40	4.97	11.59	8.6	2.5	0.2	0	3.62	1.84	249
09/06/2013	7.44	16.07	11.53	6.35	17.12	11.6	0.0	0.0	1	3.68	2.20	218
10/06/2013	7.13	13.63	10.09	7.83	15.62	10.8	1.5	0.2	0	3.55	2.33	236
11/06/2013	5.44	9.45	6.80	6.01	10.90	8.1	2.5	0.2	0	2.13	1.38	237
12/06/2013	4.45	11.24	7.52	5.24	13.00	8.8	0.3	0.0	1	4.92	1.91	176
13/06/2013	4.58	10.91	7.08	4.80	13.36	8.8	1.3	0.1	1	5.35	1.88	149
14/06/2013	4.37	15.59	9.82	2.67	17.76	10.8	0.0	0.0	1	2.56	1.28	186
15/06/2013	9.52	19.75	15.10	6.47	21.74	15.4	0.0	0.0	0	3.20	1.74	186
16/06/2013	13.60	21.50	17.76	11.58	22.38	17.3	0.0	0.0	0	3.04	2.17	271
17/06/2013	7.01	15.86	11.77	9.48	16.86	13.7	0.0	0.0	1	7.22	4.37	112
18/06/2013	3.83	15.29	10.22	5.21	18.73	12.6	0.0	0.0	0	5.61	4.27	65
19/06/2013	8.16	18.18	13.79	8.27	22.32	16.1	0.0	0.0	1	3.19	2.14	116
20/06/2013	10.77	17.88	14.65	10.07	21.11	16.0	1.2	0.1	1	4.80	1.58	129
21/06/2013	8.73	19.20	13.21	10.24	19.31	14.5	1.9	0.1	1	4.14	2.22	163

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
22/06/2013	10.85	20.26	15.52	8.72	24.93	16.7	0.0	0.0	1	3.51	2.06	181
23/06/2013	10.46	17.88	14.13	11.26	23.58	17.2	0.0	0.0	1	4.40	2.47	199
24/06/2013	11.26	23.19	17.67	9.86	27.97	19.7	0.0	0.0	1	5.02	2.31	98
25/06/2013	16.30	24.11	20.18	15.94	29.44	22.2	0.0	0.0	1	6.05	4.02	75
26/06/2013	14.38	22.32	18.68	14.81	29.22	21.8	0.0	0.0	1	3.63	2.32	93
27/06/2013	15.96	25.73	20.48	14.50	31.18	23.2	0.0	0.0	1	4.07	2.06	174
28/06/2013	10.25	18.17	14.74	13.46	23.80	18.6	1.4	0.1	2	4.59	2.30	180
29/06/2013	10.41	19.00	14.42	13.02	26.69	18.6	0.4	0.0	1	3.37	1.81	207
30/06/2013	11.48	20.59	15.92	11.92	28.30	20.3	0.0	0.0	1	5.44	2.65	180
01/07/2013	9.60	17.97	13.10	11.21	25.23	17.4	0.0	0.0	1	6.75	4.75	184
02/07/2013	6.86	15.76	11.09	9.55	23.24	16.0	0.1	0.0	1	6.42	4.15	208
03/07/2013	4.88	11.30	7.41	8.33	16.24	11.5	2.7	0.2	12	4.87	3.11	239
04/07/2013	4.04	13.02	8.17	5.91	15.63	10.5	0.6	0.1	4	3.21	2.06	235
05/07/2013	5.62	16.03	11.13	7.10	22.64	14.7	0.0	0.0	1	4.36	2.53	199
06/07/2013	6.80	16.61	12.06	8.95	22.87	16.1	0.0	0.0	1	3.56	1.83	165
07/07/2013	6.15	14.83	10.35	7.92	21.93	15.0	0.0	0.0	1	7.41	4.36	189
08/07/2013	7.08	14.73	10.42	9.65	21.19	14.4	0.0	0.0	1	8.07	4.85	185
09/07/2013	4.07	11.39	6.18	7.75	17.78	10.8	1.7	0.1	14	3.87	2.29	216
10/07/2013	3.14	10.54	6.61	5.58	14.24	9.4	2.0	0.2	3	2.92	1.44	202
11/07/2013	6.42	11.51	8.64	7.44	12.22	9.6	0.7	0.1	1	2.70	1.97	266
12/07/2013	4.94	12.79	8.58	5.55	15.83	10.2	0.2	0.0	1	3.28	1.89	197
13/07/2013	5.44	15.29	10.56	5.17	20.27	13.4	0.0	0.0	1	3.78	2.23	133
14/07/2013	8.34	21.30	15.21	6.65	24.74	16.7	0.0	0.0	1	3.41	1.54	212
15/07/2013	14.52	22.69	18.36	13.17	24.28	19.4	0.0	0.0	1	3.33	2.16	276
16/07/2013	12.16	21.06	15.12	12.67	24.02	16.3	1.0	0.1	2	4.14	2.14	235
17/07/2013	10.63	19.12	14.34	11.02	22.50	16.1	0.6	0.0	2	3.54	1.24	172
18/07/2013	9.46	18.60	13.92	10.81	22.39	16.6	0.4	0.0	2	2.62	1.57	253
19/07/2013	9.82	16.60	12.84	11.81	18.72	14.8	1.7	0.2	1	3.88	2.03	228

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
20/07/2013	7.19	12.49	9.23	9.26	15.62	11.2	5.4	0.6	4	3.62	1.96	247
21/07/2013	7.49	10.70	8.93	8.84	12.80	10.6	2.1	0.4	5	3.03	1.81	271
22/07/2013	8.53	14.41	10.52	9.31	14.94	11.6	1.1	0.1	1	6.45	3.35	72
23/07/2013	9.83	17.83	13.33	7.37	21.53	14.5	0.3	0.0	1	3.48	1.21	208
24/07/2013	10.86	18.00	14.01	9.12	20.77	14.5	3.4	0.2	2	3.40	1.40	193
25/07/2013	7.64	11.84	9.50	9.53	15.85	12.0	3.6	0.8	13	3.97	2.26	225
26/07/2013	8.76	15.47	11.93	10.01	17.41	13.5	1.2	0.1	2	2.98	1.60	244
27/07/2013	9.74	16.14	12.79	9.61	17.47	13.2	0.3	0.0	1	3.21	1.92	268
28/07/2013	10.85	18.27	14.64	11.23	19.30	15.3	0.9	0.1	1	2.81	1.58	259
29/07/2013	11.66	22.62	17.13	10.13	25.35	17.9	0.0	0.0	12	2.93	1.77	206
30/07/2013	13.92	20.70	16.47	12.35	23.44	17.1	0.0	0.0	1	2.57	1.73	258
31/07/2013	11.10	19.66	15.20	11.32	22.79	16.3	0.0	0.0	12	4.99	1.59	199
01/08/2013	9.23	19.45	14.37	9.76	23.84	16.9	0.0	0.0	1	4.05	1.36	151
02/08/2013	12.97	22.60	17.74	10.66	28.53	19.3	0.0	0.0	1	3.63	1.93	185
03/08/2013	11.25	18.33	14.58	10.30	23.18	17.1	0.0	0.0	1	5.33	3.44	191
04/08/2013	8.94	14.93	11.92	10.19	20.27	15.0	0.0	0.0	1	3.50	2.45	202
05/08/2013	6.81	16.91	11.15	8.73	22.06	13.7	0.7	0.0	195	3.24	2.09	201
06/08/2013	8.75	19.18	14.08	7.15	23.66	15.9	0.0	0.0	12	3.90	1.64	141
07/08/2013	10.44	18.65	14.74	11.70	22.53	16.9	0.7	0.0	2	5.83	3.45	98
08/08/2013	9.28	14.65	11.98	9.59	18.52	14.1	0.0	0.0	1	5.91	3.72	194
09/08/2013	6.49	17.44	11.68	7.27	23.50	15.0	0.0	0.0	1	4.77	2.77	202
10/08/2013	7.60	20.54	14.04	9.13	26.10	17.0	0.0	0.0	1	3.37	2.23	184
11/08/2013	11.18	23.01	17.07	11.18	27.64	19.1	0.0	0.0	1	3.00	1.56	164
12/08/2013	15.24	23.65	19.69	12.27	27.84	19.8	0.0	0.0	1	3.80	1.50	132
13/08/2013	15.56	23.96	19.09	13.22	28.87	20.6	0.0	0.0	1	4.17	1.72	143
14/08/2013	11.05	21.58	16.30	12.48	26.65	18.3	0.0	0.0	0	2.54	1.49	189
15/08/2013	14.01	21.49	17.03	10.90	25.78	18.1	0.0	0.0	1	2.91	1.23	142
16/08/2013	11.28	18.57	14.48	11.40	23.95	17.0	0.0	0.0	1	3.31	2.01	186

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
17/08/2013	7.58	14.06	10.19	9.43	19.67	13.7	0.0	0.0	1	4.28	2.47	202
18/08/2013	6.33	13.85	8.90	6.82	19.68	11.6	5.1	0.4	3	3.40	2.17	204
19/08/2013	5.40	11.22	7.70	8.06	13.10	9.9	0.2	0.0	1	3.95	2.57	245
20/08/2013	4.06	13.70	8.75	4.54	16.90	10.7	0.0	0.0	2	4.39	3.05	221
21/08/2013	5.35	9.89	6.70	6.76	13.46	9.1	2.1	0.1	1	3.05	1.64	207
22/08/2013	4.27	12.99	7.35	5.98	16.99	9.8	1.8	0.2	2	4.25	1.85	198
23/08/2013	4.59	8.81	6.43	5.91	11.76	8.4	1.8	0.3	2	2.85	1.82	211
24/08/2013	4.01	7.78	5.67	6.12	10.22	7.7	1.5	0.3	2	2.93	1.55	233
25/08/2013	2.61	6.53	4.55	3.67	8.98	6.3	0.1	0.0	1	3.72	2.49	95
26/08/2013	4.66	8.78	6.22	5.91	11.13	7.9	0.0	0.0	1	3.09	1.30	174
27/08/2013	4.18	11.81	7.41	4.57	12.77	8.4	0.0	0.0	1	2.48	1.33	130
28/08/2013	5.19	15.48	9.86	2.37	17.20	9.7	0.0	0.0	1	3.73	1.96	143
29/08/2013	5.41	14.33	9.72	3.86	17.41	10.4	0.0	0.0	1	4.62	2.26	170
30/08/2013	5.06	16.70	10.84	3.68	21.05	11.9	0.0	0.0	1	3.45	1.75	183
31/08/2013	6.13	10.57	8.33	7.10	12.48	9.9	1.3	0.1	2	2.61	1.43	144
01/09/2013	4.04	8.12	5.58	5.98	10.95	7.8	2.5	0.4	2	2.99	1.44	137
02/09/2013	4.54	16.90	9.51	4.09	17.57	10.0	0.0	0.0	1	3.78	2.12	168
03/09/2013	7.53	12.16	9.47	6.86	12.60	9.0	0.0	0.0	1	6.88	3.81	201
04/09/2013	6.74	15.90	10.76	4.43	15.86	9.9	0.0	0.0	1	7.21	4.81	205
05/09/2013	4.98	13.74	8.71	4.62	15.43	9.5	0.0	0.0	1	3.98	2.31	205
06/09/2013	3.34	12.84	8.33	2.91	13.55	8.3	0.0	0.0	1	10.12	4.76	189
07/09/2013	8.78	14.17	11.21	7.15	15.68	11.1	0.0	0.0	1	7.25	5.08	179
08/09/2013	5.91	12.65	9.59	6.98	13.47	9.9	1.1	0.1	1	6.94	4.09	189
09/09/2013	2.44	10.95	6.58	1.92	14.14	7.7	0.0	0.0	1	4.14	2.79	220
10/09/2013	3.17	12.94	7.31	2.73	13.92	7.6	0.0	0.0	1	4.00	2.26	193
11/09/2013	4.90	13.45	8.73	5.89	13.69	8.9	0.2	0.0	1	9.02	4.46	171
12/09/2013	3.14	12.68	7.92	1.47	14.99	8.1	0.0	0.0	1	3.09	1.97	176
13/09/2013	2.46	12.37	7.37	1.52	14.48	7.6	0.0	0.0	1	3.02	1.81	201

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
14/09/2013	4.62	6.90	5.73	4.68	8.27	6.2	0.3	0.0	1	2.40	0.73	147
15/09/2013	4.11	7.15	5.38	4.93	8.00	6.2	0.0	0.0	1	4.83	2.55	126
16/09/2013	-1.25	4.76	1.73	0.33	5.10	2.5	1.9	0.3	5	5.93	2.67	119
17/09/2013	-1.30	4.88	1.38	0.14	6.25	2.5	2.6	0.2	1	3.99	1.68	109
18/09/2013	0.93	7.11	3.61	0.02	8.28	3.7	0.1	0.0	1	5.24	2.66	187
19/09/2013	0.04	6.94	2.84	-1.12	7.69	2.9	0.5	0.0	1	4.62	2.57	137
20/09/2013	-2.04	1.16	-0.48	0.38	3.02	1.5	1.9	0.3	9	3.59	1.36	162
21/09/2013	-2.53	5.22	1.16	0.03	6.39	2.4	3.0	0.2	3	4.48	2.33	112
22/09/2013	-0.20	2.85	1.48	0.70	3.45	2.1	0.6	0.1	1	4.57	3.19	55
23/09/2013	-3.36	2.68	-0.15	-0.54	2.60	1.6	0.8	0.1	1	3.83	1.72	184
24/09/2013	-4.92	-1.85	-3.29	-1.61	0.75	-0.7	0.1	0.0	1	2.86	1.72	233
25/09/2013	-3.14	6.45	1.78	-2.30	4.05	0.8	0.1	0.0	1	4.43	2.24	140
26/09/2013	-0.63	3.07	0.98	0.19	1.08	0.7	1.2	0.3	4	4.40	2.27	210
27/09/2013	-2.65	5.17	1.52	-2.19	3.15	0.7	3.5	0.3		6.13	2.68	162
28/09/2013	0.01	3.29	1.07	-0.23	2.54	0.8	0.0	0.0	1	5.87	4.44	45
29/09/2013	0.64	4.18	1.52	0.49	3.53	1.4	0.0	0.0	0	6.86	5.12	35
30/09/2013	0.12	2.83	1.55	0.35	2.85	1.4	0.0	0.0	1	5.82	4.62	32
01/10/2013	-0.04	1.62	0.96	0.60	2.44	1.2	0.4	0.1	1	3.67	2.51	48
02/10/2013	-0.55	5.15	1.43	-0.39	5.94	1.9	0.3	0.0	1	4.32	1.83	190
03/10/2013	-0.84	1.90	0.14	-1.72	0.99	-0.4	0.0	0.0	1	5.02	2.43	142
04/10/2013	-0.84	2.69	0.50	-0.76	2.85	0.7	0.0	0.0	1	3.09	1.49	175
05/10/2013	-2.53	3.52	-0.20	-1.36	2.53	0.0	0.0	0.0	1	2.64	1.53	216
06/10/2013	-2.04	4.57	0.64	-3.05	3.15	-0.1	0.0	0.0	1	3.13	1.74	158
07/10/2013	-3.35	1.52	-0.68	-2.65	1.30	-0.6	0.0	0.0	1	3.84	1.92	247
08/10/2013	-4.52	2.17	-1.03	-3.91	0.67	-1.4	0.0	0.0	1	6.22	2.30	148
09/10/2013	-3.93	0.95	-0.97	-1.62	0.30	-0.3	0.0	0.0	15	4.98	4.04	228
10/10/2013	-5.35	1.17	-2.46	-2.65	-0.13	-1.6	1.0	0.2	14	3.21	1.62	202
11/10/2013	-3.13	3.03	-0.50	-2.80	0.06	-1.4	0.9	0.1	12	2.83	1.91	229

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
12/10/2013	-2.81	2.04	-0.96	-2.74	-0.34	-1.8	0.0	0.0	11	2.68	1.46	221
13/10/2013	-3.33	3.64	0.46	-2.54	0.59	-0.8	0.0	0.0	10	5.27	2.83	135
14/10/2013	-0.57	5.57	2.59	-2.30	1.24	-0.1	0.0	0.0	9	6.07	2.58	216
15/10/2013	-2.28	3.97	0.68	-2.88	1.17	-0.8	0.0	0.0	9	4.67	2.93	223
16/10/2013	-0.07	8.05	3.24	-1.65	2.10	0.2	0.0	0.0	9	4.61	2.81	235
17/10/2013	1.18	5.37	3.62	-1.35	1.89	0.2	0.0	0.0	9	4.04	1.58	179
18/10/2013	1.86	7.44	3.68	-0.69	2.01	0.6	0.0	0.0	9	4.31	2.87	219
19/10/2013	1.12	7.29	3.86	-1.14	2.87	0.6	0.0	0.0	8	8.60	4.43	192
20/10/2013	0.35	5.18	2.54	-2.09	2.18	-0.3	0.0	0.0	7	5.29	1.93	216
21/10/2013	-3.42	2.28	-1.15	-4.75	0.44	-2.6	0.0	0.0	7	3.29	2.20	237
22/10/2013	-3.97	0.78	-2.47	-5.70	-0.38	-3.8	0.0	0.0	7	2.86	1.84	159
23/10/2013	-6.46	-3.93	-4.66	-4.42	-2.17	-3.3	0.0	0.0	21	5.11	2.99	85
24/10/2013	-8.99	-2.60	-6.03	-4.01	-1.86	-3.0	0.1	0.0	21	4.92	1.71	148
25/10/2013	-2.77	-0.53	-1.52	-3.24	-0.59	-1.8	0.2	0.0	22	2.53	0.93	146
26/10/2013	-5.74	-0.21	-2.59	-2.46	-0.57	-1.1	0.1	0.0	27	4.31	2.34	199
27/10/2013	-5.87	-0.77	-3.23	-2.58	-1.04	-1.8	0.0	0.0	24	2.61	1.50	101
28/10/2013	0.17	6.25	4.01	-1.21	1.03	0.1	2.9	0.5	24	9.94	4.56	198
29/10/2013	-1.50	4.81	0.96	-3.14	0.43	-1.0	0.1	0.0	20	6.43	3.56	224
30/10/2013	-2.27	0.54	-1.08	-3.02	-0.58	-1.8	0.0	0.0	20	3.30	1.34	123
31/10/2013	-2.13	2.82	-0.61	-3.29	-0.38	-2.1	0.0	0.0	20	3.50	2.22	222
01/11/2013	-3.47	-0.62	-2.31	-2.36	-0.54	-1.8	0.0	0.0	19	3.48	1.78	211
02/11/2013	-6.55	-3.84	-4.97	-5.06	-1.82	-3.1	0.0	0.0	20	2.28	1.00	196
03/11/2013	-7.83	-3.41	-6.26	-6.60	-3.73	-5.4	0.0	0.0		3.37	1.85	217
04/11/2013	-8.80	-6.86	-7.59	-7.10	-4.25	-5.7	0.0	0.0	20	3.90	1.83	50
05/11/2013	-8.86	-4.87	-6.78	-5.99	-3.26	-4.7	0.0	0.0	22	2.61	0.96	191
06/11/2013	-12.41	-8.21	-10.43	-6.81	-5.25	-5.8	0.0	0.0	22	2.89	1.36	199
07/11/2013	-15.33	-11.03	-12.74	-8.16	-5.39	-6.4	0.0	0.0	24	1.21	0.47	143
08/11/2013	-22.88	-15.08	-18.66	-10.53	-7.08	-8.5	0.0	0.0	24	0.99	0.42	193

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
09/11/2013	-23.92	-12.26	-17.47	-11.33	-8.05	-9.8	0.0	0.0	24	1.15	0.41	144
10/11/2013	-14.67	-3.54	-7.19	-8.69	-3.48	-5.6	0.0	0.0	23	4.70	2.32	212
11/11/2013	-11.96	-2.54	-7.26	-6.01	-4.24	-5.2	0.0	0.0	24	2.06	1.04	200
12/11/2013	-16.18	-10.92	-12.35	-8.60	-5.72	-6.4	0.0	0.0	24	2.80	1.47	223
13/11/2013	-19.11	-6.25	-13.72	-10.11	-4.54	-7.9	0.0	0.0	24	4.09	1.98	209
14/11/2013	-7.89	-3.35	-5.58	-4.58	-2.66	-3.4	0.0	0.0	28	6.40	3.29	261
15/11/2013	-18.19	-7.23	-13.09	-6.21	-3.28	-4.4	0.0	0.0	28	3.87	2.31	265
16/11/2013	-18.94	-16.65	-17.68	-6.17	-5.52	-5.7	0.0	0.0	28	2.18	1.30	262
17/11/2013	-23.38	-19.14	-21.33	-7.79	-5.80	-6.8	0.0	0.0	28	3.66	1.92	266
18/11/2013	-27.82	-22.45	-25.09	-9.49	-7.81	-8.6	0.0	0.0	28	1.99	0.35	164
19/11/2013	-31.74	-26.55	-28.57	-10.10	-8.78	-9.6	0.0	0.0	28	1.01	0.27	134
20/11/2013	-30.45	-26.29	-28.97	-10.78	-8.68	-9.8	0.0	0.0	28	1.79	0.48	171
21/11/2013	-30.10	-23.53	-26.43	-11.26	-10.50	-10.9	0.0	0.0	28	5.05	3.80	36
22/11/2013	-23.78	-0.47	-8.86	-10.54	-3.70	-6.5	0.0	0.0	29	8.96	4.34	111
23/11/2013	-12.71	-1.52	-6.00	-5.04	-3.24	-3.8	0.0	0.0	29	7.36	3.66	198
24/11/2013	-11.85	-7.59	-9.97	-5.37	-4.73	-5.1	0.0	0.0	29	3.43	2.35	222
25/11/2013	-12.19	-9.25	-11.09	-5.39	-4.85	-5.2	0.0	0.0	30	3.90	2.86	40
26/11/2013	-14.35	-7.25	-11.03	-4.73	-4.15	-4.4	0.0	0.0	31	2.51	0.61	162
27/11/2013	-8.33	-6.16	-7.32	-4.41	-3.33	-3.8	0.0	0.0	33	5.11	2.60	76
28/11/2013	-18.26	-6.61	-13.76	-3.83	-3.14	-3.6	0.0	0.0	39	3.93	1.56	200
29/11/2013	-24.64	-18.52	-22.82	-5.07	-3.84	-4.6	0.0	0.0	39	3.92	2.68	253
30/11/2013	-27.00	-24.04	-25.37	-6.03	-5.06	-5.5	0.0	0.0	36	2.19	0.96	172
01/12/2013	-26.84	-21.65	-24.45	-6.40	-6.07	-6.3	0.0	0.0	36	3.39	1.80	237
02/12/2013	-22.16	-11.10	-16.71	-6.47	-5.68	-6.2	0.0	0.0	35	3.26	0.75	160
03/12/2013	-13.51	-8.25	-11.25	-5.62	-4.83	-5.3	0.0	0.0	35	1.74	0.74	191
04/12/2013	-11.06	-8.02	-9.14	-4.96	-4.17	-4.5	0.0	0.0	35	1.35	0.68	171
05/12/2013	-13.37	-6.84	-10.65	-5.77	-5.08	-5.5	0.0	0.0	35	0.88	0.27	154
06/12/2013	-14.28	-1.71	-9.30	-5.90	-3.59	-5.0	0.0	0.0	35	3.13	1.34	212

Date	Air Temperature (°C)			Ground Temperature (°C)			Rainfall (mm)		Snow Depth (cm)	Wind Speed (m/s)		Wind Direction (deg.)
	Min.	Max.	Mean	Min.	Max.	Mean	Max.	Mean	Max.	Max.	Mean	Mean
07/12/2013	-2.38	1.21	-0.13	-3.45	-2.00	-2.6	0.0	0.0	35	4.67	3.30	273
08/12/2013	-2.76	0.30	-0.93	-2.20	-1.97	-2.1	0.0	0.0	35	4.74	2.75	251
09/12/2013	-6.07	-1.15	-3.93	-2.37	-2.06	-2.2	0.0	0.0	35	4.12	2.72	257
10/12/2013	-11.31	-5.94	-9.64	-2.99	-2.35	-2.7	0.0	0.0	39	2.06	0.76	184
11/12/2013	-19.55	-12.40	-17.58	-7.49	-2.90	-5.7	0.0	0.0	40	10.43	7.71	34
12/12/2013	-20.74	-19.35	-19.78	-7.75	-6.90	-7.4	0.0	0.0	37	7.35	5.85	53
13/12/2013	-21.90	-18.22	-20.58	-7.24	-6.88	-7.0	0.0	0.0	37	7.24	5.02	36
14/12/2013	-18.42	-3.97	-9.36	-6.84	-4.00	-5.3	0.0	0.0	37	5.25	2.39	93
15/12/2013	-16.38	-6.72	-11.90	-4.66	-3.79	-4.3	0.0	0.0	38	7.31	2.73	171
16/12/2013	-27.01	-17.60	-23.49	-6.91	-4.71	-5.8	0.0	0.0	38	2.05	0.68	180
17/12/2013	-27.75	-24.87	-26.54	-8.18	-6.99	-7.7	0.0	0.0	38	3.04	1.40	212
18/12/2013	-25.79	-16.35	-21.88	-8.18	-7.45	-7.9	0.0	0.0	38	4.46	1.89	196
19/12/2013	-19.81	-14.28	-16.62	-7.37	-6.06	-6.6	0.0	0.0	38	3.31	0.96	210
20/12/2013	-20.54	-16.16	-18.00	-7.10	-6.77	-6.9	0.0	0.0	38	0.64	0.13	151
21/12/2013	-16.25	-14.08	-15.26	-6.73	-5.79	-6.1	0.0	0.0	38	1.09	0.37	97
22/12/2013	-15.51	-12.63	-14.16	-5.77	-4.97	-5.4	0.0	0.0	41	3.26	1.37	126
23/12/2013	-21.49	-16.14	-17.99	-5.38	-4.94	-5.1	0.0	0.0	48	5.05	2.48	237
24/12/2013	-24.01	-19.49	-21.69	-6.49	-5.49	-6.2	0.0	0.0	47	3.55	1.62	129
25/12/2013	-24.20	-18.11	-20.46	-6.09	-5.66	-5.8	0.0	0.0	46	3.82	0.72	166
26/12/2013	-28.74	-24.72	-26.64	-7.62	-5.94	-6.8	0.0	0.0	45	0.79	0.20	166
27/12/2013	-27.52	-23.35	-25.09	-7.68	-6.62	-7.1	0.0	0.0	44	3.53	1.49	85
28/12/2013	-23.84	-16.93	-19.92	-7.35	-6.37	-6.9	0.0	0.0	44	5.23	2.61	60
29/12/2013	-21.63	-15.28	-18.45	-6.29	-5.87	-6.0	0.0	0.0	44	3.42	0.82	134
30/12/2013	-17.08	-14.99	-16.05	-5.95	-5.23	-5.7	0.0	0.0	47	4.42	3.38	38
31/12/2013	-17.64	-10.83	-15.58	-5.25	-5.11	-5.2	0.0	0.0	47	2.96	1.17	63

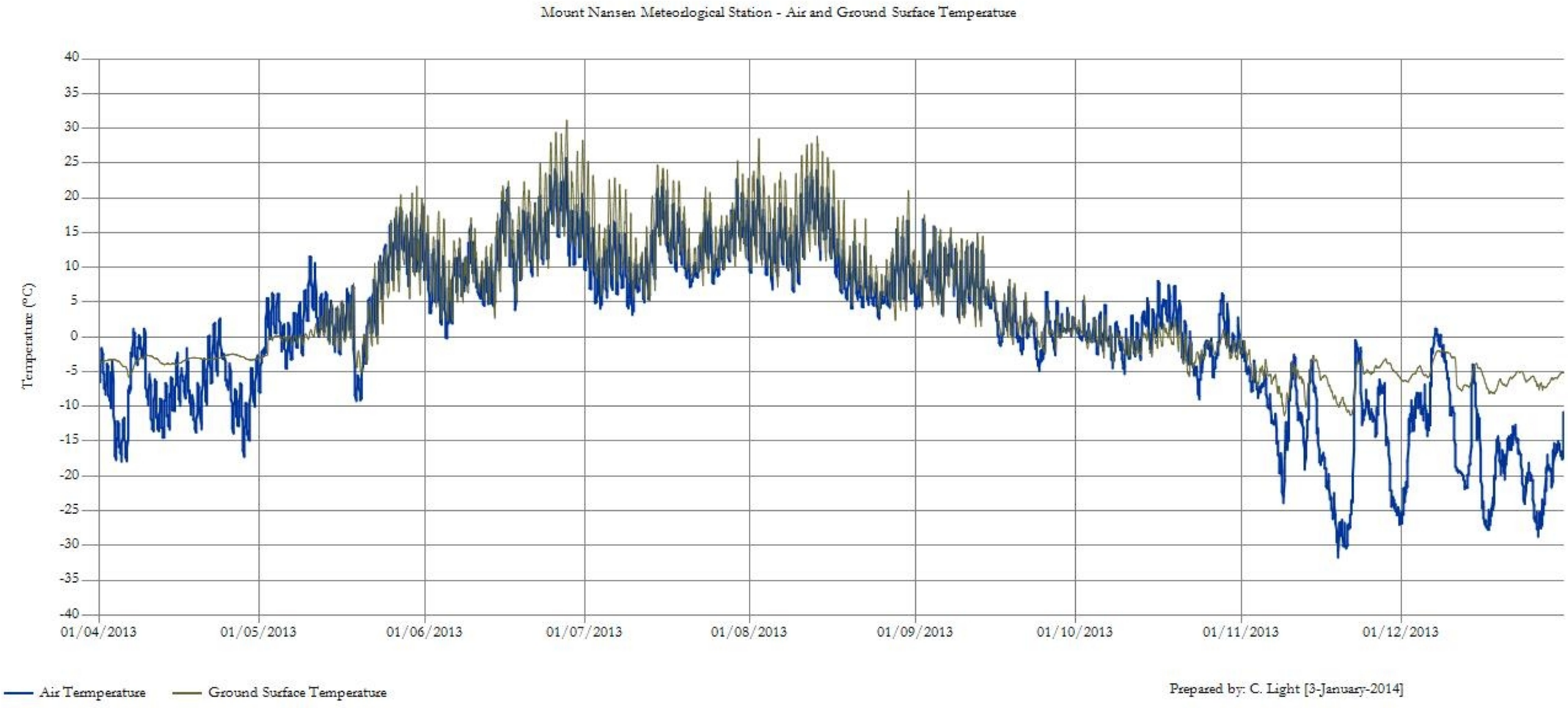

Figure F-1 Mount Nansen mean hourly air and ground temperature, April 1 to December 31, 2013.

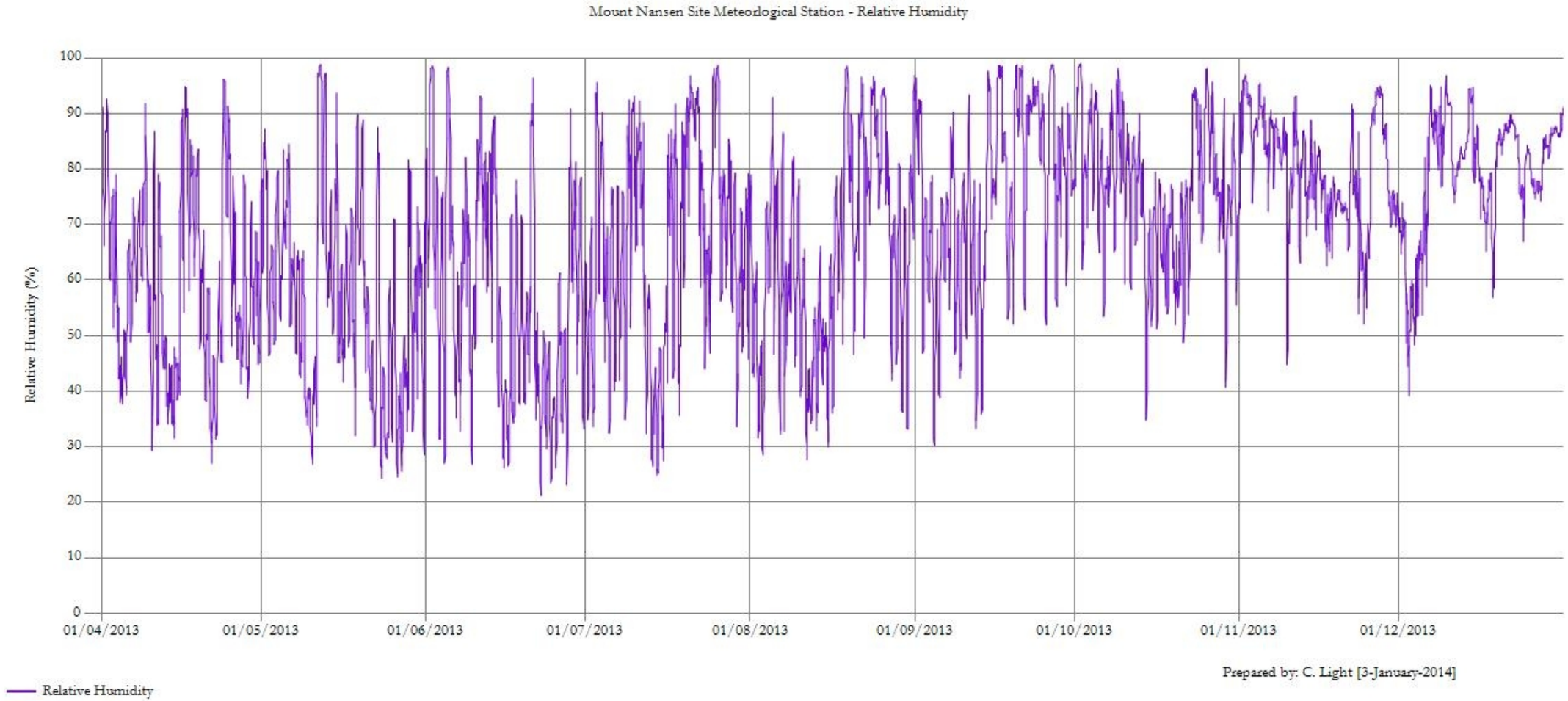

Figure F-2 Mount Nansen mean hourly relative humidity, April 1 to December 31, 2013.

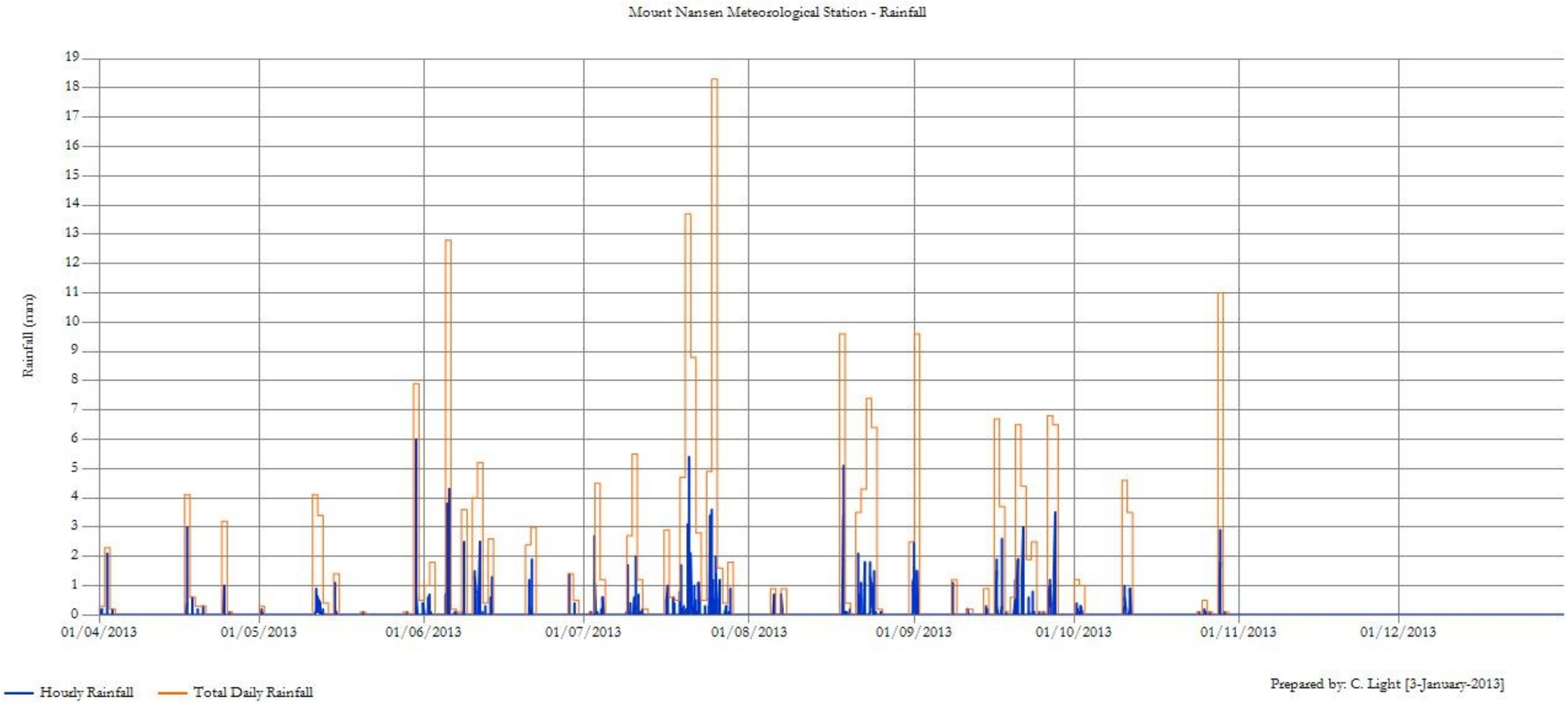

Figure F-3 Mount Nansen cumulative daily and hourly precipitation as rainfall, April 1 to December 31, 2013.

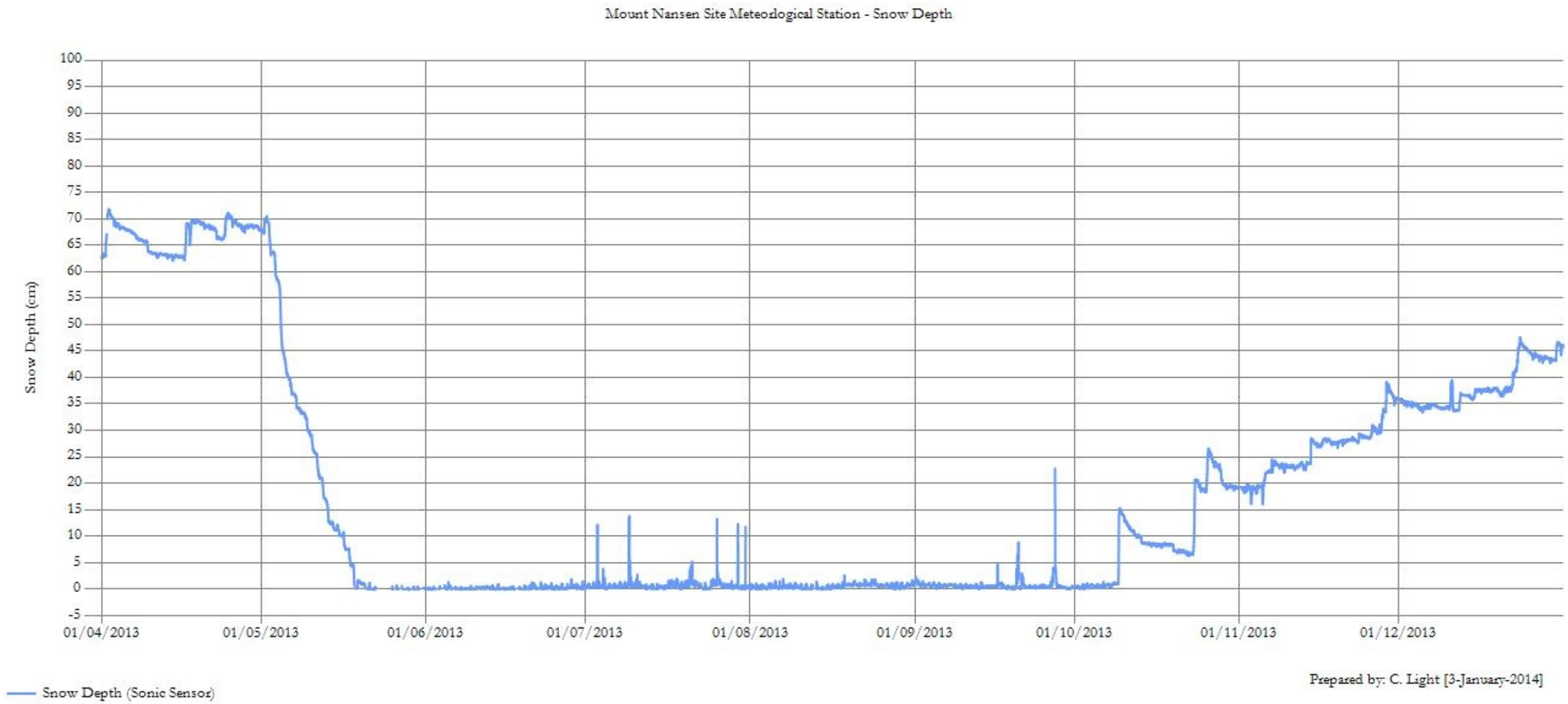

Figure F-4 Mount Nansen mean hourly snow depth, April 1 to December 31, 2013.

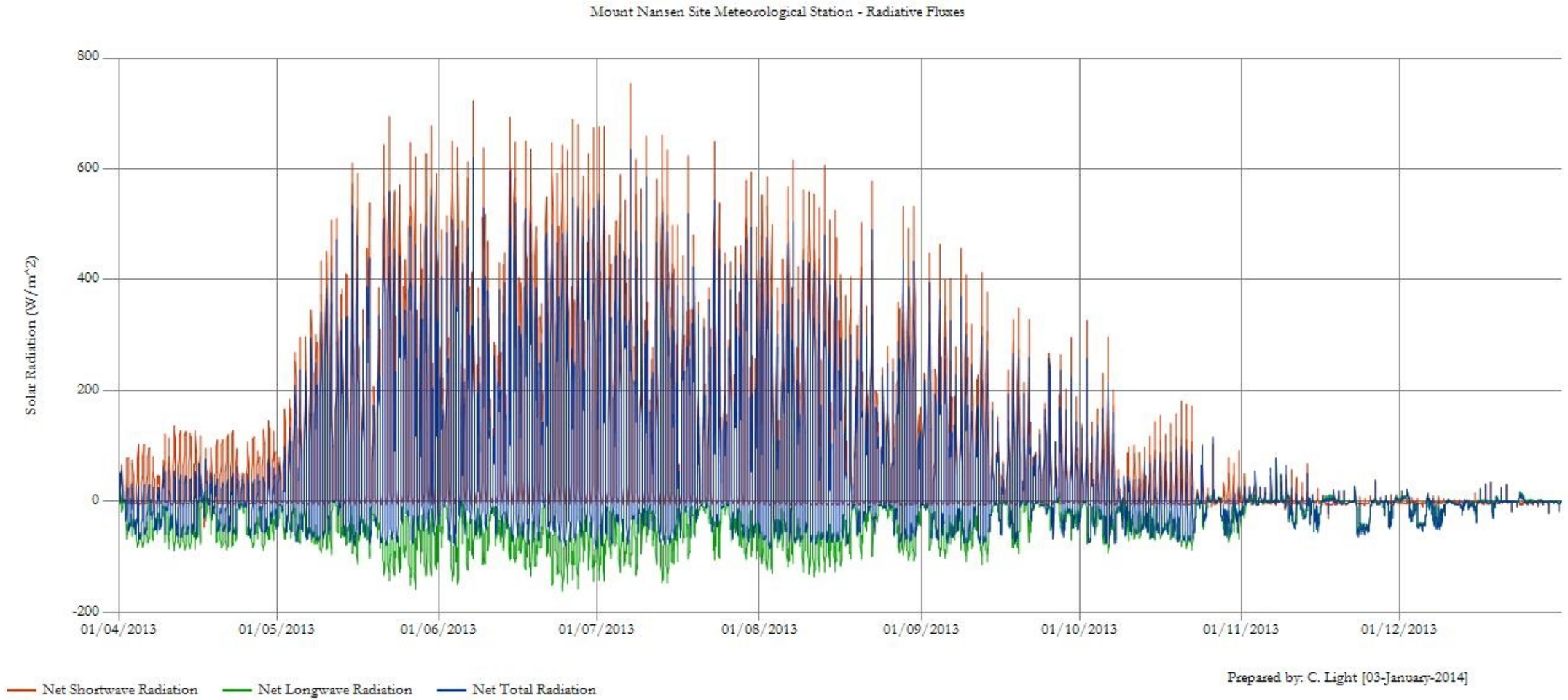

Figure F-5 Mount Nansen mean hourly net shortwave, long wave and total radiation, April 1 to December 31, 2013.

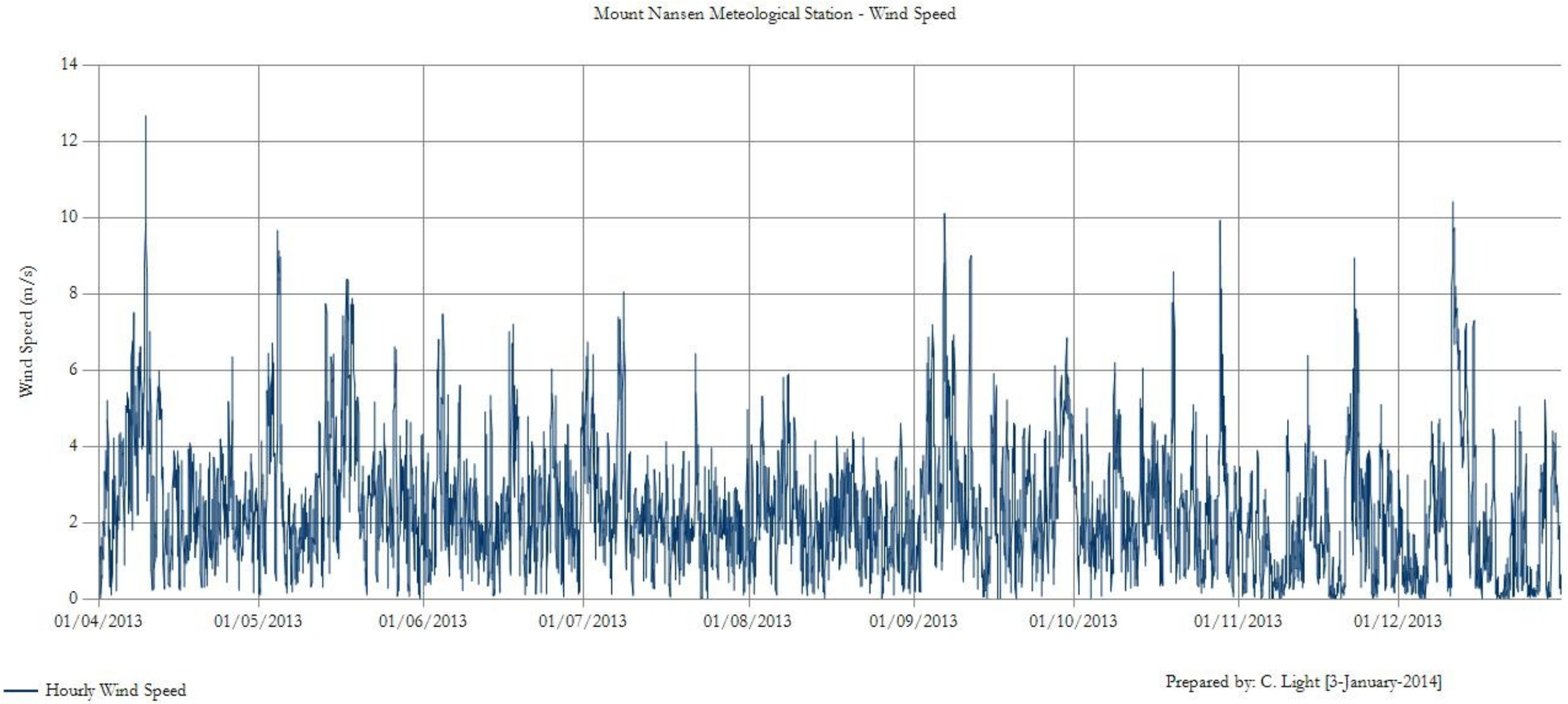

Figure F-6 Mount Nansen mean hourly wind speed, April 1 to December 31, 2013.

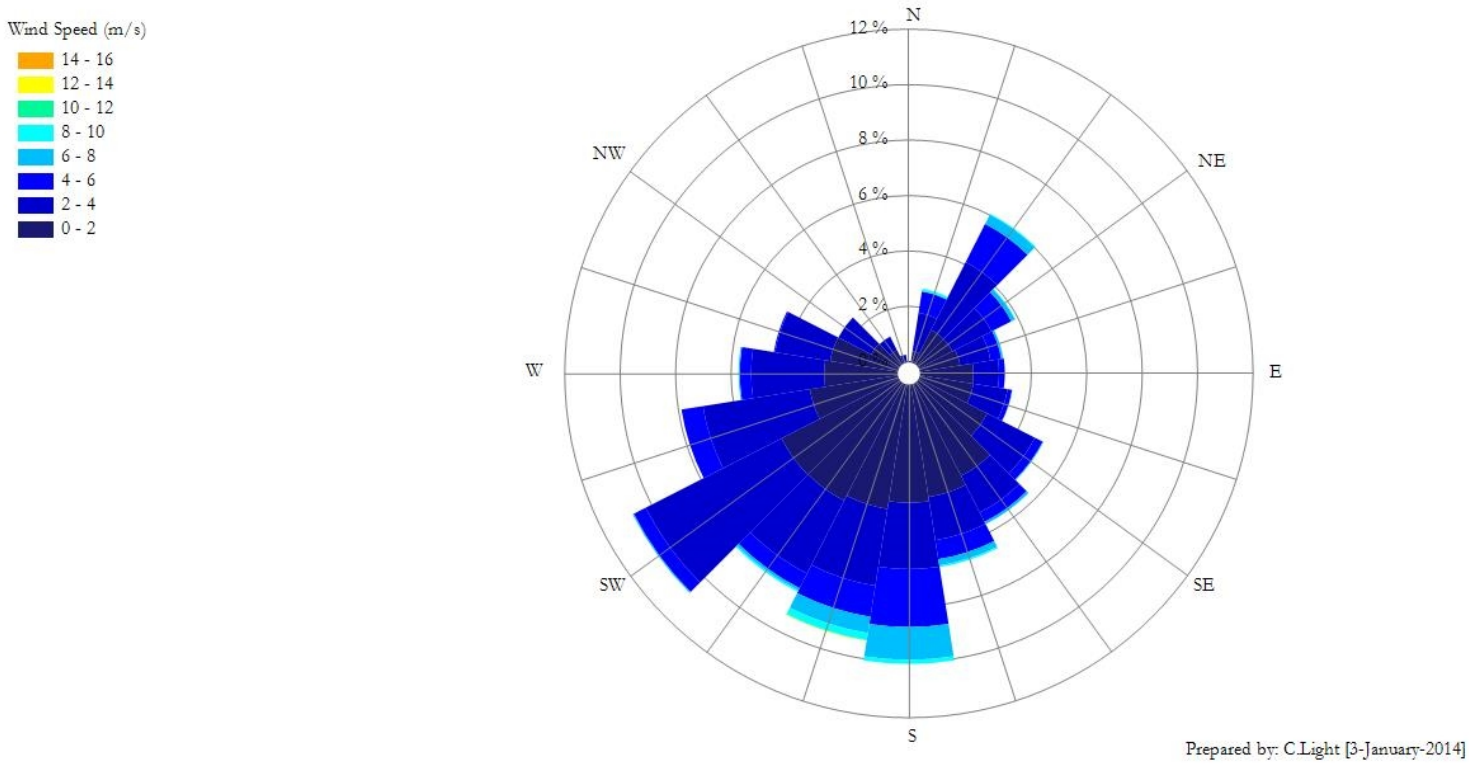

Figure F-7 Mount Nansen wind speed and direction, April 1 to December 31, 2013.