

April 06, 2017

EDI Project No: 16Y0089

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

Attention: Emilie Hamm, A/Project Manager

**RE: Mount Nansen Water Resources Investigations – Monthly Report:
March 2017 & Seasonal Analysis - FINAL**

This monthly report provides a summary of site conditions and data collected during EDI’s March 2017 trip to Mount Nansen as part of the 2016/17 Water Resources Investigations. The March 2017 trip represents the end of the winter season and thus a more detailed seasonal analysis of hydrology and meteorology data is provided for this period (October 16, 2016 to March 28, 2017). Hydrologic and meteorological details from April 1, 2016 to October 15, 2016 are provided in the October 2016 Monthly Report. In addition to hydrology and meteorology, this report describes site conditions, water quality data, program recommendations, and additional trip information (Table 1). This March 2017 trip represents the fifth and final monitoring event of the winter season.

Trip dates:	March 6 to 8, 2017
EDI field staff:	Scott Dilling, Alexandre Mischler, and Danny Skookum
Weather during trip:	Air temperatures ranged from -38°C to -15°C with clear skies and light winds.

Table 1. Summary of information provided in this monthly report

Report Section	Description
Site Conditions) Summary of weather and general site conditions
Meteorology) Statement on meteorological station status and identification of any data gaps or QA/QC issues
) Seasonal Meteorological Summary (October 2016 to March 2017)
Hydrology) Discussion of hydrology data for March
) Statement of QA/QC for the data collected this month
) Seasonal Hydrological Summary (October 2016 to March 2017)



Report Section	Description
Water Quality	<ul style="list-style-type: none">) Summary of water quality results for March) Statement on QA/QC sample results for this month
Program Recommendations	<ul style="list-style-type: none">) Program recommendations for meteorological, hydrology and water quality programs
Additional Trip Information	<ul style="list-style-type: none">) Project safety concerns) Wildlife sightings) Budget and schedule considerations
List of Attachments	<ol style="list-style-type: none"> 1. Maps of Hydrometric Stations and Water Quality Sites 2. Site and Station Photos 3. Meteorology Seasonal Data Summary (rainfall and snowfall summary data tables, data plots – October 16, 2016 to March 28, 2017) 4. Hydrology Summary Data Tables (March 2017 trip) <ul style="list-style-type: none"> ▪ Site Conditions and Tasks Completed & Summary Table of Discharge Measurements 5. Hydrology Seasonal Data Summary (October 16, 2016 to March 28, 2017) <ul style="list-style-type: none"> ▪ Instantaneous measurements and hydrographs 6. Water Quality Summary Data Tables <ul style="list-style-type: none"> ▪ Site Conditions and Samples Collected & Summary Table of In Situ Parameters and Lab Results (March 2017) 7. Laboratory Certificates of Analysis (COA) & Yukon Environmental Health Services Bacteriological Results.

SITE CONDITIONS

The hydrologic and water quality conditions observed during the March 2017 trip were reflective of winter conditions. Air temperatures noted by EDI at the Mount Nansen site ranged from lows of -38°C , to daytime highs of -15°C ; with clear skies during the three day sampling event. Seeps and small streams remained frozen, and no samples will be collected at these stations until spring melt. Stations and sites along Pony Creek and Back Creek were frozen to bed. Some sites and stations along Dome Creek (H/WQ-DC-B, H/WQ-DC-R) remain covered with overflow ice with no detectable flow under the ice layers. Snow and ice were present at all locations and water levels were low at sites where flowing water was detected.

METEOROLOGY

Meteorological data was collected at the ATM-ROAD station throughout March 2017; EDI conducted a preliminary QA/QC review of the data and all sensors appear to be functioning properly and there are no gaps in the March data. No unnatural disturbance to the snow below the snow depth sensor was observed at the time of the visit on March 6. There were no tracks inside the fenced area.



Seasonal Meteorological Summary: October 16, 2016 – March 28, 2017

All sensors at the ATM-ROAD meteorological station functioned properly during the winter season, except for the period between December 25, 2016 and January 5, 2017 when a drop in the battery voltage produced missing hourly and daily average data. After January 5, 2017 the voltage increased and no further data collection gaps occurred. As a precautionary measure, YG AAM replaced the battery at the station on January 24, 2017.

Regular seasonal air temperature trends were generally reflected during the October 16, 2016 to March 28, 2017 period. Mean daily air temperatures at the meteorological station began to fall below 0.0°C before October 16, 2016 and consistently remained below 0.0°C for the entire season except for a few hourly measurements slightly above 0.0°C on October 20, November 9 and 10, and February 13, 14 and 15. Mean daily temperatures remained below 0.0°C for the entire winter period. The second half of October 2016 had the highest mean monthly temperature at -6.7°C, and March 2017 had the lowest mean monthly temperature at -16.9°C. The maximum hourly temperature recorded at the meteorological station during the reporting period was 3.0°C on November 9, 2016, while the lowest recorded temperature was -30.5°C on December 10, 2016 (Table 2). Daily air temperature fluctuations throughout the winter season can be seen in more detail in Attachment 3, Figure 3.1.

The ground surface temperature record followed similar seasonal patterns as air temperature. The daily average ground surface temperature was below 0.0°C for the entire winter period. The maximum hourly ground temperature was 0.0°C on November 10, 2016, and the minimum hourly ground temperature was -15.0°C on November 19, 2016 (Attachment 3, Figure 3.1).

Seasonal rainfall and snowfall patterns were characteristic of the region from October 16, 2016 to March 28, 2017. Rainfall events are defined in this report as periods of rainfall greater than or equal to four hours, and/or have greater than or equal to 2.0 mm of rainfall recorded. Four rainfall events occurred during the winter when temperatures rose above 0.0°C; one event in November and three in February (Table 2 and Attachment 3, Figure 3.2). It is possible that the winter rainfall events were the result of sensor error that can occur when the sensor records melt water rather than precipitation.

Snow was present on the ground throughout the entire winter period. The depth of the snowpack at the beginning of the 2016/17 winter period was 0.9 cm on October 16, 2016, and the depth at the end of the winter season was 51.5 cm on March 28, 2017. The snowpack reached its maximum depth of 53.1 cm on March 23, 2017. Snow precipitation events are periods of snowfall greater than or equal to 4 hours and/or greater than or equal to 1 cm. In total, 24 snowfall events occurred during the season (Table 3 and Attachment 3: Table 23.1 & Figure 3.3). December 2016 represented the most intense and highest cumulative total monthly snowfall amount. Total monthly snowfall during the month of December was 35.6 cm and included eight snowfall events. The largest snowfall event resulted in an 18.1 cm increase in snow depth and occurred on December 29 or 30, 2016; the precise start and duration of event is unknown since the weather station was not functioning properly due to low battery voltage conditions.



Snow depths were not manually measured during the 2016/17 winter season as the reliability and accuracy of the snow sensor depth measurements were confirmed during the 2015/16 winter season. The snow sensor quality metric ‘Snow_Depth_Qual’ indicates that except for brief, infrequent durations, the snow sensor depths measurements were of good quality.

The dominant wind directions during the season were south, south-west and north-east (Attachment 3: Figure 3.4). The maximum mean hourly wind speed recorded during this period was 8.5 m/s (30.6 km/hr) on January 27, 2017. The month with the highest mean wind speed was January 2017 at 2.0 m/s (7.2 km/hr), while December had the lowest mean monthly wind speed at 1.6 m/s (5.8 km/hr) (Attachment 4, Figure 3.5).

Net radiation during the winter season ranged from a mean daily minimum of -49.9 W/m² on November 14, 2016 to a mean daily maximum of 45.6 W/m² on October 25, 2016. December 2016 had the highest mean monthly net radiation at 3.57 W/m², while February 2017 had the lowest mean monthly net radiation at -21.1 W/m² (Attachment 3, Figure 3.6).

Mean daily relative humidity ranged from 29.3% to 95.7% with a mean value of 75.2% for the winter season. The maximum hourly relative humidity of 98.9% occurred on November 5, 2016. The minimum hourly relative humidity was 17.4% on February 4, 2017 (Attachment 3, Figure 3.7).

Mean daily atmospheric pressure ranged from 83.2 kPa to 88.9 kPa with a mean value of 86.3 kPa for the October 16, 2016 to March 28, 2017 period. The maximum hourly atmospheric pressure of 89.1 kPa occurred on February 3, 2017. The minimum hourly atmospheric pressure was 82.8 kPa on January 17, 2017 (Attachment 3, Figure 3.8).

Table 2. Mount Nansen air temperature and precipitation statistics by month (October 16, 2016 to March 28, 2017)

Month	Air Temperature			Snowfall			Rainfall			
	Max (°C)	Min (°C)	Mean (°C)	Number of Events	Events Total (cm)	Max Event Total (cm)	Number of Events	Max Intensity (mm/hr)	Max Daily Total (mm)	Total Monthly (mm)
October (16-28)	1.5	-15.5	-6.7	3	9.2	5.4	0	0.9	1.1	1.8
November	3.0	-23.4	-8.8	4	12.1	3.9	1	0.4	1.4	2.3
December	-4.8	-30.5	-15.1	8	35.6	18.1	0	0.0	0.0	0.0
January	-0.8	-28.8	-11.5	2	10.5	8.3	0	0.1	0.1	0.1
February	2.3	-20.5	-10.6	2	2.6	1.4	3	0.9	2.5	6.3
March (1-28)	-0.6	-30.3	-16.9	5	9.6	3.2	0	0.3	0.3	0.5



HYDROLOGY

Three hydrometric stations provided suitable conditions for discharge measurements during the March 6-8, 2017 trip: H-VC-U, H-VC-DBC and H-SEEP. A total of nine discharge measurements were scheduled at the Mount Nansen site for March; however, sites H-DC-DX+105, H-DC-B, H-DC-M WP, H-BC, H-VC-UMN and H-VC-R+290 did not provide suitable conditions for discharge measurements due to ice conditions. Hydrometric stations at H-PC-DSP and H-DC-D1b remain frozen to the substrate. Flow rates at stations on Victoria Creek were very low in March 2017, with an estimated discharge of less than 0.001 m³/s at H-VC-UMN and H-VC-R+290. Continuous water level logger records are available for all Victoria Creek stations. A review of the available continuous hydrometric and barometric data files indicates that all sensors were functioning properly.

Surface water conditions and hydrometric monitoring tasks completed at each station in March 2017 are summarized in Attachment 4. Quality control and quality assurance for the hydrometric data was conducted on both the instantaneous and continuous datasets.

Field Results - March

-) Discharge measurements were collected using salt dilution gauging methods at two Victoria Creek stations, H-VC-U and H-VC-DBC, with discharge values of 0.024 m³/s and 0.028 m³/s, respectively. There was ice within the channels during the salt tracer measurements, which adds measurement uncertainty to the discharge value.
-) No flow could be detected at H-VC-R+290. Four holes were chipped through the ice and only stagnant water was detected. Data from the logger indicates that the station froze to bed on February 8, 2017 and remained frozen until the data was downloaded on March 6, 2017.
-) Salt dilution gauging methods were attempted at H-VC-UMN, however flows were too low to measure and the measurement was aborted. Discharge was estimated to be below the reportable confidence limit (0.001 m³/s).
-) Ice thicknesses at the Victoria Creek stations ranged from 0.05 m to 0.30 m.
-) For the first time during the 2016/17 winter season, the channel at H-DC-DX+105 was frozen to bed; no discharge measurement was collected.
-) Site conditions were not suitable for a salt tracer measurement at H-DC-M WP with a portion of the water flowing on top of the ice. The discharge was estimated to be less than 0.002 m³/s.
-) Sites H-DC-B, and H-BC were frozen to bed with no detectable flow.
-) The H-SEEP volumetric discharge measurement of 0.002 m³/s was equal to the flow rate observed at the pump in the seepage pond shack (0.002 m³/s).



Seasonal Hydrological Summary: October 16, 2016 to March 28, 2017

Stage hydrographs were developed for all hydrometric stations where continuous water level logger data was available during the winter season. This included four stations: H-VC-U, H-VC-DBC, H-VC-UMN, and H-VC-R+290. Stage-discharge rating curves are not applicable during the winter period due to the influence of ice on water levels and subsequently the relationship between stage and discharge described by the rating curve. As a result, no continuous discharge hydrographs are produced for the winter season; however, the instantaneous discharge measurements completed at these stations during the winter season are plotted on the hydrographs (Attachment 5). Loggers were winterized during the October field visit (October 3 to 5, 2016) in preparation for the winter period. Loggers at H-DC-B, H-DC-R and H-BC were removed on November 7 and 8, 2016 to prevent damage to the loggers as these sites are known to freeze to bed. Hydrometric stations at H-PC-DSP, H-DC-D1b, H-DC-B, H-DC-R and H-BC were frozen to bed for the entire winter period and therefore no discharge measurements were collected.

Discharge hydrographs were prepared for hydrometric stations where instantaneous discharge measurements were collected (Attachment 5). This includes stations H-DC-DX+105, H-DC-M WP and H-SEEP. The hydrograph for H-SEEP includes the instantaneous flowrate, recorded daily at the seepage pond flow meter by Denison Environmental Services (DES).

Following freeze-up in October 2016, the winter season was characterized by low flows across the Mount Nansen site; in February and March flowrates decreased further. The lowest flowrates at sites along Victoria Creek were measured in March 2017, except at H-VC-DBC where the minimum occurred in February 2017. Discharges along Victoria Creek in 2016/17 were compared to discharges measured during the 2015/16 winter period. Discharges in November 2016, December 2016 and January 2017 were similar to discharges measured during the 2015/16 winter period (Table 3). However, discharges in February and March 2017 were substantially lower than in 2016. For example, in March 2017 the discharges at H-VC-UMN and H-VC-R+290 were both estimated to be below the reportable confidence limit ($0.001 \text{ m}^3/\text{s}$, Table 3) whereas in 2016 the discharges were 0.012 and $0.023 \text{ m}^3/\text{s}$, respectively. The cause of these reduced flow rates is suspected to be partially attributable to the prolonged cold temperatures throughout winter 2016/17.



Table 3. Comparison of discharge measurements along Victoria Creek during 2015/16 and 2016/17 winter periods.

Measurement Date	Measured Discharge (m ³ /s)			
	H-VC-U	H-VC-DBC	H-VC-UMN	H-VC-R+290
November 16-17, 2015	0.148	0.176	0.164	0.158
December 14-15, 2015	0.084	0.100	0.090	0.082
January 12-13, 2016	0.040	0.057	0.033	0.025
February 15, 2016	0.050	0.092	0.024	0.021
March 14, 2016	0.039	0.063	0.012	0.023
November 7-8, 2016	0.160	0.166	0.166	0.235
December 6, 2016	0.069	0.096	0.105	0.078
January 10-12, 2017	0.038	0.045	0.006	0.006
February 7-9, 2017	0.032	0.019	0.013	0.008
March 6-7, 2017	0.028	0.024	0	0

The water balance along Victoria Creek was analyzed for the 2016/17 winter period to investigate gaining and losing reaches associated with groundwater-surface water fluxes. A preliminary analysis was completed during the winter 2015/16 period and discussed in the March 2016 monthly report.

A review of the instantaneous discharge measurements indicates that the groundwater patterns were less clearly defined in 2016/17. The discharge values at H-VC-U and H-VC-DBC in November and December 2016 and January 2017 winter period support the pattern of net gain of water between these stations over a very short distance (approximately 250 m). The Back Creek confluence with Victoria Creek between these stations was frozen to bed during the winter period and did not contribute any surface water flow. For example, in December 2016 the discharge measured at H-VC-U (0.069 m³/s) was lower than at the downstream location H-VC-DBC (0.096 m³/s). The Back Creek confluence with Victoria Creek between these stations was frozen to bed during the winter period and did not contribute any surface water flow. Open water leads were also noted between these two stations above the Back Creek confluence indicating the presence of warm groundwater inputs to the channel in this reach during all winter visits, except March 2017. It is suspected that prolonged cold temperatures and low flow conditions allowed a thin layer of ice to form over the previously open areas.

Conversely, discharge values from H-VC-DBC and H-VC-UMN continue to indicate that the reach is losing surface water to the ground. The discharge measured at H-VC-DBC was greater than at the downstream station at H-VC-UMN, except in December 2016. For example, in January 2017 the measured discharge at H-VC-DBC (0.045 m³/s) was greater than downstream at H-VC-UMN (0.006 m³/s) despite the increase in



the contributing watershed area. The Dome Creek confluence with Victoria Creek is located between these stations, however it was frozen to bed and did not contribute surface water during the winter period.

Similar to the findings in 2015/16, the groundwater gain/loss patterns between H-VC-UMN and H-VC-R+290 are less clearly defined. The discharge increased in the downstream direction in November 2016; however a decrease was measured in December 2016, January 2017 and February 2017. No flow was detected at these two sites in March 2017 and therefore any groundwater contribution to the creek in these reaches was minor.

The continuous stage records for multiple stations show abrupt increases in the water level during the winter period. For example, at H-VC-U the compensated stage abruptly rose from approximately 2.13 m to 2.45 m in March 2017. These elevated stages are suspected to be associated with ice-related processes and do not represent significant increases in the discharge during the winter period. Continuous water level data from the logger at H-VC-R+290 is presented up to February 8, 2017. Elevated stages recorded after this date have been removed from the stage hydrograph as the increase in stage was associated with the logger becoming frozen to bed and recording non-representative stage data. No discharge measurement could be collected in March because water was flowing between layers of ice and no flowing water could be detected along the bed.

Extensive overflow ice was present during the 2016/17 winter season at H-BC, H-DC-B, H-DC-M WP, and H-DC-R. Dension Environmental Services (DES) excavated the diversion channel (near H-DC-B) during the winter, whereas no excavation was required during the 2015/16 winter season. Similarly, Back Creek downstream of H-BC was filled with overflow ice above the bankfull elevation whereas this channel was dry during the 2015/16 winter season.

WATER QUALITY

Water quality samples and in-situ data were collected at the scheduled sites with flowing water during the March 2017 trip. A total of eight sites were sampled (Attachment 6). The drinking water sample, including a bacteriological sample, was collected from the pumphouse well (WQ-PW) on March 8, 2017. All samples were submitted for analysis through ALS Laboratories under chain of custody documentation, except for the bacteriological sample which was submitted to Yukon Government – Health and Social Services for analysis.

Site conditions were noted and a record of the samples collected was compiled (Attachment 6). In-situ and laboratory results summary tables as well as the lab certificates of analysis are attached (Attachment 7). Many results reflect typical winter conditions at Mount Nansen when water levels are low and watercourses are covered in ice. Parameters that exceeded the Canadian Council of Ministers of the Environment Freshwater Aquatic Life (CCME-AL) guidelines and/or the Mount Nansen Effluent Quality Standards (EQS) criteria are highlighted in Attachment 6 and discussed below.



Water Quality Results Summary

Analysis of the March 6-8, 2017 samples indicated that the following parameters exceeded applicable guidelines and standards for each site:

- J The WQ-SEEP samples exceeded CCME-AL guidelines for total and dissolved arsenic, total cadmium, total and dissolved iron, total and dissolved zinc. Total suspended solids, total iron and manganese exceeded Mount Nansen EQS.
- J Tailings Pond (WQ-TP) samples exceeded CCME-AL guidelines for fluoride, total aluminum, total and dissolved arsenic, total and dissolved cadmium, total and dissolved copper, total and dissolved iron, total lead, total silver, total thalium, and total and dissolved zinc. Total suspended solids, total cadmium, total copper, total iron, total lead, total manganese, total zinc and dissolved arsenic exceeded Mount Nansen EQS. Water quality results were affected by the disturbance of fine sediment during prior to sample collection, resulting in elevated total dissolved solids. Although several minutes were allowed for sediment to settle prior to collecting the samples, the fine particle matter remained in suspension and resulted in elevated total metals concentrations.
- J On Lower Dome Creek site WQ-DC-U, the CCME-AL guidelines were exceeded for total and dissolved arsenic, total and dissolved iron. Total iron and total manganese exceeded Mount Nansen EQS.
- J On all Victoria Creek sites (WQ-VC-U, WQ-VC-DBC, WQ-VC-UMN and WQ-VC-R+150), no parameters exceeded CCME-AL guidelines.
- J No sample could be collected at WQ-DC-DSS (on Dome Creek downstream of WQ-SEEP) due to thick overflow ice.
- J The bacteriological sample collected at WQ-PW on March 8, 2017 was absent of total coliforms and E. coli.

QA/QC Samples

Travel Blank Sample – did not have any parameters above detection limit. No contamination from storage or transport is suspected.

Field Blank Sample – did not have any parameters above detection limits. No contamination from field sampling methodology is suspected.

Replicate Sample(s) – the average RPD of the replicate sample WQ-SEEP-r was 4% with an average difference of 2% for total and 7% for dissolved metals. Dissolved chromium had RPD>20%.



PROGRAM RECOMMENDATIONS

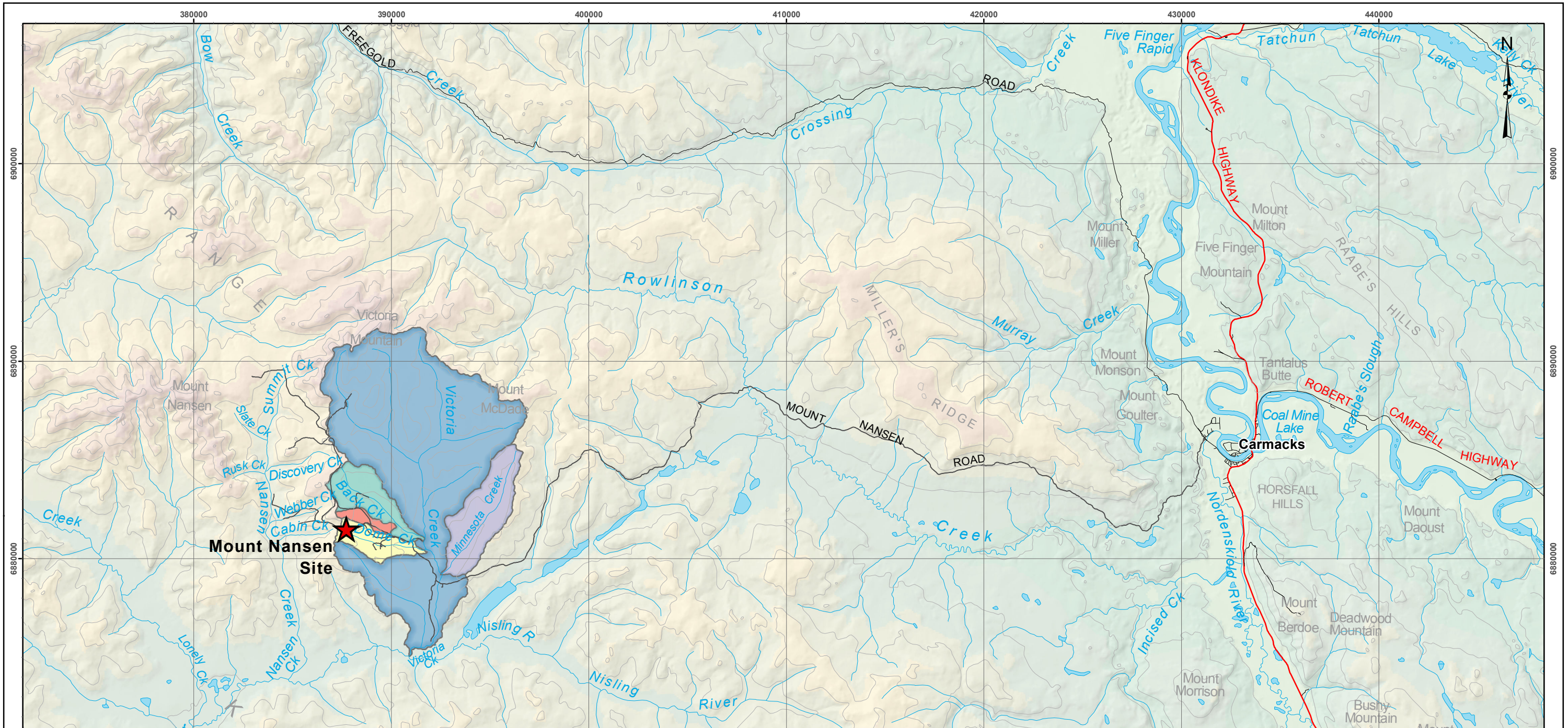
-) Collect photographs of the meteorological station until all snow inside the compound has melted to support a coarse validation of snow depths recorded by the sensor.
-) The continuous water level logger at H-VC-R+290 needs to be tested for damage after the well froze to bed in February 2017 and recorded erroneous stage measurements. If the logger was damaged, a new logger will need to be installed at the site. A temporary logger will be installed at the site to ensure there are no gaps in the data set.
-) Where feasible, EDI will collect concurrent discharge measurements whenever salt tracer tests are completed using a secondary method (such as velocity-area or volumetric). The secondary measurement is used to validate the winter measurements if poor hydraulic conditions due to complex ice formations are present. The low flow conditions throughout the Mount Nansen site have prohibited the use of secondary discharge methods during the 2016/17 winter period.

ADDITIONAL TRIP INFORMATION

Any changes to project scope (i.e. additional sites sampled):	All sampling and monitoring was conducted within scope. The schedule for the next trip is unknown at this time. The next trip will be the first of the 2017/18 Water Resources Investigation.
Any alterations to sample schedule/budget:	None.
Additional Comments:	Site conditions were reflective of winter: water levels were low and ice and snow was present at all locations. Sites that have been determined to be dry or frozen to bed will not be visited until the beginning of spring melt.
Wildlife Sightings:	On March 6, field crew observed 15 caribou beside the Mount Nansen road approximately 15 km east of the mine site. On March 7, a lynx was observed on the road between the tailings pond and the pit. Pine grosbeaks were observed at H-VC-U. Several snowshoe hares were observed when accessing sites along Victoria Creek.
Site concerns (safety):	None



**ATTACHMENT 1: MAPS OF HYDROMETRIC
STATIONS AND WATER
QUALITY SITES**



Regional Overview Map of Mount Nansen Site

Legend

Local Drainage Area

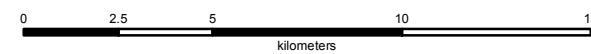
- Back Creek
- Dome Creek
- Minnesota Creek
- Pony Creek
- Victoria Creek

- Topographic Contour
- Secondary Road
- Highway

Data sources
 1:250,000 Topographic Spatial Data courtesy of Her Majesty the Queen in Right of Canada, Department of Natural Resources. All Rights Reserved.

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

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



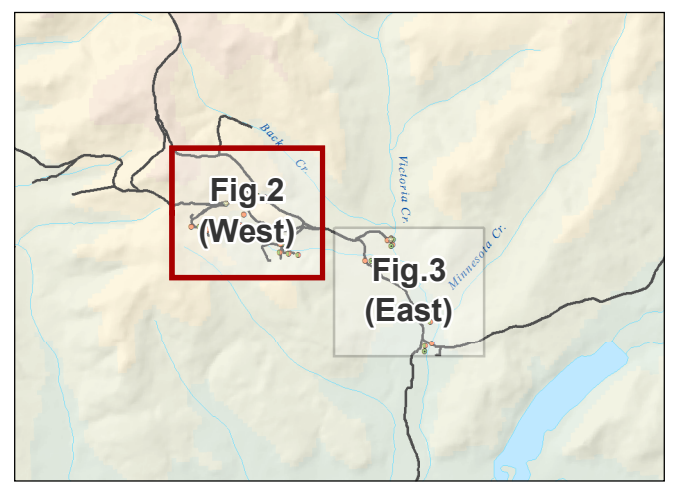
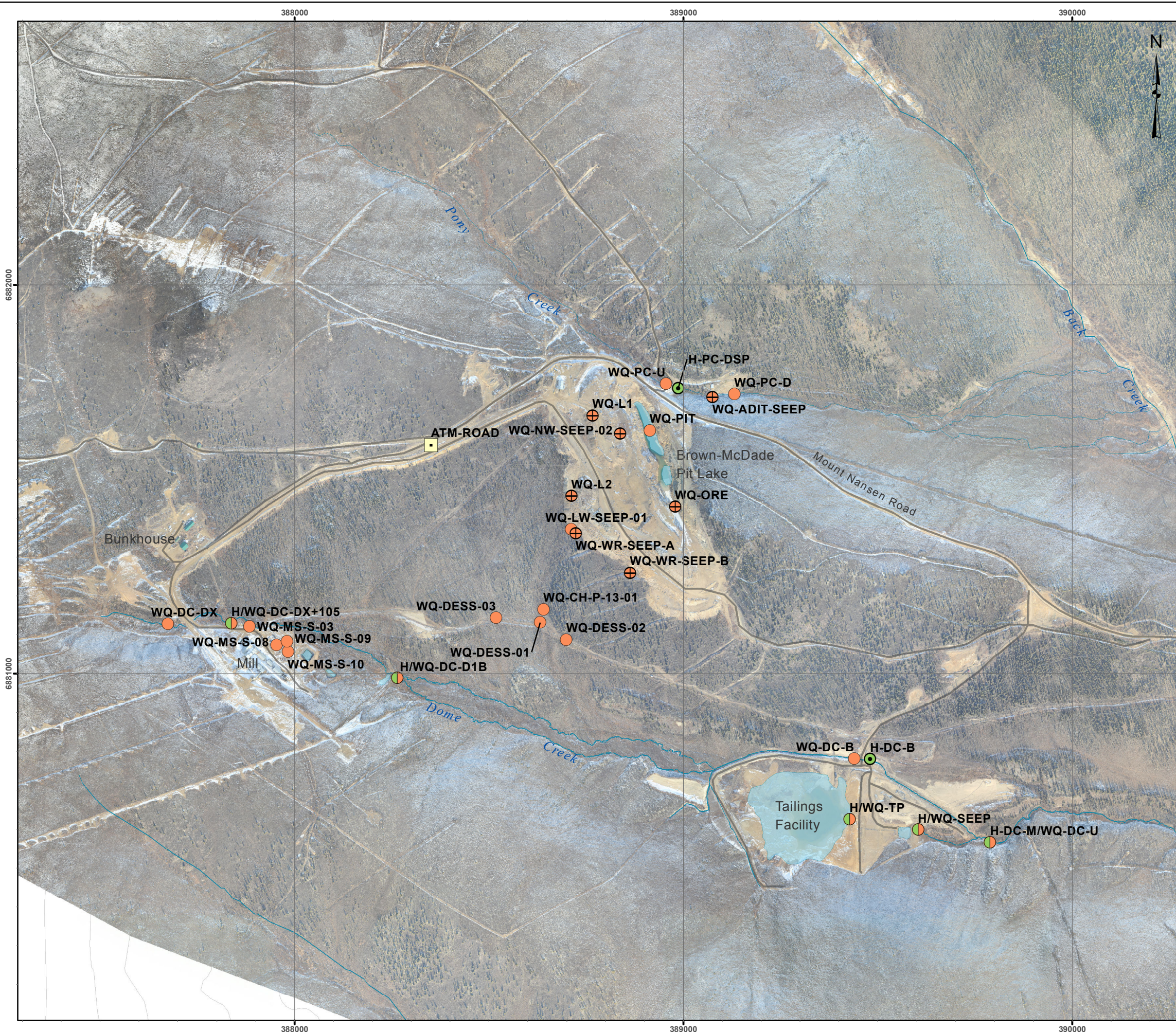
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 Map Projection: NAD 1983 UTM Zone 8N

Drawn: LG	Checked: MM / JB	Date: 14/07/2016	FIGURE 1
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Yukon





- Legend**
- Atmospheric Station (label e.g. ATM-ROAD)
 - Hydrometric Station and Water Quality Site (label e.g. H/WQ-VC-UMN)
 - Hydrometric Station (label e.g. H-VC-R)
 - Water Quality Site (label e.g. WQ-PC-U)
 - Temporary Water Quality Site (label e.g. WQ-MS-S-03)
 - Unpaved Road/Access

Mount Nansen Site (West): Hydrometric Stations and Water Quality Sites

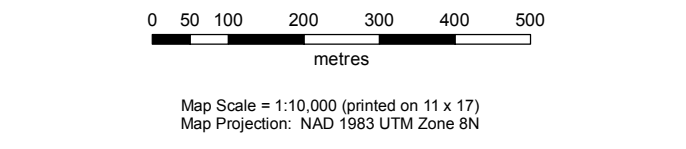
Notes:

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

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

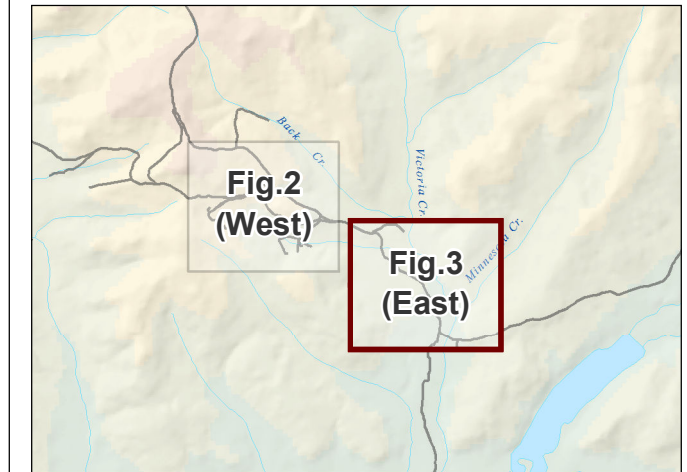
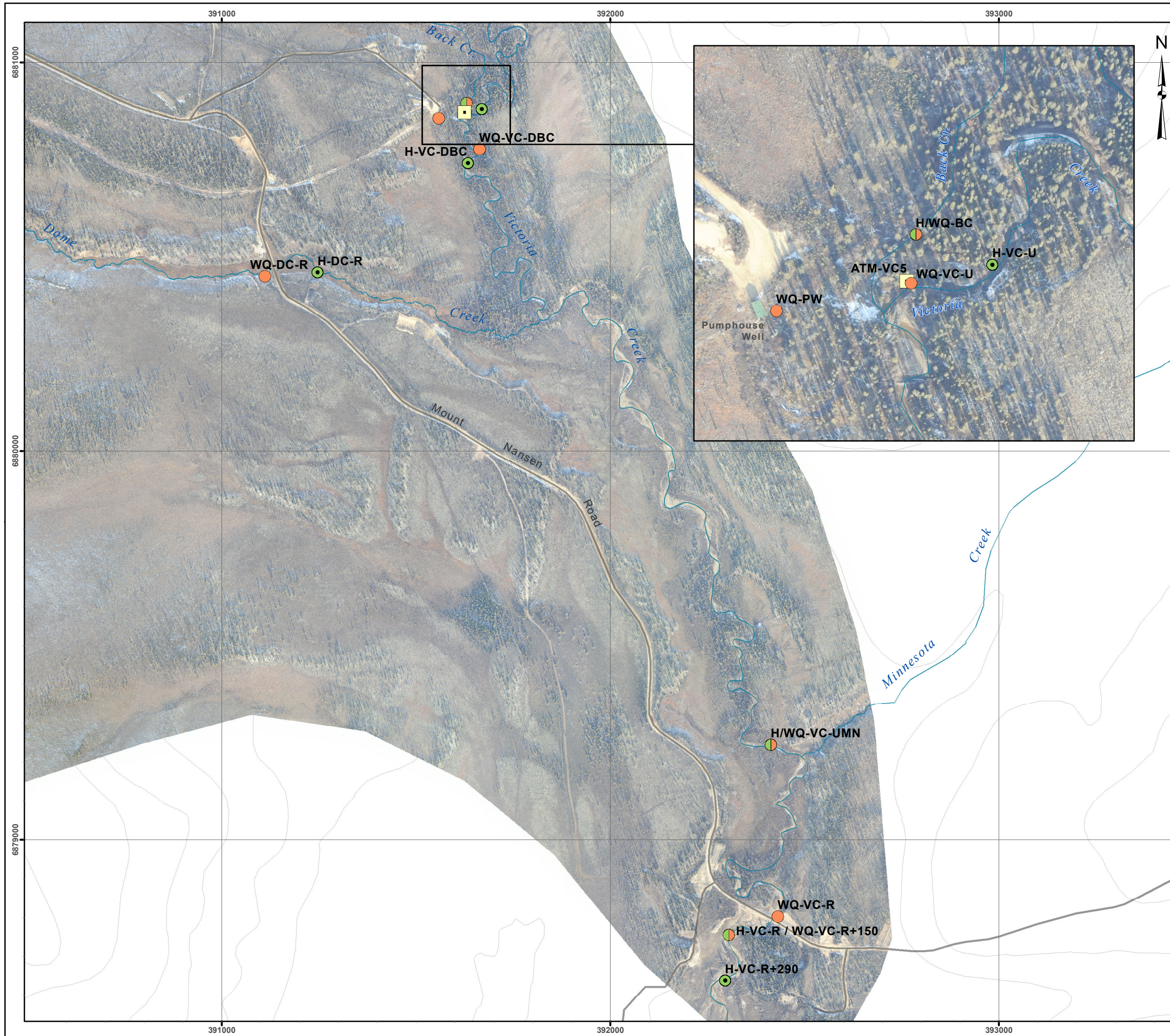
Imagery provided by Yukon Government - Energy, Mines and Resources - Abandoned Mines Branch.

Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. (2015) was obtained using Garmin GPS technology.



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Legend

- Atmospheric Station (label e.g. ATM-ROAD)
- Hydrometric Station and Water Quality Site (label e.g. H/WQ-VC-UMN)
- Hydrometric Station (label e.g. H-VC-R)
- Water Quality Site (label e.g. WQ-PC-U)
- Temporary Water Quality Site (label e.g. WQ-MS-S-03)
- Unpaved Road/Access

Mount Nansen Site (East): Hydrometric Stations and Water Quality Sites

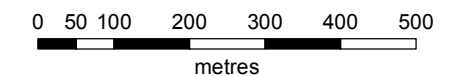
Notes:

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

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

Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. (2015) was obtained using Garmin GPS technology.



Map Scale = 1:10,000 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 8N

Drawn: MP	Checked: MM/SD	Date: 14/07/2016	FIGURE 3
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**ATTACHMENT 2: SITE AND STATION
 PHOTOS**



Photo 1. H/WQ-DC-DX+105 – looking upstream.
Channel frozen to bed.



Photo 2. H/WQ-DC-DX+105 – transect chipped
across frozen channel.



Photo 3. H/WQ-DC-B – looking upstream. Diversion
channel frozen to bed.



Photo 4. H/WQ-DC-B – looking downstream.
Diversion channel frozen to bed.



Photo 5. WQ-TP – overview of tailings pond.



Photo 6. H-TP – lower staff gauge encased in ice.



Photo 7. H/WQ-SEEP – looking downstream at discharge site.



Photo 8. H-DC-M WP – looking upstream at v-notch weir and weir pond. Water flowing on top of ice.



Photo 9. H-DC-M WP/WQ-DC-U – looking downstream at water on top of ice.



Photo 10. WQ-DC-DSS – looking upstream at holes augured through thick overflow ice.



Photo 11. H/WQ-BC – overview of site (site dry).



Photo 12. H-VC-U – looking downstream.



Photo 13. H-VC-U – looking upstream.



Photo 14. WQ-VC-U – looking downstream at confluence of Victoria Creek and Back Creek.



Photo 15. H-VC-DBC – looking downstream.



Photo 16. WQ-VC-DBC – overview of sample site.



Photo 17. H-VC-UMN – looking downstream at water flowing on top of ice.



Photo 18. WQ-VC-UMN – looking upstream at sample site.



Photo 19. WQ-VC-R+150 – looking upstream from sample collection location (adjacent to stilling well).



Photo 20. H-VC-R+290 – looking downstream.



Photo 21. H-VC-R+290 – overview of stilling well.



Photo 22. WQ-PW – overview of pipe outlet.



Photo 23. Meteorological Station overview



Photo 24. Meteorological Station overview



**ATTACHMENT 3: METEOROLOGY PLOTS –
WINTER PERIOD**

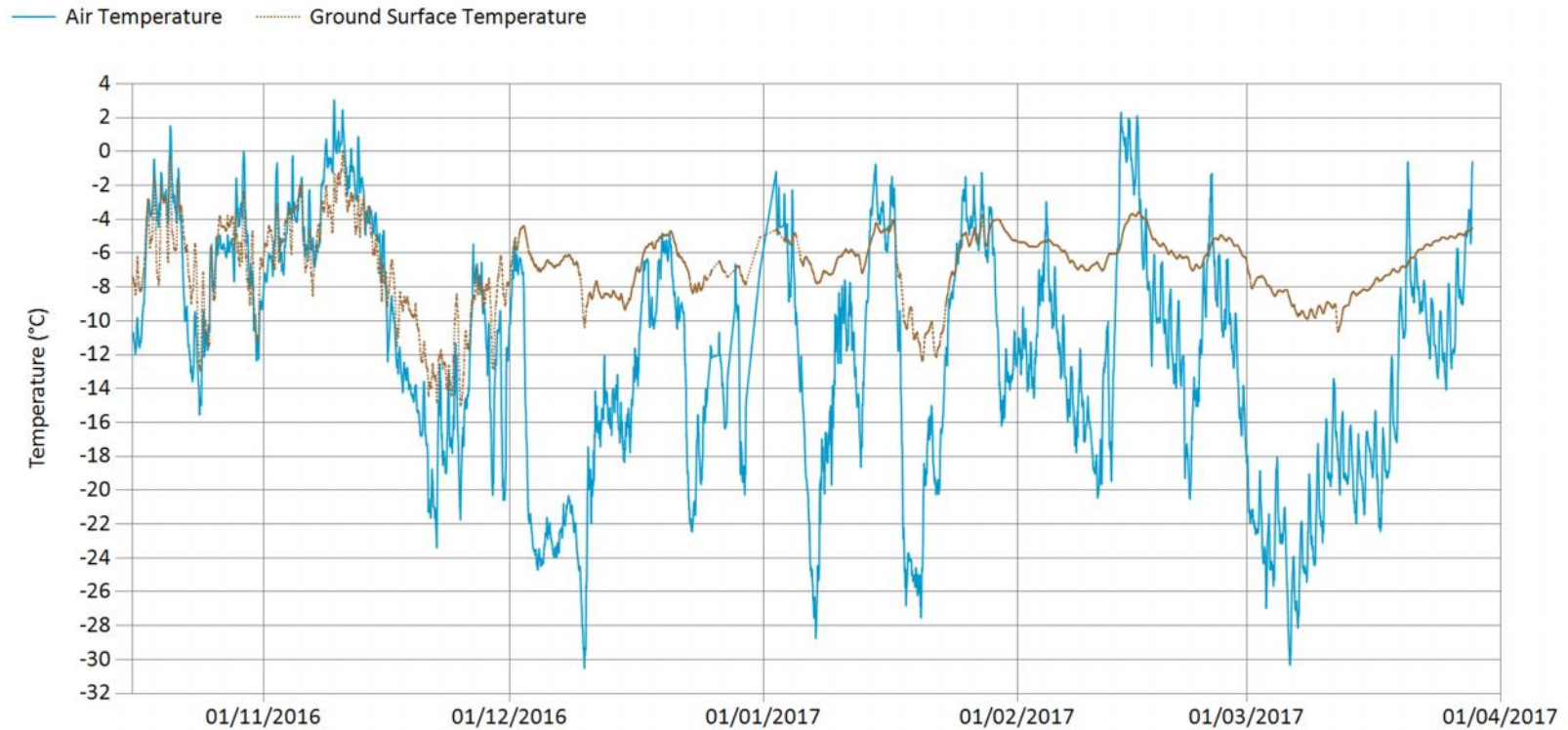


Figure 3.1 Mount Nansen mean hourly air and ground temperature, October 16, 2016 to March 28, 2017.

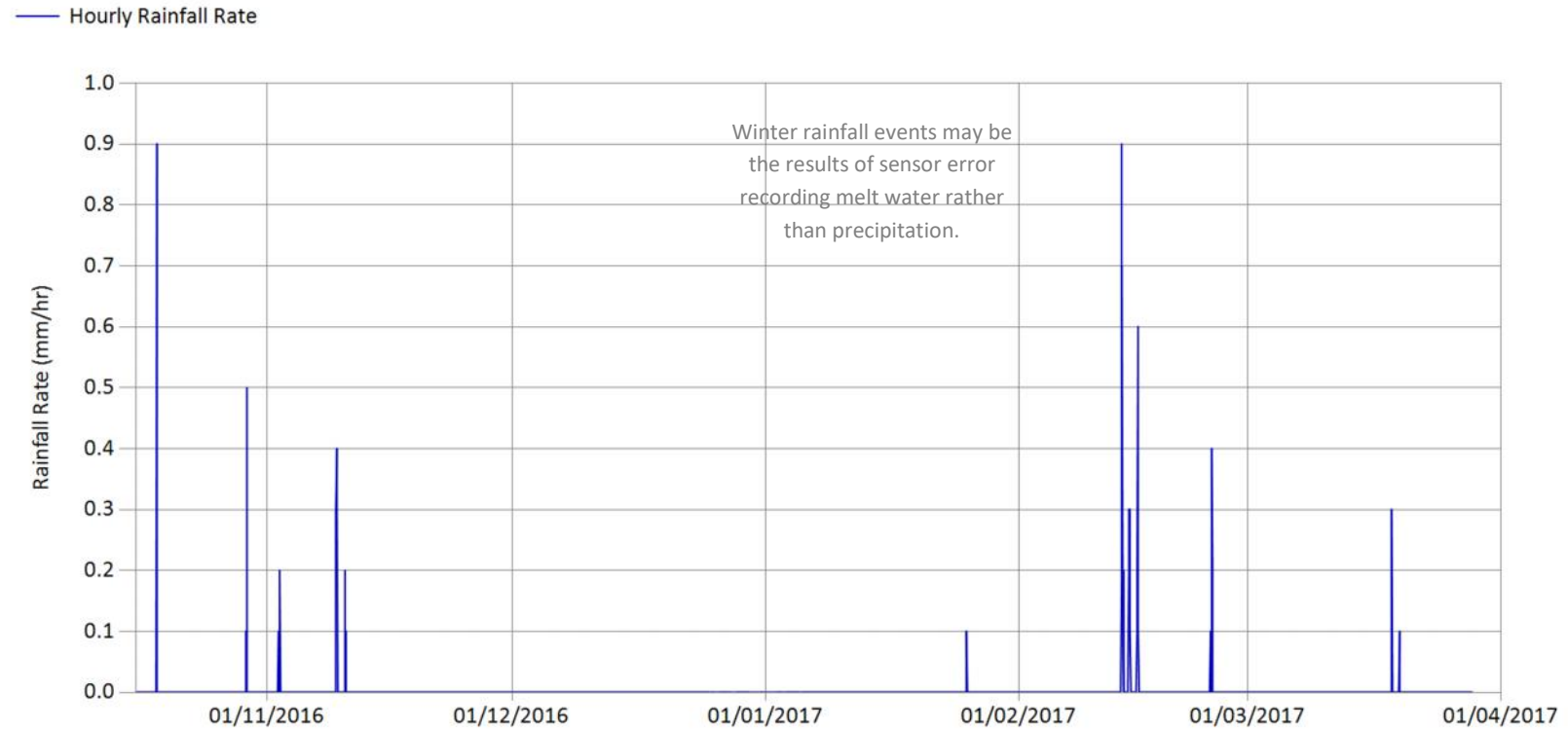


Figure 3. 2 Mount Nansen hourly rainfall rate, October 16, 2016 to March 28, 2017.

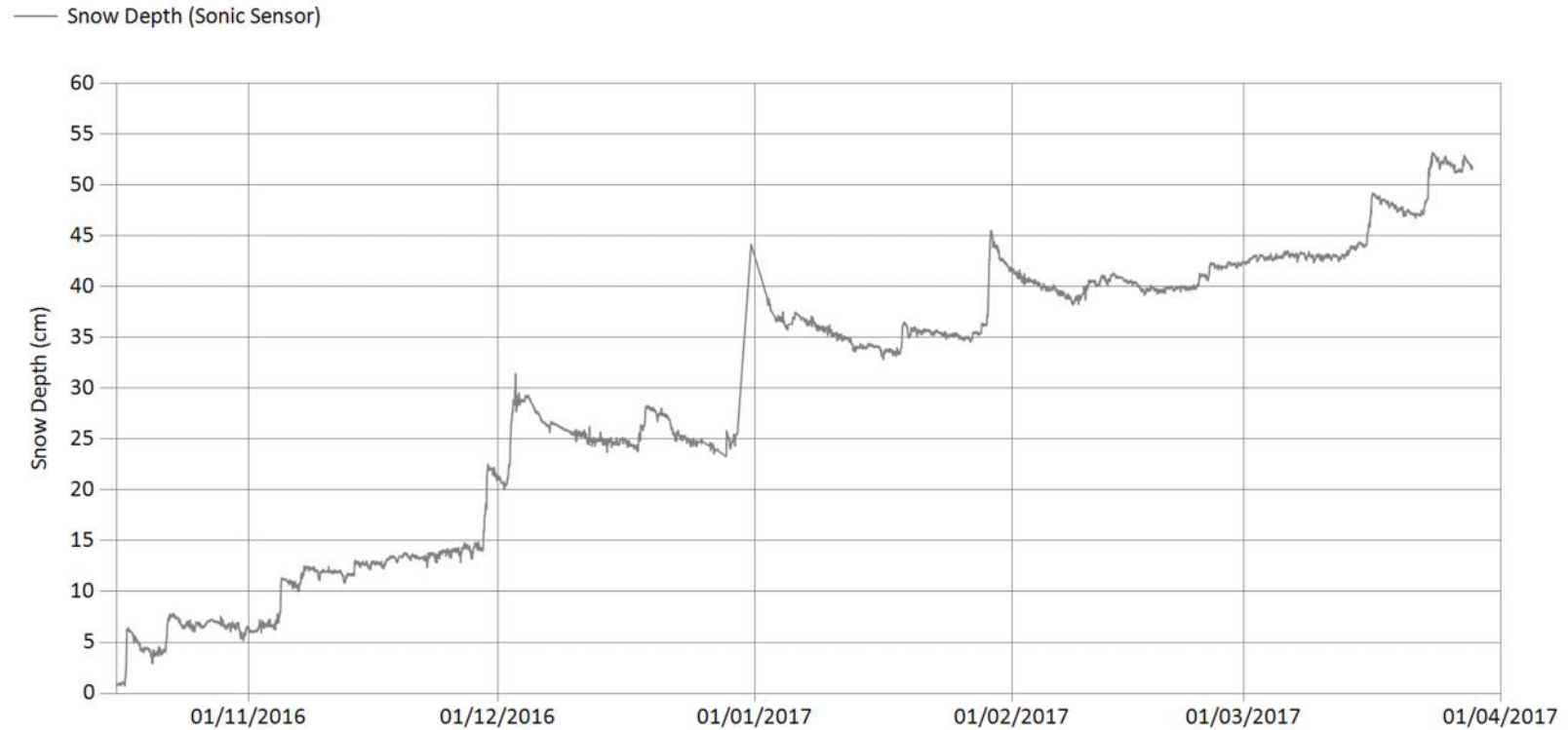


Figure 3.3 Mount Nansen cumulative daily snow depth, October 16, 2016 to March 28, 2017.

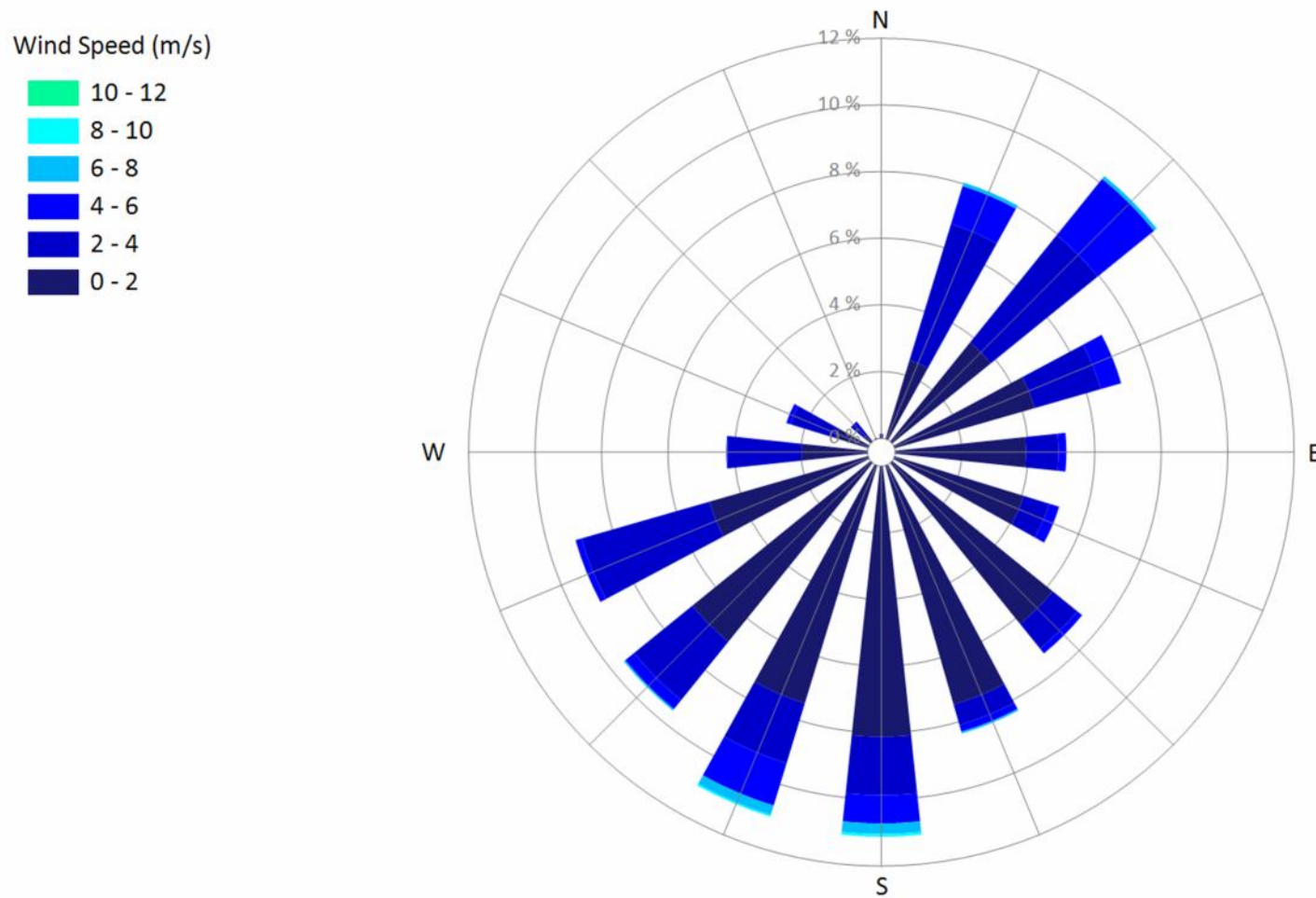


Figure 3.4 Mount Nansen mean hourly wind speed (m/s) and direction (wind rose diagram), October 16, 2016 to March 28, 2017.

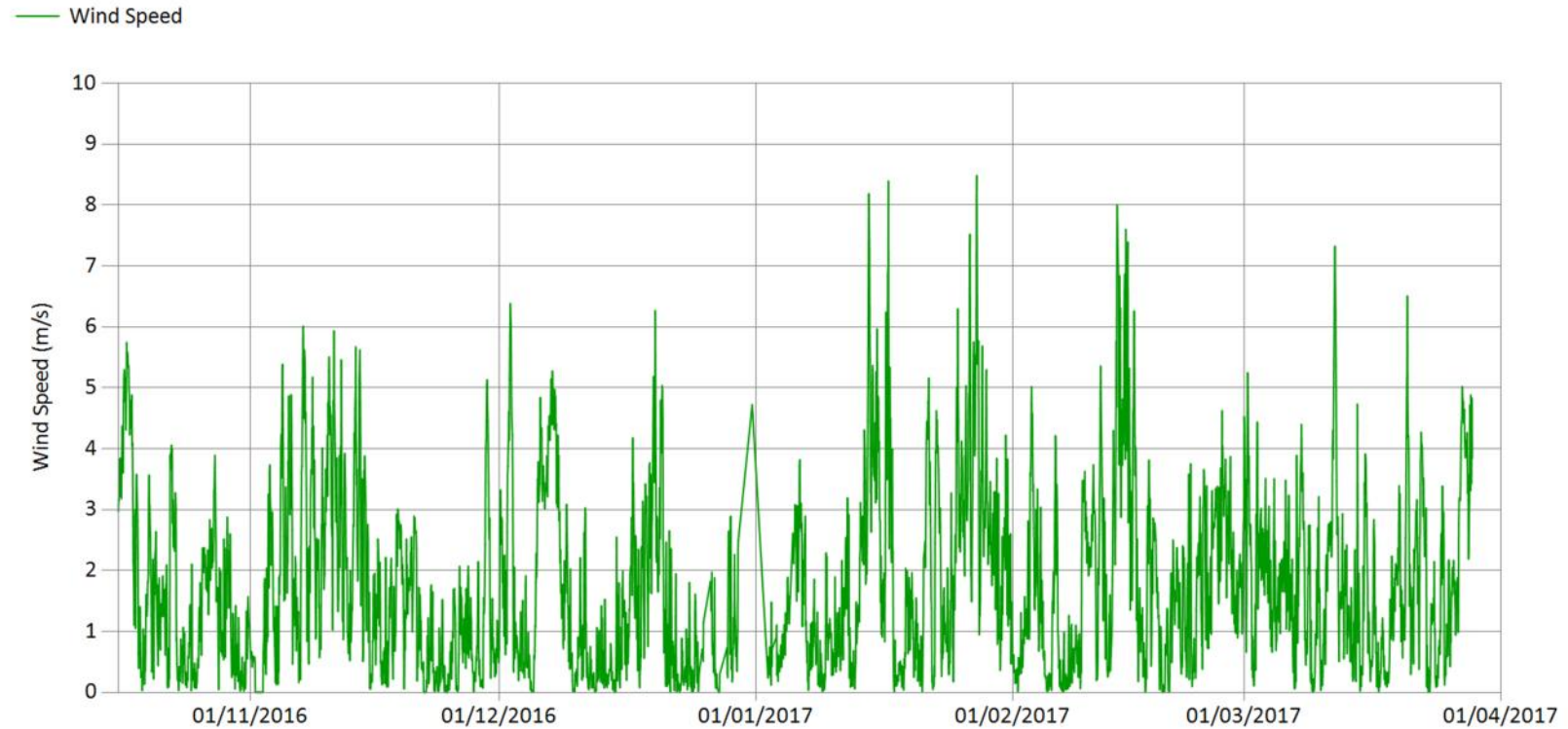


Figure 3. 5 Mount Nansen mean hourly wind speed, October 16, 2016 to March 28, 2017.

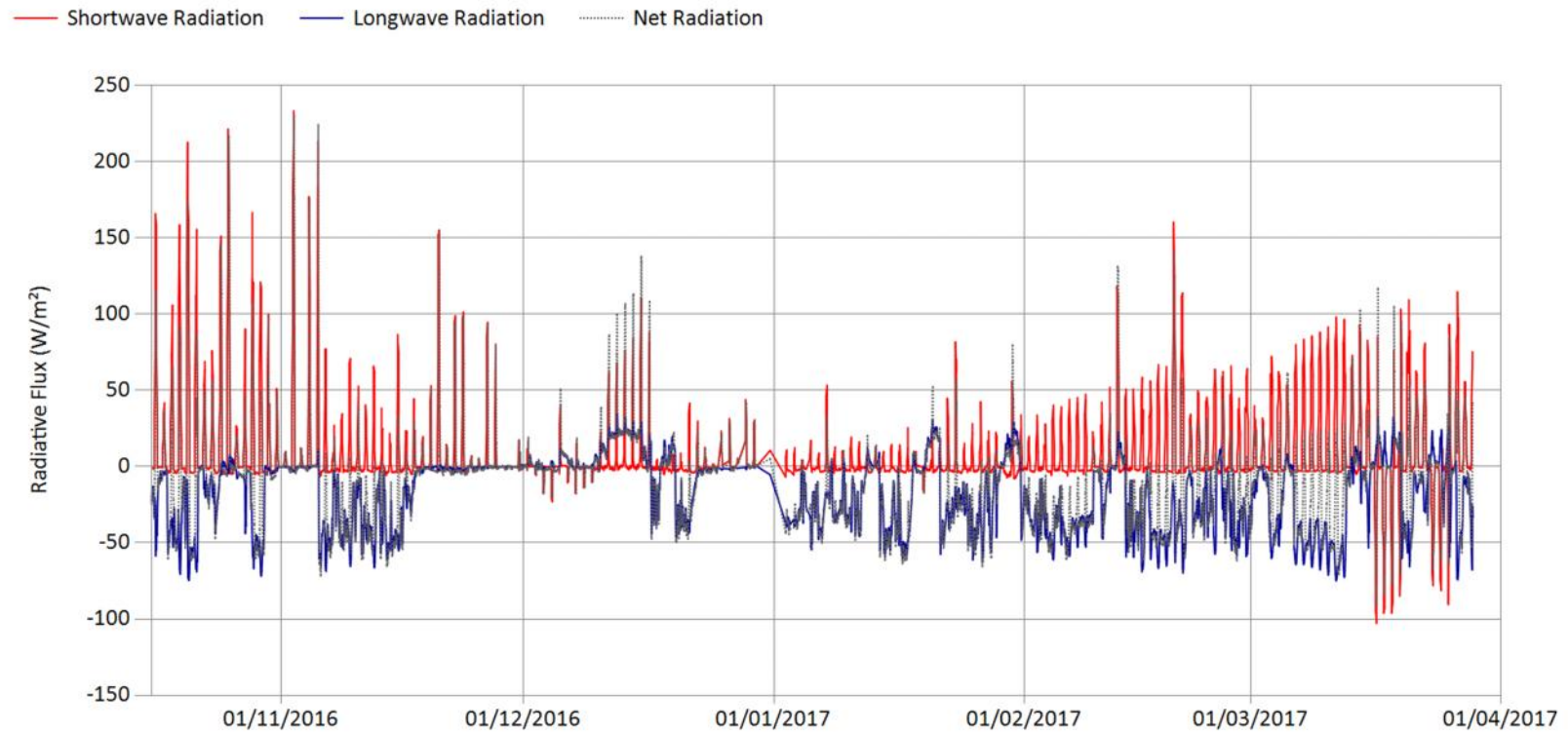


Figure 3. 6 Mount Nansen mean hourly net shortwave, longwave and total radiation, October 16, 2016 to March 28, 2017.

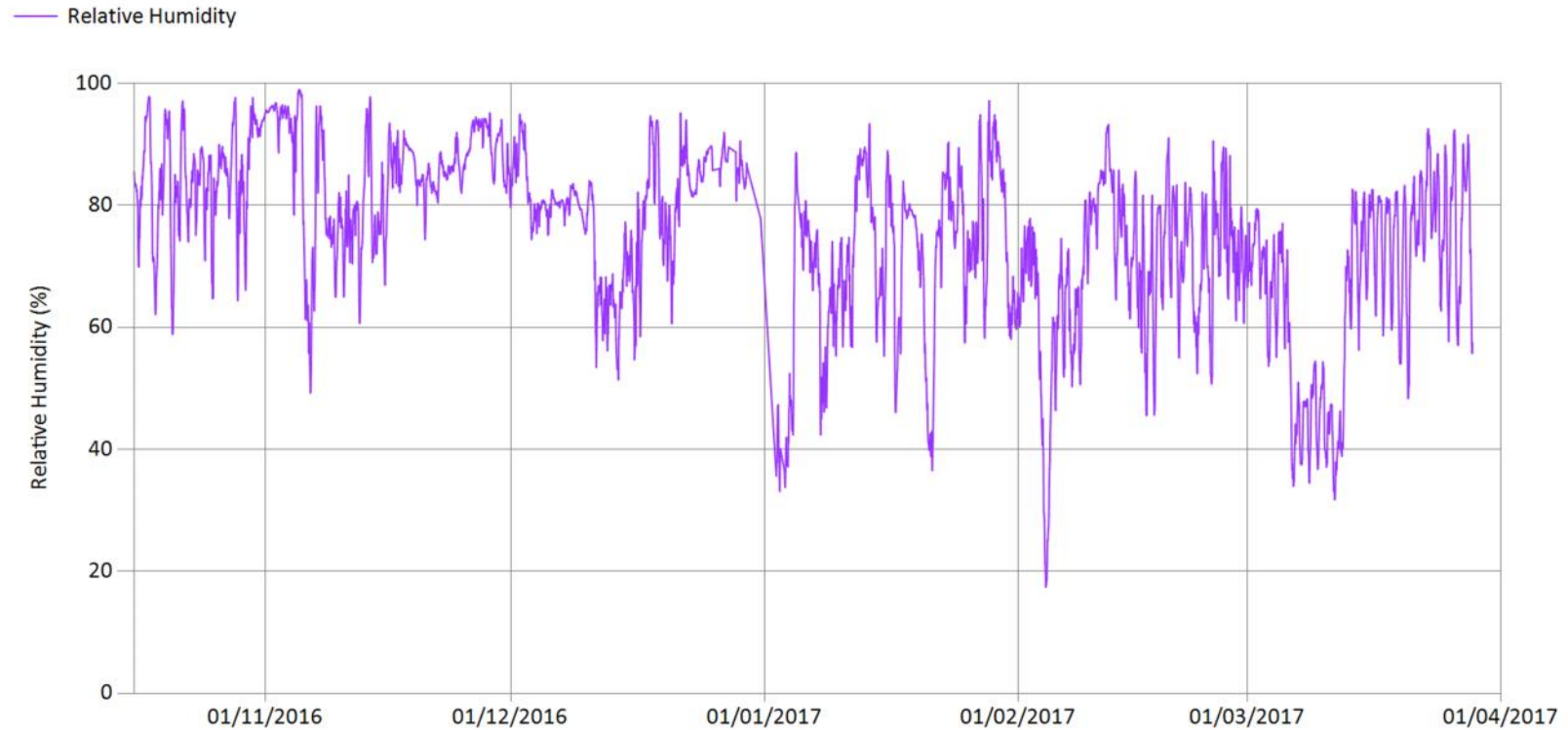


Figure 3. 7 Mount Nansen mean hourly relative humidity, October 16, 2016 to March 28, 2017.

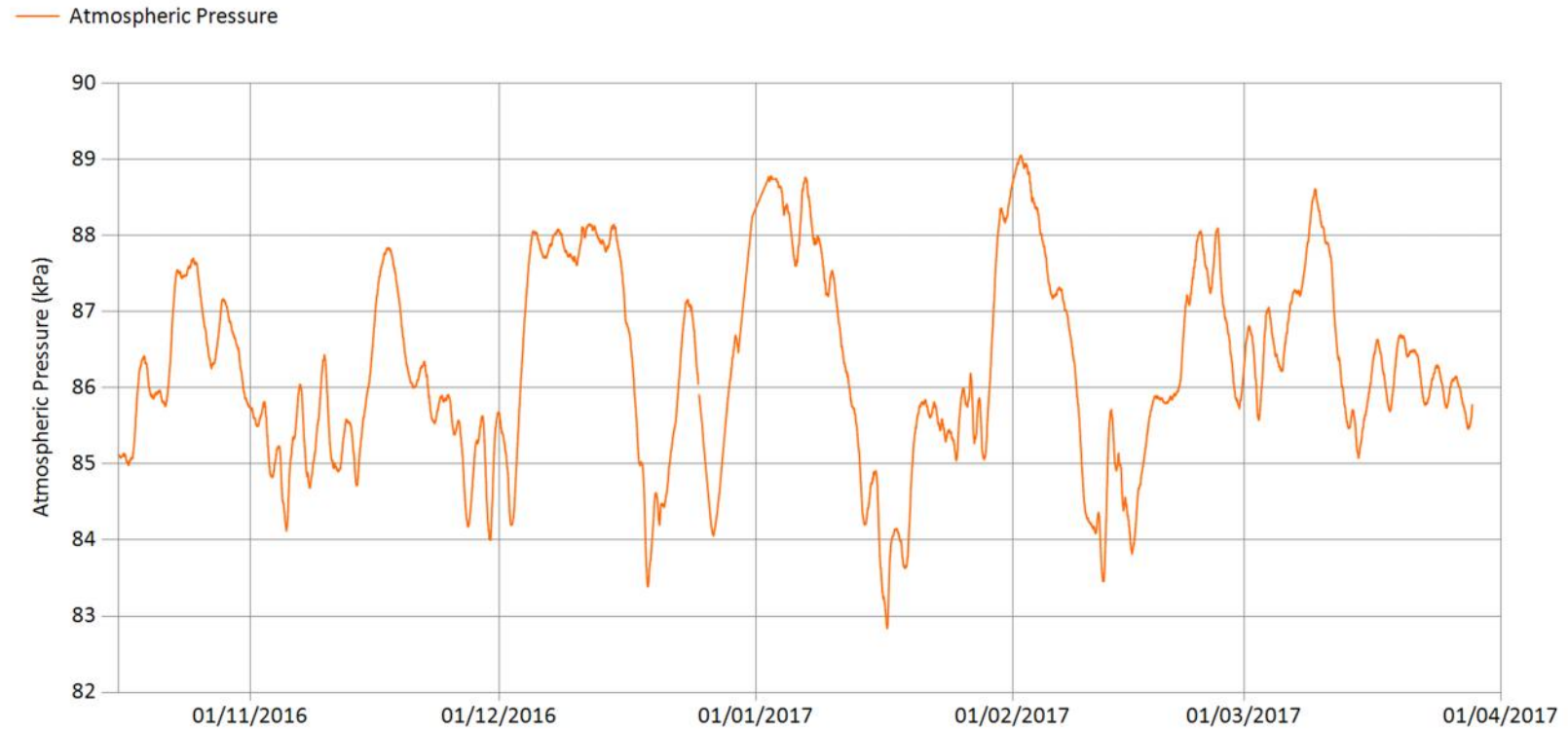


Figure 3. 8 Mount Nansen mean hourly atmospheric pressure, October 16, 2016 to March 28, 2017.



Table 3.1 Mount Nansen precipitation events for the winter period, October 16, 2016 to March 28, 2017.

Start Date and Time	Duration (hours)	Precipitation Type	Total Snow Accumulation (cm)	Total Rainfall (mm)
October 16, 00:00	7	Snow	5.4	-
October 20, 09:00	1	Snow	1.0	-
October 21, 22:00	6	Snow	2.8	-
November 04, 16:00	5	Snow	3.5	-
November 09, 14:00	4	Rain	-	1.5
November 13, 16:00	2	Snow	1.4	-
November 29, 05:00	5	Snow	3.4	-
November 29, 15:00	4	Snow	3.9	-
December 02, 05:00	3	Snow	1.2	-
December 02, 10:00	11	Snow	6.4	-
December 03, 00:00	3	Snow	2.8	-
December 03, 09:00	4	Snow	1.2	-
December 17, 22:00	3	Snow	1.6	-
December 18, 16:00	4	Snow	1.8	-
December 28, 11:00	1	Snow	2.3	-
December 29, 21:00	unknown	Snow	18.1	-
January 18, 16:00	4	Snow	2.1	-
January 29, 02:00	9	Snow	8.3	-



Start Date and Time	Duration (hours)	Precipitation Type	Total Snow Accumulation (cm)	Total Rainfall (mm)
February 13, 15:00	7	Rain	-	3.2
February 14, 12:00	6	Rain	-	1.5
February 15, 12:00	6	Rain	-	2.0
February 23, 11:00	4	Snow	1.1	-
February 24, 16:00	6	Snow	1.4	-
March 15, 19:00	2	Snow	1.0	-
March 16, 04:00	8	Snow	3.2	-
March 22, 16:00	4	Snow	1.1	-
March 23, 02:00	5	Snow	3.1	-
March 27, 07:00	3	Snow	1.2	-

Note: Rain precipitation events are periods of rainfall greater than or equal to 4 hours, and/or have greater than or equal to 2.0 mm; snow precipitation events are periods of snowfall greater than or equal to 4 hours and/or greater than or equal to 1 cm (10.0 mm).

ATTACHMENT 4:

**HYDROLOGY
SUMMARY DATA
TABLES**

Measurement ID	Hydrometric Identifier (HID)	Measurement Date	Measurement Time	Discharge Measurement Method	Discharge (m ³ /s)	Discharge Data Flag	Surveyed Water Elevation (m)	Survey Data Flag	Comments
1557	ATM-VC5	07/03/2017	14:50	-	-	-	-	-	Barologger downloaded and functioning properly.
1558	H-DC-DX+105	07/03/2017	10:30	N	0.000	X	-	-	Channel frozen to bed with 0.15 m thick ice. Three holes chipped through ice to frozen substrate; no water detected at site.
1559	H-DC-B	08/03/2017	08:15	N	0.000	X	-	-	Channel frozen to bed with no detectable flow. Ice approximately 0.2 m thick with evidence of multiple layers of overflow.
1560	H-DC-M WP	08/03/2017	08:30	N	0.002	E	-	-	Conditions not suitable for discharge measurement. Water flowing above and below overflow ice downstream of weir pond. Flowrate less than during previous visit; estimated to be less than 0.002 m ³ /s.
1561	H-VC-U	07/03/2017	17:10	SS	0.028	B	-	-	Salt tracer completed for discharge measurement. Low water level in channel. Holes chipped through ice 0.05 m thick for salt tracer injection and measurement locations. Logger downloaded and functioning properly.
1562	H-VC-DBC	07/03/2017	14:05	SS	0.024	B	-	-	Salt tracer completed for discharge measurement. Low water level in channel. Ice approximately 0.1 m thick at salt injection and measurement locations. Logger downloaded and functioning properly.
1563	H-BC	07/03/2017	17:30	N	0.000	X	-	-	Creek frozen to bed with no detectable flow; no discharge measurement completed. Overflow ice (0.75 m thick) fills channel to 0.05 m above bankfull elevation. No evidence of fresh overflow ice since previous visit.
1564	H-VC-UMN	07/03/2017	11:50	SS	0.000	X	-	-	Salt tracer attempted for discharge measurement. Tracer aborted due to very low flow. Discharge estimated to be less than 0.001 m ³ /s. Ice up to 0.3 m thick at centre of channel. Logger downloaded and functioning properly. Water temporarily upwelled onto surface of ice when hole chipped through ice. Logger downloaded and functioning properly.
1565	H-VC-R+290	06/03/2017	14:00	N	0.000	X	-	-	Water flowing through multiple layers of ice. Four holes chipped through ice up to 0.5 m thick with stagnant water at the bottom of each hole. Discharge visually estimated to be less than 0.001 m ³ /s. Stilling well and logger encased in ice. Logger downloaded and appears to be functioning properly.
1566	H-SEEP	07/03/2017	18:45	V	0.002	-	-	-	Volumetric discharge measurement collected. Ice 0.5 m thick inside stilling culvert and thin ice (0.01 m) along downstream channel. Pump house reading 126 L/min (0.002 m ³ /s) at 18:45.
1567	H-TP	06/03/2017	19:30	-	-	-	-	-	Staff gauges encased in ice and snow.

Discharge Measurement Method Legend

Measurement Method ID	Measurement Method	Measurement Description
ADV-MID	Mid Section Method - Acoustic Doppler Velocimeter	Cross-sectional velocity using an ADV, mid-section method.
SS	Brine Salt Slug Tracer	Salt dilution gauging using a brine salt slug.
V	Volumetric	Volumetric measurement obtained by filling a graduated contained at a culvert, pipe outlet or weir.
W	Weir	Measurement obtained by a rated structure (v-notch weir).
N	None	No measurement could be obtained.
SD	Dry Salt Slug Tracer	Salt dilution gauging using a dry salt slug.
HWM	High Water Mark - Indirect Method	Indirect method using high water mark in the slope-area calculation for estimating high discharges.
ADCP	Acoustic Doppler Current Profiler	Cross-sectional velocity using an ADCP, mid-section method.
SC	Constant Rate Salt Tracer	Salt dilution gauging using the constant rate method.
CM-MID	Mid Section Method - Current Meter	Cross-sectional velocity using a velocimeter (Swoffer or Pygmy AA)

Hydrometric Stations

Hydrometric ID	Hydrometric Stations
ATM-VC5	Atmospheric Barologger (5) at Victoria Creek
H-BC	Back Creek
H-DC-B	Diversion Channel at Bridge
H-DC-D1B	Dome Creek at D1b
H-DC-DX	Dome Creek at DX
H-DC-DX+105	Dome Creek at DX+105
H-DC-M-WP	Middle Dome Creek at Weir Pond
H-DC-R	Dome Creek at Road
H-PC-DSP	Pony Creek Downstream of Pit
H-SEEP	Seepage Pond Outflow
H-TP	Tailings Pond
H-VC-DBC	Victoria Creek Downstream of Back Creek
H-VC-R	Victoria Creek at Road
H-VC-R+290	Victoria Creek at Road + 290
H-VC-U	Upper Victoria Creek
H-VC-UMN	Victoria Creek Upstream of Minnesota Creek

Discharge Data Flag Legend

Discharge Data Flag	Discharge Data Flag Description
E	Estimated value
B	Backwater effects (ice related)
F	Instrument malfunction
M	Manual measurement
A	Automated measurement (logged)
ML	Missing length data
MD	Missing depth data
MW	Missing width data
O	Outside of measurement reporting range
S	Suspect data
X	Poor channel conditions for discharge measurement
MI	Missing Data
SH-L	Data logger Shift
SH-SG	Staff Gauge Shift
UR	Under review

Survey Data Flag Legend

Survey Flag	Survey Flag Description
S	Suspect data
MI	Missing data
UR	Under review
F	Instrument Malfunction
O	Outside measurement Accuracy (+/-0.003 m)
N	No survey conducted
B	Backwater effects (ice related)



**ATTACHMENT 5: INSTANTANEOUS MEASUREMENTS AND
HYDROGRAPHS – WINTER SEASON**

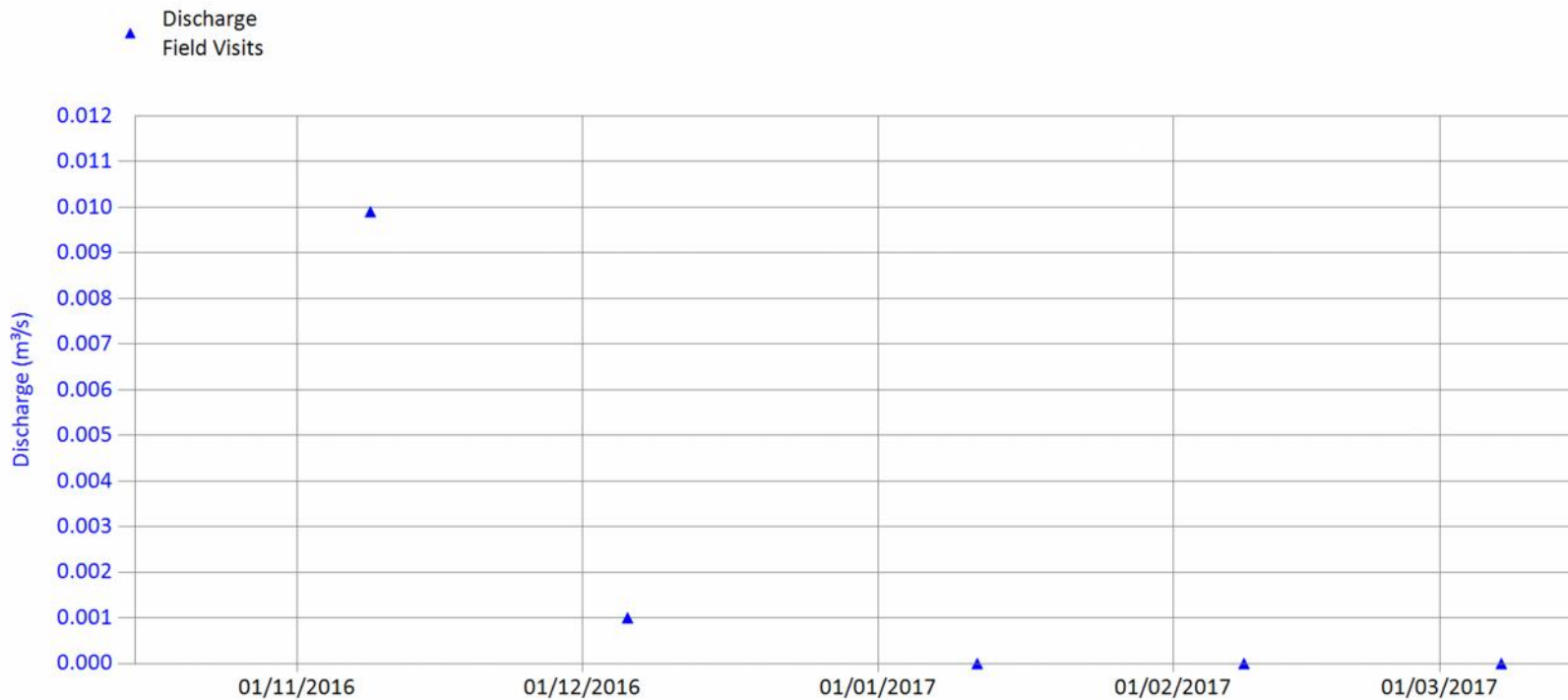


Figure 5.1 Hydrographs for upper Dome Creek hydrometric station H-DC-DX+105, October 16, 2016 to March 15, 2017 (no continuous data loggers or stage survey)

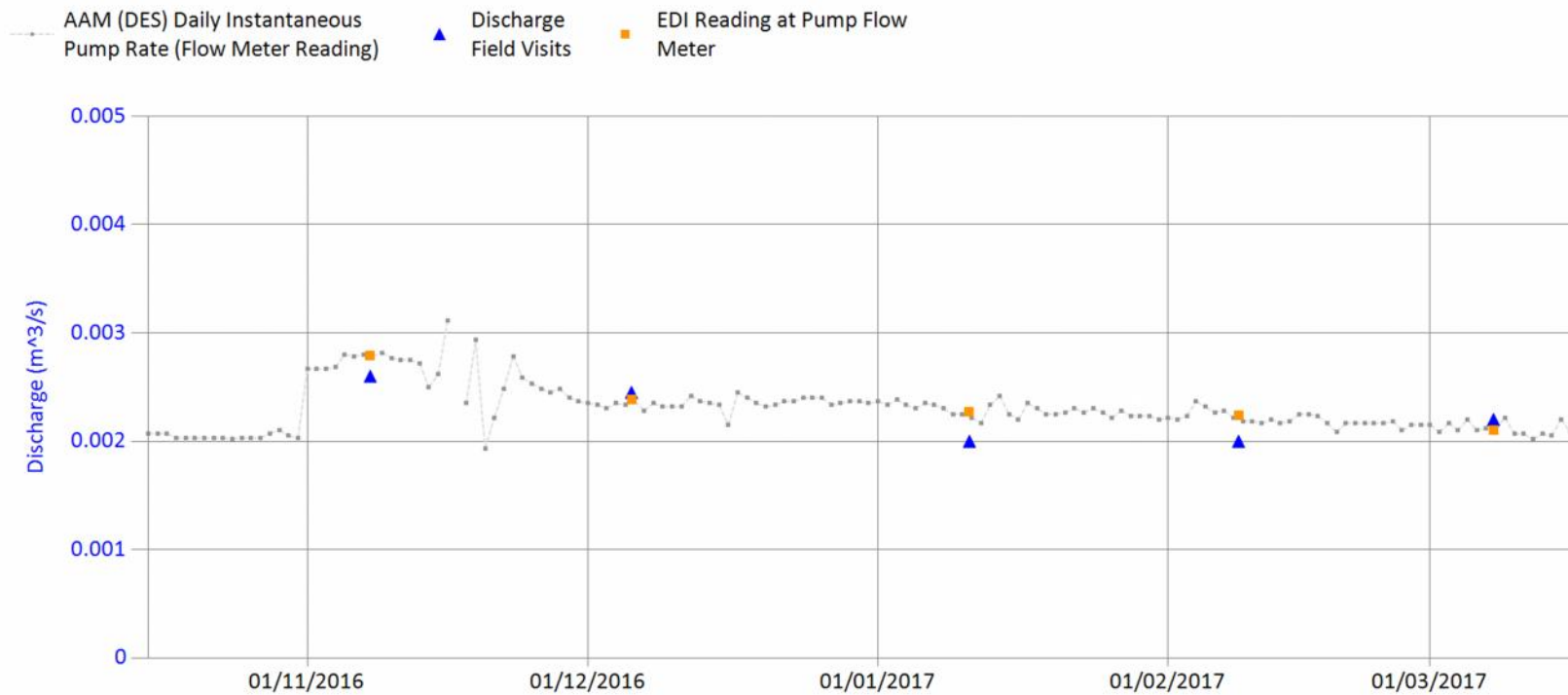


Figure 5.2 Hydrograph for the Seepage Pond Outlet (H-SEEP), October 16, 2016 to March 15, 2017 (no continuous data loggers or stage survey).

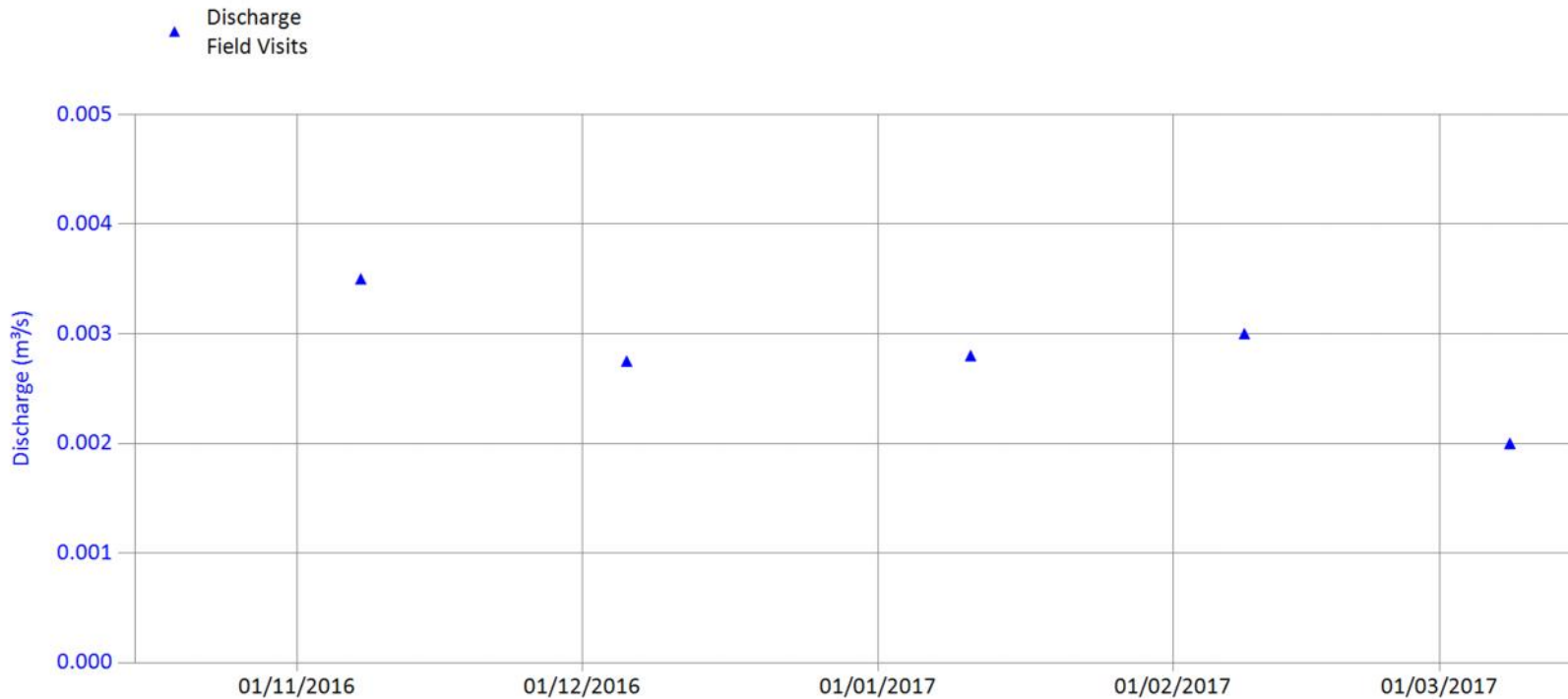


Figure 5.3 Hydrograph for the Middle Dome Creek at the Weir Pond, H-DC-M WP, October 16, 2016 to March 15, 2017 (no continuous data loggers or rating curves).

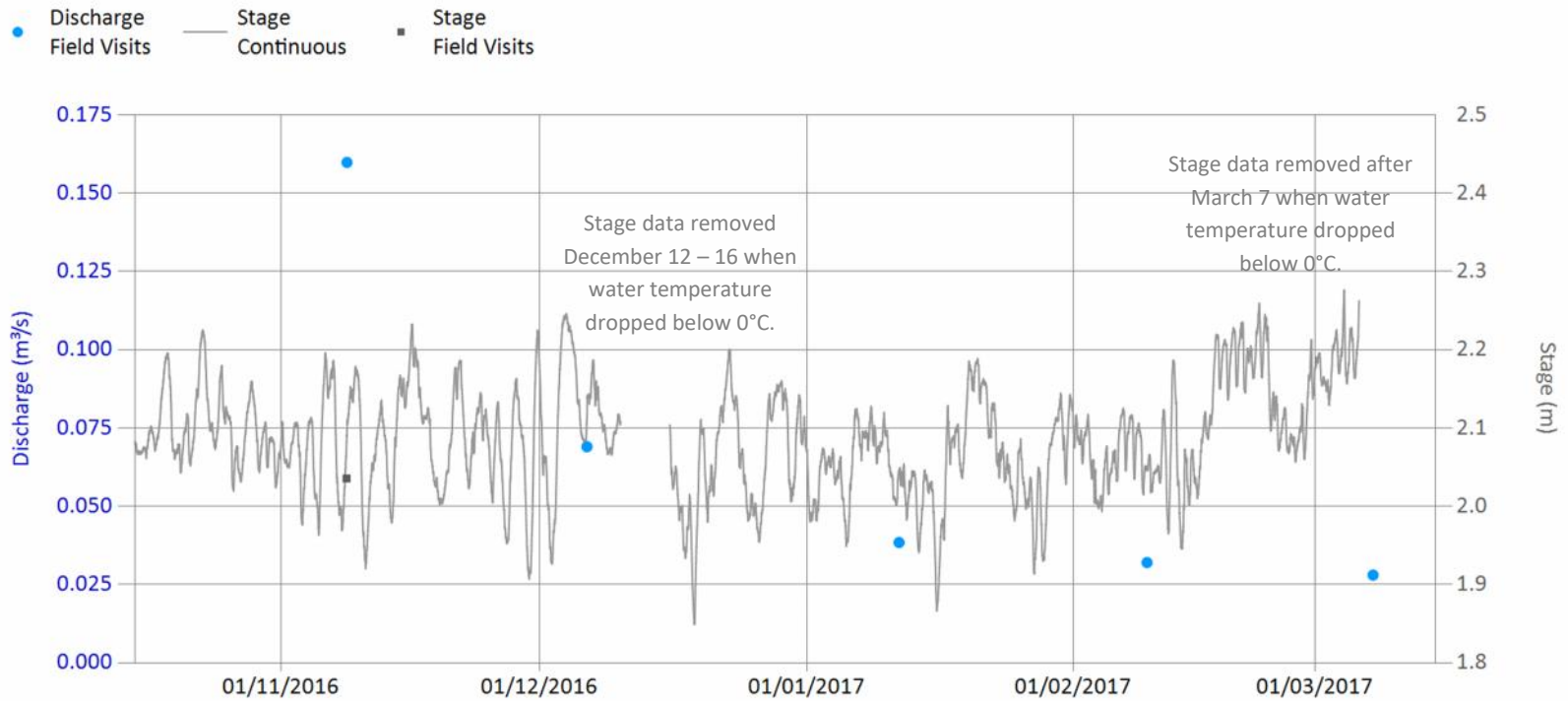


Figure 5. 4 Hydrograph for Upper Victoria Creek (H-VC-U), October 16, 2016 to March 15, 2017.

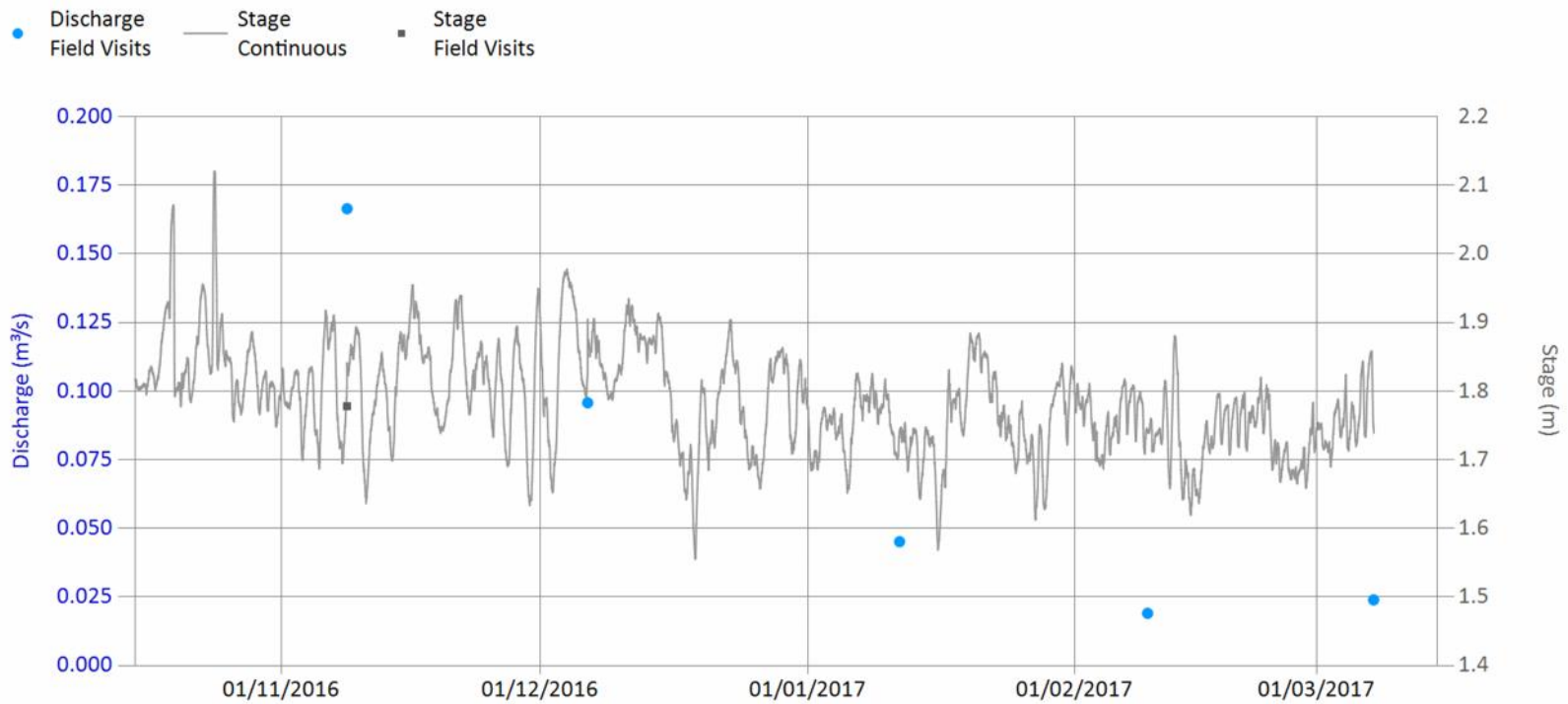


Figure 5.5 Hydrograph for Victoria Creek downstream of Back Creek (H-VC-DBC), October 16, 2016 to March 15, 2017.

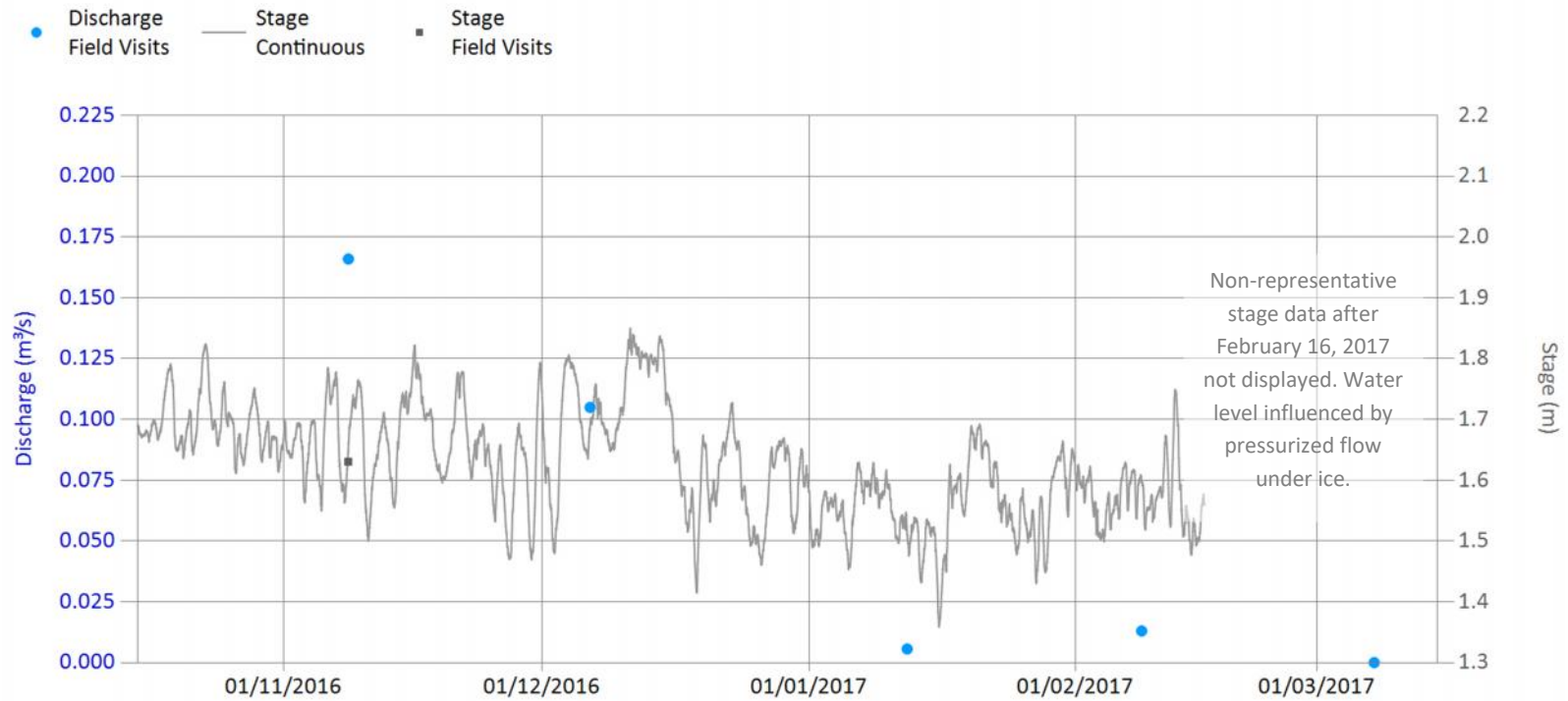


Figure 5. 6 Hydrograph for the Victoria Creek upstream of Minnesota Creek (H-VC-UMN), October 16, 2016 to March 15, 2017.

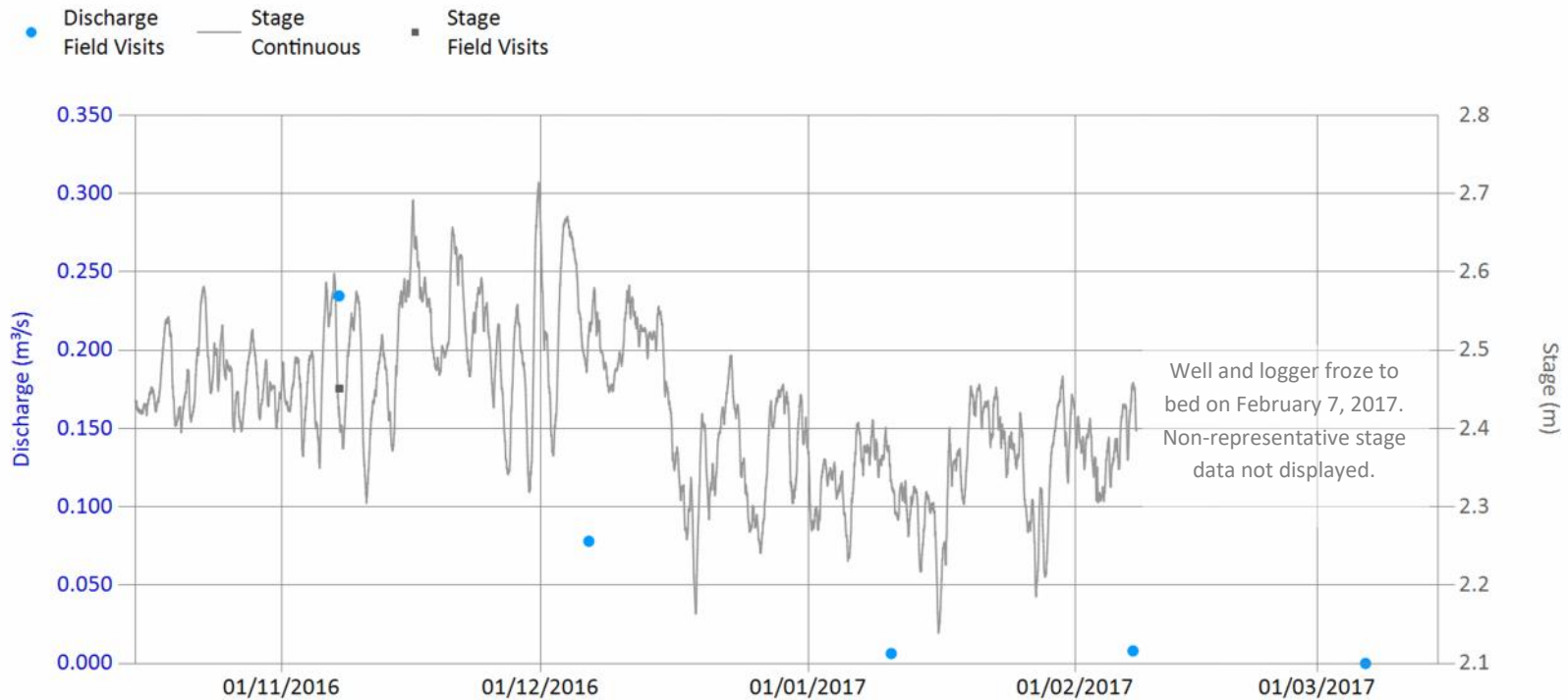


Figure 5. 7 Hydrograph for Victoria Creek at the Road + 290 m Downstream (H-VC-R+290), October 16, 2016 to March 15, 2017.

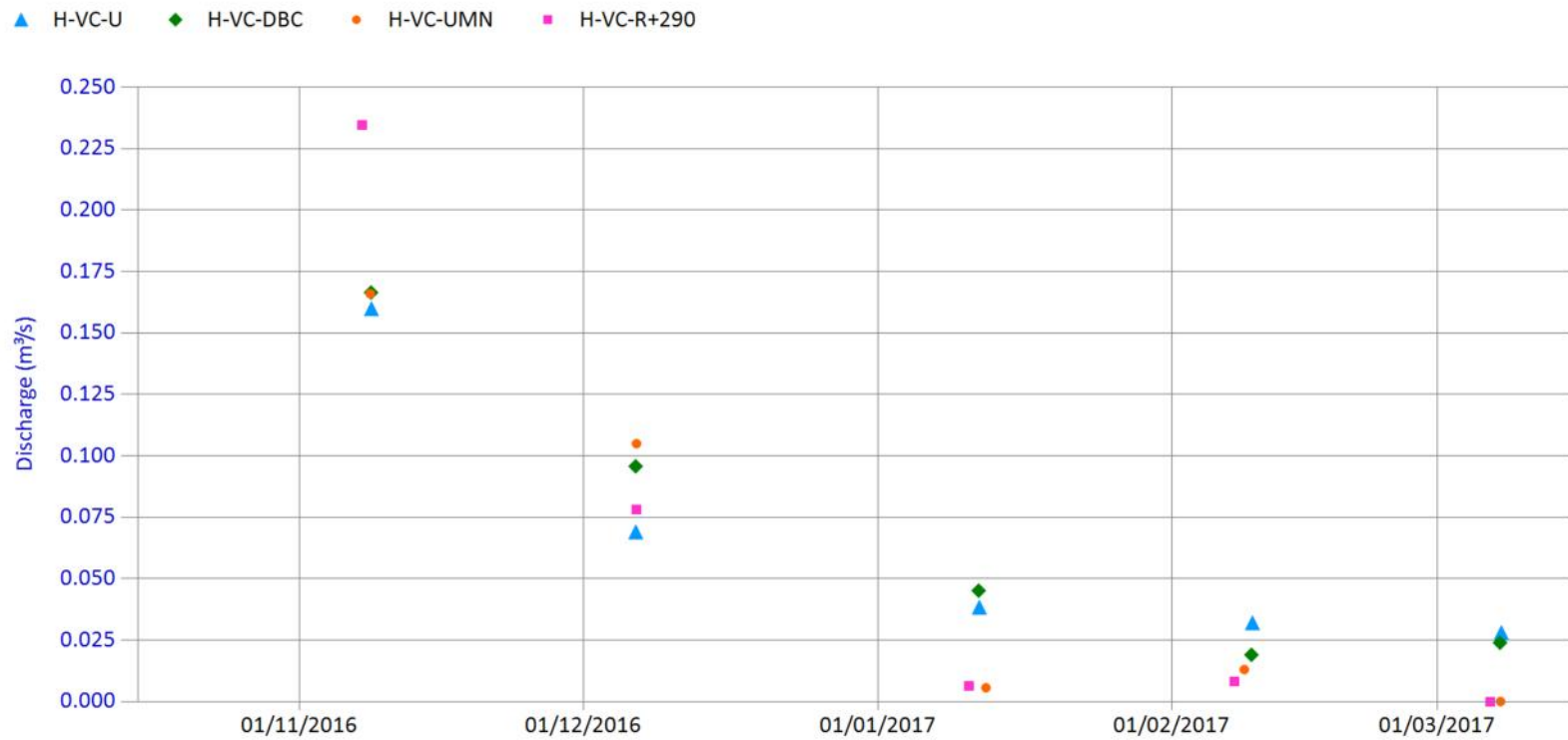


Figure 5.8 Instantaneous Discharge Measurements along Victoria Creek, October 16, 2016 to March 15, 2017

ATTACHMENT 6:

**WATER QUALITY
SUMMARY DATA
TABLES**

Mount Nansen Mine Site
Water Resources Investigation Program
Water Quality



Monthly Report
Attachment 6: Water Quality Data Tables

Water Quality Site	Sample Collected? (Y/N)	Measurement Date	Comments
WQ-SEEP	Y	07/03/2017	Ice build up in the culvert 0.50 m deep. Thin ice cover (0.01 m) downstream of culvert. Flow in pipe outlet low to moderate. Replicate collected at site. Site has typical, distinct odour of wet organic material, similar to wet moss.
WQ-DC-DSS	N	06/03/2017	Unable to locate water at site and no sample collected. Hole augered down to limit of auger height. Hole deepened with ice chipper but unable to reach bed. Ice thickness greater than 1.5 m.
WQ-TP	Y	06/03/2017	Hole augered through ice. Turbid water in hole. Allowed to settle for five minutes prior to collecting sample.
WQ-DC-DX+105	N	07/03/2017	Site frozen to bed. No sample collected. Chipped trough across width of channel to find frozen ground.
WQ-DC-B	N	08/03/2017	No sample collected. No detectable flow.
WQ-DC-U	Y	06/03/2017	Sample collected approximately 5 m downstream of weir pond at same location as February. Clear, swift moving water. Approximately 5 cm flow depth. Site covered with overflow ice thickness extending entire visible limits from site. Overflow ice up to 0.75 m thick. Water and general site area has typical organic odour similar to WQ-SEEP site.
WQ-VC-U	Y	08/03/2017	Water is clear, level is low. Samples collected one day after salt tracers trials to avoid interference with water quality parameters.
WQ-BC	N	07/03/2017	No sample collected. Creek frozen to bed with no detectable flow.
WQ-VC-DBC	Y	07/03/2017	Water is clear, water level and velocity are low.
WQ-VC-UMN	Y	07/03/2017	Sample collected 4 m upstream of typical sampling location. Fresh overflow ice downstream of sample site suspected to be from upwelling at previous sample hole.
WQ-VC-R+150	Y	06/03/2017	Sample collected beside stilling well. Hole chipped through ice up to 0.5 m thick. Anchor ice along bed. Water flowing between layers of ice and no stagnant water along bed.
WQ-PW	Y	08/03/2017	Sample collected at pipe outlet. Water flowing freely from outlet.

Water quality results collected during the monthly surface water monitoring; March 2017

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	L1898852-9 WQ-SEEP 07/03/2017 18:40	L1898852-10 WQ-SEEP-R 07/03/2017 18:45	QA/QC WQ-SEEP Replicate Analysis	L1898852-8 WQ-TP 06/03/2017 19:10	L1898852-7 WQ-DC-U 06/03/2017 17:45	L1898852-1 WQ-VQ-V 08/03/2017 08:40	L1898852-2 WQ-VQ-DBC 07/03/2017 14:50	L1898852-3 WQ-VQ-UMN 07/03/2017 13:00	L1898852-4 WQ-VQ-R+150 08/03/2017 14:45	L1898852-11 WQ-PW 08/03/2017 08:55	L1898852-6 FIELD BLANK 08/03/2017 10:35	L1898852-5 TRAVEL BLANK 08/03/2017 00:00
Temperature (in-situ)	°C	-	-	-	0.4	0.4	-	0.0	-0.1	0.0	0.0	0.0	0.4	0.3	-	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	1,688	1,688	-	3,710	1,578	214	118	284	291	-	-	-
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	6.98	6.98	-	7.65	7.04	6.52	6.95	6.88	6.85	7.13	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	3.35	3.35	-	1.28	3.74	6.65	2.09	7.54	6.77	-	-	-
Turbidity (in-situ)	NTU	-	-	-	25.70	25.80	-	487.00	13.49	0.10	0.30	0.02	0.60	0.16	0.00	-
Colour, True	CU	15	-	-	5	-	-	-	-	-	-	-	-	5.0	-	-
Conductivity	µS/cm	-	-	2	1570	1570	0%	3380	1470	206	212	269	295	348	-	<2.0
Hardness (as CaCO3)	mg/L	-	-	0.5	882	887	1%	2380	848	111	109	142	151	186	-	<0.50
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	7.7	7.7	0%	7.82	7.95	7.69	7.7	7.64	8.04	8.16	5.39	5.41
Total Suspended Solids	mg/L	-	50	3	51.4	49.9	3%	419	49.5	<3.0	<3.0	<3.0	<3.0	-	<3.0	<3.0
Total Dissolved Solids	mg/L	-	-	1	1260	1250	1%	3470	1150	118	119	159	174	217	-	<1.0
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	287	291	1%	404	288	93.7	105	119	119	119	-	<1.0
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	<1.0	<1.0	<DL	<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	<DL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<1.0	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	287	291	1%	404	288	93.7	105	119	119	160	-	<1.0
Ammonia, Total (as N)	mg/L	19.0 *	-	0.005	4.98	5	0%	1.58	3.8	0.00	<0.010	<0.010	<0.010	-	<0.010	<0.010
Bromide (Br)	mg/L	-	-	0.05	<0.25	<0.25	<DL	<1.0	<0.25	<0.050	<0.050	<0.050	<0.050	-	<0.050	<0.050
Chloride (Cl)	mg/L	120	-	0.5	<2.5	<2.5	<DL	<10	<2.5	<0.50	<0.50	<0.50	<0.50	-	<0.50	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	<0.10	<0.10	<DL	0.47	0.11	0.039	0.04	0.042	0.05	0.097	-	<0.020
Nitrate (as N)	mg/L	13	-	0.005	0.619	0.607	2%	<0.10	0.287	0.104	0.101	0.0978	0.158	0.122	-	<0.0050
Nitrite (as N)	mg/L	0.06	-	0.001	0.0238	0.0209	13%	<0.020	0.016	<0.0010	<0.0010	<0.0010	<0.0010	0.011	-	<0.0010
Sulfate (SO4)	mg/L	-	-	0.5	694	680	2%	2240	618	19.1	20.2	41.8	44.2	30.6	-	<0.30
Anion Sum	meq/L	-	-	-	20.2	20	<DL	54.7	18.6	2.28	2.3	2.98	3.32	-	<0.10	<0.10
Cation Sum	meq/L	-	-	-	21.1	21	<DL	52.1	19.3	2.37	2.34	3.02	3.23	-	<0.10	<0.10
Cation - Anion Balance	%	-	-	-	2.4	2.4	<DL	-2.4	1.7	2	0.7	0.6	-1.3	-	0	0
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	0.0068	0.0073	<2xDL	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	0.0195	0.0227	<2xDL	<0.0050	0.0136	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	<0.0050
Cyanate	mg/L	-	-	0.2	<0.20	<0.20	<DL	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	-	<0.20	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	5.58	5.59	0%	0.69	3.37	<0.50	<0.50	<0.50	<0.50	-	<0.50	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	0.0192	0.0188	2%	2.45	0.076	0.0124	0.0102	0.0099	0.017	-	<0.010	<0.010
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	0.00056	0.00056	0%	0.187	0.00045	0.00013	0.00011	0.00058	0.00052	-	<0.00050	<0.00010
Arsenic (As)-Total	mg/L	0.005	-	0.0001	0.01000	0.01000	3%	2.36000	0.07780	0.00031	0.00033	0.00077	0.00154	0.00051	-	<0.00010
Barium (Ba)-Total	mg/L	-	1.0	0.00005	0.0696	0.0711	2%	0.1760	0.0941	0.0997	0.0926	0.1120	0.0910	-	<0.00050	<0.00050
Beryllium (Be)-Total	mg/L	-	-	0.00002	<0.000020	<0.000020	<DL	0.00018	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-	<0.000020	<0.000020
Bismuth (Bi)-Total	mg/L	-	-	0.0005	<0.000050	<0.000050	<DL	0.0201	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	<0.000050
Boron (B)-Total	mg/L	-	-	0.01	0.053	0.052	2%	0.174	0.041	<0.010	<0.010	<0.010	<0.010	-	<0.010	<0.010
Cadmium (Cd)-Total (Lab Result)	mg/L	HD	0.02	0.00001	0.000488	0.000492	1%	0.021	0.000194	0.0000486	0.0000585	0.0000206	0.0000229	-	<0.00020	<0.000050
Cadmium (Cd)-Total (Hardness Adjusted Guideline)	mg/L	-	-	0.00001	0.00037	0.00037	-	0.00037	0.00017	0.00017	0.00017	0.00021	0.00022	-	0.00022	0.00027
Calcium (Ca)-Total	mg/L	-	-	0.05	268	267	0%	770	245	29	29.6	36.7	39.8	42.7	-	<0.050
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	0.00074	0.00073	1%	0.00583	0.00063	0.00016	<0.00010	0.00014	<0.00010	-	<0.00010	<0.00010
Cobalt (Co)-Total	mg/L	-	-	0.0001	0.000793	0.00803	1%	0.0189	0.00599	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	<0.00010
Copper (Cu)-Total (Lab Result)	mg/L	HD	0.2	0.0005	0.00332	0.00341	3%	1.18	0.00162	0.00143	0.00141	0.0013	0.00156	<0.0010	-	<0.00050
Copper (Cu)-Total (Hardness Adjusted Guideline)	mg/L	-	-	0.0005	0.0040	0.0040	-	0.0040	0.0040	0.0025	0.0025	0.0034	0.0040	-	0.0040	0.0040
Iron (Fe)-Total	mg/L	0.3	1	0.01	22.1	22.8	3%	31	3.4	0.014	0.013	0.014	0.023	-	<0.010	<0.010
Lead (Pb)-Total (Lab Result)	mg/L	HD	0.1	0.00005	0.000168	0.000091	<2xDL	1.09	0.000125	<0.000050	<0.000050	0.000051	0.00006	-	<0.00050	<0.000050
Lead (Pb)-Total (Hardness Adjusted Guideline)	mg/L	-	-	0.00005	0.00700	0.00700	-	0.00700	0.00700	0.00363	0.00355	0.00497	0.00538	-	0.00700	0.00700
Lithium (Li)-Total	mg/L	-	-	0.0005	<0.0010	<0.0010	<DL	0.0207	0.0012	<0.0010	<0.0010	0.0013	0.0025	-	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L	-	-	0.1	59.7	61	2%	140	66.1	10.3	10.3	13.7	15	19.3	-	<0.10
Manganese (Mn)-Total	mg/L	-	0.5	0.00005	6.48	6.61	2%	25.8	5.56	0.271	0.283	0.0342	0.0132	-	<0.0010	<0.0010
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.00001	<0.000050	<0.000050	<DL	0.000022	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	<0.000050
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	0.00108	0.00111	3%	0.00729	0.00107	0.000329	0.000338	0.000267	0.000517	-	<0.00050	<0.00050
Nickel (Ni)-Total (Lab Result)	mg/L	HD	0.3	0.0005	0.00308	0.00325	5%	0.013	0.00252	0.00072	0.00078	0.00062	<0.00050	-	<0.00050	<0.00050
Nickel (Ni)-Total (Hardness Adjusted Guideline)	mg/L	-	-	0.0005	0.1500	0.1500	-	0.1500	0.1500	0.1035	0.1020	0.1248	0.1307	-	0.1500	0.1500
Phosphorus (P)-Total	mg/L	-	-	0.05	0.059	0.052	<2xDL	0.28	0.064	<0.050	<0.050	<0.050	<0.050	-	<0.050	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	6.59	6.78	3%	47	5.96	0.8	0.78	1.04	1.27	1	-	<0.10
Selenium (Se)-Total	mg/L	0.001	-	0.0001	0.000271	0.00027	<2xDL	0.0003	0.000195	<0.000050	<0.000050	0.000066	0.000068	<0.00010	-	<0.000050
Silicon (Si)-Total	mg/L	-	-	0.05	9.13	9.13	2%	11.9	8.45	6.53	6.86	7.95	-	-	<0.050	<0.050
Silver (Ag)-Total	mg/L	0.00025	0.1	0.00001	0.000036	0.00003	<2xDL	0.0198	0.000017	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	38.4	39.9	4%	48.7	3.11	3.11	4.13	4.66	5.1	-	<0.050	<0.050
Strontium (Sr)-Total	mg/L	-	-	0.0002	0.789	0.784	1%	2.07	0.751	0.296	0.304	0.337	0.375	-	<0.00020	<0.00020
Sulfur (S)-Total	mg/L	-	-	0.5	276	281	2%	615	257	6.93	34.7	17.1	-	-	<0.50	<0.50
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<DL	0.000815	<0.000010	<0.000010	<0.000010	<0.000010	-	-	<0.000010	<0.000010
Tin (Sn)-Total	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	-	-	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	-	-	0.0003	0.00139	0.00161	15%	0.0098	0.00399	<0.00030	<0.00030	0.00048	-	-		

Water quality results collected during the monthly surface water monitoring; March 2017

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID WQ Site ID Date Sampled Detection Limit	L1898852-9	L1898852-10	QA/QC	L1898852-8	L1898852-7	L1898852-1	L1898852-2	L1898852-3	L1898852-4	L1898852-11	L1898852-6	L1898852-5
					WQ-SEEP 07/03/2017 18:40	WQ-SEEP-R 07/03/2017 18:45	WQ-SEEP Replicate Analysis	WQ-TP 06/03/2017 19:10	WQ-DC-U 06/03/2017 17:45	WQ-VC-U 08/03/2017 08:40	WQ-VC-DBC 07/03/2017 14:50	WQ-VC-UMIN 07/03/2017 13:00	WQ-VC-R+150 08/03/2017 14:45	WQ-PW 08/03/2017 08:55	FIELD BLANK 08/03/2017 10:35	TRAVEL BLANK 08/03/2017 00:00
Aluminum (Al)-Dissolved	mg/L	0.1	-	0.001	0.014	0.0107	6%	<0.0050	0.0084	0.0065	0.0065	0.0056	0.0041	-	<0.0010	-
Antimony (Sb)-Dissolved	mg/L	-	-	0.0001	0.00049	0.00048	<2xDL	0.00719	0.00035	<0.00010	<0.00010	0.00054	0.00048	-	<0.00010	-
Arsenic (As)-Dissolved	mg/L	0.005	0.15	0.0001	0.06320	0.05820	8%	0.68700	0.06060	0.00028	0.00025	0.00065	0.00129	-	<0.00010	-
Barium (Ba)-Dissolved	mg/L	-	-	0.00005	0.0678	0.0592	14%	0.101	0.0888	0.097	0.0938	0.0874	0.1	-	<0.000050	-
Beryllium (Be)-Dissolved	mg/L	-	-	0.00002	<0.00020	<0.00020	<DL	<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-	<0.00020	-
Bismuth (Bi)-Dissolved	mg/L	-	-	0.0005	<0.00050	<0.00050	<DL	<0.00025	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-
Boron (B)-Dissolved	mg/L	-	-	0.01	0.046	0.046	<2xDL	0.161	0.036	<0.010	<0.010	<0.010	<0.010	-	<0.010	-
Cadmium (Cd)-Dissolved (Lab Result)	mg/L	HD	-	0.00001	0.000354	0.000329	7%	0.0014	0.000111	0.00005	0.0000507	0.0000203	0.0000195	-	<0.000050	-
Cadmium (Cd)-Diss. (Hardness Adjusted Guideline)	mg/L	-	-	0.00001	0.00037	0.00037	-	0.00037	0.00037	0.00017	0.00017	0.00021	0.00022	-	0.00022	-
Calcium (Ca)-Dissolved	mg/L	-	-	0.05	258	262	2%	724	236	28.1	28.5	36.5	38.7	-	<0.050	-
Chromium (Cr)-Dissolved	mg/L	0.0089	-	0.0001	0.00046	0.00059	25%	<0.00050	0.00041	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-
Cobalt (Co)-Dissolved	mg/L	-	-	0.0001	0.00767	0.00699	9%	0.0151	0.00563	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-
Copper (Cu)-Dissolved (Lab Result)	mg/L	HD	-	0.0002	0.00183	0.0017	7%	0.0076	0.00081	0.00137	0.00119	0.00119	0.00131	-	<0.00020	-
Copper (Cu)-Diss. (Hardness Adjusted Guideline)	mg/L	-	-	0.002	0.004	0.004	-	0.004	0.004	0.003	0.003	0.003	0.003	-	0.004	-
Iron (Fe)-Dissolved	mg/L	0.3	-	0.01	18.400	18.400	5%	5.500	7.510	<0.010	<0.010	<0.010	<0.010	-	<0.010	-
Lead (Pb)-Dissolved (Lab Result)	mg/L	HD	-	0.00005	<0.000050	<0.000050	<DL	0.00097	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	0.000125	-
Lead (Pb)-Diss. (Hardness Adjusted Guideline)	mg/L	-	-	0.00005	0.00700	0.00700	-	0.00700	0.00700	0.00368	0.00368	0.00497	0.00538	-	0.00700	-
Lithium (Li)-Dissolved	mg/L	-	-	0.0005	<0.0010	<0.0010	<DL	0.0186	<0.0010	<0.0010	<0.0010	0.0013	0.0022	-	<0.0010	-
Magnesium (Mg)-Dissolved	mg/L	-	-	0.1	58	56.5	3%	138	62.5	9.87	9.26	12.3	13.2	-	<0.10	-
Manganese (Mn)-Dissolved	mg/L	-	-	0.00005	6.33	6.06	4%	24.3	5.34	0.261	0.254	0.0307	0.0102	-	<0.00010	-
Mercury (Hg)-Dissolved	mg/L	0.000026	-	0.00001	<0.000050	<0.000050	<DL	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-
Molybdenum (Mo)-Dissolved	mg/L	0.0073	-	0.00005	0.00102	0.00102	0%	0.00645	0.000982	0.000298	0.000317	0.000247	0.000456	-	<0.00050	-
Nickel (Ni)-Dissolved (Lab Result)	mg/L	HD	-	0.0005	0.0029	0.00277	5%	0.0074	0.00235	0.00077	0.00064	0.00055	<0.00050	-	<0.00050	-
Nickel (Ni)-Diss. (Hardness Adjusted Guideline)	mg/L	-	-	0.0005	0.1500	0.1500	-	0.1500	0.1500	0.1035	0.1030	0.1248	0.1307	-	0.1500	-
Phosphorus (P)-Dissolved	mg/L	-	-	0.05	<0.050	<0.050	<DL	<0.25	<0.050	<0.050	<0.050	<0.050	<0.050	-	<0.050	-
Potassium (K)-Dissolved	mg/L	-	-	0.1	6.48	6.2	4%	46.3	5.7	0.76	0.71	0.97	1.14	-	<0.10	-
Selenium (Se)-Dissolved	mg/L	0.001	-	0.0001	0.00029	0.000315	<2xDL	<0.00025	0.000238	<0.000050	<0.000050	0.000069	0.000066	-	<0.00050	-
Silicon (Si)-Dissolved	mg/L	-	-	0.05	8.76	8.16	7%	8.81	7.95	6.4	6.21	6.55	7.3	-	<0.050	-
Silver (Ag)-Dissolved	mg/L	0.00025	-	0.00001	<0.000010	0.000013	<DL	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-
Sodium (Na)-Dissolved	mg/L	-	-	0.05	37.7	36.1	4%	48.4	31.1	2.96	2.81	3.71	4.17	-	<0.050	-
Strontium (Sr)-Dissolved	mg/L	-	-	0.0002	0.771	0.755	2%	1.91	0.725	0.295	0.336	0.366	<0.00020	-	<0.00020	-
Sulfur (S)-Dissolved	mg/L	-	-	0.5	268	241	11%	796	241	6.52	6.32	13.5	15.2	-	<0.50	-
Thallium (Tl)-Dissolved	mg/L	0.0008	-	0.00001	<0.000010	<0.000010	<DL	0.000077	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	<0.000010	-
Tin (Sn)-Dissolved	mg/L	-	-	0.0001	<0.00010	<0.00010	<DL	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	<0.00010	-
Titanium (Ti)-Dissolved	mg/L	-	-	0.0003	0.00113	0.00103	<2xDL	<0.0015	0.00067	<0.00030	<0.00030	<0.00030	<0.00030	-	<0.00030	-
Uranium (U)-Dissolved	mg/L	0.015	-	0.00001	0.00173	0.00179	3%	0.00458	0.0018	0.000421	0.000463	0.000488	0.000715	-	<0.00010	-
Vanadium (V)-Dissolved	mg/L	-	-	0.001	0.00243	0.0023	<2xDL	<0.0025	0.00136	<0.00050	<0.00050	<0.00050	<0.00050	-	<0.00050	-
Zinc (Zn)-Dissolved	mg/L	0.03	-	0.001	0.0473	0.0440	7%	0.4540	0.0227	<0.010	0.0018	0.0020	0.0017	-	<0.010	-
Zirconium (Zr)-Dissolved	mg/L	-	-	0.0003	0.00077	0.00076	<2xDL	<0.0015	0.00047	<0.00030	<0.00030	<0.00030	<0.00030	-	<0.00030	-

Applied Guidelines: Federal CCME Canadian Environmental Quality Guidelines (January 2015), CCME: Freshwater Aquatic Life Mount Nansen Effluent Discharge Standards

Ammonia guideline is temperature dependent and the March value is based on a water temperature of 0°C and a pH of 7.0

Notes:

HD - Guideline is hardness dependent, and is individually calculated for each sample based on hardness results

COLOUR KEY:	QA/QC Comments
Exceeds CCME Guideline	The Travel Blank sample did not have any parameters above detection limit. No contamination from storage or transport is suspected.
Exceeds MN Effluent Discharge Standards	The Field Blank did not have any parameters above detection limits. No contamination from field sampling methodology is suspected.
Exceeds both CCME and MN Standards	QA/QC Replicate Analysis -
	The average RPD of the replicate sample WQ-SEEP was 4% with an average difference of 2% for total and 7% for dissolved metals.
QA/QC Codes: RPD - Relative Percent Difference, <DL - below detection limit, and <2XDL - less than two times the detection limit.	Dissolved chromium had RPD>20%.



ATTACHMENT 7:

**LABORATORY
CERTIFICATES OF
ANALYSIS AND
YUKON
ENVIRONMENTAL
HEALTH SERVICES
BACTERIOLOGICAL
RESULTS**



EDI ENVIRONMENTAL DYNAMICS INC.
ATTN: Lyndsay Doetzel
2195 - 2nd Ave
Whitehorse YT Y1A 3T8

Date Received: 08-MAR-17
Report Date: 16-MAR-17 19:05 (MT)
Version: FINAL

Client Phone: 867-393-4882

Certificate of Analysis

Lab Work Order #: L1898852
Project P.O. #: NOT SUBMITTED
Job Reference: MOUNT NANSEN 16-Y-0089
C of C Numbers:
Legal Site Desc:

Can Dang
Senior Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

16-MAR-17 19:05 (MT)

Version: FINAL

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L1898852-1	L1898852-2	L1898852-3	L1898852-4	L1898852-5
					Water	Water	Water	Water	Water
		08-MAR-17	08:40		08-MAR-17	07-MAR-17	07-MAR-17	08-MAR-17	08-MAR-17
					WQ-VC-U	WQ-VC-DBC	WQ-VC-UMN	WQ-VC-R+150	TRAVEL BLANK
Grouping	Analyte								
WATER									
Physical Tests	Colour, True (CU)								
	Conductivity (uS/cm)	206	212	269	295	<2.0			
	Hardness (as CaCO3) (mg/L)	111	109	142	151	<0.50			HTC
	pH (pH)	7.69	7.70	7.64	8.04	5.41			
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0			
	Total Dissolved Solids (mg/L)								
	TDS (Calculated) (mg/L)	118	119	159	174	<1.0			
	Turbidity (NTU)								
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	93.7	93.7	105	119	<1.0			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	93.7	93.7	105	119	<1.0			RRV
	Ammonia, Total (as N) (mg/L)	<0.010 ^{DLB}	<0.010 ^{DLB}	<0.010 ^{DLB}	<0.010 ^{DLB}	<0.010			
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50			
	Fluoride (F) (mg/L)	0.039	0.040	0.042	0.050	<0.020			
	Nitrate (as N) (mg/L)	0.104	0.101	0.0978	0.158	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	19.1	20.2	41.8	44.2	<0.30			
	Anion Sum (meq/L)	2.28	2.30	2.98	3.32	<0.10			
	Cation Sum (meq/L)	2.37	2.34	3.02	3.23	<0.10			
	Cation - Anion Balance (%)	2.0	0.7	0.6	-1.3	0.0			
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			
	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			
	Cyanate (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20			
	Thiocyanate (SCN) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0124	0.0102	0.0099	0.0170	<0.0030			
	Antimony (Sb)-Total (mg/L)	0.00013	0.00011	0.00058	0.00052	<0.00010			
	Arsenic (As)-Total (mg/L)	0.00031	0.00033	0.00077	0.00154	<0.00010			
	Barium (Ba)-Total (mg/L)	0.0992	0.0997	0.0926	0.112	<0.000050			
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	0.0000486	0.0000585	0.0000206	0.0000229	<0.0000050			
	Calcium (Ca)-Total (mg/L)	29.0	29.6	36.7	39.8	<0.050			
	Chromium (Cr)-Total (mg/L)	0.00014	0.00016	<0.00010	0.00014	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1898852-11	Water	08-MAR-17	08:55	WQ-PW
WATER						
Physical Tests	Colour, True (CU)			<5.0		
	Conductivity (uS/cm)			348		
	Hardness (as CaCO3) (mg/L)			186 ^{HTC}		
	pH (pH)			8.16		
	Total Suspended Solids (mg/L)					
	Total Dissolved Solids (mg/L)			217		
	TDS (Calculated) (mg/L)					
	Turbidity (NTU)			<0.10		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)					
	Alkalinity, Carbonate (as CaCO3) (mg/L)					
	Alkalinity, Hydroxide (as CaCO3) (mg/L)					
	Alkalinity, Total (as CaCO3) (mg/L)			160		
	Ammonia, Total (as N) (mg/L)					
	Bromide (Br) (mg/L)					
	Chloride (Cl) (mg/L)			<0.50		
	Fluoride (F) (mg/L)			0.097		
	Nitrate (as N) (mg/L)			0.122		
	Nitrite (as N) (mg/L)			0.0011		
	Sulfate (SO4) (mg/L)			30.6		
	Anion Sum (meq/L)					
	Cation Sum (meq/L)					
	Cation - Anion Balance (%)					
Cyanides	Cyanide, Weak Acid Diss (mg/L)					
	Cyanide, Total (mg/L)					
	Cyanate (mg/L)					
	Thiocyanate (SCN) (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)			<0.010		
	Antimony (Sb)-Total (mg/L)			<0.00050		
	Arsenic (As)-Total (mg/L)			0.00051		
	Barium (Ba)-Total (mg/L)			0.091		
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)			<0.10		
	Cadmium (Cd)-Total (mg/L)			<0.00020		
	Calcium (Ca)-Total (mg/L)			42.7		
	Chromium (Cr)-Total (mg/L)			<0.0020		
	Cobalt (Co)-Total (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1898852-1 Water 08-MAR-17 08:40 WQ-VC-U	L1898852-2 Water 07-MAR-17 14:50 WQ-VC-DBC	L1898852-3 Water 07-MAR-17 13:00 WQ-VC-UMN	L1898852-4 Water 08-MAR-17 14:45 WQ-VC-R+150	L1898852-5 Water 08-MAR-17 TRAVEL BLANK
Grouping	Analyte					
WATER						
Total Metals	Copper (Cu)-Total (mg/L)	0.00143	0.00141	0.00130	0.00156	<0.00050
	Iron (Fe)-Total (mg/L)	0.014	0.013	0.014	0.023	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	0.000051	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0013	0.0025	<0.0010
	Magnesium (Mg)-Total (mg/L)	10.3	10.3	13.7	15.0	<0.10
	Manganese (Mn)-Total (mg/L)	0.271	0.283	0.0342	0.0132	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000329	0.000338	0.000267	0.000517	<0.000050
	Nickel (Ni)-Total (mg/L)	0.00072	0.00078	0.00062	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	0.80	0.78	1.04	1.27	<0.10
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	0.000086	0.000068	<0.000050
	Silicon (Si)-Total (mg/L)	6.53	6.63	6.86	7.95	<0.050
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	3.11	3.11	4.13	4.66	<0.050
	Strontium (Sr)-Total (mg/L)	0.296	0.304	0.337	0.375	<0.00020
	Sulfur (S)-Total (mg/L)	6.61	6.93	14.7	17.1	<0.50
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	0.00048	<0.00030
	Uranium (U)-Total (mg/L)	0.000463	0.000504	0.000526	0.000788	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0065	0.0065	0.0056	0.0041	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00054	0.00048	
	Arsenic (As)-Dissolved (mg/L)	0.00028	0.00025	0.00065	0.00129	
	Barium (Ba)-Dissolved (mg/L)	0.0970	0.0938	0.0874	0.100	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	0.0000500	0.0000507	0.0000203	0.0000195	
	Calcium (Ca)-Dissolved (mg/L)	28.1	28.5	36.5	38.7	
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

16-MAR-17 19:05 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L1898852-6 Water 08-MAR-17 10:35 FIELD BLANK	L1898852-7 Water 06-MAR-17 17:45 WQ-DC-U	L1898852-8 Water 06-MAR-17 19:10 WQ-TP	L1898852-9 Water 07-MAR-17 18:40 WQ-SEEP	L1898852-10 Water 07-MAR-17 18:45 WQ-SEEP-R
Grouping	Analyte					
WATER						
Total Metals	Copper (Cu)-Total (mg/L)	<0.00050	0.00162	1.18	0.00332	0.00341
	Iron (Fe)-Total (mg/L)	<0.010	9.40	31.0	22.1	22.8
	Lead (Pb)-Total (mg/L)	<0.000050	0.000125	1.09	0.000168	0.000091
	Lithium (Li)-Total (mg/L)	<0.0010	0.0012	0.0207	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)	<0.10	66.1	140	59.7	61.0
	Manganese (Mn)-Total (mg/L)	<0.00010	5.56	25.8	6.48	6.61
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	0.0000220	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.00107	0.00729	0.00108	0.00111
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00252	0.0130	0.00308	0.00325
	Phosphorus (P)-Total (mg/L)	<0.050	0.064	0.28	0.059	0.052
	Potassium (K)-Total (mg/L)	<0.10	5.96	47.0	6.59	6.78
	Selenium (Se)-Total (mg/L)	<0.000050	0.000195	0.00030	0.000271	0.000270
	Silicon (Si)-Total (mg/L)	<0.050	8.45	11.9	8.95	9.13
	Silver (Ag)-Total (mg/L)	<0.000010	0.000017	0.0198	0.000036	0.000030
	Sodium (Na)-Total (mg/L)	<0.050	32.8	48.7	38.4	39.9
	Strontium (Sr)-Total (mg/L)	<0.00020	0.751	2.07	0.789	0.784
	Sulfur (S)-Total (mg/L)	<0.50	257	815	276	281
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	0.000815 ^{DLA}	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00050 ^{DLA}	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	0.00399	0.0098	0.00139	0.00161
	Uranium (U)-Total (mg/L)	<0.000010	0.00173	0.00529	0.00184	0.00184
	Vanadium (V)-Total (mg/L)	<0.00050	0.00226	0.0079	0.00361	0.00363
	Zinc (Zn)-Total (mg/L)	<0.0030	0.0230	1.55 ^{DLA}	0.0475	0.0481
	Zirconium (Zr)-Total (mg/L)	<0.00030	0.00050	<0.0015 ^{DLA}	0.00083	0.00084
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	0.0084	<0.0050 ^{DLA}	0.0114	0.0107
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00035	0.00719	0.00049	0.00048
	Arsenic (As)-Dissolved (mg/L)	<0.00010	0.0606	0.687	0.0632	0.0582
	Barium (Ba)-Dissolved (mg/L)	<0.000050	0.0888	0.101	0.0678	0.0592
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.00010 ^{DLA}	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.00025 ^{DLA}	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.036	0.161	0.046	0.046
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	0.000111	0.00140	0.000354	0.000329
	Calcium (Ca)-Dissolved (mg/L)	<0.050	236	724 ^{DLA}	258	262
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	0.00041	<0.00050 ^{DLA}	0.00046	0.00059
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00563	0.0151	0.00767	0.00699

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1898852-11			
		Water			
		08-MAR-17			
		08:55			
		WQ-PW			
Grouping	Analyte				
WATER					
Total Metals	Copper (Cu)-Total (mg/L)	<0.0010			
	Iron (Fe)-Total (mg/L)	<0.030			
	Lead (Pb)-Total (mg/L)	0.00060			
	Lithium (Li)-Total (mg/L)				
	Magnesium (Mg)-Total (mg/L)	19.3			
	Manganese (Mn)-Total (mg/L)	<0.0020			
	Mercury (Hg)-Total (mg/L)	<0.00020			
	Molybdenum (Mo)-Total (mg/L)				
	Nickel (Ni)-Total (mg/L)				
	Phosphorus (P)-Total (mg/L)				
	Potassium (K)-Total (mg/L)	1.00			
	Selenium (Se)-Total (mg/L)	<0.0010			
	Silicon (Si)-Total (mg/L)				
	Silver (Ag)-Total (mg/L)				
	Sodium (Na)-Total (mg/L)	5.1			
	Strontium (Sr)-Total (mg/L)				
	Sulfur (S)-Total (mg/L)				
	Thallium (Tl)-Total (mg/L)				
	Tin (Sn)-Total (mg/L)				
	Titanium (Ti)-Total (mg/L)				
	Uranium (U)-Total (mg/L)	0.00167			
	Vanadium (V)-Total (mg/L)				
	Zinc (Zn)-Total (mg/L)	<0.050			
	Zirconium (Zr)-Total (mg/L)				
Dissolved Metals	Dissolved Mercury Filtration Location				
	Dissolved Metals Filtration Location				
	Aluminum (Al)-Dissolved (mg/L)				
	Antimony (Sb)-Dissolved (mg/L)				
	Arsenic (As)-Dissolved (mg/L)				
	Barium (Ba)-Dissolved (mg/L)				
	Beryllium (Be)-Dissolved (mg/L)				
	Bismuth (Bi)-Dissolved (mg/L)				
	Boron (B)-Dissolved (mg/L)				
	Cadmium (Cd)-Dissolved (mg/L)				
	Calcium (Ca)-Dissolved (mg/L)				
	Chromium (Cr)-Dissolved (mg/L)				
	Cobalt (Co)-Dissolved (mg/L)				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L1898852-1	L1898852-2	L1898852-3	L1898852-4	L1898852-5
					Water	Water	Water	Water	Water
		08-MAR-17	08:40		08-MAR-17	07-MAR-17	07-MAR-17	08-MAR-17	08-MAR-17
					WQ-VC-U	WQ-VC-DBC	WQ-VC-UMN	WQ-VC-R+150	TRAVEL BLANK
Grouping	Analyte								
WATER									
Dissolved Metals	Copper (Cu)-Dissolved (mg/L)	0.00137	0.00119	0.00119	0.00131				
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0013	0.0022				
	Magnesium (Mg)-Dissolved (mg/L)	9.87	9.26	12.3	13.2				
	Manganese (Mn)-Dissolved (mg/L)	0.261	0.254	0.0307	0.0102				
	Mercury (Hg)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000298	0.000317	0.000247	0.000456				
	Nickel (Ni)-Dissolved (mg/L)	0.00077	0.00064	0.00055	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050				
	Potassium (K)-Dissolved (mg/L)	0.76	0.71	0.97	1.14				
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	0.000069	0.000066				
	Silicon (Si)-Dissolved (mg/L)	6.40	6.21	6.55	7.30				
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	2.96	2.81	3.71	4.17				
	Strontium (Sr)-Dissolved (mg/L)	0.290	0.295	0.336	0.366				
	Sulfur (S)-Dissolved (mg/L)	6.52	6.32	13.5	15.2				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030				
	Uranium (U)-Dissolved (mg/L)	0.000421	0.000463	0.000488	0.000715				
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0018	0.0020	0.0017				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1898852-11	Water	08-MAR-17	08:55	WQ-PW
Grouping	Analyte					
WATER						
Dissolved Metals	Copper (Cu)-Dissolved (mg/L) Iron (Fe)-Dissolved (mg/L) Lead (Pb)-Dissolved (mg/L) Lithium (Li)-Dissolved (mg/L) Magnesium (Mg)-Dissolved (mg/L) Manganese (Mn)-Dissolved (mg/L) Mercury (Hg)-Dissolved (mg/L) Molybdenum (Mo)-Dissolved (mg/L) Nickel (Ni)-Dissolved (mg/L) Phosphorus (P)-Dissolved (mg/L) Potassium (K)-Dissolved (mg/L) Selenium (Se)-Dissolved (mg/L) Silicon (Si)-Dissolved (mg/L) Silver (Ag)-Dissolved (mg/L) Sodium (Na)-Dissolved (mg/L) Strontium (Sr)-Dissolved (mg/L) Sulfur (S)-Dissolved (mg/L) Thallium (Tl)-Dissolved (mg/L) Tin (Sn)-Dissolved (mg/L) Titanium (Ti)-Dissolved (mg/L) Uranium (U)-Dissolved (mg/L) Vanadium (V)-Dissolved (mg/L) Zinc (Zn)-Dissolved (mg/L) Zirconium (Zr)-Dissolved (mg/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1898852-1, -10, -2, -3, -4, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L1898852-1, -2, -3, -4, -6, -7, -8
Matrix Spike	Barium (Ba)-Total	MS-B	L1898852-5
Matrix Spike	Calcium (Ca)-Total	MS-B	L1898852-1, -2, -3, -4, -6, -7, -8
Matrix Spike	Calcium (Ca)-Total	MS-B	L1898852-10, -11, -9
Matrix Spike	Calcium (Ca)-Total	MS-B	L1898852-5
Matrix Spike	Iron (Fe)-Total	MS-B	L1898852-5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1898852-1, -2, -3, -4, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1898852-10, -11, -9
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1898852-5
Matrix Spike	Manganese (Mn)-Total	MS-B	L1898852-1, -2, -3, -4, -6, -7, -8
Matrix Spike	Manganese (Mn)-Total	MS-B	L1898852-5
Matrix Spike	Potassium (K)-Total	MS-B	L1898852-10, -11, -9
Matrix Spike	Silicon (Si)-Total	MS-B	L1898852-5
Matrix Spike	Sodium (Na)-Total	MS-B	L1898852-1, -2, -3, -4, -6, -7, -8
Matrix Spike	Sodium (Na)-Total	MS-B	L1898852-10, -11, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L1898852-5
Matrix Spike	Strontium (Sr)-Total	MS-B	L1898852-1, -2, -3, -4, -6, -7, -8
Matrix Spike	Strontium (Sr)-Total	MS-B	L1898852-10, -11, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1898852-5
Matrix Spike	Sulfur (S)-Total	MS-B	L1898852-5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-VA Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-CNO-WT Water Cyanate APHA 4500-CN-L

This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode

CN-SCN-VA Water Thiocyanate by Colour APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.

Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method. Contact ALS for additional information if required.

CN-T-CFA-VA Water Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

CN-WAD-CFA-VA Water Weak Acid Diss. Cyanide in water by CFA APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.

COLOUR-TRUE-VA Water Colour (True) by Spectrometer BCMOE Colour Single Wavelength

This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.

Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.

Concurrent measurement of sample pH is recommended.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

EC-SCREEN-VA Water Conductivity Screen (Internal Use Only) APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-TOT-CVAFS-VA Water Total Hg in Water by CVAFS LOR=50ppt EPA 1631E (mod)

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Reference Information

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TDS-VA Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878



L1898852-COFC

COC Number:

Page 2 of 3

Report To Company: EDI Contact: Lyndsay Doetzel Address: 2195 - 2nd Avenue Whitehorse, YT Y1A 3T8 Phone: 867-393-4882		Report Format / Distribution Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL) Quality Control (QC) Report with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: ldoetzel@edynamics.com Email 2: Emilie.Hamm@gov.yk.ca Email 3: erik_pit@gov.yk.ca		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days) P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge Specify Date Required for E2, E or P:																																																																																																																																																																																																																																																
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Drinking Water (DW) Samples¹ (client use) Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Special Instructions / Specify Criteria to add on report (client use)		SAMPLE CONDITION AS RECEIVED (lab use only) Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling Initiated <input type="checkbox"/> INITIAL COOLER TEMPERATURES °C: 3-3 FINAL COOLER TEMPERATURES °C: _____																																																																																																																																																																																																																																																
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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION
 Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.
 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878



L1898852-COFC

COC Number:

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Report To		Report Format / Distribution			<small>Select service level below (Rush Turnaround Time (TAT) is not available for all tests)</small>																																																																																																														
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Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client use)																																																																																																																	
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No																																																																																																																			
Are samples for human drinking water use? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																																																																																																																			
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)																																																																																																																	
Released by: A. MISCHLER		Date: 08 MAR 17		Time: 15:25		Received by: VD.		Date: Mar 8/17		Time: 15:25		FINAL SHIPMENT RECEPTION (lab use only)																																																																																																							
												Received by: _____ Date: _____ Time: _____																																																																																																							
												Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>																																																																																																							
												Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>																																																																																																							
												Cooling Initiated <input checked="" type="checkbox"/>																																																																																																							
												INITIAL COOLER TEMPERATURES °C: 33. FINAL COOLER TEMPERATURES °C: _____																																																																																																							

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION
 Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.
 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



BACTERIOLOGICAL ANALYSIS OF DRINKING WATER ANALYSE BACTÉRIOLOGIQUE DE L'EAU POTABLE

Health and Social Services
Santé et Affaires sociales
Environmental Health Services
Service d'hygiène du milieu

#2 Hospital Road, Whitehorse, Yukon Y1A 3H8
phone : (867) 667-8391 fax : (867) 667-8322
Toll free: 1-800-661-0408 ext.8391

2 Hospital Road, Whitehorse (Yukon) Y1A 3H8
Tél. : 867-667-8391 Téléc. : 867-667-8322
Sans frais au Yukon : 1-800-661-0408, poste 8391

Contact Information • Coordonnées de la personne ressource

Contact Person / Personne ressource: LYNBSA F DOETZEL Phone / Téléphone: 393-4882
Mailing address / Adresse postale: 2195 2ND AVE Fax / Télécopieur: _____
Address postale: _____ Postal code / Code postal: _____

First Nation, Municipal or Business Name / Nom de la Première nation, de la municipalité ou de l'entreprise: ED1

Agent: _____ Fax: _____
Agent: _____ Télécopieur: _____

Sampling Location • Lieu de la prise d'échantillon

Municipal Address / Adresse municipale: MOUET WADSEN Subdivision / Lotissement: _____
Legal Description Lot / Description officielle Lot: _____ Quad / Parcelle: _____ Plan n.°: _____
Designation officielle Lot: _____ Quatrièrte: _____
Other Information (e.g., Location, Business / Building Name) / Autres renseignements (ex.: emplacement, nom de l'entreprise, nom de l'édifice): _____

Sample Collection / Prélèvement de l'échantillon

Sample Collected By / Échantillon prélevé par: SD Date: 17/03/08 Time: 0855 am
Date: YYMMDD • AAAMMU Heure: _____ pm

Point d'échantillonnage (ex.: robinet de cuisine) / Point de prélèvement: PUMPHOUSE WELL

Is this a Resample from a Previous Test? / Est-ce un deuxième échantillon d'un test antérieur? Yes / Oui No / Non Previous Sample Number: _____

Sample Supply / Source d'approvisionnement en eau

Public Supply / Municipal - par canalisation Bulk Water Distributor / Municipal - par camion Business / Privé - entreprise Private Residence / Privé - résidence

Sample Source / Provenance de l'échantillon

Dug Well / Puits creusé Driven Well / Puits tubulaire Drilled Well / Puits foré à la sondeuse Depth of Well / Profondeur du puits: _____
 Water Holding Tank / Réservoir d'eau Other (explain) / Autre (précisez): _____

Water Treatment / Traitement de l'eau

Is the Water Chlorinated? / L'eau contient-elle du chlore? Yes / Oui No / Non Free Available Chlorine / Chlore libre disponible: _____ ppm
mg/L
Other Treatment Systems (e.g., UV, softener, filter) / Autre dispositif de traitement (ex.: désinfection aux rayons UV, adoucisseur d'eau, filtre): _____

For Laboratory Use Only / À l'usage du laboratoire seulement

Receipt of Sample / Réception de l'échantillon Date: 17/03/08 Time: 5:00 am By: SD
Date: YYMMDD • AAAMMU Heure: _____ am / pm Par: _____

Condition of Sample / État de l'échantillon Satisfactory / Satisfaisant Unsatisfactory / Non satisfaisant Details / Précisez: 5.2

Incubation / Incubation Date: 170308 Time: 4:00 am By: SD Incubator / Incubateur: 2
Date: YYMMDD • AAAMMU Heure: _____ am / pm Par: _____

Analysis Completed / Analyse terminée Date: 170309 Time: 4:00 am By: SD
Date: YYMMDD • AAAMMU Heure: _____ am / pm Par: _____

Results (See Reverse Side for Interpretation) per 100 ml / Résultats (Voir au verso l'interprétation des résultats)

Total Coliforms/Coliformes totaux Present / Présence Absent / Absence

E. coli/E. coli Present / Présence Absent / Absence

Comments / Commentaires