

November 22, 2013

EDI Job Number: 13-Y-0167

Assessment and Abandoned Mines Branch (AAM) K-149
Department of Energy, Mines and Resources, Yukon Government
Room 2C Royal Center, 4114-4th Avenue
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Attention: Adrienne Turcotte, Mount Nansen Project Officer

Re: Mount Nansen Surface Water Quality Field Memo: November 12-14, 2013

Trip Dates:	November 12-14, 2013
EDI Field Staff:	Dawn Hansen, Danny Skookum, Joel MacFabe
Tasks:	Hydrology and Water Quality

Field Summary

EDI completed the surface water quality sampling and hydrometric monitoring at the Mount Nansen Site from November 12 to November 14, 2013. Air temperatures during the trip ranged from -2°C to -28°C. Weather conditions were overcast or snowing with light, gusting winds. Ice had formed over the tailings pond (12 cm thick) and Brown McDade pit lake (37 cm thick), with ice cover also on most streams, however some only had ice along the margins of the streams. There was between 6 cm and 15 cm of snow on the ground during the site visit. Water levels across most of the sites/stations were low to moderate, however four creeks were frozen to substrate. EDI visited all regular water quality sites and hydrometric stations for the sampling period.

Each section below details additional site- and station-specific information for the Hydrology (Section 1) and Water Quality (Section 2) programs. Included in the Water Quality section are appendices of water quality parameters that exceeded guidelines and/or the Mount Nansen Effluent Quality Standards, ALS Lab Analysis Reports, and YG Environmental Health Services bacteriological analysis results for the previous trip (October 15-17, 2013). Section 3 contains relevant photos of field conditions. Section 4 details additional monitoring program comments, noteworthy observations, and any changes to budget or scope moving forward.



1. Hydrology

All hydrometric stations were visited and station conditions documented. Stream discharge measurements were collected at each hydrometric station that was not frozen or dry using the cross-sectional velocity-area method (*i.e.* mid-section method), the volumetric method, and/or the salt tracer method using a salt slug injection.

Water levels at all stations were typical of the early winter period, with discharges ranging from low to moderate. Due to air temperatures remaining below zero degrees ice had formed over most of the streams, which were also snow covered. Some streams are not entirely covered in ice and have ice along the shore as well as snow up to the water's edge, such as some sites on Victoria Creek. Overflow ice ('aufeis') was beginning to form at several stations on Dome Creek (H-DC-D1b, H-DC-U1, H-DC-U2), making conditions unsuitable for discharge measurements. In general, ice thickness ranged from 1 cm to 20 cm across the Mount Nansen Site. Of note some stations had frozen to substrate and were dry during this trip, such as H-BC, H-PC-D, H-DC-B. Table 1 summarizes the hydrometric monitoring program measurements completed at each station and any additional relevant station details.

Table 1. Hydrometric program details.

Hydrology program dates:	November 12-14, 2013
Weather at time of monitoring:	Weather conditions were typically overcast and calm, with temperatures between -2°C to -28°C.

Station	Hydrometric Measurement Type	Notes & Comments
ATM-DC2/DC4	None	Both atmospheric barologgers were downloaded.
H-DC-DX	None	No hydrometric measurement taken, culvert frozen through with no flow, upstream of culvert water level too low and braiding through vegetation.
H-DC-DX+105	Salt Slug	Water levels moderate. Salt tracer method used to measure stream discharge. Shore ice along channel and snow.
H-DC-D1b	Salt Slug	Flow levels were low. Salt tracer discharge measurement taken. Sections of channel are snow and ice covered. Crew noted excavator activity upstream with the removal of the building on the upstream pond.
H-DC-U1	None	No salt slug performed due to unsuitable conditions for Q measurement. No channel, water flowing through ice and overflow ice forming. Channel comprised of snow and ice.
H-DC-U2	None	Salt slug attempted but unsuccessful due to unsuitable conditions with overflow ice. Water levels were low and channel was entirely covered in snow and layers of ice 20 centimeters thick.
H-DC-B	None	Channel frozen through and dry beneath. Channel covered in ice and snow. Crew noted signs of recent re-trenching in diversion (Photo 1).
H-DC-M	Salt Slug	Water level low, channel snow and ice (1-4cm thick) covered. Salt tracer used to estimate stream discharge. Logger downloaded.



Station	Hydrometric Measurement Type	Notes & Comments
H-DC-R	Salt Slug	Water level low. Salt tracer used to estimate stream discharge. Snow and ice covered channel with overflow beginning to form downstream.
H-VC-REF	Salt Slug	Flow levels low and water clear. Salt tracer used to estimate stream discharge. Channel snow and ice covered (Photo 2).
H-VC-U	Salt Slug	Water level moderate and clear. Discharge measurement completed using salt tracer. Logger downloaded and survey conducted. Ice cover on majority of the channel, however there are still open sections (Photo 3).
H-BC	None	No hydrometric measurement taken, channel frozen through and dry (Photo 4).
H-VC-DBC	ADV & Salt Slug	Water level moderate and water was clear. Mid-section method was the primary method used to measure discharge. Salt tracer was also used to measure discharge as a secondary method. Logger downloaded. Channel is snow and ice covered with some sections of water flowing above and below the ice.
H-VC-UMN	Salt Slug	Salt tracer used to measure discharge. Water level was moderate and turbidity was clear. Channel snow and ice covered with an open water section.
H-MN	Salt Slug	Salt tracer used to measure discharge. Water level was moderate and turbidity was light. Channel snow and ice covered (1-10cm).
H-VC-R	ADV	Water level low and water relatively clear. Mid-section method used to estimate discharge. Logger downloaded. Channel snow and ice covered with small open leads in thalweg. Water flowing above and below ice (Photo 5).
H-SEEP	Volumetric	A volumetric measurement was made at the pipe discharge. Flow rate and total volume was recorded from the flow meter. No staff gauge reading taken due to ice.
H-TP	None	Note full ice coverage at time of sampling. No staff gauge reading taken due to ice.
H-PC-U	Salt Slug	Very low and slow flow at station (almost frozen to substrate). Salt tracer was used to measure discharge. Channel snow and ice covered.
H-PC-DSP	None	No hydrometric measurement taken, channel frozen through and dry.

2. Water Quality

Water quality samples were collected from all monitoring sites with the exception of WQ-ADIT-SEEP, WQ-BC and WQ-PC-U due to zero flow. Water levels were moderate to low at all sites, with most creek sites having ice cover across the channel, while some remained with ice cover only on the margins. The pit lake had sufficient ice thickness to safely access the sampling location, and the regular samples were taken. Table 2 summarizes the water quality sampling conditions at each site.



All water quality samples were delivered to ALS on Thursday, November 14, 2013. Bacteriological samples collected from the pump house well were submitted to YG Environmental Health Services (EHS) on Thursday, November 14, 2013.

This memo includes analytical results from samples collected during the October 15-17, 2013 trip (Appendix A, C) as well as copies of the ALS Certificate of Analysis (Appendix B).

Table 2. Water quality sampling program details.

WQ Sampling dates:	November 13-14, 2013
Weather at time of sampling:	Weather conditions were typically overcast or snowing and calm with gusts of wind. Temperatures ranged between -2°C to -28°C during sampling.

Site	Sampled? (Yes/No)	Notes / Explanations
WQ-PIT1	Yes	Samples taken from surface. Water level was lower than usual with total depth of 6.5 meters (Photo 6). Dissolved oxygen (DO) 9.84 mg/L.
WQ-PIT2	Yes	Samples taken from 3 m depth (Photo 6). DO 9.09 mg/L.
WQ-PIT3	Yes	Samples taken from 6 m depth (Photo 6). DO 5.49 mg/L.
WQ-SEEP	Yes	Conditions normal for this time of year. Ice build-up around pipe and barrel at the site.
WQ-TP	Yes	Ice thickness 12 cm.
WQ-DC-DX	Yes	Water levels were very low and turbidity was high (59.8 NTU).
WQ-DC-DX+105	Yes	Water levels were moderate.
WQ-DC-D1b	Yes	Water levels were low and overflow ice was 12 cm thick with water flowing through. Excavator activity upstream with the removal of the building on the upstream pond. Suspect disturbed bed when cutting hole in ice, water did not clear up over time.
WQ-DC-U1	Yes	Water quality sample collected slightly upstream of regular site, due to more suitable sampling conditions. Overflow ice developing.
WQ-DC-U2	Yes	Water levels were low under cover of ice and snow (30 cm). Overflow ice developing.
WQ-DC-U	Yes	Water levels were low. Sample collected at regular location. Ice cover over whole channel.
WQ-DC-R	Yes	Water levels were low with multiple layers of overflow ice on top (25 cm). Turbidity was moderate (17.02 NTU).
WQ-VC-REF	Yes	Water levels were low. Whole site ice covered. Ice in layers (20 cm).
WQ-VC-U	Yes	Water levels were moderate. Area of open water just below sample site.
WQ-BC	No	Channel frozen to bed and dry. No sample collected (Photo 4).
WQ-VC-DBC	Yes	Water levels were moderate. Open water section upstream of sample site.
WQ-VC-UMN	Yes	Water levels were moderate. Water quality samples were collected within an open water section.
WQ-MN	Yes	Water levels were moderate and turbidity was light (11.95 NTU).



Site	Sampled? (Yes/No)	Notes / Explanations
WQ-VC-R	Yes	Water levels were low. No open water upstream of culvert at sampling location. Ice approximately 20 cm thick.
WQ-PW	Yes	Bacteriological sample and drinking water samples collected from discharge pipe.
WQ-PC-U	No	Channel frozen to bed and dry. No sample collected.
WQ-PC-D	Yes	Low flows present in creek, almost frozen to substrate. Sample was collected.
WQ-ADIT-SEEP	No	Seep was dry. No samples collected.
WQ-MS-S-03	Yes	Water levels were moderate. Channel snow covered with thin ice.
WQ-DRY	No	No sampling required at this time.
Quality Assurance/Quality Control Samples		
Field Replicate A	Yes	Collected from WQ-DC-R.
Field Replicate B	Yes	Collected from WQ-VC-DBC.
Field Blank	Yes	Samples prepared with lab-supplied de-ionized water at the site.
Trip Blank	Yes	Samples provided by lab and were transported to and from site.

3. Trip Photographs



Photo 1. H-DC-B Snow and ice covered as well as signs of recent re-trenching November 12, 2013.



Photo 2. H/WQ-VC-REF - snow and ice covered November 13, 2013, looking downstream.



Photo 3. H-VC-U - ice covered with open sections November 13, 2013, looking downstream.



Photo 4. H/WQ-BC Snow and ice covered channel with dry streambed below November 12, 2013.



Photo 5. H-VC-R (looking downstream) station showing ice across stream with open water at thalweg.



Photo 6. WQ-PIT ice and snow covered.

4. Additional Trip Information/Comments

Any changes to project scope (i.e. additional sites sampled):	None
Any alterations to sample scheduling:	No alterations to monitoring trip schedule
Any events resulting in changes to budget:	None
Additional Comments:	Note: There has been a change in lab bottles and sampling processes based on the new mercury analysis requirements. This has resulted in three additional bottles added to all bottle sets for all sites, with one of the additional bottles requiring filtering. This has added a small amount of time and effort per site, which may add up in the long run. This will be noted for budget tracking purposes, but is not expected to have a large impact.
Wildlife Sightings:	Red Fox (<i>Vulpes vulpes</i>) sighted on walk into Back Creek.
Site concerns including safety concerns:	None



Appendix A:
Water Quality Parameter Guideline Exceedances
October 15-17, 2013



Appendix B:
ALS Analytical Reports
October 15-17, 2013



Appendix C:
YG Bacteriological Results
October 15-17, 2013