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BAKER CREEK REACH 7 OVERFLOW MONITORING PROGRAM - INTERIM REPORT

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REPORT



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Executive Summary

In May 2011, icing in upper Baker Creek caused changes to the regular flow path of the creek near Giant Mine (the Mine). The normal flow path of Baker Creek is from little Martin Lake to Baker Pond through a series of wetlands and a waterfall upstream of the pond. Over the past winter, ice built up over a distance of approximately one kilometre upstream of Baker Pond, causing early spring flows from Martin Lake to flow northeast around the ice jam instead of the usual flow path through the ice (referred to as “the overflow event” below). The diverted flow eroded an old mine road and entered historic Jo Jo Lake, where sediments have been impacted by mine tailings during the early years of mining (SRK 2009). The flow of water through historic Jo Jo Lake resulted in re-suspension and transport of tailings impacted sediments through lower Baker Creek to Yellowknife Bay. Sediment quality in the area affected by tailings has most notably been characterized by elevated concentrations of metals and metalloids (e.g., arsenic, cadmium, aluminum, chromium) (Jacques-Whitford-Axys 2006).

The event timeline for the sediment release and subsequent monitoring was as follows:

- May 14, 2011 – Spring flows from Martin Lake deviate from regular flow path and enter historic Jo Jo Lake; regulatory consultation initiated.
- May 16, 2011 – Acute toxicity and water quality sampling of creek initiated.
- May 17, 2011 – Continued sampling and mobilization of response team.
- May 18, 2011 – Project engineers divert overflow back to the original channel; coarse fill laid in the tailings area of Reach 6 prevent flows from circulating upstream.
- May 18 onwards – Continued sampling and data analysis.

The main objective of the Baker Creek overflow monitoring program was to characterize water and sediment quality at various locations in Baker Creek on several occasions during the overflow event. To address this objective, water quality data collected between May 16 and 27, 2011 were evaluated by comparing concentrations of individual parameters with water quality guidelines for the protection of aquatic life and human health (i.e., drinking water) (CCME 1999, with updates to 2011; Health Canada 2010). Concentrations were also compared to the limits outlined in the Metal Mining Effluent Regulations (MMER) (Government of Canada 2002, 2006).

The interim key findings from the Baker Creek Reach 7 overflow monitoring program include the following:

- In-stream concentrations of TSS and other parameters associated with Mine tailings (i.e., sulphate and metals) indicate that during the overflow event, sediment and tailings in historic Jo Jo Lake were re-suspended and discharged through lower Baker Creek into Yellowknife Bay.
- Toxicity testing conducted during the overflow event indicated that stream water downstream of the tailings impacted area was not acutely toxic.



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- TSS concentrations were high during the overflow event, but declined to levels within the typical background range in approximately 10 days.
- Levels of cyanide and ammonia, which were historically high at Giant Mine, were low during the overflow event.
- Sulphate concentrations in the lower reaches of Baker Creek were higher than typically observed in Baker Creek during spring.
- Concentrations of total metals in Baker Creek were elevated during the overflow event, and there was a strong relationship between TSS and total metal concentrations. At high concentrations, such as those observed immediately after the overflow event, only a small proportion of the total metal concentration was in the dissolved form. Post-mitigation, both the total metal concentrations and the percentage in the dissolved form approached values typically measured in Baker Creek.

Monitoring will continue until background levels in water quality are achieved. Next steps in monitoring include continued water quality monitoring in the creek and in localized areas of Yellowknife Bay as well as sediment sampling in the creek after freshet. Fish monitoring in the creek will also be initiated, in consultation with Fisheries and Oceans Canada. Water quality and sediment quality data collected after May 28, 2011 will be reported in a final report once the full set of monitoring data have been received and analyzed.



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1.0 INTRODUCTION

1.1 Background

In May 2011, icing in upper Baker Creek caused changes to the normal flow path of the creek near Giant Mine (the Mine). The normal flow path of upper Baker Creek is from Little Martin Lake to Baker Pond through a series of wetlands and a waterfall upstream of the pond (Figure 1). Over the winter of 2010/2011, ice built up over a distance of approximately one kilometre upstream of Baker Pond, causing early spring flows from Martin Lake to flow northeast around the ice jam instead of the usual flow path through the ice (referred to as “the overflow event” below). The diverted flow eroded an old mine road and entered historic Jo Jo Lake, where sediments have been impacted by mine tailings during the early years of mining (SRK 2009). The flow of water through historic Jo Jo Lake resulted in re-suspension and transport of tailings impacted sediments through lower Baker Creek to Yellowknife Bay. Sediment quality in the historic Jo Jo Lake has most notably been characterized by elevated concentrations of metals and metalloids (e.g., arsenic, cadmium, aluminum and chromium) (Jacques-Whitford-Axys 2006).

Golder Associates Ltd. (Golder) was retained by Public Works Government Services of Canada (PWGSC) through AECOM Engineering to complete a water quality monitoring program in Baker Creek during and after the overflow event and summarize the resulting data. Golder's scope included collecting sufficient data to characterize in-stream water quality, and using this information, in conjunction with supplemental data collected by Indian and Northern Affairs Canada (INAC) and available historical data, to determine if the sediment release negatively affected water quality in Baker Creek, from downstream of the tailings impacted area to Yellowknife Bay.

1.2 Event Timeline

The event timeline for the sediment release and subsequent monitoring was as follows:

- May 14, 2011 – Spring flows from Martin Lake deviate from the normal flow path and enter historic Jo Jo Lake; regulatory consultation initiated.
- May 16, 2011 – Acute toxicity and water quality sampling of creek initiated.
- May 17, 2011 – Continued sampling and mobilization of response team.
- May 18, 2011 – Project engineers divert overflow back to the original channel; coarse fill laid in the tailings area of Reach 6 prevent flows from circulating upstream.
- May 18 onwards – Continued sampling and data analysis.



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Figure 1: Aerial View of Reaches 6 and 7 of Baker Creek, May 13, 2011



Photo taken by Golder Associates Ltd., courtesy INAC Cumulative Impact Monitoring Program

1.3 Study Objectives

The main objective of the Baker Creek overflow monitoring program was to characterize water and sediment quality at various locations in Baker Creek on several occasions during the overflow event. Specifically, monitoring in Baker Creek was initiated to address the following questions:

- 1) Was stream water downstream of the tailings impacted area acutely toxic to fish and other aquatic life during the overflow event?
- 2) What was the concentration of total suspended solids (TSS) in Baker Creek from upstream of the Mine to Yellowknife Bay during the overflow event and after mitigation?
- 3) What was the detailed water chemistry in Baker Creek during the overflow event and after mitigation?
- 4) What was the composition (i.e., chemistry and particle size) of suspended sediments in Baker Creek?
- 5) In areas of visible sediment deposition in Baker Creek, what was the chemistry of the sediment?



1.4 Scope

The scope of this report is to address the first three questions listed in Section 1.3, using recently collected water quality information. The last two questions, related to sediment composition and chemistry, will be addressed at a later date, once a full set of monitoring data are available. Sediment collection has not been completed at this time, but will likely occur within the next two weeks depending on flow and ice-cover in Baker Creek. The purpose of this report is to provide an interim summary of the initial water quality results, to be submitted as part of the record on the sediment release, which will be filed with the appropriate regulators by PWGSC. The scope of this report is as follows:

- present final results from the toxicity bioassays completed on May 16, 2011;
- characterize water quality in Baker Creek from upstream of the mine to Yellowknife Bay using data collected between May 16 and May 27, 2011 (as received by May 30);
- compare water quality data to applicable background concentrations, aquatic life and drinking water guidelines (CCME 1999; with updates), and limits outlined in the Metal Mining Effluent Regulations (MMER) (Government of Canada 2002, 2006); and
- review potential spatial (i.e., with distance downstream) and temporal (i.e., through time) trends in the water quality data.

Water quality and sediment quality data collected after May 28, 2011 will be reported in a final report, to be issued once a full and final set of sampling results have been received and analyzed.

1.5 Report Organization

A description of methods, including sample collection procedures and data analysis methods are provided in Section 2. Interim study results are presented in Section 3, followed by a summary of key findings in Section 4. Quality assurance and quality control (QA/QC) information is presented in Appendix A, followed by detailed water quality results in Appendix B, and a copy of the laboratory results and supporting information in Appendix C.

2.0 METHODS

2.1 Sample Locations

Golder collected water samples and in-situ measurements from the sample stations noted on Figure 2. A description of the sampling stations is provided below:

- Reference Point (SNP43-11)¹ – Baker Creek, upstream of the overflow location;
- Reach 7 Overflow, upstream (u/s) road – immediately downstream of diversion, u/s of an old mine road;
- Reach 7 Overflow, downstream (d/s) road – downstream of diversion and eroded road, but upstream of tailings deposit;

¹ Station numbers containing 'SNP' refer to historical sampling stations established as part of the Surveillance Network Program for Giant Mine.

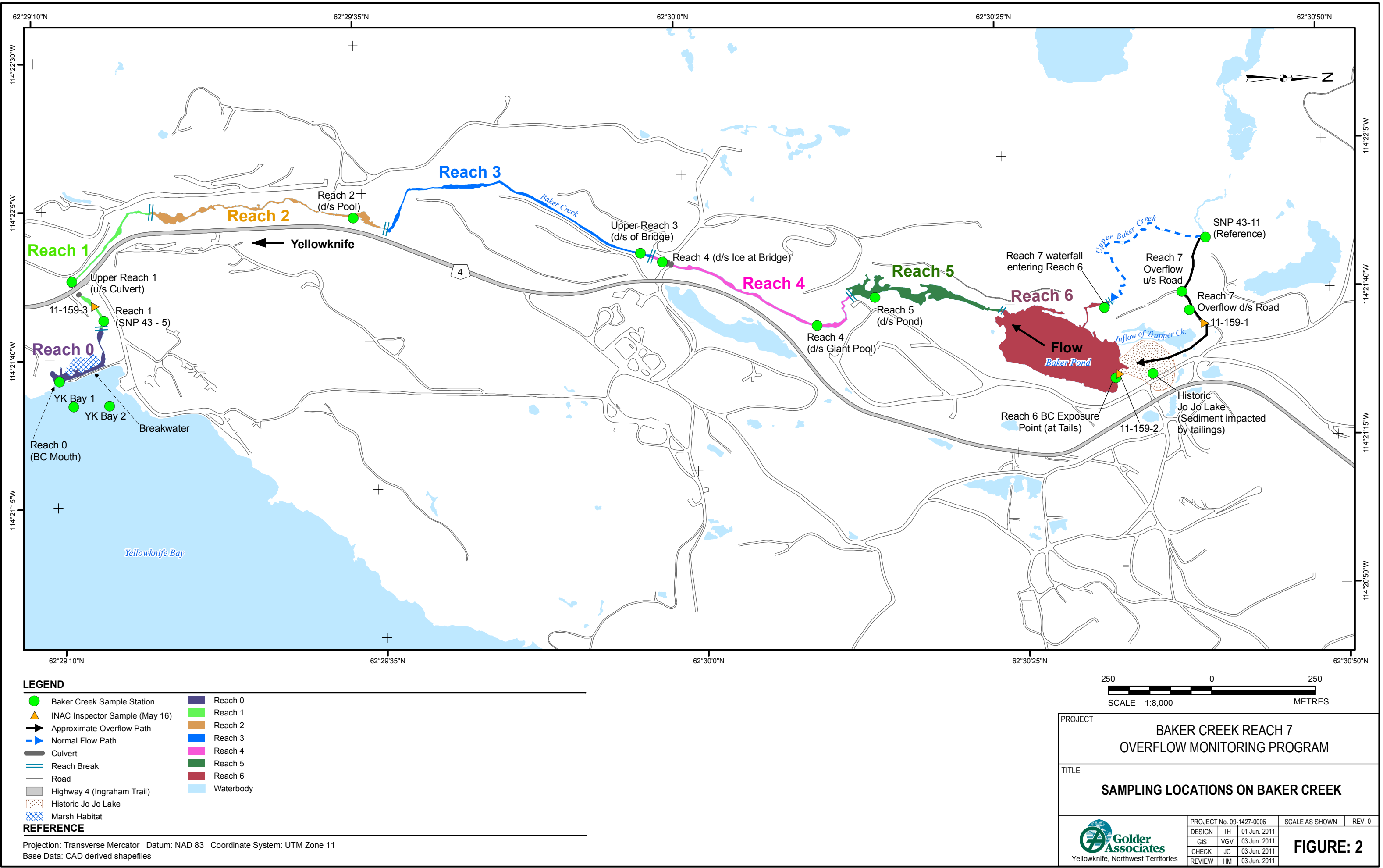


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- Reach 6, Baker Creek Exposure Point – near the tailings impacted area;
- Reach 5, d/s pond – upper portion of Reach 5, just downstream of Baker Pond;
- Reach 4, d/s Giant Pool – upper portion of Reach 4, in a pool area;
- Reach 4, d/s ice at bridge – lower portion of Reach 4, taken from under ice near the bridge crossing;
- Reach 3 – upper portion of Reach 3, downstream of bridge crossing;
- Reach 2 – lower portion of Reach 2, downstream pool area;
- Reach 1, u/s culvert – middle portion of Reach 1, upstream of culvert;
- Reach 1 (SNP43-5) – downstream of the culvert at Ingraham Trail near the mouth of the creek;
- Reach 0 - mouth of Baker Creek; and
- Yellowknife Bay 1 and 2 – near Giant Mine public dock.

In addition to the sampling that Golder conducted, Inspectors from INAC collected samples from three locations (i.e., 11-159-1, 2 and 3) (Figure 2). Indian and Northern Affairs Canada has made these data available for this assessment; sampling locations and sample names are as follows:

- INAC sample near Golder sample “Reach 7 Overflow, d/s road” (11-159-1);
- INAC sample in Reach 6 (11-159-2); and
- INAC sample in Reach 1 (11-159-3).





2.2 Field Program

Prior to collecting water samples, water depth (m), temperature (°C), pH, dissolved oxygen (mg/L), specific conductivity (µS/cm), and turbidity measurements were recorded. A YSI 650 MDS water quality meter connected to an YSI 600 QS multi-parameter water quality probe was used for the physico-chemical field measurements, and field turbidity measurements were obtained using a LaMotte turbidity meter. Surface water samples were collected in accordance with the Mine's Standard Operating Procedure (SOP) (INAC 2010) and specific laboratory instructions. Samples for biological toxicity testing were collected in 20-L plastic carboys, and kept cool (4°C) prior to submitting to the laboratory. All toxicity tests were initiated within five days of sample collection, as required by the SOP.

Sampling frequency and specific parameters analyzed are provided in Table 1.

2.3 Quality Control

For quality control (QC) purposes, a field blank, travel blank and a duplicate sample were prepared as part of the sampling program. The field blank (a deionized water sample prepared at a field site) was used to assess potential sample contamination during collection, handling, shipping and analysis. The travel blank (bottle pre-filled with deionized water and sealed by the laboratory) was used to detect sample contamination during shipping, storage and analysis. The results of the duplicate sample analysis were used to assess within-site variability and precision of the field sampling methods. Detailed information on QC samples is provided in Appendix A.

2.4 Laboratory Analysis

Samples collected for acute toxicity analysis were submitted to HydroQual Laboratories (HydroQual) in Calgary, Alberta. Acute toxicity testing was conducted according to the following methods:

- EPS 1/RM/13 – Reference Method for Determining Acute Lethality of Effluents Using Rainbow Trout (Environment Canada 2007); and
- EPS 1/RM/14 – Reference Method for Determining Acute Lethality of Effluents Using *Daphnia* spp. (Environment Canada 2000).

Surface water samples were submitted to ALS Laboratory Group (ALS) in Yellowknife, Northwest Territories, Edmonton, Alberta and Vancouver, British Columbia for analysis of water quality parameters listed in Table 1.



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Table 1: Sampling Frequency and Parameters Analyzed for the Baker Creek Reach 7 Overflow Monitoring Program, May 2011

Component	Location	Frequency	Parameter	Rationale	Status
Acute toxicity (Question 1 in Section 1.3)	Reach 6 - Baker Ck. Exposure Point Reach 1 (SNP 43-5)	Day 1 – May 16, 2011	<i>Lab</i> – Rainbow Trout and <i>Daphnia magna</i> (LC ₅₀). <i>Method</i> – consistent with Reference Methods provided by Environment Canada (2000, 2007)	Characterize the acute toxicity of water near the exposure area and near the mouth of Baker Creek	Complete
TSS-Turbidity Characterization (Question 2 in Section 1.3)	Reach 0 to Reach 7	Weeks 1-2 Once per day	<i>Lab</i> – TSS, turbidity <i>Field</i> – turbidity, temperature, conductivity, dissolved oxygen, pH, water depth, photographs <i>Method</i> – surface grab samples (TSS); water quality meter and probe (in-situ parameters).	Characterize extent of sediment plume; use data to establish a TSS-turbidity relationship	On-going
Water characterization (Question 3 in Section 1.3)	SNP43-11 (reference) Reach 7 overflow – u/s of road Reach 7 overflow – d/s of road Reach 6 - Baker Ck. Exposure Point Reach 4, d/s Giant pool Reach 1 (SNP 43-5) Reach 0 (mouth of Baker Creek) Yellowknife Bay (near dock)	May 16 to May 18, May 27 (once per station) SNP 43-5 repeated on May 20 Yellowknife Bay samples added May 24 and May 31	<i>Lab</i> – TSS, turbidity, major ions, nutrients, total and dissolved metals <i>Field</i> – turbidity, temperature, conductivity, dissolved oxygen, pH, water depth, UTM coordinates and photographs <i>Method</i> – surface grab samples; water quality meter and probe (in-situ parameters).	Characterize detailed water quality in Baker Creek, from upstream of the Mine to Yellowknife Bay	On-going
Sediment monitoring (Questions 4 and 5 in Section 1.3)	Reach 4 Reach 2 Reach 0 Yellowknife Bay, localized area	TBD	<i>Lab</i> – particle size, TOC, total metals <i>Field</i> – water depth, sediment depth and photographs <i>Method</i> – Ekman grab	Characterize sediment quality in areas of visible deposition, if present; select locations where pre-discharge sediment data are available	Pending

TBD = to be determined pending freshet flows; Ck = creek; u/s = upstream; d/s = downstream; TOC = total organic carbon; TDS = total dissolved solids; TSS = total suspended solids; LC₅₀ = concentration of test water required to kill 50% of the test population.



2.5 Data Analysis

Water quality data were evaluated by comparing concentrations of individual parameters with water quality guidelines for the protection of aquatic life and human health (i.e., drinking water) (CCME 1999, with updates to 2011; Health Canada 2010). Concentrations were also compared with limits outlined in the Metal Mining Effluent Regulations (MMER) (Government of Canada 2002, 2006).

Water quality guidelines are nationally endorsed indicators of environmental quality for the protection of aquatic ecosystems and designated water uses, to identify parameters of potential concern. The aquatic life guidelines are based on the most current, scientifically defensible toxicological data and are intended to be protective of all forms and life stages of aquatic life (CCME 1999). Exceedance of a guideline does not, therefore, automatically imply unacceptable or harmful conditions.

Water quality data were also plotted spatially (i.e., with distance downstream) and temporally (i.e., through time), then visually examined to identify any potential trends.

3.0 RESULTS

Was stream water downstream of the tailings impacted area acutely toxic to fish and other aquatic life during the overflow event?

Water is considered to be not acutely toxic if more than 50% of the test organisms survive in full-strength (100%) test water concentration (Government of Canada 2002, 2006). Acute toxicity test results are expressed as an LC_{50} (i.e., percent concentration that is lethal to 50% of the test organisms), with non-toxic samples having an LC_{50} value of greater than 100%. No acutely toxic effects were observed in the rainbow trout (*Oncorhynchus mykiss*) or *Daphnia magna* survival tests ($LC_{50} \geq 100\%$) on the samples collected from Baker Creek on May 16, 2011 (Table 2). Therefore, water downstream of the tailings impacted area was non-acutely toxic during the period of overflow. Detailed acute toxicity results and supporting information are provided in Appendix C.

Table 2: Baker Creek Stream Water Toxicity Characterization Results for May 16, 2011

Location	Test Species	Biological Endpoint of Test	Statistic	Test Result (%)	Confidence Limits ^(a)		Pass Limit ^(b)
					Upper	Lower	
Reach 6	<i>Oncorhynchus mykiss</i> (rainbow trout)	Survival	LC_{50}	>100	not determined		$\geq 100\%$
	<i>Daphnia magna</i> (water flea)	Survival	LC_{50}	>100	not determined		$\geq 100\%$
Reach 1 (SNP 43-5)	<i>Oncorhynchus mykiss</i> (rainbow trout)	Survival	LC_{50}	>100	not determined		$\geq 100\%$
	<i>Daphnia magna</i> (water flea)	Survival	LC_{50}	>100	not determined		$\geq 100\%$

(a) Confidence limits cannot be calculated for non-toxic stream water (refer to HydroQual report, Appendix C).

(b) As defined by Government of Canada (2002).

Notes: LC_{50} = concentration expressed as the percentage of test water that results in a lethal effect to 50% of the test population; > = greater than; \geq = greater than or equal to; % = percent.



What was the concentration of total suspended solids (TSS) in Baker Creek from upstream of the Mine to Yellowknife Bay during the overflow event and after mitigation?

Temporal Trends

TSS concentrations at four representative reaches in lower Baker Creek (i.e., Reaches 6, 4, 1 and 0) are presented in Figure 3, panels (a) to (d). Concentrations from reference locations, as well as typical background concentrations are provided for comparison in the same figure. The TSS concentration in Reach 6 was 4,340 milligrams per litre (mg/L) on May 16, indicating that sediment and tailings in historic Jo Jo Lake were re-suspended into the water column. Post-mitigation (i.e., after May 18), in-stream TSS concentration in Reach 6 declined to 79 mg/L. The TSS concentration then briefly increased to approximately 520 mg/L as a result of re-circulation of water through the tailings. This flow was subsequently blocked with coarse fill, and as a result, TSS values declined again, reaching 5 mg/L on May 27, at the outlet of the pond entering Reach 5 (Figure 3; panel a).

In Reach 4, downstream of the pooled area, post-mitigation TSS concentrations declined from 72 mg/L on May 18 to 29 mg/L on May 19. Concentrations remained at this level for one more day, and then increased to 70 mg/L on May 24. The cause of this increase is unknown, although it may have been erosion of a stream bank by instream ice. However, on May 25 and 27, TSS concentrations declined to 5 and 7 mg/L, respectively, which was approaching the average historical background concentration of approximately 2 mg/L during spring (Figure 3; panel b).

TSS concentrations in Reaches 1 and 0 (i.e., near the mouth of Baker Creek) similarly declined after mitigation was in place. TSS concentration was approximately 160 mg/L pre-mitigation, and then decreased to approximately 10 mg/L, which is within the historical background range in Reach 0 during spring (Figure 3; panels c and d).

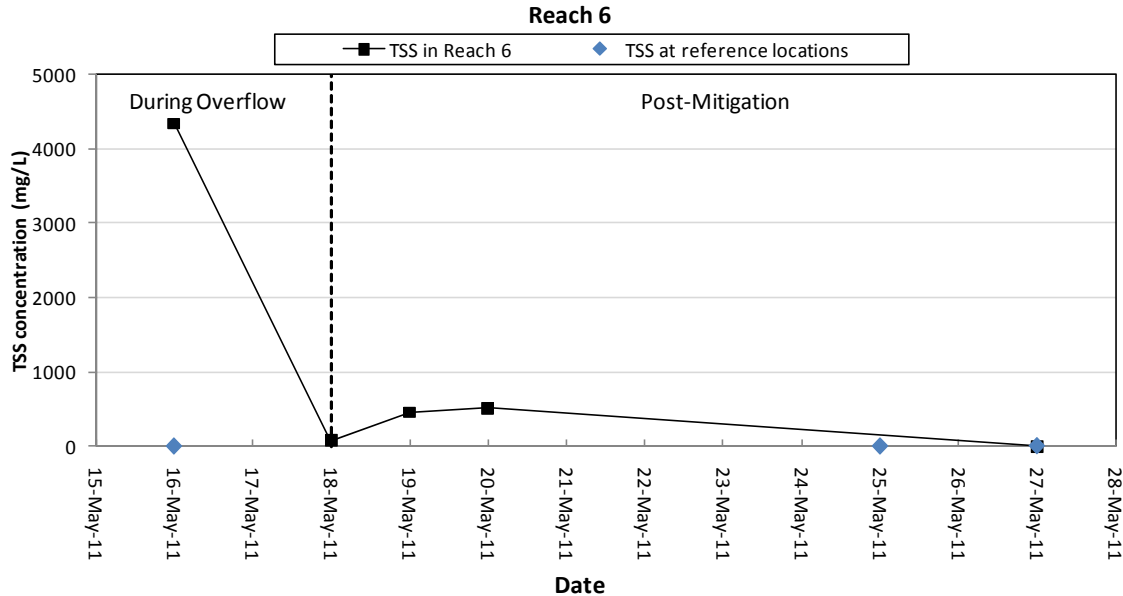
In summary, in-stream concentrations of TSS indicate that during the overflow event, sediment and tailings in historic Jo Jo Lake were re-suspended and discharged through lower Baker Creek into Yellowknife Bay. With mitigation in place, TSS levels declined to levels that are within or approaching typical background levels; the time to return to background levels was approximately 10 days.



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Figure 3: Total Suspended Solids Concentrations at Representative Locations in Baker Creek

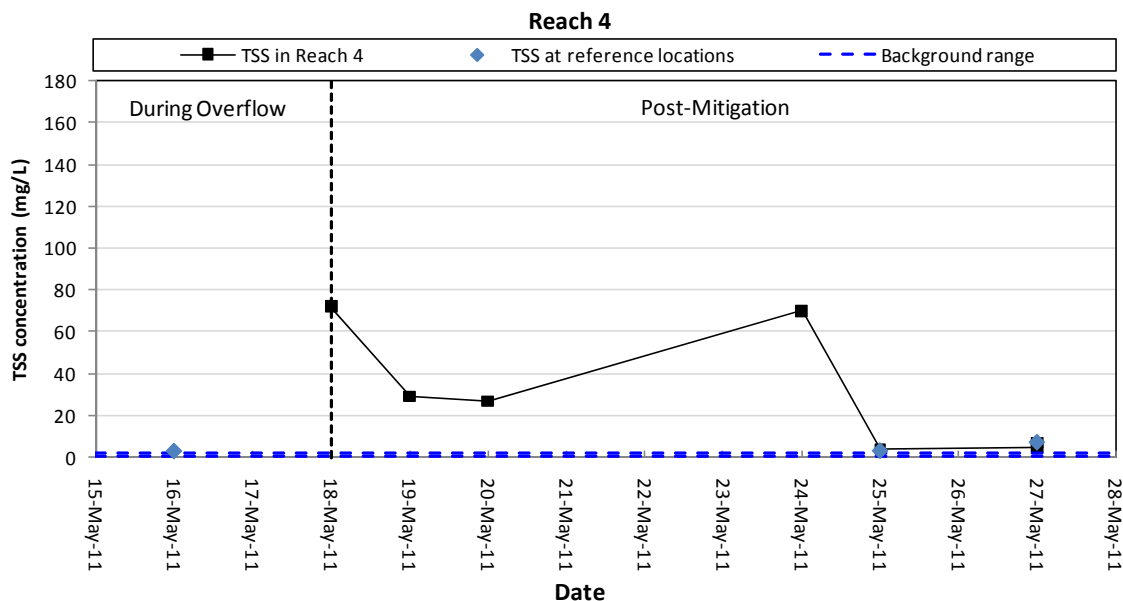
(a) Reach 6



Notes: TSS concentration at reference locations was defined based on samples collected from SNP 43-11 on May 16, and from Reach 7 waterfall entering Reach 6 on May 25 and May 27.

TSS data collected between May 16 and May 20, 2011 were collected from Reach 6 BC Exposure Point (at Tails); data from May 27, 2011 were collected from Reach 5 (d/s Pond).

(b) Reach 4



Notes: TSS concentration at reference locations was defined based on samples collected from SNP 43-11 on May 16, and from Reach 7 waterfall entering Reach 6 on May 25 and May 27.

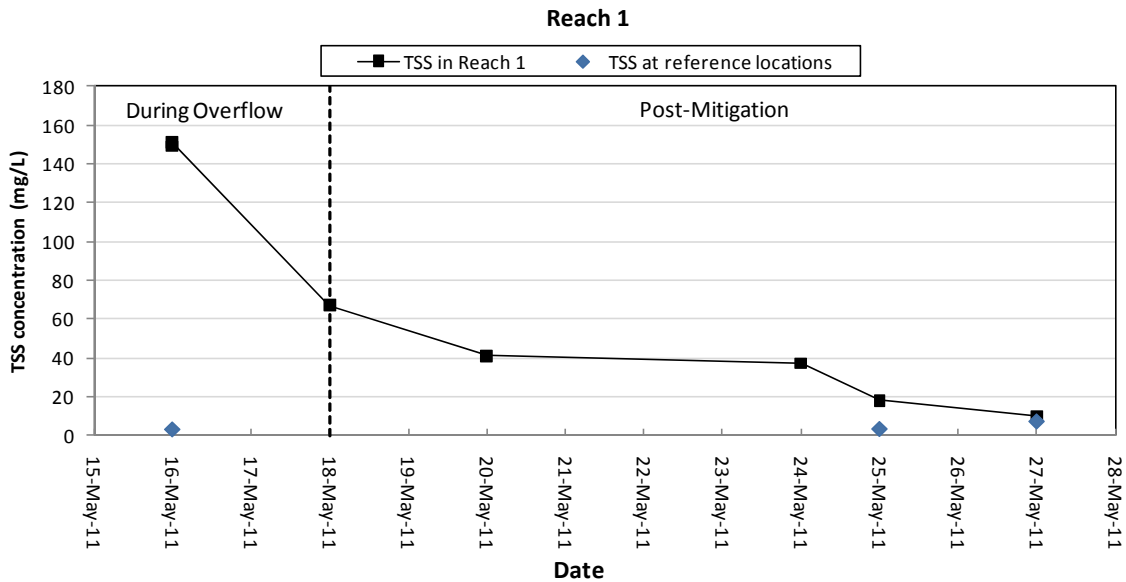
Background range defined by minimum and maximum of samples collected in from Reach 4 in May and June between 2007 and 2009 (Golder 2011).



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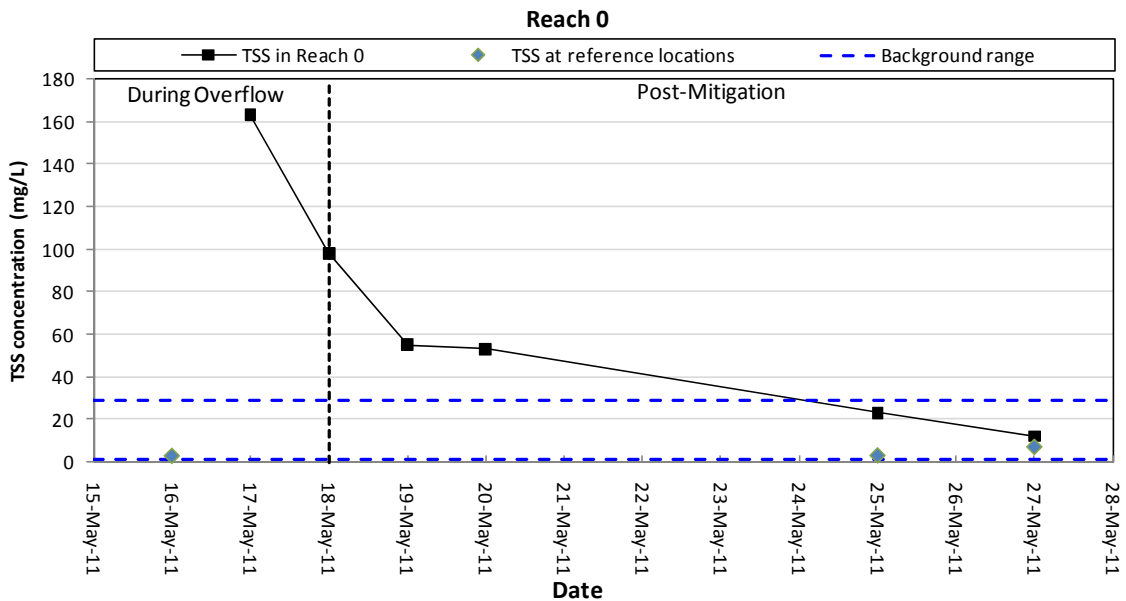
Figure 3: Total Suspended Solids Concentrations at Representative Locations in Baker Creek (continued)

(c) Reach 1



Notes: TSS concentration at reference locations was defined based on samples collected from SNP 43-11 on May 16, and from Reach 7 waterfall entering Reach 6 on May 25 and May 27.

(d) Reach 0



Notes: TSS concentration at reference locations was defined based on samples collected from SNP 43-11 on May 16, and from Reach 7 waterfall entering Reach 6 on May 25 and May 27.

Background range defined by minimum and maximum of samples collected from Reach 4 in May and June between 2007 and 2009 (Golder 2011).

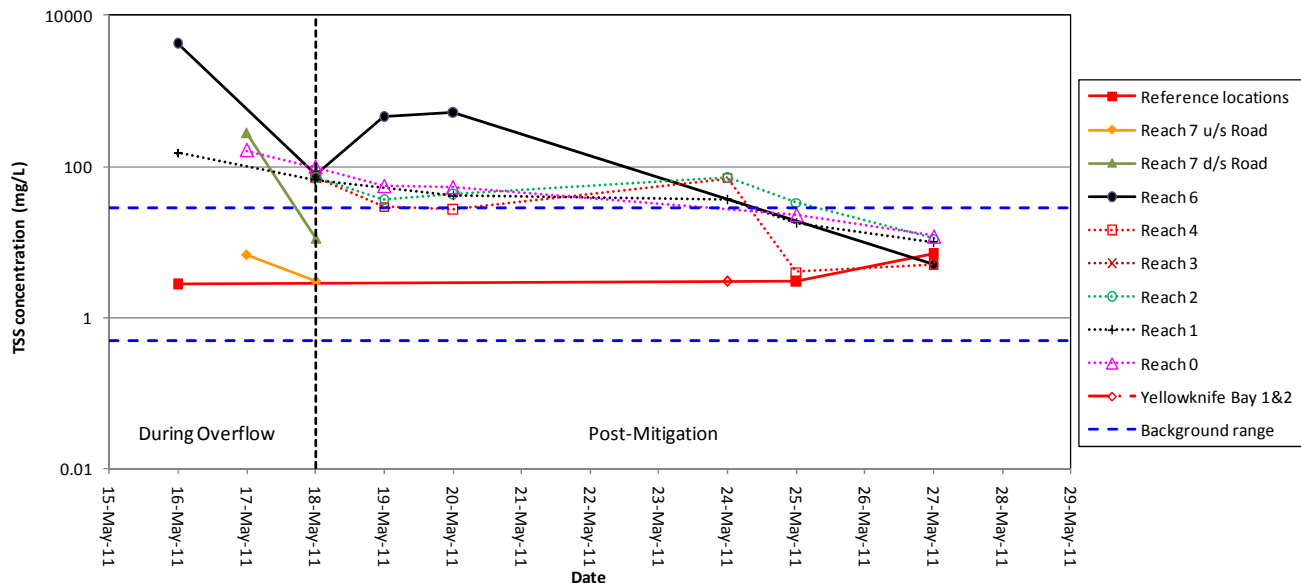


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Spatial Trends

Total suspended solids concentrations at all monitored locations in Baker Creek were plotted for comparison in Figure 4. TSS concentrations were lowest at the reference locations, in Reach 7 (upstream of the old Mine road) and in Yellowknife Bay. Concentrations at these locations ranged from 3 to 7 mg/L, which is characteristic of natural spring conditions in Baker Creek. Concentrations of TSS were elevated in Reach 7 (downstream of the old Mine road) due to the re-suspension of sediments by water flowing along the old Mine road. Concentrations in Reach 6 were typically the highest, as a result of re-suspension of sediments in the tailings impacted area. In the lower reaches of Baker Creek (i.e., Reaches 4, 3, 2, 1, 0), TSS concentrations were similar and lower than in Reach 6, but slightly above the background range. By May 27, the differences in TSS concentrations among reaches were small, and concentrations at all locations declined to levels within the background range characteristic of lower Baker Creek.

Figure 4: Total Suspended Solids Concentrations at All Monitored Locations in Baker Creek



Notes: TSS concentration at reference locations was defined based on samples collected from SNP 43-11 on May 16, and from Reach 7 waterfall entering Reach 6 on May 25 and May 27.

TSS data collected between May 16 and May 20, 2011 were collected from Reach 6 BC Exposure Point (at Tails); data from May 27, 2011 were collected from Reach 5 (d/s Pond).

The background range was defined by the minimum and maximum values for samples collected from lower Baker Creek (i.e., Reaches 4 and 0) in May and June between 2007 and 2009 (Golder 2011).

What was the detailed water chemistry in Baker Creek during the overflow event and after mitigation?

Between May 16 and 27, 2011, waters from Baker Creek were well-oxygenated and slightly alkaline (Appendix B; Table B-1). Conductivity and total dissolved solids concentrations were higher downstream of the of the tailings impacted area than in the upstream reference area, but remained within the ranges previously measured in Baker Creek (Appendix B; Tables B-1 and B-2). Ammonia and cyanide concentrations have historically been high at Giant Mine (Golder 2003, 2005). Although cyanide concentrations were above the



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water quality guideline for the protection of aquatic life during this study, values were within the background range. Nutrient levels in Baker Creek were generally low during and after the overflow event.

Sulphate concentrations were elevated downstream of the tailings impacted area, which may have resulted from contact of water released during the overflow event with treatment chemical residue present in materials at the bottom of historical Jo Jo Lake. Ferric sulphate is used in the water treatment process at the Mine (INAC 2011). Levels of sulphate in the lower reaches of Baker Creek were higher than typically observed in Baker Creek during spring (Appendix B; Table B-2).

Concentrations of metals and metalloids (herein referred to as metals), were also elevated in lower Baker Creek during the overflow event (Appendix B; Table B-2). With the exception of manganese and arsenic, total metal concentrations were below guidelines in the sample collected from the upstream reference site on May 16. Downstream of the tailings impacted area, total aluminum, antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, silver and zinc were measured at concentrations above water quality guidelines for the protection of aquatic life and/or human health on May 16, indicating contact with tailings. After mitigation, concentrations of total metals decreased and approached background levels, although some were still above aquatic life and drinking water guidelines on May 27. Exceptions included total nickel, selenium and silver, which were no longer above guidelines on May 27. Levels of total metals above guidelines have historically been observed within Baker Creek (Appendix B; Table B-2).

Total metals measured at concentrations above guidelines on May 27 were primarily associated with suspended sediments, as shown by the strong correlation between TSS and total metal concentrations in stream water (Table 3). TSS concentrations in lower Baker Creek declined between May 16 and 27, and were approaching background levels (Figures 3 and 4). Total metals followed a similar trend, as expected based on the strong relationships between TSS and total metals.

The dissolved portion of metals is not associated with suspended sediments and does not settle out of the water column. Dissolved metal concentrations are bioavailable and readily taken up by aquatic organisms. Dissolved metal concentration as a percentage of total metal concentration in Baker Creek was plotted for two representative metals (i.e., arsenic and aluminum) in Figure 5, to investigate whether increases total metal concentrations also resulted in proportional increases in dissolved metal concentrations. At high concentrations, such as those observed immediately after the overflow event, only a small proportion (<5%) of the total metal concentration was contributed by dissolved metals, indicating that increases in total metal concentrations were not accompanied by proportional increases in dissolved metal concentrations. Post-mitigation, both the total metal concentrations and the percentage in the dissolved form approached values typically measured in Baker Creek.

With the exception of Reach 6, dissolved arsenic concentrations in Baker Creek were within the background range, and remained similar during the overflow event and post-mitigation (Figure 6). In Reach 6, dissolved arsenic concentrations were elevated during the overflow event, but declined to levels consistent with those at stations in lower Baker Creek and with the background range.



Table 3: Correlations between Total Suspended Solids and Total Metal Concentrations

Metal	Correlation Coefficient ($r^{(a)}$)
Aluminum	0.98
Antimony	0.66
Arsenic	0.79
Cadmium	0.65
Chromium	0.82
Cobalt	0.73
Copper	0.79
Iron	0.98
Lead	0.83
Manganese	0.73
Mercury	0.64
Nickel	0.76
Zinc	0.86

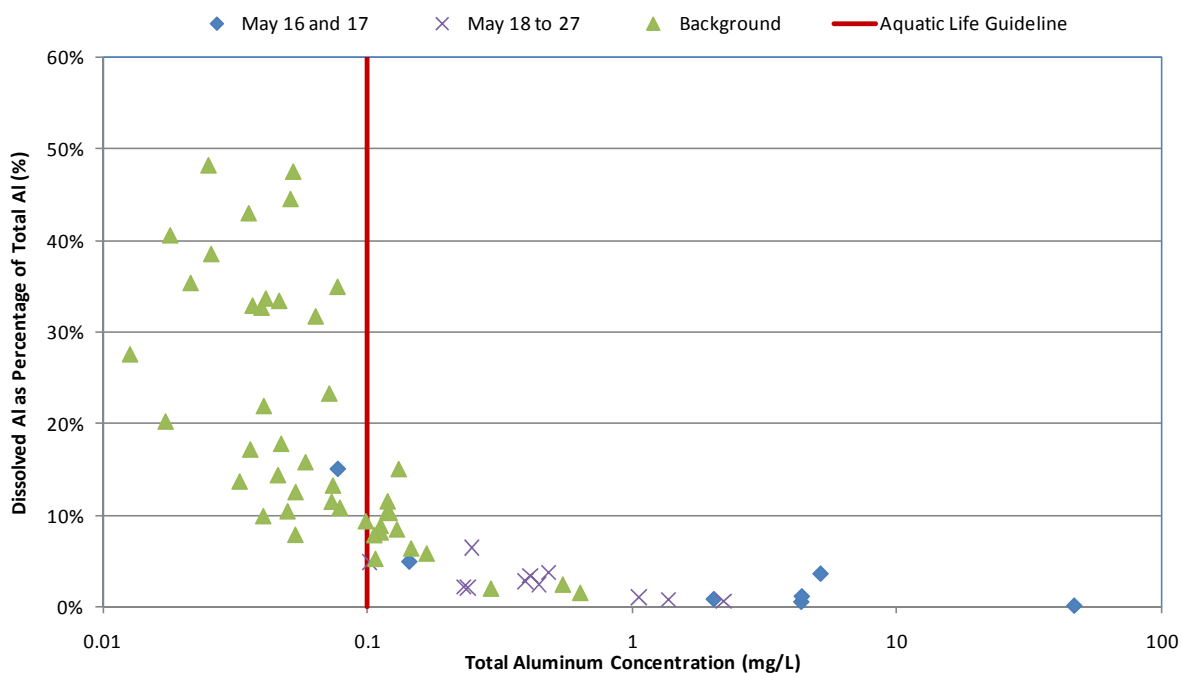
(a) Pearson correlations were run for total metals measured above water quality guidelines, after verifying that relationships were linear; n = 20 to 22. Silver and selenium were excluded from this analysis, because a high proportion of values were below method detection limits.



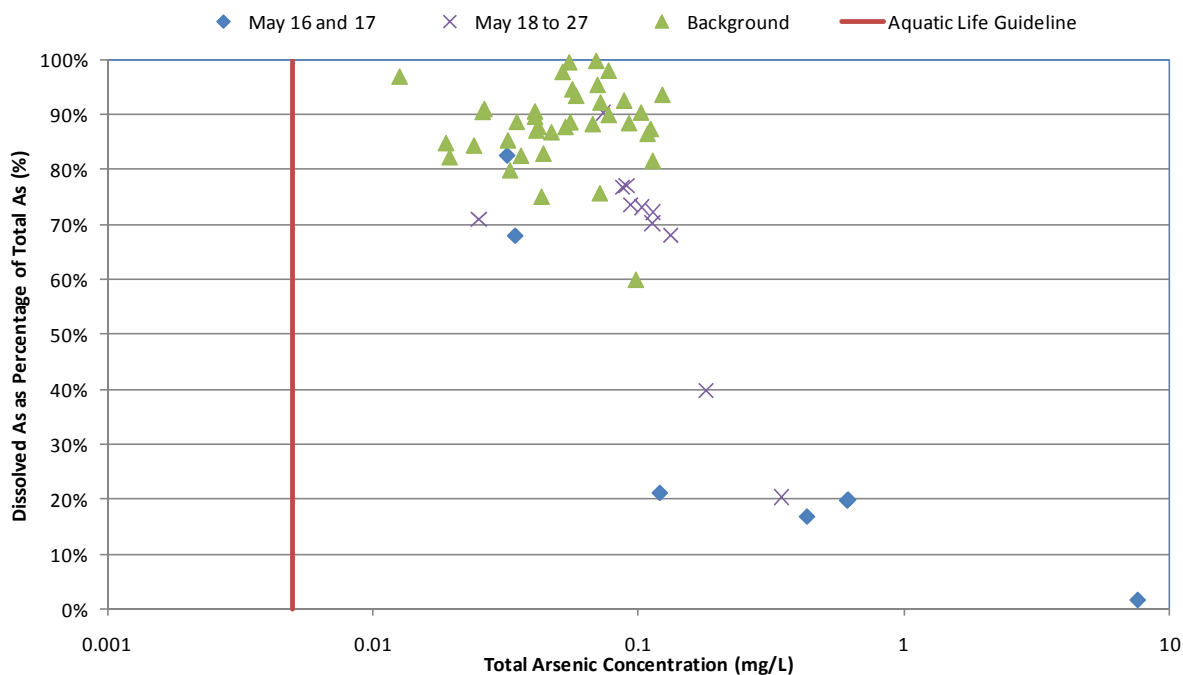
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Figure 5: Percentage (%) of the Total Metal Concentration (mg/L) in the Dissolved Form

(a) Aluminum



(b) Arsenic



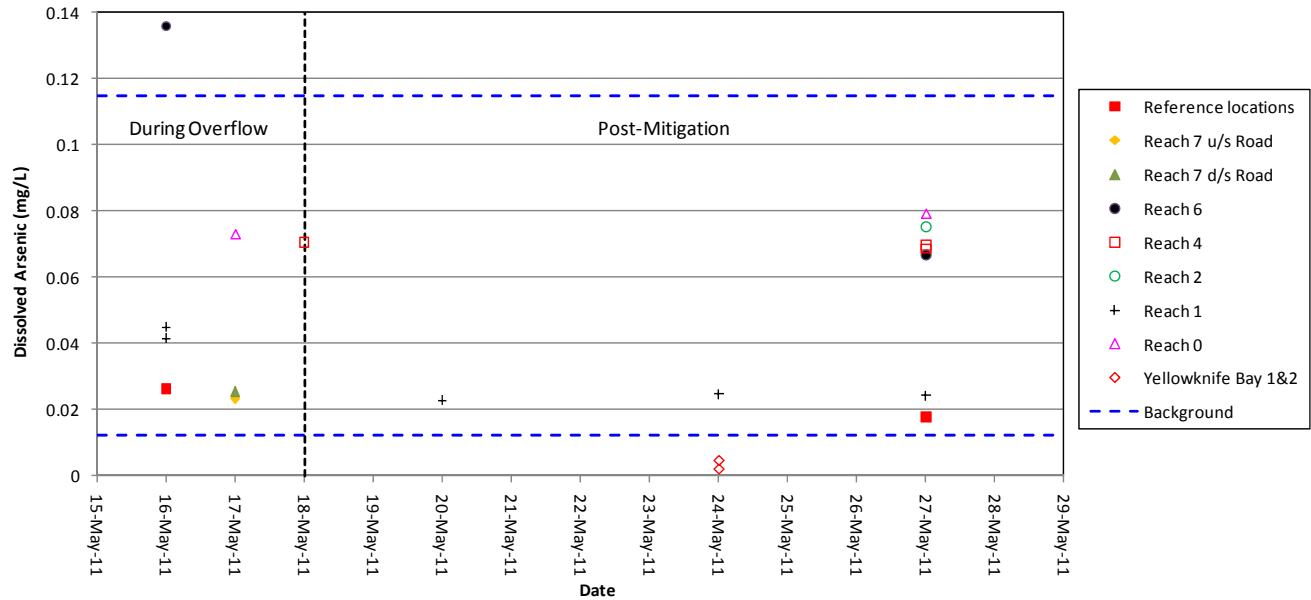
Notes: Al = aluminum; As = arsenic; % = percent; mg/L = milligrams per litre.

The proportion of dissolved metal was calculated as: $(\text{dissolved metal concentration} / \text{total metal concentration}) \times 100$.



BAKER CREEK REACH 7 OVERFLOW MONITORING PROGRAM

Figure 6: Dissolved Arsenic Concentrations at All Monitored Locations in Baker Creek



Notes: Dissolved arsenic concentration at reference locations was defined based on samples collected from SNP 43-11 on May 16, and from Reach 7 waterfall entering Reach 6 on May 27.

Dissolved arsenic data collected between May 16 and May 20, 2011 were collected from Reach 6 BC Exposure Point (at Tails); data from May 27, 2011 were collected from Reach 5 (d/s Pond).

The background range was defined by the minimum and maximum concentrations in samples collected from lower Baker Creek (i.e., Reaches 4 and 0) in May and June, between 2007 and 2009 (Golder 2011).



4.0 INTERIM KEY FINDINGS SUMMARY

The interim key findings from the Baker Creek Reach 7 overflow monitoring program include the following:

- In-stream concentrations of TSS and other parameters associated with Mine tailings (i.e., sulphate and metals) indicate that during the overflow event, sediment and tailings in historic Jo Jo Lake were re-suspended and discharged through lower Baker Creek into Yellowknife Bay.
- Toxicity testing conducted during the overflow event indicated that stream water downstream of the tailings impacted area was not acutely toxic.
- TSS concentrations were high during the overflow event, but declined to levels within the typical background range in approximately 10 days.
- Levels of cyanide and ammonia, which were historically high at Giant Mine, were low during the overflow event.
- Sulphate concentrations in the lower reaches of Baker Creek were higher than typically observed in Baker Creek during spring.
- Concentrations of total metals in Baker Creek were elevated during the overflow event, and there was a strong relationship between TSS and total metal concentrations. At high concentrations, such as those observed immediately after the overflow event, only a small proportion of the total metal concentration was in the dissolved form. Post-mitigation, both the total metal concentrations and the percentage in the dissolved form approached values typically measured in Baker Creek.

5.0 NEXT STEPS

Monitoring will continue until concentrations of metals return to background levels. Next steps include continued water quality monitoring in Baker Creek and in localized areas of Yellowknife Bay, as well as sediment sampling in the creek after freshet. Fish monitoring in the creek will also be initiated, in consultation with Fisheries and Oceans Canada.

Water quality and sediment quality data collected after May 28, 2011 will be reported in a final report once the full set of analytical results have been received and analyzed.



6.0 CLOSURE

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7.0 REFERENCES

- CCME (Canadian Council of Ministers of the Environment). 1999 (with updates to 2011). *Canadian Environmental Quality Guidelines*. Winnipeg, MB, Canada.
- Environment Canada. 2000. *Reference Method for Determining Acute Lethality of Effluents to Daphnia magna*, 2000. Environment Canada, EPS 1/RM/14. Second Edition.
- Environment Canada. 2007. *Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*, 2000. Environment Canada, EPS 1/RM/13. Second Edition (amended May 2007).
- Golder (Golder Associates Ltd.). 2003. *Environmental Effects Monitoring Site Characterization and Study Design*. Prepared for Miramar Giant Mine Ltd. by Golder Associates Ltd., Yellowknife, NWT, Canada.
- Golder. 2005. *Environmental Effects Monitoring, Cycle 1, Final Interpretative Report*. Prepared for Miramar Giant Mine Ltd., by Golder Associates Ltd., Yellowknife, NWT, Canada.
- Golder. 2011. *Gap Analysis and Sampling Plan for Baker Creek*. Document currently in preparation for AECOM/Public Works.
- Government of Canada. 2002. *Metal Mining Effects Regulations*. Canada Gazette Part II.
- Government of Canada. 2006. *Metal Mining Effects Regulations*. Canada Gazette Part II.
- Health Canada. 2010. *Guidelines for Canadian Drinking Water Quality*. Federal-Provincial-Territorial Committee on Drinking Water.
- INAC (Indian and Northern Affairs Canada). 2010. *Environmental Sampling Procedures at Giant Mine*. Prepared for Deton' Cho Nuna Joint Venture, Indian and Northern Affairs Canada by Golder Associates Ltd., with updates from INAC, Yellowknife, NT. 54 p.
- INAC. 2011. *Giant Mine – 2010 Annual MMER/EEM Report*. Submitted to Environment Canada, Yellowknife, NWT, Canada.
- Jacques Whitford-AXYS. 2006. *Sediment Investigation of Baker Creek*. Report prepared for Indian and Northern Affairs Canada, Yellowknife, NWT, Canada.
- SRK (SRK Consulting). 2009. *Baker Creek Remediation Design and Complication and Options, Draft*. Prepared for Indian and Northern Affairs Canada, Giant Mine Remediation Project. Project No. 1CI001.013.D12.06. 61 pp. plus appendices.



APPENDIX A

Quality Assurance and Quality Control



QUALITY ASSURANCE

Golder Associates Ltd. (Golder) has developed Quality Assurance (QA) protocols designed to ensure production of data of known and defensible quality. Golder's QA procedures cover three areas of internal and external management, as outlined in more detail below.

Field Staff Training and Operations

It is important that field data collected are of known, acceptable and defensible quality. Golder field staff are trained to be proficient in standardized field sampling procedures, data recording and equipment operations, and all field work is completed according to specified instructions and established technical procedures.

Surface water samples were collected in accordance with the Mine's Standard Operating Procedure (SOP) (INAC 2010) and specific laboratory instructions. Field crews also use Specific Work Instructions (SWIs), which are standardized forms that detail specific sampling instructions, equipment needs, required technical procedures, sample labelling and shipping protocols, and laboratory contacts.

Laboratory Analysis

To ensure that data of acceptable quality are generated, laboratories used for the water sample analysis are accredited by the Canadian Association for Laboratory Accreditation (CALA). Under CALA's accreditation program, laboratory procedures, methods and internal quality control are evaluated annually.

Office Operations

A data management system is in place to ensure that an organized, consistent system of data control, data analysis and filing was used for the Baker Creek Reach 7 overflow monitoring program. Relevant elements of this system included the following:

- pre-field meeting to discuss SWIs and review relevant technical procedures with field crew(s);
- field crews checking-in with task managers every 24 to 48 hours with an update on work completed;
- designation of one Golder field crew member who is responsible for managing the sample shipping process to ensure that:
 - *all required samples are collected;*
 - *chain-of-custody/analytical request forms are completed and checked to ensure they are correct;*
 - *proper labelling and documentation procedures are followed;*
 - *samples are delivered to shipping agents in a timely manner; and*
 - *samples arrive at the designated laboratory(ies) within two days of being shipped;*
 - *checking of chain-of-custody/analytical request forms by the task manager to ensure the correct analysis package(s) had been requested;*
 - *reviewing laboratory data upon receipt to ensure data quality;*
 - *creating backup files before each major operation as data are manipulated; and*



- *completing appropriate logic checks to ensure the accuracy of calculations.*

QUALITY CONTROL

Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality. The water quality QC program consisted of the preparation and analysis of the a field blank, a travel blank and one duplicate water sample during the field program in Baker Creek.

For the purposes of this study, field blank, travel blank and duplicate samples were defined as follows:

Field Blank

A separate sample prepared in the field using laboratory-provided deionized water to fill a set of sample containers, which are then submitted to the appropriate laboratories for the same analysis as the field water samples. Field blanks are used to detect potential sample contamination during collection, handling, shipping and analysis.

Travel Blank

A separate sample prepared and sealed by the laboratory using laboratory deionized water. The containers are to be taken into the field and then submitted to the appropriate laboratory for the same analysis as the field water samples. Travel blanks are used to detect potential sample contamination during shipping, storage and analysis.

Duplicate Sample

Two samples are collected from one location using identical sampling procedures. They are labelled, preserved individually and submitted separately to the analytical laboratories for identical analyses.

Duplicate samples are used to check intra-site variation and the precision of the field sampling methods. The following sections contain a description of the assessment criteria used to determine if QC sample results were indicative of sample contamination or sampling imprecision, along with a discussion of the key finding of the water quality QC program.

Quality Control Assessment Criteria

Field Blanks and Travel Blanks

Although most parameters should not be at detectable concentrations in the field and travel blanks, concentrations were considered notable if they were greater than five times the corresponding Method Detection Limit (MDL). This threshold is based on the Practical Quantitation Limit defined by the United States Environmental Protection Agency (U.S. EPA 1985), which takes into account the potential for data accuracy errors when concentrations approach or are below MDLs.

Notable results observed in the field and travel blanks were evaluated relative to concentrations observed in field samples collected during the sampling trip to determine if sample contamination was limited to the QC sample, or apparent in other samples. If, based on this comparison, sample contamination did not appear to have been an isolated error; field data were flagged and interpreted with this limitation in mind.

Duplicate Samples

Differences between concentrations measured in duplicate water samples were considered notable if:



- they were greater than 20%; and
- they were greater than five times the relevant reported MDL.

These criteria are consistent with those used by the analytical laboratories for their internal QC procedures and take into account the potential for data accuracy error as concentrations approach MDLs.

Intra-site variability and field sampling precision was rated as:

- low and high, respectively, if less than 10% of the parameters included in the duplicate sample analysis were notably different from one another;
- moderate if 10 to 30% of the parameters included in the duplicate sample analysis were notably different from one another; or
- high and low, respectively, if more than 30% of the parameters included in the duplicate sample analysis were notably different from one another.

Quality Control Sample Results

Potential Sample Contamination

Concentrations in the field and travel blanks were all either below the MDLs or within five times of the relevant MDL (Table A-1). These results indicate that samples were free of contamination during collection, handling, shipping and analysis.

Within-Site Variability and Field Sampling Precision

Variations in turbidity and concentrations of dissolved lead and zinc reported for the duplicate water sample collected from the Reach 4, were above the assessment criteria (Table A-2). These differences were associated with less than 3% of the parameters included in the duplicate sample analysis. Within-site variation and sampling precision were, therefore, rated as low and high, respectively.



BAKER CREEK REACH 7 OVERFLOW MONITORING PROGRAM

Table A-1: Baker Creek Quality Control Results – Field and Travel Blank Samples

Parameter	Units	Method Detection Limit	Field Blank	Travel Blank
Conventional Parameters				
Total Suspended Solids	mg/L	1	<1	<1
Total Dissolved Solids	mg/L	3	<3	<3
Turbidity	NTU	0.1	0.34	0.27
Major Ions				
Acidity (to pH 8.3; as calcium carbonate)	mg/L	1.0	1.8	2.9
Total Alkalinity (as calcium carbonate)	mg/L	1.0	1.1	<1
Bicarbonate Alkalinity (as calcium carbonate)	mg/L	1.0	<1	<1
Bromide	mg/L	0.05	<0.05	<0.05
Carbonate Alkalinity (as calcium carbonate)	mg/L	1.0	<1	<1
Chloride	mg/L	0.5	<0.5	<0.5
Fluoride	mg/L	0.02	<0.02	<0.02
Hardness (as calcium carbonate)	mg/L	0.5	0.57	<0.5
Hydroxide Alkalinity (as calcium carbonate)	mg/L	1.0	<1	<1
Sulphate	mg/L	0.5	<0.5	<0.5
Nutrients				
Ammonia (as nitrogen)	mg/L	0.005	<0.005	<0.005
Nitrate and Nitrite (as nitrogen)	mg/L	0.0051	<0.0051	<0.0051
Nitrate (as nitrogen)	mg/L	0.005	<0.005	<0.005
Nitrite (as nitrogen)	mg/L	0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	0.05	<0.05	<0.05
Total Dissolved Phosphorus	mg/L	0.002	<0.002	<0.002
Total Phosphorus	mg/L	0.002	<0.002	<0.002
Cyanides				
Total Cyanide	mg/L	0.005	<0.005	<0.005
Organic / Inorganic Carbon				
Dissolved Organic Carbon	mg/L	0.5	<0.5	<0.5
Total Organic Carbon	mg/L	0.5	0.59	0.6
Total Metals				
Aluminum	mg/L	0.003	<0.003	<0.003
Antimony	mg/L	0.0001	<0.0001	<0.0001
Arsenic	mg/L	0.0001	<0.0001	<0.0001
Barium	mg/L	0.01	<0.01	<0.01
Beryllium	mg/L	0.005	<0.005	<0.005
Bismuth	mg/L	0.2	<0.2	<0.2
Boron	mg/L	0.1	<0.1	<0.1
Cadmium	mg/L	0.00005	<0.00005	<0.00005
Calcium	mg/L	0.1	<0.05	<0.05
Chromium	mg/L	0.01	<0.01	<0.01
Cobalt	mg/L	0.01	<0.01	<0.01
Copper	mg/L	0.0005	<0.0005	<0.0005
Iron	mg/L	0.01	<0.01	<0.01
Lead	mg/L	0.00005	<0.00005	<0.00005
Magnesium	mg/L	0.1	<0.1	<0.1
Manganese	mg/L	0.005	<0.005	<0.005
Mercury	mg/L	0.00001	<0.00001	<0.00001



BAKER CREEK REACH 7 OVERFLOW MONITORING PROGRAM

Table A-1: Baker Creek Reach 7 Quality Control – Field and Travel Blank Samples (continued)

Parameter	Units	Method Detection Limit	Field Blank	Travel Blank
Molybdenum	mg/L	0.0005	<0.00005	<0.00005
Nickel	mg/L	0.0005	<0.0005	<0.0005
Potassium	mg/L	2	<2	<2
Selenium	mg/L	0.0001	<0.0001	<0.0001
Silver	mg/L	0.01	<0.01	<0.01
Sodium	mg/L	2	<2	<2
Strontium	mg/L	0.005	<0.005	<0.005
Thallium	mg/L	0.2	<0.2	<0.2
Tin	mg/L	0.03	<0.03	<0.03
Titanium	mg/L	0.01	<0.01	<0.01
Uranium	mg/L	0.00001	<0.00001	<0.00001
Vanadium	mg/L	0.03	<0.03	<0.03
Zinc	mg/L	0.004	<0.004	<0.004
Dissolved Metals				
Aluminum	mg/L	0.003	<0.003	<0.003
Antimony	mg/L	0.0001	<0.0001	<0.0001
Arsenic	mg/L	0.0001	<0.0001	<0.0001
Barium	mg/L	0.01	<0.01	<0.01
Beryllium	mg/L	0.005	<0.005	<0.005
Bismuth	mg/L	0.2	<0.2	<0.2
Boron	mg/L	0.1	<0.1	<0.1
Cadmium	mg/L	0.00005	<0.00005	<0.00005
Calcium	mg/L	0.05	0.229	<0.05
Chromium	mg/L	0.01	<0.01	<0.01
Cobalt	mg/L	0.01	<0.01	<0.01
Copper	mg/L	0.0005	<0.0005	<0.0005
Iron	mg/L	0.01	<0.01	<0.01
Lead	mg/L	0.00005	<0.00005	<0.00005
Magnesium	mg/L	0.1	<0.1	<0.1
Manganese	mg/L	0.005	<0.005	<0.005
Molybdenum	mg/L	0.00005	<0.00005	<0.00005
Mercury	mg/L	0.00001	<0.00001	<0.00001
Nickel	mg/L	0.00005	<0.0005	<0.0005
Potassium	mg/L	2	<2	<2
Selenium	mg/L	0.0001	<0.0001	<0.0001
Silver	mg/L	0.01	<0.01	<0.01
Sodium	mg/L	2	<2	<2
Strontium	mg/L	0.005	<0.005	<0.005
Thallium	mg/L	0.2	<0.2	<0.2
Tin	mg/L	0.03	<0.03	<0.03
Titanium	mg/L	0.01	<0.01	<0.01
Uranium	mg/L	0.00001	<0.00001	<0.00001
Vanadium	mg/L	0.03	<0.03	<0.03
Zinc	mg/L	0.004	<0.004	<0.004

Note: mg/L = milligrams per litre; µg/L = micrograms per litre; NTU = nephelometric turbidity units; < = concentration of analyte was less than the method detection limit.



BAKER CREEK REACH 7 OVERFLOW MONITORING PROGRAM

Table A-2: Baker Creek Quality Control Results – Duplicate Samples

Parameter	Units	Method Detection Limit	Duplicate Samples Collected at Reach 4 [d/s Giant Pool]		Relative Percent Difference
			Sample 1	Sample 2	
Conventional Parameters					
Total Suspended Solids	mg/L	3.0	5	7	-
Turbidity	NTU	0.10	9	7	22.5%
Total Metals					
Aluminum	mg/L	0.02	0.24	0.25	3.3%
Antimony	mg/L	0.0004	0.0219	0.0221	0.9%
Arsenic	mg/L	0.0004	0.0905	0.0935	3.3%
Barium	mg/L	0.0002	0.0104	0.0108	3.8%
Beryllium	mg/L	0.001	0.001	0.0011	-
Bismuth	mg/L	0.0002	<0.0002	<0.0002	-
Boron	mg/L	0.02	<0.02	<0.02	-
Cadmium	mg/L	0.0002	<0.0002	<0.0002	-
Calcium	mg/L	0.5	12.9	12.9	0%
Chromium	mg/L	0.0008	<0.0008	<0.0008	-
Cobalt	mg/L	0.0002	0.0009	0.0010	-
Copper	mg/L	0.001	0.0095	0.0096	1.1%
Iron	mg/L	0.01	0.433	0.423	2.4%
Lead	mg/L	0.0001	0.0028	0.0030	6.9%
Magnesium	mg/L	0.1	3.69	3.64	1.4%
Manganese	mg/L	0.002	0.15	0.149	0.7%
Mercury	mg/L	0.00002	<0.00002	<0.00002	-
Molybdenum	mg/L	0.0001	0.0012	0.0014	12.2%
Nickel	mg/L	0.0002	0.0060	0.0063	5.9%
Potassium	mg/L	0.1	1.3	1.2	0.8%
Selenium	mg/L	0.0004	<0.0004	<0.0004	-
Silver	mg/L	0.0004	<0.0004	<0.0004	-
Sodium	mg/L	1.0	3.3	3.2	-
Strontium	mg/L	0.0002	0.0577	0.0595	3.1%
Thallium	mg/L	0.0001	<0.0001	<0.0001	-
Tin	mg/L	0.0004	<0.0004	<0.0004	-
Titanium	mg/L	0.005	0.0078	0.0084	-
Uranium	mg/L	0.0001	0.0004	0.0004	-
Vanadium	mg/L	0.0005	0.0009	0.0009	-
Zinc	mg/L	0.004	0.0087	0.0101	-
Dissolved Metals					
Aluminum	mg/L	0.01	<0.01	0.016	-
Antimony	mg/L	0.0004	0.0199	0.0193	3.1%
Arsenic	mg/L	0.0004	0.0697	0.0687	1.5%
Barium	mg/L	0.0001	0.0092	0.0088	5.6%
Beryllium	mg/L	0.0005	<0.0005	<0.0005	-
Bismuth	mg/L	0.00005	0.00007	0.00005	-
Boron	mg/L	0.002	0.0168	0.0166	1.2%
Cadmium	mg/L	0.0001	0.0001	0.00025	-



BAKER CREEK REACH 7 OVERFLOW MONITORING PROGRAM

Table A-2: Baker Creek Reach 7 Water Quality Control – Duplicate Samples (continued)

Parameter	Units	Method Detection Limit	Duplicate Samples Collected at Reach 4 [d/s Giant Pool]		Relative Percent Difference
			Sample 1	Sample 2	
Calcium	mg/L	0.5	14.1	14.2	0.7%
Chromium	mg/L	0.0004	0.0005	0.0006	-
Cobalt	mg/L	0.0001	0.0008	0.0008	10.5%
Copper	mg/L	0.0006	0.0057	0.0059	3.1%
Iron	mg/L	0.01	0.071	0.091	28.2%
Lead	mg/L	0.0001	0.00125	0.00102	22.5%
Magnesium	mg/L	0.1	3.96	3.93	0.8%
Manganese	mg/L	0.002	0.152	0.147	3.4%
Molybdenum	mg/L	0.0001	0.00139	0.00135	3.0%
Mercury	mg/l	0.00002	<0.00002	<0.00002	-
Nickel	mg/L	0.0001	0.0058	0.0056	2.7%
Potassium	mg/L	0.1	1.34	1.26	6.3%
Selenium	mg/L	0.0004	<0.0004	0.00049	-
Silver	mg/L	0.0002	<0.0002	<0.0002	-
Sodium	mg/L	0.5	3.47	3.46	0.3%
Strontium	mg/L	0.0001	0.059	0.0567	4.1%
Thallium	mg/L	0.00005	0.00012	0.00010	-
Tin	mg/L	0.0002	<0.0002	<0.0002	-
Titanium	mg/L	0.0003	0.0023	0.0025	6.1%
Uranium	mg/L	0.0001	0.0004	0.0004	-
Vanadium	mg/L	0.0001	0.0005	0.0006	9.8%
Zinc	mg/L	0.001	0.009	0.007	28.6%

Notes: mg/L = milligrams per litre; µg/L = micrograms per litre; NTU = nephelometric turbidity units; < = concentration of analyte was less than the method detection limit.

Percent difference was calculated using the following formula: (maximum concentration - minimum concentration)/average concentration.

Notable sample results are in **bold**.

- = not applicable, no data, or the percent difference was not calculated, because concentration in one or both of the duplicate samples was <5 times the method detection limit.



REFERENCES

- INAC (Indian and Northern Affairs Canada). 2010. *Environmental Sampling Procedures at Giant Mine*. Prepared for Deton' Cho Nuna Joint Venture, Indian and Northern Affairs Canada by Golder Associates Ltd., with updates from INAC, Yellowknife, NT. 54 p.
- U.S. EPA (United States Environmental Protection Agency). 1985. *National Primary Drinking Water Regulations; Volatile Synthetic Organic Chemicals; Proposed Rule; Recommendations for and Documentation of Biological Values for Use in Risk Assessment*. U.S. EPA, Environmental Criteria and Assessment Office. Federal Register: 50;EPA/600/6-87/008. Volume 50. Cincinnati, OH. Submitted November 13, 1985.



APPENDIX B

Detailed Water Quality Results

Table B-1. Field Measured and Physical Test Results for the Baker Creek Reach 7 Overflow Monitoring Program, May 2011

					Field Measured Parameters					Physical Tests		
Parameter					pH	Specific Conductivity	Temperature	Dissolved Oxygen	Turbidity	Total Suspended Solids	Total Dissolved Solids	Turbidity
Units					-	(µS/cm)	(°C)	(mg/L)	(NTU)	(mg/L)	(mg/L)	(NTU)
Canadian Water Quality Guidelines for the Protection of Aquatic Life ^(a)					6.5-9.0	-	-	< 6.5	-	-	-	-
Canadian Drinking Water Quality Guidelines ^(b)					6.5-8.5	-	-	-	1 ^(c)	-	≤ 500 ^(d)	1 ^(c)
Maximum Authorized Concentration ^(e)					6.0-9.0	-	-	-	-	30	-	-
					Baker Creek Background Conditions ^(f)							
Median					-	-	-	-	-	2.0	78	2.3 ^W
Minimum					-	-	-	-	-	<1	55	0.69
Maximum					-	-	-	-	-	29	179	8 ^W
n					-	-	-	-	-	44	26	26
n less than the MDL					-	-	-	-	-	4	0	0
Sample ID		Date Sampled	Lab Sample ID	Collected by								
During Overflow Event	SNP 43-11	16-May-11	L1005341-3	DCNJV	-	-	-	-	-	3	68	3 ^W
	Reach 7 Overflow u/s Road	16-May-11	11-159-1 (Taiga)	INAC	-	-	-	-	-	288 ^M	84	97 ^W
	Reach 6 BC Exposure Point (at Tails)	16-May-11	L100576-1	Golder	7.8	165	1.9	12.8	834 ^W	4,340 ^M	148	2740 ^W
	Reach 6 BC Exposure Point (in pond)	16-May-11	11-159-2 (Taiga)	INAC	-	-	-	-	-	374 ^M	184	-
	SNP 43-5	16-May-11	L1005341-1	DCNJV	-	-	-	-	-	149 ^M	151	219 ^W
	SNP 43-5	16-May-11	L1005341-2	DCNJV	-	-	-	-	-	151 ^M	158	213 ^W
	Reach 7 overflow u/s Road	17-May-11	L1008285-1	Golder	7.4	61	0.7	14.0	2 ^W	7	60	3 ^W
	Reach 7 Overflow d/s Road	17-May-11	L1008285-2	Golder	7.4	61	0.9	14.0	118 ^W	279 ^M	-	95 ^W
	Reach 0- Baker BC Mouth	17-May-11	L1008285-3	Golder	7.6	176	0.9	12.3	214 ^W	163 ^M	-	134 ^W
	Reach 7 Overflow u/s Road	18-May-11	L1006655-1	Golder	7.3	63	4.5	12.4	3 ^W	< 3	-	8 ^W
Post-Mitigation	Reach 7 Overflow d/s Road	18-May-11	L1006655-2	Golder	7.4	64	4.5	12.9	29 ^W	11	-	31 ^W
	Reach 6 BC Exposure Point (at Tails)	18-May-11	L1006655-3	Golder	7.7	140	2.6	12.2	1100 ^W	79 ^M	-	491 ^W
	Reach 4 (d/s Giant Pool)	18-May-11	L1006658-1	Golder	7.8	126	0.8	12.4	636 ^W	72 ^M	123	142 ^W
	Reach 3 (d/s of Bridge)	18-May-11	L1006655-4	Golder	7.8	128	0.7	13.2	359 ^W	72 ^M	-	130 ^W
	Reach 2 (d/s Pool)	18-May-11	L1006655-5	Golder	7.7	152	0.4	12.6	243 ^W	72 ^M	-	129 ^W
	Reach 1 (u/s Culvert)	18-May-11	L1006655-6	Golder	7.7	148	0.2	12.8	169 ^W	66 ^M	-	117 ^W
	SNP 43-5	18-May-11	L1006655-7	Golder	7.7	153	0.4	13.3	187 ^W	67 ^M	-	149 ^W
	Reach 0 (BC Mouth)	18-May-11	L1006655-8	Golder	7.6	155	1.0	12.6	235 ^W	98 ^M	-	160 ^W
	Reach 6 BC Exposure Point (at Tails)	19-May-11	L1007648-3	Golder	7.5	421	3.4	11.1	583 ^W	460 ^M	-	468 ^W
	Reach 2 (d/s Pool)	19-May-11	L1007648-1	Golder	7.6	134	0.4	12.6	67 ^W	36 ^M	-	64 ^W
	Reach 4 (d/s Giant Pool)	19-May-11	L1007648-2	Golder	7.6	129	1.5	12.1	49 ^W	29	-	53 ^W
	Reach 0 (BC Mouth)	19-May-11	L1007648-4	Golder	7.6	158	0.9	12.8	70 ^W	55 ^M	-	68 ^W
	Reach 6 BC Exposure Point (at Tails)	20-May-11	L1007649-7	Golder	7.5	220	3.0	11.8	529 ^W	517 ^M	-	349 ^W
	Reach 4 (d/s Giant Pool)	20-May-11	L1007649-5	Golder	7.4	146	2.4	11.1	39 ^W	27	-	30 ^W
	Reach 2 (d/s Pool)	20-May-11	L1007649-6	Golder	7.5	141	0.6	12.3	81 ^W	44 ^M	-	44 ^W
	Reach 0 (BC Mouth)	20-May-11	L1007649-4	Golder	7.5	153	2.1	12.3	90 ^W	53 ^M	-	48 ^W
	SNP 43-5	20-May-11	L1007649-1	Golder	7.6	143	0.2	12.8	93 ^W	41 ^M	125	47 ^W
	Reach 6 BC Exposure Point (at Tails)	21-May-11	-	-	7.2	-	4.7	-	73 ^W	-	-	-
	Reach 4 (d/s Giant Pool)	21-May-11	-	-	7.3	-	5.8	-	9 ^W	-	-	-
	Reach 2 (d/s Pool)	21-May-11	-	-	7.4	-	1.3	-	54 ^W	-	-	-
	Reach 0 (BC Mouth)	21-May-11	-	-	7.5	-	5.5	-	33 ^W	-	-	-
	Reach 6 BC Exposure Point (at Tails)	22-May-11	-	-	7.5	-	5.8	-	415 ^W	-	-	-
	Reach 4 (d/s Giant Pool)	22-May-11	-	-	7.3	-	2.9	-	14 ^W	-	-	-
	Reach 2 (d/s Pool)	22-May-11	-	-	7.3	-	1.2	-	29 ^W	-	-	-
	Reach 0 (BC Mouth)	22-May-11	-	-	8.7 ^W	-	6.6	-	33 ^W	-	-	-
	Reach 4 (d/s Giant Pool)	24-May-11	L1008512-4	Golder	7.4	-	3.6	-	57 ^W	70 ^M	-	53 ^W
	Reach 2 (d/s Pool)	24-May-11	L1008512-5	Golder	7.4	-	2.2	-	58 ^W	72 ^M	-	51 ^W
	SNP 43-5	24-May-11	L1008512-3	Golder	7.5	-	1.6	-	40 ^W	37 ^M	-	38 ^W
	YK Bay 1	24-May-11	L1008512-1	Golder	7.5	68	7.3	12.5	8 ^W	< 3	-	6 ^W
	YK Bay 2	24-May-11	L1008512-2	Golder	7.6	67	7.8	12.5	7 ^W	< 3	-	5 ^W
	Reach 7 waterfall entering Reach 6	25-May-11	L1009010-1	Golder	7.5	86	8.8	11.7	4 ^W	< 3	-	3 ^W
	Reach 4 (d/s Giant Pool)	25-May-11	L1009010-2	Golder	7.4	124	3.6	9.9	13 ^W	4	-	9 ^W
	Reach 2 (d/s Pool)	25-May-11	L1009010-3	Golder	-	168	1.9	10.8	70 ^W	33 ^M	-	40 ^W
	Reach 0 (BC Mouth)	25-May-11	L1009010-5	Golder	7.5	164	1.5	11.8	43 ^W	23	-	33 ^W
	SNP 43-5 (above)	25-May-11	L1009010-4	Golder	7.5	-	1.6	-	40 ^W	18	-	33 ^W
	Reach 7 waterfall entering Reach 6	27-May-11	L1010143-1	Golder	7.5	87	10.6	11.0	0.3	7	-	2 ^W
	Reach 5 (d/s Pond)	27-May-11	L1010143-2	Golder	7.3	110	6.5	9.6	6 ^W	5	-	9 ^W
	Reach 4 (d/s Giant Pool)	27-May-11	L1010143-3	Golder	7.3	119	4.8	9.1	10 ^W	5	-	9 ^W
	Reach 4 (d/s Giant Pool) dup	27-May-11	L1010143-4	Golder	-	-	-	-	-	7	-	7 ^W
	Reach 4 (d/s Ice at Bridge)	27-May-11	L1010143-5	Golder	7.3	120	2.6	9.7	22 ^W	20	-	17 ^W
	Reach 2 (d/s Pool)	27-May-11	L1010143-6	Golder	-	131	3.7	10.2	12 ^W	11	-	11 ^W
	SNP 43-5	27-May-11	L1010143-7	Golder	-	-	-	-	-	10	-	10 ^W
	Reach 0 (BC Mouth)	27-May-11	L1010143-8	Golder	7.4	116	3.3	11.1	11 ^W	12	-	11 ^W

Notes: u/s = upstream; d/s = downstream; mg/L = milligrams per litre; NTU = nephelometric turbidity units; MDL = method detection limit; < = less than; ≤ = less than or equal to;

- = no data or guideline available; min = minimum; max = maximum; n = sample size

^(a) Source: Canadian Council of Ministers of the Environment (CCME) 2011.^(b) Source: Health Canada (2010).^(c) Aesthetic objective.^(d) Maximum acceptable concentration (Health Canada 2010)^(e) Source: MMER (Government of Canada)^(f) Background concentrations were calculated using data collected from Baker Creek in May and June between 2007 and 2010 (Golder 2011).^M = concentration is higher than the relevant maximum authorized concentration.^W = concentration is higher than the relevant drinking water guideline.

Table B-2 DRAFT Water Chemistry Results for the Baker Creek Reach 7 Overflow Monitoring Program, May 2011

Parameter	Units	Canadian Water Quality Guidelines for the Protection of Aquatic Life ^(a)	Canadian Drinking Water Quality Guidelines ^(b)	Maximum Authorized Concentration ^(c)	Baker Creek Background Conditions ^(d)					During Overflow Event										Post-Mitigation															
										SNP 43-1 (Reference)	Reach 7 Overflow u/s Road	Reach 6 BC Exposure Point (at Tails)	Reach 6 BC Exposure Point (in pond)	SNP 43-5	SNP 43-5	SNP 43-5	Reach 7 Overflow u/s Road	Reach 7 Overflow d/s Road	Reach 0 (BC Mouth)	Reach 4 (d/s Giant Pool)	SNP 43-5	SNP 43-5	YK Bay 1	YK Bay 2	Reach 7 waterfall entering Reach 6	Reach 7 waterfall entering Reach 6	Reach 6 Exposure Point (at Tails)	Reach 5 (d/s Pond)	Reach 4 (d/s Giant Pool)	Reach 4 (d/s Giant Pool) Duplicate	Reach 4 (d/s Ice at Bridge)	Reach 2 (d/s Pool)	SNP 43-5	Reach 0 (BC Mouth)	
					Median	Minimum	Maximum	n	n less than MDL	16-May-11 L1005341-3	16-May-11 11-159-1(Taiga)	16-May-11 L1005761-1	16-May-11 11-159-2(Taiga)	16-May-11 L1005341-1	16-May-11 L1005341-2	16-May-11 11-159-3 (Taiga)	16-May-11 L1008285-1	16-May-11 L1008285-2	16-May-11 L1008285-3	16-MAY-11 L1006658-1	20-May-11 L1007649-1	24-May-11 L1008512-3	24-May-11 L1008512-1	24-May-11 L1008512-2	25-May-11 L1009010-1	27-May-11 L101043-1	27-May-11 L101043-9	27-May-11 L101043-2	27-May-11 L101043-3	27-May-11 L101043-4	27-May-11 L101043-5	27-May-11 L101043-6	27-May-11 L101043-7	27-May-11 L101043-8	27-May-11 L101043-9
					DCNVJ	INAC	Goldier	INAC	DCNVJ	DCNVJ	INAC	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier	Goldier
Field Measured																																			
pH	-	6.5 to 9.0	6.5 to 8.5	6.0 to 9.5	-	-	-	-	-	-	-	-	-	-	-	-	7.4	7.4	7.6	7.8	7.8	7.5	7.5	7.6	7.5	7.5	-	7.3	7.3	-	7.3	-	-	7.4	
Specific Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61	61	176	126	143	-	68	67	86	87	-	110	119	-	120	131	-	116	
Temperature	°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.74	0.9	0.9	0.8	0.2	1.6	7.3	7.8	8.8	11	-	6.5	4.8	-	2.6	3.7	-	3.3	
Dissolved Oxygen	mg/L	< 6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	14	12	12	13	-	13	13	12	11	-	9.6	9.1	-	9.7	10	-	11	
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	118	214	636	93	40	7.5	7.0	4.3	0.29	-	6.4	9.7	-	22	12	-	11	
Conventional Parameters																																			
Acidity (to pH 8.3; as calcium carbonate)	mg/L	-	-	-	3.1	<1	12	31	2	-	-	4.0	-	-	-	-	3.4	3.3	2.3	<5	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	
Hardness (as calcium carbonate)	mg/L	-	-	-	51	37	134	67	0	38	-	106	-	105	104	-	-	-	-	65	74	-	-	-	40	-	-	-	-	-	-	-	-	-	
pH (laboratory)	-	6.5 to 9.0	6.5 to 8.5 ^(b)	6.5 to 9.5	7.6	5.2 ^{W-M}	8.7 ^M	34	0	7.9	7.8	7.9	8.0	7.8	7.8	7.9	-	-	-	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Specific Conductivity	µS/cm	-	-	-	110	87	269	52	0	86	87	204	221	230	230	222	-	-	-	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Alkalinity (as calcium carbonate)	mg/L	-	-	-	42	<1	80	31	4	0	34	57	57	57	50	32	34	53	46	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Dissolved Solids	mg/L	-	≤ 500 ^(b)	-	78	55	179	26	0	68	84	148	184	151	158	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
TDS (Calculated)	mg/L	-	≤ 500 ^(b)	-	-	-	-	-	-	-	-	148	-	-	-	-	-	-	-	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Suspended Solids	mg/L	-	-	30	2.3	<1	29	44	4	3	288 ^M	4,340 ^M	374 ^M	149 ^M	151 ^M	-	7	279 ^M	163 ^M	72 ^M	67 ^M	37 ^M	-	-	-	-	5	5	7	20	11	10	12		
Turbidity	mg/L	-	1 ^(b)	-	2.3 ^M	0.69	8.0 ^M	26	0	3 ^W	97 ^M	2740 ^W	-	219 ^W	213 ^M	-	3 ^W	95 ^W	134 ^M	8 ^M	47 ^M	38 ^W	6 ^W	5 ^W	3 ^W	2 ^W	-	9 ^W	9 ^W	7 ^W	17 ^W	11 ^W	11 ^W		
Ions																																			
Bromide	mg/L	-	-	-	<0.05	<0.05	<0.05	2	2	-	-	<0.05	-	-	-	-	<0.05	<0.05	<0.05	<0.1	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	mg/L	-	-	-	14	9.6	36	68	0	10	-	31	-	30	30	-	9.1	9.5	29	19	21	19	7.3	6.9	11	8.9	-	12	14	14	12	15	17	16	
Chloride	mg/L	-	≤ 250 ^(b)	-	3.5	2.4	14	31	0	-	2.2	6.6	7.5	-	-	8.0	2.1	11	5.3	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Fluoride	mg/L	-	1.5 ^(b)	-	0.077	0.065	0.09	4	0	-	<0.1	0.29	<0.1	0.09	0.075	0.076	0.075	0.075	0.074	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Magnesium	mg/L	-	-	-	4.1	3.0	11	68	0	3.2	-	7.1	-	7.3	7.2	-	2.9	2.9	6.6	4.5	5.2	4.9	2.5	2.3	3.2	2.7	-	3.5	4.0	3.9	3.4	4.0	4.4	4.0	
Potassium	mg/L	-	-	-	<2	1.5	2.8	53	49	<2	-	<2	-	<2	<2	-	<2	2.1	1.5	<2	1.5	1.1	1.0	1.0	0.86	-	1.2	1.3	1.3	1.0	1.2	1.3	1.2	1.2	
Sodium	mg/L	-	≤ 200 ^(b)	-	3.4	2.0	10	68	0	2.6	-	4.8	-	5.1	5.0	-	2.1	2.1	6.7	3.7	5.2	4.7	2.6	2.4	2.5	1.9	-	3.0	3.5	3.5	2.9	3.5	3.9	3.7	
Sulphate	mg/L	-	≤ 500 ^(b)	-	4.4	3.8	5.2	4	0	-	4.0	41	43	-	-	44	3.2	3.3	39	23	29	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nutrients																																			
Ammonia (as nitrogen)	mg/L	5.86, 3.87 ^(b)	-	-	0.022	<0.005	0.4	37	9	0.091	-	-	-	0.11	0.11	-	0.11	0.1	0.12	0.15	0.092	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrate and Nitrite (as nitrogen)	mg/L	-	-	-	0.021	<0.005	0.75	31	2	-	-	0.072	-	-	-	-	0.035	0.035	0.14	0.05	0.046	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrate (as nitrogen)	mg/L	1.3	45 ^(b)	-	0.012	<0.001	0.028	3	1	-	0.08	0.072	0.16	-	-	0.15	0.035	0.035	0.13	0.048	0.046	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrite (as nitrogen)	mg/L	0.06	-	-	<0.001	-	-	1	1	-	<0.01	<0.001	<0.01	-	-	<0.01	<0.001	<0.001	0.0034	0.0028	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.63	0.5	0.73	5	0	-	-	-	-	-	-	-	-	-	-	1.0	0.85	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Dissolved Phosphorus	mg/L	-	-	-	0.0062	0.006	0.011	5	0	-	-	-	-	-	-	-	-	-	-	0.008	0.0083	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Phosphorus	mg/L	-	-	-	0.019	0.0082	0.046	23	0	-	-	-	-	-	-	-	-	-	-	0.10	0.068	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cyanides																																			
Total Cyanide	mg/L	0.005 ^(b)	0.2 ^(b)	2	0.0061 ^C	<0.005	0.020 ^C	26	10	0.007 ^C	-	0.085 ^C	-	0.014	0.015	-	-	-	-	0.008	0.0059	-	-	-	-	-	-	-	-	-	-	-	-	-	
Carbon																																			
Dissolved Organic Carbon	mg/L	-	-	-	12	10	14	5	0	-	-	-	-	-	-	-	-	-	-	12	11	-	-	-	-	-	-	-	-						



APPENDIX C

Laboratory Results



DETON'CHO \ NUNA JOINT VENTURE
ATTN: KATRINA NOKLEBY
GIANT MINESITE
PO BOX 2951
Yellowknife NT X1A 2R2

Date Received: 16-MAY-11
Report Date: 20-MAY-11 18:18 (MT)
Version: FINAL

Client Phone: 604-253-4188

Certificate of Analysis

Lab Work Order #: L1005341
Project P.O. #: 606927
Job Reference:
Legal Site Desc:
C of C Numbers: G2011-119

Can Dang
Senior Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

20-MAY-11 18:18 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L1005341-1	L1005341-2	L1005341-3	L1005341-4	L1005341-5
		16-MAY-11 08:00 G2011-119-01	16-MAY-11 08:10 G2011-119-02	16-MAY-11 08:20 G2011-119-03	16-MAY-11 08:30 G2011-119-04	16-MAY-11 08:40 G2011-119-05
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	230	230	85.8	219	348
	Hardness (as CaCO3) (mg/L)	105	104	38.2	94.2	160
	pH (pH)	7.82	7.83	7.89	7.66	7.77
	Total Suspended Solids (mg/L)	149	151	2.8	9.4	10.2
	Total Dissolved Solids (mg/L)	151	158	67.8	145	233
	Turbidity (NTU)	219	213	2.65	7.34	13.8
Anions and Nutrients	Ammonia (as N) (mg/L)	0.114	0.111	0.0908	0.0972	0.214
Cyanides	Cyanide, Total (mg/L)	0.0137	0.0148	0.0070	0.0078	0.0056
Total Metals	Aluminum (Al)-Total (mg/L)	4.34	4.36	0.0774	0.377	0.459
	Antimony (Sb)-Total (mg/L)	0.199	0.201	0.00175	0.00446	0.00453
	Arsenic (As)-Total (mg/L)	0.609	0.614	0.0320	0.101	0.109
	Barium (Ba)-Total (mg/L)	0.026	0.026	0.013	0.027	0.043
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.000843	0.000831	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Total (mg/L)	33.5	33.5	10.3	26.0	42.9
	Chromium (Cr)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cobalt (Co)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Copper (Cu)-Total (mg/L)	0.0617	0.0621	0.00073	0.00165	0.00180
	Iron (Fe)-Total (mg/L)	7.59	7.63	0.270	0.761	0.902
	Lead (Pb)-Total (mg/L)	0.0995	0.101	0.000076	0.000366	0.000350
	Lithium (Li)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Magnesium (Mg)-Total (mg/L)	10.3	10.3	3.29	8.62	14.2
	Manganese (Mn)-Total (mg/L)	0.434	0.434	0.390	0.284	0.344
	Mercury (Hg)-Total (mg/L)	0.000051	0.000049	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total (mg/L)	0.00150	0.00155	0.000451	0.000662	0.000952
	Nickel (Ni)-Total (mg/L)	0.0144	0.0145	<0.00050	0.00139	0.00148
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	2.7	2.7	<2.0	3.7	3.2
	Selenium (Se)-Total (mg/L)	0.00020	0.00020	<0.00010	<0.00010	<0.00010
	Silicon (Si)-Total (mg/L)	6.43	6.34	0.517	2.49	3.58
	Silver (Ag)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Sodium (Na)-Total (mg/L)	5.4	5.4	2.4	6.6	11.1
	Strontium (Sr)-Total (mg/L)	0.0865	0.0867	0.0371	0.0884	0.148
	Thallium (Tl)-Total (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1005341-1	L1005341-2	L1005341-3	L1005341-4	L1005341-5
Grouping Analyte						
WATER						
Total Metals	Tin (Sn)-Total (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Titanium (Ti)-Total (mg/L)	0.075	0.073	<0.010	0.018	0.024
	Uranium (U)-Total (mg/L)	0.000686	0.000703	0.000342	0.000625	0.00309
	Vanadium (V)-Total (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Zinc (Zn)-Total (mg/L)	0.181	0.180	<0.0040	0.0218	<0.0040
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0206	0.0469	0.0116	0.0041	0.0075
	Antimony (Sb)-Dissolved (mg/L)	0.0416	0.0449	0.00168	0.00416	0.00440
	Arsenic (As)-Dissolved (mg/L)	0.121	0.123	0.0264	0.0729	0.0726
	Barium (Ba)-Dissolved (mg/L)	<0.010	<0.010	0.010	0.022	0.033
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.000191	0.000209	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Dissolved (mg/L)	29.9	30.0	10.1	24.6	41.5
	Chromium (Cr)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cobalt (Co)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Copper (Cu)-Dissolved (mg/L)	0.0153	0.0166	<0.00050	0.00071	0.00110
	Iron (Fe)-Dissolved (mg/L)	0.039	0.049	0.122	0.156	0.161
	Lead (Pb)-Dissolved (mg/L)	0.000617	0.00118	<0.000050	0.000054	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Magnesium (Mg)-Dissolved (mg/L)	7.25	7.16	3.16	7.97	13.6
	Manganese (Mn)-Dissolved (mg/L)	0.312	0.304	0.191	0.236	0.123
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	0.00139	0.00145	0.000398	0.000579	0.000872
	Nickel (Ni)-Dissolved (mg/L)	0.00291	0.00284	<0.00050	0.00072	0.00100
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	3.4	2.9
	Selenium (Se)-Dissolved (mg/L)	0.00016	0.00014	<0.00010	<0.00010	<0.00010
	Silicon (Si)-Dissolved (mg/L)	0.680	0.743	0.385	1.58	2.22
	Silver (Ag)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Sodium (Na)-Dissolved (mg/L)	5.1	5.0	2.6	6.2	10.5
	Strontium (Sr)-Dissolved (mg/L)	0.0784	0.0776	0.0355	0.0824	0.138
	Thallium (Tl)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Tin (Sn)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.000587	0.000586	0.000276	0.000511	0.00296
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030

		Sample ID	L1005341-1	L1005341-2	L1005341-3	L1005341-4	L1005341-5
		Description					
		Sampled Date	16-MAY-11	16-MAY-11	16-MAY-11	16-MAY-11	16-MAY-11
		Sampled Time	08:00	08:10	08:20	08:30	08:40
		Client ID	G2011-119-01	G2011-119-02	G2011-119-03	G2011-119-04	G2011-119-05
Grouping	Analyte						
WATER							
Dissolved Metals	Zinc (Zn)-Dissolved (mg/L)		0.0203	0.0173	<0.0040	0.0153	<0.0040

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AS-DIS-GRAPH-YL	Water	Dissolved Arsenic by Graphite Furnance	APHA 3111 B
A discrete sample volume is dispensed into the graphite sample tube and determinations are made by heating in three or more stages.			
AS-TOT-GRAPH-YL	Water	Total Arsenic by Graphite Furnance	APHA 3111 B
CN-T-MID-HH-COL-VA	Water	Total Cyanide by HH Distillation	APHA 4500-CN Cyanide
This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method.			
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.			
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-DIS-LOW-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS(Low)	EPA SW-846 3005A & EPA 245.7
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 procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and 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 (EPA Method 245.7).			
HG-TOT-LOW-CVAFS-VA	Water	Total Mercury in Water by CVAFS(Low)	EPA 245.7
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 (EPA Method 245.7).			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B
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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-DIS-LOW-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA 3005A/6010B
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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-TOT-LOW-ICP-VA	Water	Total Metals in Water by ICPOES	EPA 3005A/6010B
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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
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.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

Reference Information

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.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540 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-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540 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.

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.

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
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA
YL	ALS ENVIRONMENTAL - YELLOWKNIFE, NW, CANADA

Chain of Custody Numbers:

G2011-119

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 ww - milligrams per kilogram based on wet weight of sample.

mg/kg lw - 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.



From:

Deton Cho-Nuna JV - Giant Mine

Address: PO Box 2951

Yellowknife, NT X1A 2R2

Telephone: (867) 669-3725

Fax: (867) 669-3701

Contact: Katrina Nokleby

Email: KatrinaN@nunalogistics.com

Send Samples For
Analysis To:

ALS Group, Yellowknife

Address: PO Box 2801

Yellowknife, NT X1A 2R2

Phone: (867) 873-5593

Fax: (867) 920-4239

Contact:

Email:

eMail Confirmation
and Results To:

Tara.Kramers@inac.gc.ca

KatrinaN@nunalogistics.com

Send Original
Signed Lab Reports

Deton Cho\Nuna Joint Venture

Address: PO Box 2951,

Yellowknife, NT X1A 2R2

Phone: (867) 669-3725

Fax: (867) 669-3701

Attn: Katrina Nokleby

Email: KatrinaN@nunalogistics.com

Send Invoice To:

Deton Cho\Nuna Joint Venture

Address: 9839-31 Ave.

Edmonton, AB T6N 1C5

Phone: (780) 408-2897

Fax: (780) 408-5472

Attn: Brenda Kalis

Email:

FIELD SAMPLE INFORMATION

REQUESTED LAB SUITES (see reverse side for details)

Fields Notes:

Please ensure that there is only one COC per report

P.O Number 606927

* L1005341 *

* 43-5 Rush ON
Total Metals TSS.
* 43-11 rush all analyses

Fields Notes:																									
Please ensure that there is only one COC per report							√ = Preserved :																		
							√ = Field Filtered :																		
							√ = 1-Day Rush :																		
P.O Number 606927																									
* 43-5 Rush ON Total Metalo TSS. * 43-11 rush all analyses																									

Relinquished by (Sampler Signature):

Date/Time:

Company:

Received by (Signature):

Company:

Relinquished by (Signature):

Date/Time:

Company:

Received by (Signature):

Company:

Sampler (Printed Name):

Sample Storage Temperature prior to Shipping
(deg. C):Sample Receipt
Temperature (deg. C):Samples Received in Good Condition? ☒ Yes ☐ No (If no, provide details.)

SAMPLE CONDITION (lab use only)



Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.:
110196

- FINAL REPORT -

Prepared For: South MacKenzie District
DIAND

Address: 140 Bristol Ave.
Yellowknife, NT
X1A 3T2

Attn: Michael Martin

Facsimile: (867) 669-2720

Final report has been reviewed and approved by:

Judy Mah
Client Service Officer

NOTES:

- Test methods and data are validated by the laboratory's Quality Assurance Program. Taiga Environmental Laboratory is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) as a testing laboratory for specific tests registered with CALA.
- Routine methods are based on recognized procedures from sources such as
 - Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF;
 - Environment Canada
 - USEPA
- Samples shall be kept for thirty (30) days after the final report is issued. All microbiological samples shall be disposed of immediately upon completion of analysis to minimize biohazardous risks to laboratory personnel. Please contact the laboratory if you have any special requirements.
- Final results are based on the specific tests at the time of analysis and do not represent the conditions during sampling.

ReportDate: Tuesday, May 24, 2011
Print Date: Tuesday, May 24, 2011



Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: 11-159-1

Taiga Sample ID: 001

Client Project: 11-159

Sample Type: Unknown Water

Received Date: 16-May-11

Sampling Date: 16-May-11

Sampling Time: 15:00

Location: Giant Mine-Baker Creek

Report Status: Final

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifer
<u>Inorganics - Physicals</u>						
Alkalinity, Total (as CaCO ₃)	33.8	0.4	mg/L	16-May-11	SM2320:B	
Colour, Apparent	430	5	CU	17-May-11	SM2120:B	
Conductivity, Specific (@ 25°C)	87.2	0.4	µS/cm	16-May-11	SM2510:B	
pH	7.78		pH units	16-May-11	SM4500-H:B	
Solids, Total Dissolved	84	10	mg/L	19-May-11	SM2540:C	
Solids, Total Suspended	288	3	mg/L	19-May-11	SM2540:D	
Turbidity	96.9	0.05	NTU	17-May-11	SM2130:B	
<u>Major Ions</u>						
Calcium	10.5	0.1	mg/L	17-May-11	SM4110:B	
Chloride	2.2	0.7	mg/L	17-May-11	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	17-May-11	SM4110:B	
Magnesium	3.1	0.1	mg/L	17-May-11	SM4110:B	
Nitrate as Nitrogen	0.08	0.01	mg/L	17-May-11	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	17-May-11	SM4110:B	

ReportDate: Tuesday, May 24, 2011

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Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: **11-159-1**

Taiga Sample ID: **001**

Potassium	1.1	0.1	mg/L	17-May-11	SM4110:B
Sodium	2.3	0.1	mg/L	17-May-11	SM4110:B
Sulphate	4	1	mg/L	17-May-11	SM4110:B

Trace Metals, Total

Aluminum	4540	5	µg/L	17-May-11	EPA200.8
Antimony	2.1	0.1	µg/L	17-May-11	EPA200.8
Arsenic	46.5	0.2	µg/L	17-May-11	EPA200.8
Barium	54.2	0.1	µg/L	17-May-11	EPA200.8
Beryllium	0.1	0.1	µg/L	17-May-11	EPA200.8
Cadmium	< 0.1	0.1	µg/L	17-May-11	EPA200.8
Cesium	0.5	0.1	µg/L	17-May-11	EPA200.8
Chromium	9.9	0.1	µg/L	17-May-11	EPA200.8
Cobalt	2.6	0.1	µg/L	17-May-11	EPA200.8
Copper	7.7	0.2	µg/L	17-May-11	EPA200.8
Iron	5040	5	µg/L	17-May-11	EPA200.8
Lead	2.3	0.1	µg/L	17-May-11	EPA200.8
Lithium	9.3	0.2	µg/L	17-May-11	EPA200.8
Manganese	402	0.1	µg/L	17-May-11	EPA200.8
Molybdenum	0.4	0.1	µg/L	17-May-11	EPA200.8
Nickel	7.0	0.1	µg/L	17-May-11	EPA200.8
Rubidium	9.9	0.1	µg/L	17-May-11	EPA200.8
Selenium	< 0.5	0.5	µg/L	17-May-11	EPA200.8
Silver	< 0.1	0.1	µg/L	17-May-11	EPA200.8
Strontium	42.2	0.1	µg/L	17-May-11	EPA200.8

ReportDate: Tuesday, May 24, 2011
Print Date: Tuesday, May 24, 2011



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Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: 11-159-1

Taiga Sample ID: 001

Thallium	< 0.1	0.1	µg/L	17-May-11	EPA200.8
Titanium	181	0.1	µg/L	17-May-11	EPA200.8
Uranium	0.7	0.1	µg/L	17-May-11	EPA200.8
Vanadium	9.6	0.1	µg/L	17-May-11	EPA200.8
Zinc	13	5	µg/L	17-May-11	EPA200.8



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Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: **11-159-2**

Taiga Sample ID: **002**

Client Project: 11-159

Sample Type: Unknown Water

Received Date: 16-May-11

Sampling Date: 16-May-11

Sampling Time: 15:00

Location: Giant Mine-Baker Creek

Report Status: Final

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifier
<u>Inorganics - Physicals</u>						
Alkalinity, Total (as CaCO ₃)	57.1	0.4	mg/L	16-May-11	SM2320:B	
Colour, Apparent	1130	50	CU	17-May-11	SM2120:B	
Conductivity, Specific (@ 25°C)	221	0.4	µS/cm	16-May-11	SM2510:B	
pH	7.99		pH units	16-May-11	SM4500-H:B	
Solids, Total Dissolved	184	10	mg/L	19-May-11	SM2540:C	
Solids, Total Suspended	374	3	mg/L	19-May-11	SM2540:D	

Major Ions

Calcium	28.5	0.1	mg/L	17-May-11	SM4110:B	
Chloride	7.5	0.7	mg/L	17-May-11	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	17-May-11	SM4110:B	
Magnesium	6.4	0.1	mg/L	17-May-11	SM4110:B	
Nitrate as Nitrogen	0.16	0.01	mg/L	17-May-11	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	17-May-11	SM4110:B	
Potassium	1.9	0.1	mg/L	17-May-11	SM4110:B	
Sodium	4.9	0.1	mg/L	17-May-11	SM4110:B	

ReportDate: Tuesday, May 24, 2011

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Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: **11-159-2**

Taiga Sample ID: **002**

Sulphate	43	1	mg/L	17-May-11	SM4110:B
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Trace Metals, Total

Aluminum	6370	5	µg/L	17-May-11	EPA200.8
Antimony	449	0.1	µg/L	17-May-11	EPA200.8
Arsenic	3770	0.2	µg/L	17-May-11	EPA200.8
Barium	21.0	0.1	µg/L	17-May-11	EPA200.8
Beryllium	0.1	0.1	µg/L	17-May-11	EPA200.8
Cadmium	1.7	0.1	µg/L	17-May-11	EPA200.8
Cesium	0.4	0.1	µg/L	17-May-11	EPA200.8
Chromium	17.9	0.1	µg/L	17-May-11	EPA200.8
Cobalt	9.5	0.1	µg/L	17-May-11	EPA200.8
Copper	101	0.2	µg/L	17-May-11	EPA200.8
Iron	15000	5	µg/L	17-May-11	EPA200.8
Lead	257	0.1	µg/L	17-May-11	EPA200.8
Lithium	12.1	0.2	µg/L	17-May-11	EPA200.8
Manganese	534	0.1	µg/L	17-May-11	EPA200.8
Molybdenum	2.0	0.1	µg/L	17-May-11	EPA200.8
Nickel	26.3	0.1	µg/L	17-May-11	EPA200.8
Rubidium	6.1	0.1	µg/L	17-May-11	EPA200.8
Selenium	0.6	0.5	µg/L	17-May-11	EPA200.8
Silver	0.8	0.1	µg/L	17-May-11	EPA200.8
Strontium	115	0.1	µg/L	17-May-11	EPA200.8
Thallium	0.1	0.1	µg/L	17-May-11	EPA200.8
Titanium	56.0	0.1	µg/L	17-May-11	EPA200.8

ReportDate: Tuesday, May 24, 2011

Page 6 of 10

Print Date: Tuesday, May 24, 2011



Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: **11-159-2**

Taiga Sample ID: **002**

Uranium	0.9	0.1	µg/L	17-May-11	EPA200.8
Vanadium	19.8	0.1	µg/L	17-May-11	EPA200.8
Zinc	361	5	µg/L	17-May-11	EPA200.8



Taiga Environmental Laboratory
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Tel: (867)-669-2788 Fax: (867)-669-2718

Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: 11-159-3

Taiga Sample ID: 003

Client Project: 11-159

Sample Type: Unknown Water

Received Date: 16-May-11

Sampling Date: 16-May-11

Sampling Time: 15:00

Location: Giant Mine-Baker Creek

Report Status: Final

Test Parameter	Result	Detection Limit	Units	Analysis Date	Analytical Method *	Qualifier
<u>Inorganics - Physicals</u>						
Alkalinity, Total (as CaCO ₃)	49.5	0.4	mg/L	16-May-11	SM2320:B	
Conductivity, Specific (@ 25°C)	222	0.4	µS/cm	16-May-11	SM2510:B	
pH	7.93		pH units	16-May-11	SM4500-H:B	
<u>Major Ions</u>						
Calcium	27.3	0.1	mg/L	17-May-11	SM4110:B	
Chloride	8.0	0.7	mg/L	17-May-11	SM4110:B	
Fluoride	< 0.1	0.1	mg/L	17-May-11	SM4110:B	
Magnesium	6.6	0.1	mg/L	17-May-11	SM4110:B	
Nitrate as Nitrogen	0.15	0.01	mg/L	17-May-11	SM4110:B	
Nitrite as Nitrogen	< 0.01	0.01	mg/L	17-May-11	SM4110:B	
Potassium	1.7	0.1	mg/L	17-May-11	SM4110:B	
Sodium	5.0	0.1	mg/L	17-May-11	SM4110:B	
Sulphate	44	1	mg/L	17-May-11	SM4110:B	
<u>Trace Metals, Total</u>						
Aluminum	2870	5	µg/L	17-May-11	EPA200.8	

ReportDate: Tuesday, May 24, 2011

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Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: 11-159-3

Taiga Sample ID: 003

Antimony	166	0.1	µg/L	17-May-11	EPA200.8
Arsenic	541	0.2	µg/L	17-May-11	EPA200.8
Barium	20.5	0.1	µg/L	17-May-11	EPA200.8
Beryllium	< 0.1	0.1	µg/L	17-May-11	EPA200.8
Cadmium	0.6	0.1	µg/L	17-May-11	EPA200.8
Cesium	0.3	0.1	µg/L	17-May-11	EPA200.8
Chromium	7.4	0.1	µg/L	17-May-11	EPA200.8
Cobalt	4.5	0.1	µg/L	17-May-11	EPA200.8
Copper	50.4	0.2	µg/L	17-May-11	EPA200.8
Iron	5610	5	µg/L	17-May-11	EPA200.8
Lead	84.1	0.1	µg/L	17-May-11	EPA200.8
Lithium	6.6	0.2	µg/L	17-May-11	EPA200.8
Manganese	377	0.1	µg/L	17-May-11	EPA200.8
Molybdenum	1.2	0.1	µg/L	17-May-11	EPA200.8
Nickel	11.8	0.1	µg/L	17-May-11	EPA200.8
Rubidium	4.6	0.1	µg/L	17-May-11	EPA200.8
Selenium	< 0.5	0.5	µg/L	17-May-11	EPA200.8
Silver	0.3	0.1	µg/L	17-May-11	EPA200.8
Strontium	75.2	0.1	µg/L	17-May-11	EPA200.8
Thallium	< 0.1	0.1	µg/L	17-May-11	EPA200.8
Titanium	51.5	0.1	µg/L	17-May-11	EPA200.8
Uranium	0.6	0.1	µg/L	17-May-11	EPA200.8
Vanadium	8.2	0.1	µg/L	17-May-11	EPA200.8
Zinc	138	5	µg/L	17-May-11	EPA200.8

ReportDate: Tuesday, May 24, 2011
Print Date: Tuesday, May 24, 2011



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Taiga Batch No.:
110196

- CERTIFICATE OF ANALYSIS -

Client Sample ID: 11-159-3

Taiga Sample ID: 003

*** Taiga analytical methods are based on the following standard analytical methods**

SM - Standard Methods for the Examination of Water and Wastewater

EPA - United States Environmental Protection Agency

ReportDate: Tuesday, May 24, 2011

Print Date: Tuesday, May 24, 2011

Result Summary

 Client: GAL100
 Reference: 11-0847-01-TRD

Client: Golder Associates Ltd.; operation Yellowknife

Sample: SNP43-5
 Giant Mine

Collection: collected on 2011/05/16 at 1530 by J. Crowe/ N. Sweetman

Receipt: received on 2011/05/18 at 0830 by C. Quinteros

Containers: received 2 x 20 L pails at 16 °C, in good condition with no seals and no initials

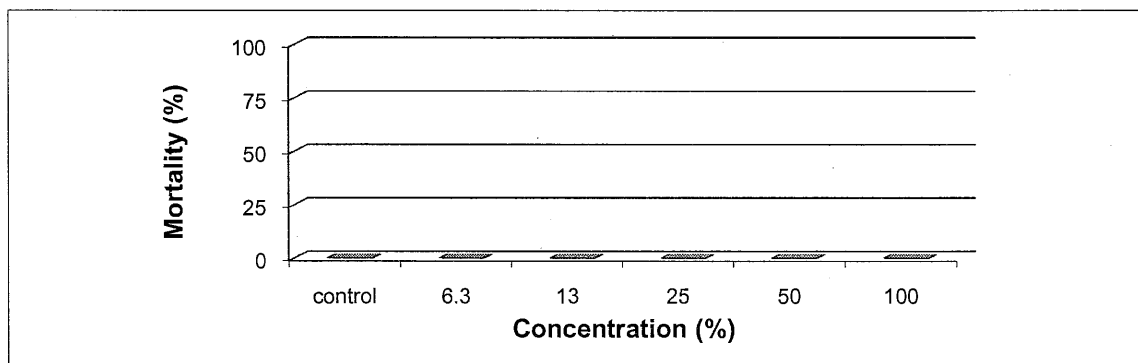
Description: type: water, collection method: grab

Test: started on 2011/05/18 ; ended on 2011/05/22

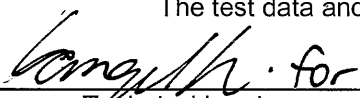
Result:

	Endpoint (96-hour)	Value (%)	Confidence Limits (95%) lower upper		Method Calculated
Acute:	LC50	>100			could not be calculated
(mortality)	LC25	>100			could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.


 Technical Lead


 Quality Coordinator

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.

Test Conditions

Client: GAL100 Reference: 11-0847-01-TRD

Method: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 2000. Environment Canada, EPS 1/RM/13. Second Edition (amended May 2007).

Test type: Trout 96-h Static Acute Test (WTR-ME-041)

Species: *Oncorhynchus mykiss*

Organism source: Miracle Springs Inc. (Batch 20110503TR)

Acclimation: 15 days (must be ≥ 2 weeks)

Stock mortality: 0.61% (seven days preceding testing)

Sample initial chemistry: pH: 7.3; EC: 217 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.1 (mg/L); temperature: 17 °C
hardness (mg CaCO_3/L): 88; colour: brown; odour: odourless

Sample holding time: 2 days (must be ≤ 5 days)

Sample storage: $4 \pm 2^\circ\text{C}$ in darkness

Test vessel: The test was conducted in 22 L plastic pails with polyethylene liners

Test volume: 16 Litres (depth of solution in each test vessel $\geq 15\text{cm}$)

Sample pre-treatment: All test solutions and controls were pre-aerated for 30 minutes at $6.5 \pm 1 \text{ mL}/\text{min}/\text{L}$
Dissolved oxygen in 100 % sample was 7.4 mg/L after pre-aeration
The sample was not filtered or pH adjusted prior to or during testing

Loading density: 0.329 g/Litre (must be $\leq 0.5 \text{ g}/\text{Litre}$)

Control/dilution water: Dechlorinated City of Calgary water acclimated to test conditions

Test concentrations: 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment; 10 fish per replicate

Feeding: Fish are not fed 24 hours before test initiation and no feeding during test

Measurements: pH, conductivity, dissolved oxygen and temperature measured daily

Aeration: All treatments aerated at $6.5 \pm 1 \text{ mL}/\text{min}/\text{L}$ by oil-free compressed air
passed through airline tubes connected to disposable air stones

Lighting: Overhead full spectrum fluorescent lights; 100-500 lux at surface

Photoperiod: 16h light:8h dark

Test temperature: $15 \pm 1^\circ\text{C}$

Endpoint: Mortality, 96-h LC50 (with 95% confidence limits)

Test validity: The control had 100% survival (must $\geq 90\%$)

The control had 0 percent (%) stressed behaviour (must $\leq 10\%$)

Reference toxicant: 96-h test with Phenol ($\text{C}_6\text{H}_6\text{O}$) initiated May 12, 2011; current results
(96-h LC50 and 95% confidence limits) = 1.04 (0.98-1.09) log (mg/L Phenol)

Note: Outlined sections are protocol deviations explained on the comment page; v/v, volume per volume



Test Data

Client: GAL100
Reference: 11-0847-01-TRD

Test Log:

Date	Day	Time	Technician	Comment/Observation
2011/05/18	0	1440	E. Petho/ N. Turner	test fish loaded at 1440 h
2011/05/19	1	1050	N. Turner/ E. Blais	all test fish appear normal
2011/05/20	2	0950	C. Velasco/ N. Turner	all test fish appear normal
2011/05/21	3	1105	R. Bradley/ E. Blais	all test fish appear normal
2011/05/22	4	1130	R. Bradley/ E. Blais	all test fish appear normal

Chemistry:

Conc. (%)	control	6.3	13	25	50	100		
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Day

pH (units)

0	7.3	7.2	7.1	7.2	7.2	7.4		
1	7.7	7.7	7.7	7.7	7.6	7.6		
2	7.7	7.7	7.7	7.7	7.7	7.6		
3	7.7	7.8	7.8	7.7	7.6	7.6		
4	7.7	7.8	7.8	7.7	7.7	7.6		

Conductivity ($\mu\text{S}/\text{cm}$ @ 25°C)

0	422	413	404	381	340	249		
1	410	398	390	372	329	236		
2	404	399	390	373	328	240		
3	422	415	401	387	343	260		
4	424	416	406	390	346	260		

Dissolved Oxygen (mg/L)

0	7.4	7.6	7.9	8.0	8.1	7.4		
1	7.7	7.7	7.7	7.7	7.7	7.7		
2	7.8	7.7	7.8	7.8	7.7	7.7		
3	7.8	7.8	7.8	7.8	7.7	7.7		
4	7.7	7.8	7.8	7.8	7.7	7.6		

Temperature (°C)

0	14	14	14	14	14	16		
1	15	15	15	15	15	15		
2	15	15	15	15	15	15		
3	14	14	14	15	15	15		
4	15	14	14	14	14	15		

Test Data

Client: GAL100
Reference: 11-0847-01-TRD

Number Alive (In brackets number stressed):

Conc. (%)	control	6.3	13	25	50	100		
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Day

0	10	10	10	10	10	10		
1	10	10	10	10	10	10		
2	10	10	10	10	10	10		
3	10	10	10	10	10	10		
4	10	10	10	10	10	10		

Mortality (%)

4	0	0	0	0	0	0		
---	---	---	---	---	---	---	--	--

Stressed (%)

4	0	0	0	0	0	0		
---	---	---	---	---	---	---	--	--

Biology Summary Tables:

Control Fish	Length (cm)	Wet Weight(g)
1	3.5	0.3
2	3.7	0.5
3	3.7	0.5
4	4.1	0.6
5	4.0	0.7
6	4.0	0.5
7	4.6	0.8
8	4.2	0.5
9	3.8	0.5
10	3.6	0.5

Conc. (%)	Group Wet Weight (g)
control	5.3
6.3	4.5
13	4.4
25	5.2
50	6.1
100	6.1

average	3.9	0.5
sd	0.3	0.1
cv(%)	8.4	25.8

Notes: nd, not done; na, not applicable;
 sd, standard deviation; cv(%), coefficient
 of variation



Comments/Statistics

Client: GAL100 Reference: 11-0847-01-TRD

Test Result Comments:

None

Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Protocol Deviations:

None

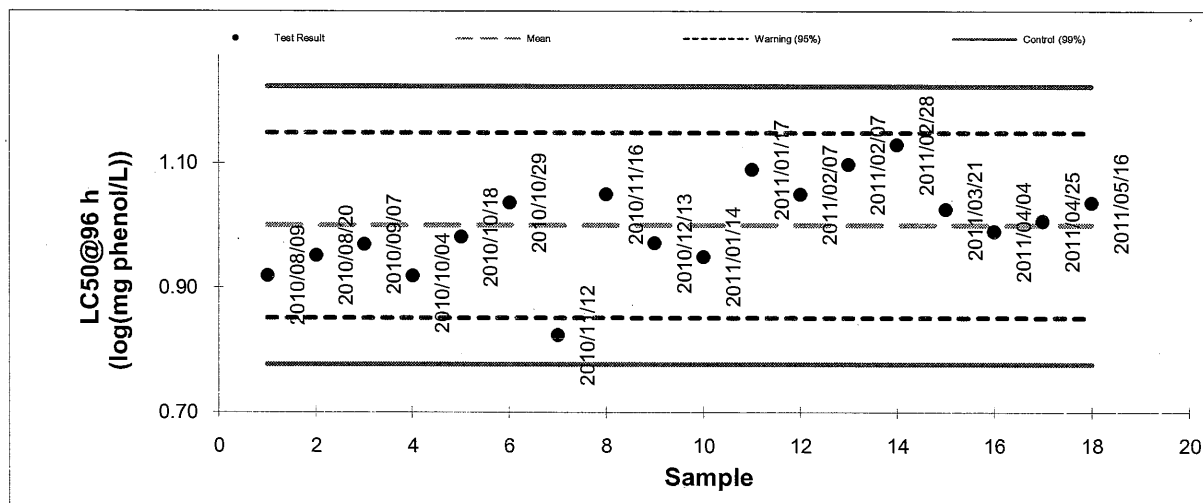
Test Method: Trout 96h Static Acute Test. (LC50, 5 treatments plus a control)
 HydroQual Test Method: WTR-ME-042

Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. including May 1996 and December 2000 amendments.

Test Organism: test species: <i>Oncorhynchus mykiss</i> culture source: Miracle Springs temperature (°C): 15 ± 1 dissolved oxygen: 70-100% saturation stock mortality (last 7d): 0.71% batch number: 20110503TR	Test Design: vol. of test vessel (L): 20 test volume depth: >15 cm replicates per treatment: 1 fish per replicate: 10 loading (g fish/L): ≤0.5 temperature (°C): 15 ± 1 photoperiod: 16h light: 8h dark light level (water surface): 100-500 lux (full-spectrum) control/dilution water: dechlorinated tap water
--	--

Current Test				
toxicant phenol (C ₆ H ₅ OH)				
started on 2011/05/12		ended on 2011/05/16		
Result (LC50 @ 96h)	1.04	log (mg phenol/L); geometric mean		
Confidence Limits (95%)	lower	0.98	upper	1.09
Historical Values				
mean	1.00	sd	0.07	cv(%): 7
	lower	upper		
warning limits (±2 sd)	0.85	1.15	(95% confidence limits)	
control limits (±3 sd)	0.78	1.22	(99% confidence limits)	

notes: sd, standard deviation; cv, coefficient of variance



The data and results are authorized and verified correct.

Technical Lead


 Quality Coordinator

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Result Summary

 Client: GAL100
 Reference: 11-0847-01-DAD

Client: Golder Associates Ltd.; operation Yellowknife

Sample: SNP43-5

Giant Mine

Collection: collected on 2011/05/16 at 1530 by J. Crowe/ N. Sweetman

Receipt: received on 2011/05/18 at 0830 by C. Quinteros

Containers: received 2 x 20 L pails at 16 °C, in good condition with no seals and no initials

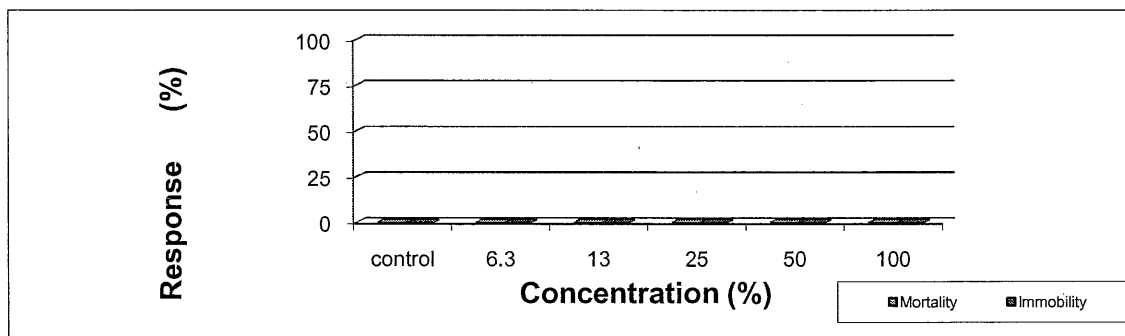
Description: type: water, collection method: grab

Test: started on 2011/05/18 ; ended on 2011/05/20

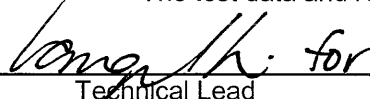
Result:

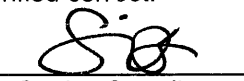
	Endpoint (48-hour)	Value (%)	Confidence Limits (95%) lower upper	Method Calculated
Acute: (mortality)	LC50	>100		could not be calculated
	LC25	>100		could not be calculated
Acute: (immobility)	EC50	>100		could not be calculated
	EC25	>100		could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.


 Technical Lead


 Quality Coordinator

Test Conditions

Client: GAL100 Reference: 11-0847-01-DAD

Method: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*, 2000. Environ. Can., EPS 1/RM/14. Second Edition.

Test type: *Daphnia* 48-h Static Acute Test (WTR-ME-015)

Species: *Daphnia magna*

Age: < 24 hours old

Organism source: in-house culture

Stock mortality: 7%

Culture brood data: 10 days to first brood
26 neonates per average brood

Sample initial chemistry: pH: 7.3; EC: 217 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.1 (mg/L); temperature: 17 °C
hardness (mg CaCO_3/L): 88; colour: brown; odour: odourless

Sample holding time: 2 days (must be ≤ 5 days)

Sample storage: $4 \pm 2^\circ\text{C}$ in darkness

Test vessel: 385 mL plastic vessels

Test volume: 150 mL

Sample pre-treatment: The sample was not filtered or pH adjusted prior to or during testing
The sample was pre-aerated for 0 minutes (rate of $37.5 \pm 12.5 \text{ mL}/\text{min} \cdot \text{L}^{-1}$)
The hardness of the sample was not adjusted (mg CaCO_3/L) prior to or during testing

Loading density: One daphnid/15 mL (must ≤ 1 organism/15 mL)

Control/dilution water: Dechlorinated City of Calgary water acclimated to test conditions
The hardness of the control/dilution water was 135 mg CaCO_3/L

Test concentrations: 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment, 10 daphnids per replicate

Feeding: None

Aeration: None

Measurements: pH, conductivity, dissolved oxygen and temperature at test initiation and termination

Lighting: Cool white fluorescent lights; 400-800 lux at surface

Photoperiod: 16h light:8h dark

Test temperature: $20 \pm 2^\circ\text{C}$

Note: Outlined sections are protocol deviations explained on the comment page

Test Conditions

Client: GAL100 Reference: 11-0847-01-DAD

Endpoint: Mortality, 48-h LC50 (95% confidence limits)
Immobility, 48-h EC50 (95% confidence limits)

Test validity: The control had 100% survival (must $\geq 90\%$)
Control had 0 percent (%) abnormal behaviour (must $\leq 10\%$, immobility)

Reference toxicant: 48-h test with NaCl initiated May 9, 2011; current results
(48-h LC50 and 95% confidence limits) = 0.74 (0.71-0.77) log (g/L NaCl)

Note: Outlined sections are protocol deviations explained on the comment page



Test Data

Client: GAL100
Reference: 11-0847-01-DAD

Test Log:

Date	Day	Time	Technician	Comment/Observation
2011/05/18	0	1230	E. Petho	test <i>Daphnia</i> appear normal
2011/05/19	1	0910	E. Petho	test <i>Daphnia</i> appear normal
2011/05/20	2	1005	H. Stewart/ H. Caro-Riano	test <i>Daphnia</i> appear normal

Chemistry:

Conc. (%)	control	6.3	13	25	50	100		
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Day

pH (units)

0	7.9	7.9	7.9	7.8	7.8	7.7		
2	8.2	8.2	8.1	8.1	8.0	7.9		

Conductivity (µS/cm @ 25°C)

0	408	404	395	372	325	238		
2	417	418	408	383	341	258		

Dissolved Oxygen (mg/L)

0	7.6	7.6	7.6	7.6	7.6	7.7		
2	7.6	6.7	6.7	6.7	6.6	6.6		

Temperature (°C)

0	21	21	21	21	21	22		
2	21	21	21	22	22	22		

Biology:

Conc. (%)	control	6.3	13	25	50	100		
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Day

Number Alive and Behavior (behavior is in brackets)

1	10	10	10	10	10	10		
2	10	10	10	10	10	10		

Notes: F, floating; I, immobile; B, stuck on bubble; D, caught in debris; nd, not done; na, not applicable;

Mortality (%)

2	0	0	0	0	0	0		
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Immobility (%)

2	0	0	0	0	0	0		
---	---	---	---	---	---	---	--	--

Comments/Statistics

Client: GAL100 Reference: 11-0847-01-DAD

Test Result Comments:

None

Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Endpoints for immobility could not be calculated. No effect occurred.

Protocol Deviations:

None

Quality Assurance Information

Test Method: *Daphnia* Static Acute Test (LC50, 5 treatments plus a control)
 HydroQual Test Method: WTR-ME-016

Reference: Biological Test Method: Reference Method for Determining the Acute Lethality of Effluents to *Daphnia magna*, 1990. Environment Canada, EPS 1/RM/14. including May 1996 and December 2000 amendments.

Test Organism:

test species: *Daphnia magna*
 culture source: in-house
 original culture source: Environment Canada
 days to first brood: 10
 mean brood size: 26
 ephippia in stock culture: no
 age of test organisms: <24 hours old
 culture mortality (%): 7%
 dissolved oxygen: 40-100% saturation

Test Design:

vol. of test vessel (mL): 500
 toxicant: sodium chloride
 test volume (mL): 150
 replicates per treatment: 1
 neonates per replicate: 10
 volume per neonate (mL): 15
 samples preaerated: no
 hardness adjustment: no
 temperature (°C): 20
 photoperiod: 16h light:8h dark
 light level (water surface): 400-800 lux (cool white)
 control/dilution water: dechlorinated tap water

Current Test

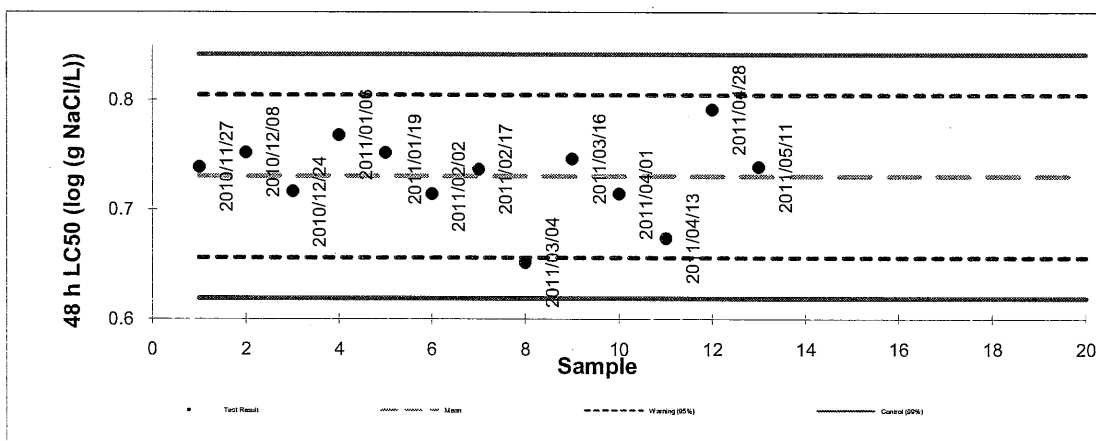
toxicant Sodium chloride (NaCl)
 started on 2011/05/09 ended on 2011/05/11
 Result (LC50 @ 48h) 0.74 log (g NaCl/L); geometric mean
 Confidence Limits (95%) lower 0.71 upper 0.77

Historical Values

	mean	sd	lower	upper	cv(%):
	0.73	0.04	0.66	0.80	5
warning limits (±2 sd)	0.66				(95% confidence limits)
control limits (±3 sd)	0.62				(99% confidence limits)

notes: sd, standard deviation; cv, coefficient of variance

Comments:



The data and results are authorized and verified correct.

[Signature]
 Technical Lead

[Signature]
 Quality Coordinator

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HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1
 tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca

Result Summary

 Client: GAL100
 Reference: 11-0848-01-DAD

Client: Golder Associates Ltd.; operation Yellowknife

Sample: Baker Ck Exposure Point
 Giant Mine

Collection: collected on 2011/05/16 at 1645 by J. Crowe/N. Sweetman

Receipt: received on 2011/05/18 at 0830 by C. Quinteros

Containers: received 2 x 20 L pails at 16 °C, in good condition with no seals and no initials

Description: type: water, collection method: grab

Contents

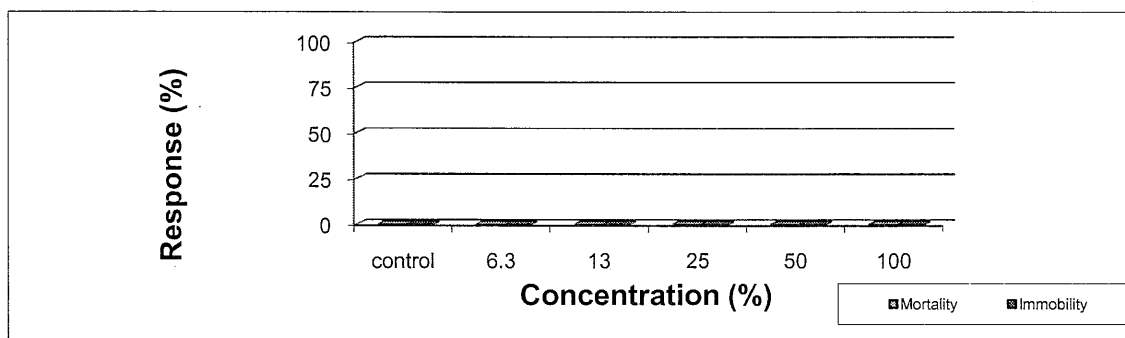
 Result Summary.....1
 Test Conditions.....2
 Test Data.....4
 Comments/Statistics..5
 QA/QC.....6

Test: started on 2011/05/18 ; ended on 2011/05/20

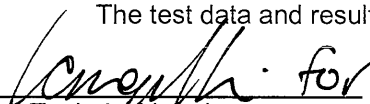
Result:

	Endpoint (48-hour)	Value (%)	Confidence Limits (95%) lower upper	Method Calculated
Acute:	LC50	>100		could not be calculated
(mortality)	LC25	>100		could not be calculated
Acute:	EC50	>100		could not be calculated
(immobility)	EC25	>100		could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.


 Technical Lead


 Quality Coordinator

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Test Conditions

Client: GAL100 Reference: 11-0848-01-DAD

Method: Biological Test method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*, 2000. Environ. Can., EPS 1/RM/14. Second Edition.

Test type: *Daphnia* 48-h Static Acute Test (WTR-ME-015)

Species: *Daphnia magna*

Age: < 24 hours old

Organism source: in-house culture

Stock mortality: 0%

Culture brood data: 10 days to first brood
26 neonates per average brood

Sample initial chemistry: pH: 7.3; EC: 315 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.0 (mg/L); temperature: 17 °C
hardness (mg CaCO_3/L): 116; colour: brown; odour: odourless

Sample holding time: 2 days (must be \leq 5 days)

Sample storage: $4 \pm 2^\circ\text{C}$ in darkness

Test vessel: 385 mL plastic vessels

Test volume: 150 mL

Sample pre-treatment: The sample was not filtered or pH adjusted prior to or during testing
The sample was pre-aerated for 0 minutes (rate of $37.5 \pm 12.5 \text{ mL}/\text{min.L}^{-1}$)
The hardness of the sample was not adjusted (mg CaCO_3/L) prior to or during testing

Loading density: One daphnid/15 mL (must \leq 1 organism/15 mL)

Control/dilution water: Dechlorinated City of Calgary water acclimated to test conditions
The hardness of the control/dilution water was 135 mg CaCO_3/L

Test concentrations: 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment, 10 daphnids per replicate

Feeding: None

Aeration: None

Measurements: pH, conductivity, dissolved oxygen and temperature at test initiation and termination

Lighting: Cool white fluorescent lights; 400-800 lux at surface

Photoperiod: 16h light:8h dark

Test temperature: $20 \pm 2^\circ\text{C}$

Note: Outlined sections are protocol deviations explained on the comment page

Test Conditions

Client: GAL100 Reference: 11-0848-01-DAD

Endpoint: Mortality, 48-h LC50 (95% confidence limits)
Immobility, 48-h EC50 (95% confidence limits)

Test validity: The control had 100% survival (must $\geq 90\%$)
Control had 0 percent (%) abnormal behaviour (must $\leq 10\%$, immobility)

Reference toxicant: 48-h test with NaCl initiated May 9, 2011; current results
(48-h LC50 and 95% confidence limits) = 0.74 (0.71-0.77) log (g/L NaCl)

Note: Outlined sections are protocol deviations explained on the comment page



Test Data

Client: GAL100
Reference: 11-0848-01-DAD

Test Log:

Date	Day	Time	Technician	Comment/Observation
2011/05/18	0	1230	E. Petho	test <i>Daphnia</i> appear normal
2011/05/19	1	0910	E. Petho	test <i>Daphnia</i> appear normal
2011/05/20	2	1010	H. Stewart	test <i>Daphnia</i> appear normal

Chemistry:

Conc. (%)	control	6.3	13	25	50	100		
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Day

pH (units)

0	7.9	7.9	7.9	7.9	7.8	7.7		
2	7.9	8.0	8.0	8.0	8.0	8.0		

Conductivity (µS/cm @ 25°C)

0	425	412	407	396	373	331		
2	418	424	418	411	389	348		

Dissolved Oxygen (mg/L)

0	7.6	7.6	7.6	7.6	7.6	7.6		
2	6.7	6.7	6.7	6.7	6.7	6.7		

Temperature (°C)

0	21	21	21	21	21	22		
2	21	21	21	21	21	21		

Biology:

Conc. (%)	control	6.3	13	25	50	100		
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Day

Number Alive and Behavior (behavior is in brackets)

1	10	10	10	10	10	10		
2	10	10	10	10	10	10		

Notes: F, floating; I, immobile; B, stuck on bubble; D, caught in debris; nd, not done; na, not applicable;

Mortality (%)

2	0	0	0	0	0	0		
---	---	---	---	---	---	---	--	--

Immobility (%)

2	0	0	0	0	0	0		
---	---	---	---	---	---	---	--	--

Comments/Statistics

Client: GAL100 Reference: 11-0848-01-DAD

Test Result Comments:

None

Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Endpoints for immobility could not be calculated. No effect occurred.

Protocol Deviations:

None

Quality Assurance Information

Test Method: *Daphnia* Static Acute Test (LC50, 5 treatments plus a control)
 HydroQual Test Method: WTR-ME-016

Reference: Biological Test Method: Reference Method for Determining the Acute Lethality of Effluents to *Daphnia magna*, 1990. Environment Canada, EPS 1/RM/14. including May 1996 and December 2000 amendments.

Test Organism:		Test Design:	
test species:	<i>Daphnia magna</i>	vol. of test vessel (mL):	500
culture source:	in-house	toxicant:	sodium chloride
original culture source:	Environment Canada	test volume (mL):	150
days to first brood:	10	replicates per treatment:	1
mean brood size:	26	neonates per replicate:	10
ephippia in stock culture:	no	volume per neonate (mL):	15
age of test organisms:	<24 hours old	samples pre-aerated:	no
culture mortality (%):	7%	hardness adjustment:	no
dissolved oxygen:	40-100% saturation	temperature (°C):	20
		photoperiod:	16h light:8h dark
		light level (water surface):	400-800 lux (cool white)
		control/dilution water:	dechlorinated tap water

Current Test

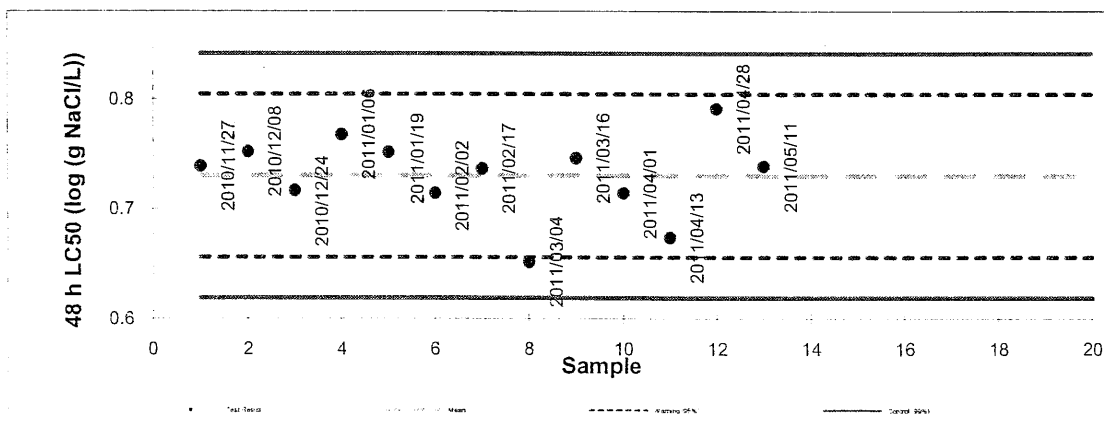
toxicant	Sodium chloride (NaCl)		
started on	2011/05/09	ended on	2011/05/11
Result (LC50 @ 48h)	0.74	log (g NaCl/L); geometric mean	
Confidence Limits (95%)	lower	0.71	upper 0.77

Historical Values

mean	0.73	sd	0.04	cv(%):	5
	lower	upper			
warning limits (± 2 sd)	0.66	0.80	(95% confidence limits)		
control limits (± 3 sd)	0.62	0.84	(99% confidence limits)		

notes: sd, standard deviation; cv, coefficient of variance

Comments:



The data and results are authorized and verified correct.


 Technical Lead


 Quality Coordinator

Our liability is limited to the cost of the test requested on the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results in part or in whole.

HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1
 tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca

DA Ref. Tox.v 3.0

Result Summary

Client: GAL100
Reference: 11-0848-01-TRD

Client: Golder Associates Ltd.; operation Yellowknife

Sample: Baker Ck Exposure Point
Giant Mine

Collection: collected on 2011/05/16 at 1645 by J. Crowe/N. Sweetman

Receipt: received on 2011/05/18 at 0830 by C. Quinteros

Containers: received 2 x 20 L pails at 16 °C, in good condition with no seals and no initials

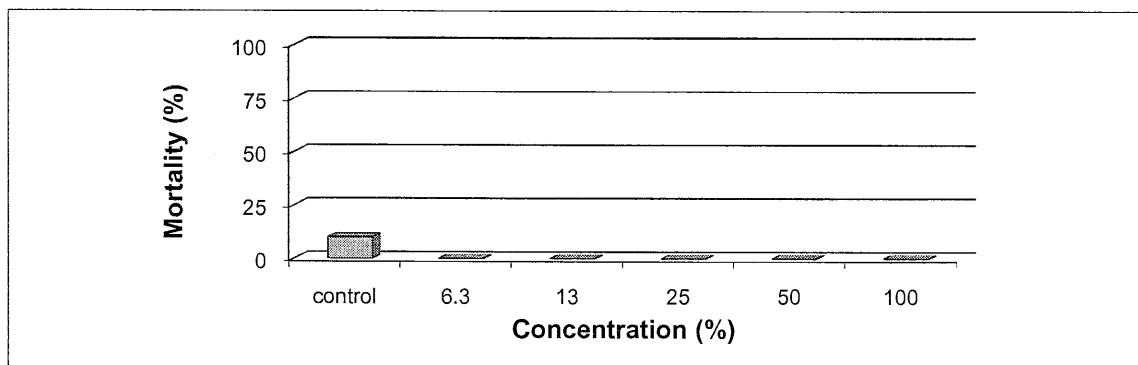
Description: type: water, collection method: grab

Test: started on 2011/05/18 ; ended on 2011/05/22

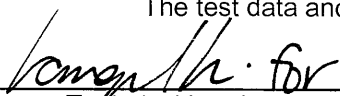
Result:

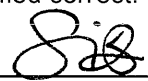
	Endpoint (96-hour)	Value (%)	Confidence Limits (95%)		Method Calculated
			lower	upper	
Acute:	LC50	>100			could not be calculated
(mortality)	LC25	>100			could not be calculated

Notes: LC25 & LC50, concentrations lethal to 25% and 50% of the test population



The test data and results are authorized and verified correct.


 Technical Lead


 Quality Coordinator

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Test Conditions

Client: GAL100 Reference: 11-0848-01-TRD

Method: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 2000. Environment Canada, EPS 1/RM/13. Second Edition (amended May 2007).

Test type: Trout 96-h Static Acute Test (WTR-ME-041)

Species: *Oncorhynchus mykiss*

Organism source: Miracle Springs Inc. (Batch 20110503TR)

Acclimation: 15 days (must be ≥ 2 weeks)

Stock mortality: 0.61% (seven days preceding testing)

Sample initial chemistry: pH: 7.3; EC: 315 ($\mu\text{S}/\text{cm}$ @ 25°C); DO: 8.0 (mg/L); temperature: 17 °C
hardness (mg CaCO_3/L): 116; colour: brown; odour: odourless

Sample holding time: 2 days (must be ≤ 5 days)

Sample storage: $4 \pm 2^\circ\text{C}$ in darkness

Test vessel: The test was conducted in 22 L plastic pails with polyethylene liners

Test volume: 16 Litres (depth of solution in each test vessel $\geq 15\text{cm}$)

Sample pre-treatment: All test solutions and controls were pre-aerated for 30 minutes at 6.5 ± 1 mL/min/L
Dissolved oxygen in 100 % sample was 7.9 mg/L after pre-aeration
The sample was not filtered or pH adjusted prior to or during testing

Loading density: 0.368 g/Litre (must be ≤ 0.5 g/Litre)

Control/dilution water: Dechlorinated City of Calgary water acclimated to test conditions

Test concentrations: 5 effluent concentrations (6.3, 12.5, 25, 50, 100% (v/v) plus a negative control)

Test replicates: One replicate per treatment; 10 fish per replicate

Feeding: Fish are not fed 24 hours before test initiation and no feeding during test

Measurements: pH, conductivity, dissolved oxygen and temperature measured daily

Aeration: All treatments aerated at 6.5 ± 1 mL/min/L by oil-free compressed air
passed through airline tubes connected to disposable air stones

Lighting: Overhead full spectrum fluorescent lights; 100-500 lux at surface

Photoperiod: 16h light:8h dark

Test temperature: $15 \pm 1^\circ\text{C}$

Endpoint: Mortality, 96-h LC50 (with 95% confidence limits)

Test validity: The control had 90% survival (must $\geq 90\%$)

The control had 0 percent (%) stressed behaviour (must $\leq 10\%$)

Reference toxicant: 96-h test with Phenol ($\text{C}_6\text{H}_6\text{O}$) initiated May 12, 2011; current results
(96-h LC50 and 95% confidence limits) = 1.04 (0.98-1.09) log (mg/L Phenol)

Note: Outlined sections are protocol deviations explained on the comment page; v/v, volume per volume



Test Data

Client: GAL100
Reference: 11-0848-01-TRD

Test Log:

Date	Day	Time	Technician	Comment/Observation
2011/05/18	0	1440	E. Petho/N. Turner	test fish loaded at 1440 h
2011/05/19	1	1050	N. Turner/E. Blais	all test fish appear normal
2011/05/20	2	1000	C. Velasco/N. Turner	all test fish appear normal
2011/05/21	3	1110	R. Bradley/E. Blais	all test fish appear normal
2011/05/22	4	1130	R. Bradley/E. Blais	all test fish appear normal

Chemistry:

Conc. (%)	control	6.3	13	25	50	100		
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Day

pH (units)

0	7.2	7.1	7.1	7.2	7.3	7.4		
1	7.6	7.6	7.6	7.6	7.6	7.6		
2	7.5	7.6	7.7	7.7	7.6	7.6		
3	7.7	7.7	7.7	7.7	7.7	7.6		
4	7.7	7.7	7.8	7.7	7.7	7.6		

Conductivity (µS/cm @ 25°C)

0	422	421	414	398	367	299		
1	391	401	398	383	353	290		
2	404	407	393	385	355	293		
3	422	422	416	401	369	309		
4	414	424	417	401	371	313		

Dissolved Oxygen (mg/L)

0	8.2	8.5	8.5	8.5	8.4	7.9		
1	7.6	7.7	7.7	7.7	7.7	7.6		
2	7.7	7.8	7.7	7.7	7.7	7.7		
3	7.8	7.7	7.7	7.7	7.7	7.7		
4	7.8	7.8	7.8	7.8	7.7	7.7		

Temperature (°C)

0	14	14	14	14	15	16		
1	15	15	15	15	15	15		
2	15	15	15	15	15	15		
3	15	14	14	15	15	15		
4	15	14	14	14	15	15		

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.



Test Data

Client: GAL100
Reference: 11-0848-01-TRD

Number Alive (In brackets number stressed):

Conc. (%)	control	6.3	13	25	50	100		
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Day

0	10	10	10	10	10	10		
1	10	10	10	10	10	10		
2	10	10	10	10	10	10		
3	10	10	10	10	10	10		
4	9	10	10	10	10	10		

Mortality (%)

4	10	0	0	0	0	0		
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Stressed (%)

4	0	0	0	0	0	0		
---	---	---	---	---	---	---	--	--

Biology Summary Tables:

Control Fish	Length (cm)	Wet Weight(g)
1	3.9	0.5
2	4.3	0.7
3	3.6	0.4
4	3.5	0.4
5	4.0	0.7
6	3.8	0.5
7	4.4	0.8
8	4.7	1.1
9	3.2	0.4
10	4.0	0.5

Conc. (%)	Group Wet Weight (g)
control	5.9
6.3	5.5
13	5.3
25	5.6
50	5.7
100	5.0

average	3.9	0.6
sd	0.4	0.2
cv(%)	11.4	35.6

Notes: nd, not done; na, not applicable;
sd, standard deviation; cv(%), coefficient
of variation

Comments/Statistics

Client: GAL100 Reference: 11-0848-01-TRD

Test Result Comments:

None

Data Analysis:

Endpoints for mortality could not be calculated. No effect occurred.

Protocol Deviations:

None

Test Method: Trout 96h Static Acute Test. (LC50, 5 treatments plus a control)
 HydroQual Test Method: WTR-ME-042

Reference: Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, 1990. Environment Canada, EPS 1/RM/13. including May 1996 and December 2000 amendments.

Test Organism:

test species: *Oncorhynchus mykiss*
 culture source: Miracle Springs
 temperature (°C): 15 ± 1
 dissolved oxygen: 70-100% saturation
 stock mortality (last 7d): 0.71%
 batch number: 20110503TR

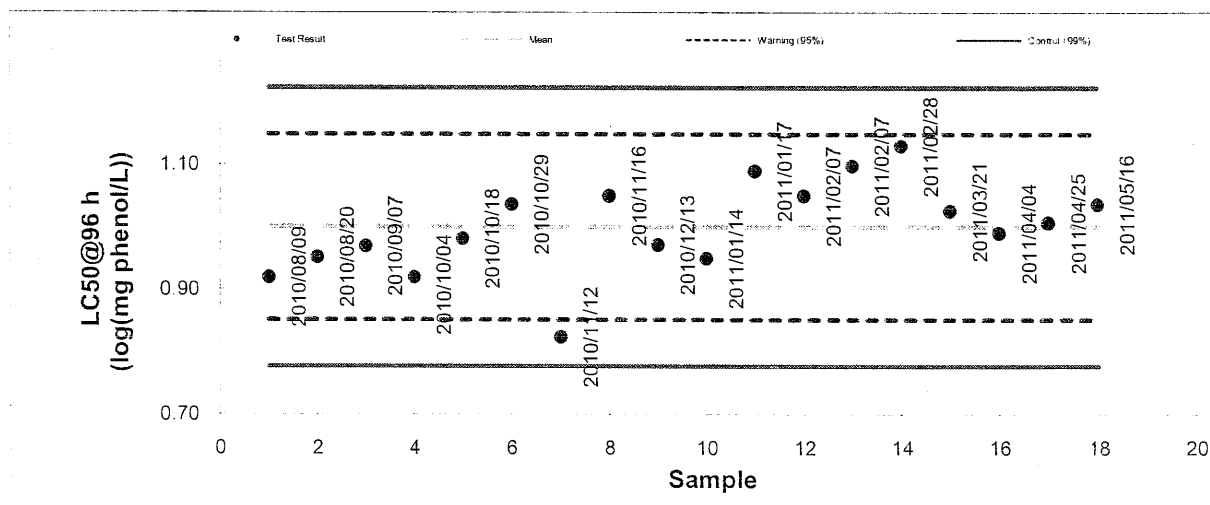
Test Design:

vol. of test vessel (L): 20
 test volume depth: >15 cm
 replicates per treatment: 1
 fish per replicate: 10
 loading (g fish/L): ≤0.5
 temperature (°C): 15 ± 1
 photoperiod: 16h light: 8h dark
 light level (water surface): 100-500 lux (full-spectrum)
 control/dilution water: dechlorinated tap water

Current Test

toxicant phenol (C ₆ H ₅ OH)				
started on 2011/05/12		ended on 2011/05/16		
Result (LC50 @ 96h)	1.04	log (mg phenol/L); geometric mean		
Confidence Limits (95%)	lower	0.98	upper	1.09
Historical Values				
mean	1.00	sd	0.07	cv(%): 7
	lower	upper		
warning limits (±2 sd)	0.85	1.15	(95% confidence limits)	
control limits (±3 sd)	0.78	1.22	(99% confidence limits)	

notes: sd, standard deviation; cv, coefficient of variance



The data and results are authorized and verified correct.


 Technical Lead


 Quality Coordinator

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DETON'CHO \ NUNA JOINT VENTURE
ATTN: KATRINA NOKLEBY
GIANT MINESITE
PO BOX 2951
Yellowknife NT X1A 2R2

Date Received: 17-MAY-11
Report Date: 20-MAY-11 16:40 (MT)
Version: DRAFT

Client Phone: 604-253-4188

Certificate of Analysis

Lab Work Order #: L1005761
Project P.O. #: 606989
Job Reference: 09-1427-0006
Legal Site Desc:
C of C Numbers: 1

Can Dang
Senior Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1005761-1 WATER 16-MAY-11 16:45 BAKER CREEK EXPOSURE POINT (ABOVE)				
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	106				
	Total Suspended Solids (mg/L)	4340				
	Turbidity (NTU)	2740				
Anions and Nutrients	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	6.64				
	Fluoride (F) (mg/L)	0.285				
	Nitrate and Nitrite (as N) (mg/L)	0.0722				
	Nitrate (as N) (mg/L)	0.0722				
	Nitrite (as N) (mg/L)	<0.0010				
	Sulfate (SO4) (mg/L)	41.0				
Total Metals	Aluminum (Al)-Total (mg/L)	46.5				
	Antimony (Sb)-Total (mg/L)	1.53				
	Arsenic (As)-Total (mg/L)	7.55				
	Barium (Ba)-Total (mg/L)	0.087				
	Beryllium (Be)-Total (mg/L)	<0.0050				
	Bismuth (Bi)-Total (mg/L)	<0.20				
	Boron (B)-Total (mg/L)	<0.10				
	Cadmium (Cd)-Total (mg/L)	0.0108				
	Calcium (Ca)-Total (mg/L)	182				
	Chromium (Cr)-Total (mg/L)	0.115				
	Cobalt (Co)-Total (mg/L)	0.045				
	Copper (Cu)-Total (mg/L)	0.647				
	Iron (Fe)-Total (mg/L)	99.9				
	Lead (Pb)-Total (mg/L)	1.62				
	Lithium (Li)-Total (mg/L)	0.068				
	Magnesium (Mg)-Total (mg/L)	66.8				
	Manganese (Mn)-Total (mg/L)	3.27				
	Mercury (Hg)-Total (mg/L)	0.000331 ^{DLM}				
	Molybdenum (Mo)-Total (mg/L)	0.00259				
	Nickel (Ni)-Total (mg/L)	0.126				
	Phosphorus (P)-Total (mg/L)	1.29				
	Potassium (K)-Total (mg/L)	5.4				
	Selenium (Se)-Total (mg/L)	0.00128				
	Silicon (Si)-Total (mg/L)	44.0				
	Silver (Ag)-Total (mg/L)	<0.010				
	Sodium (Na)-Total (mg/L)	6.6				

* 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		L1005761-1 WATER 16-MAY-11 16:45 BAKER CREEK EXPOSURE POINT (ABOVE)				
Grouping	Analyte					
WATER						
Total Metals	Strontium (Sr)-Total (mg/L)	0.193				
	Thallium (Tl)-Total (mg/L)	<0.20				
	Tin (Sn)-Total (mg/L)	<0.030				
	Titanium (Ti)-Total (mg/L)	0.238				
	Uranium (U)-Total (mg/L)	0.00122				
	Vanadium (V)-Total (mg/L)	0.117				
	Zinc (Zn)-Total (mg/L)	2.04				
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0240				
	Antimony (Sb)-Dissolved (mg/L)	0.0716				
	Arsenic (As)-Dissolved (mg/L)	0.136				
	Barium (Ba)-Dissolved (mg/L)	<0.010				
	Beryllium (Be)-Dissolved (mg/L)	<0.0050				
	Bismuth (Bi)-Dissolved (mg/L)	<0.20				
	Boron (B)-Dissolved (mg/L)	<0.10				
	Cadmium (Cd)-Dissolved (mg/L)	0.00025				
	Calcium (Ca)-Dissolved (mg/L)	30.9				
	Chromium (Cr)-Dissolved (mg/L)	<0.010				
	Cobalt (Co)-Dissolved (mg/L)	<0.010				
	Copper (Cu)-Dissolved (mg/L)	0.0210				
	Iron (Fe)-Dissolved (mg/L)	0.028				
	Lead (Pb)-Dissolved (mg/L)	0.00076				
	Lithium (Li)-Dissolved (mg/L)	<0.010				
	Magnesium (Mg)-Dissolved (mg/L)	7.05				
	Manganese (Mn)-Dissolved (mg/L)	0.261				
	Mercury (Hg)-Dissolved (mg/L)	<0.000050 ^{DLM}				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00134				
	Nickel (Ni)-Dissolved (mg/L)	0.0021				
	Phosphorus (P)-Dissolved (mg/L)	<0.30				
	Potassium (K)-Dissolved (mg/L)	<2.0				
	Selenium (Se)-Dissolved (mg/L)	<0.00020 ^{DLA}				
	Silicon (Si)-Dissolved (mg/L)	0.649				
	Silver (Ag)-Dissolved (mg/L)	<0.010				
	Sodium (Na)-Dissolved (mg/L)	4.8				
	Strontium (Sr)-Dissolved (mg/L)	0.0689				
	Thallium (Tl)-Dissolved (mg/L)	<0.20				
	Tin (Sn)-Dissolved (mg/L)	<0.030				
	Titanium (Ti)-Dissolved (mg/L)	<0.010				

* 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		L1005761-1 WATER 16-MAY-11 16:45 BAKER CREEK EXPOSURE POINT (ABOVE)				
Grouping	Analyte					
WATER						
Dissolved Metals	Uranium (U)-Dissolved (mg/L)	0.000524				
	Vanadium (V)-Dissolved (mg/L)	<0.030				
	Zinc (Zn)-Dissolved (mg/L)	0.0197				

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

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.			
ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
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-DIS-LOW-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS(Low)	EPA SW-846 3005A & EPA 245.7
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 procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and 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 (EPA Method 245.7).			
HG-TOT-LOW-CVAFS-VA	Water	Total Mercury in Water by CVAFS(Low)	EPA 245.7
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 (EPA Method 245.7).			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B
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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-DIS-LOW-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA 3005A/6010B
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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A

Reference Information

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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-LOW-ICP-VA Water Total Metals in Water by ICPOES EPA 3005A/6010B

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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540 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.

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.

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
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

1

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.



COC #

4

Mexico
TSS



L O C A L I Z A T I O N

Page 1 of 43

Report						Service Requested (Rush for routine analysis subject to availability)									
Company: Deton'Cho/Nuna Joint Venture AND Golder As. Ltd.						<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Other									
Contact: DCNJV: Katrina Nokleby; Golder: Justine Crowe						<input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax									
Address:						Email 1: jcrowe@golder.com									
						Email 2: hmachtans@golder.com									
Phone: 867 669 6735 Fax:						Email 3: KatrinaN@nunalogistics.com									
Invoice To Same as Report ? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						Client / Project Information									
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						Job #: 09-1427-0006-5000-5500									
Company: Deton'Cho/Nuna Joint Venture						PO / AFE: 606989									
Contact: Brenda Kalis						LSD:									
Address: 9838-31st Avenue., Edmonton AB, T6N 1C5															
Phone: 780 408 2897 Fax: 780 408 5472						Quote #:									
Lab Work Order # (lab use only) U1008282						ALS Contact: Can Dang Sampler: Justine Crowe									
Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	1st Step: Filter Sample	2nd Step: Combine Liquid Filtrate - Analyze for Dissolved Metals (Low Level DLs)	3rd Step: Combine solids from filter - analyze for MOISTURE, PARTICLE SIZE, and TOTAL METALS (Low Level DLs)								Number of Containers
	Baker Creek Exposure Point (Above)	17-May-11	146:00	Surface Water	X	X	X								3
				Surface Water											
	Reach 0 - Baker BC Mouth	17-May-11	16:00	Surface Water	X	X	X								3
Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details															
Please refer to special instructions in the Analysis Requested Section. All Samples are RUSH / EMERGENCY!!!! If there are any questions regarding analysis please contact Justine Crowe at 867 873 6319 ext. 226.															
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 provided on a separate Excel tab.															
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.															
SHIPMENT RELEASE (client use)				SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)							
Released by: J. Crowe	Date (dd-mmm-yy) May 17 11	Time (hh-mm) 16:30	Received by: JP	Date: May 24	Time: 12:20	Temperature: 7 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF					



DETON'CHO \ NUNA JOINT VENTURE
ATTN: KATRINA NOKLEBY
GIANT MINESITE
PO BOX 2951
Yellowknife NT X1A 2R2

Date Received: 24-MAY-11
Report Date: 25-MAY-11 16:53 (MT)
Version: DRAFT

Client Phone: 604-253-4188

Certificate of Analysis

Lab Work Order #: L1008285
Project P.O. #: 606989
Job Reference: 09-1427-0006
Legal Site Desc:
C of C Numbers:

Can Dang
Senior Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1008285-1	L1008285-2	L1008285-3		
Grouping Analyte						
WATER						
Physical Tests	Total Suspended Solids (mg/L)	6.7	279	163		
	Total Dissolved Solids (mg/L)	59.5				
	Turbidity (NTU)	3.05	94.9	134		
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	3.4	3.3	2.3		
	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	32.4	33.6	53.2		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	32.4	33.6	53.2		
	Ammonia (as N) (mg/L)	0.105	0.104	0.123		
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050		
	Chloride (Cl) (mg/L)	2.07	2.06	10.6		
	Fluoride (F) (mg/L)	0.075	0.076	0.075		
	Nitrate and Nitrite (as N) (mg/L)	0.0345	0.0352	0.136		
	Nitrate (as N) (mg/L)	0.0345	0.0352	0.133		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	0.0034		
	Sulfate (SO4) (mg/L)	3.21	3.26	39.3		
	Sulphide as S (mg/L)	<0.020	<0.020	0.025		
Total Metals	Aluminum (Al)-Total (mg/L)	0.144	5.13	2.03		
	Antimony (Sb)-Total (mg/L)	0.00168	0.00420	0.124		
	Arsenic (As)-Total (mg/L)	0.0343	0.120	0.430		
	Barium (Ba)-Total (mg/L)	0.012	0.064	0.022		
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	<0.000050	<0.000050	0.000569		
	Calcium (Ca)-Total (mg/L)	8.93	11.2	30.2		
	Chromium (Cr)-Total (mg/L)	<0.010	0.012	<0.010		
	Cobalt (Co)-Total (mg/L)	<0.010	<0.010	<0.010		
	Copper (Cu)-Total (mg/L)	0.00068	0.00763	0.0413		
	Iron (Fe)-Total (mg/L)	0.405	6.02	3.82		
	Lead (Pb)-Total (mg/L)	0.000186	0.00519	0.0729		
	Lithium (Li)-Total (mg/L)	<0.010	0.011	<0.010		
	Magnesium (Mg)-Total (mg/L)	2.81	5.05	7.98		
	Manganese (Mn)-Total (mg/L)	0.479	0.584	0.401		
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	0.000028		
	Molybdenum (Mo)-Total (mg/L)	0.000405	0.000481	0.00108		

* 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		L1008285-1	L1008285-2	L1008285-3		
Grouping Analyte						
WATER						
Total Metals	Nickel (Ni)-Total (mg/L)	<0.00050	0.00738	0.00961		
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	<2.0	2.5	2.4		
	Selenium (Se)-Total (mg/L)	<0.00010	<0.00010	0.00015		
	Silicon (Si)-Total (mg/L)	0.544	9.40	3.31		
	Silver (Ag)-Total (mg/L)	<0.010	<0.010	<0.010		
	Sodium (Na)-Total (mg/L)	2.0	2.7	6.6		
	Strontium (Sr)-Total (mg/L)	0.0327	0.0484	0.0820		
	Thallium (Tl)-Total (mg/L)	<0.20	<0.20	<0.20		
	Tin (Sn)-Total (mg/L)	<0.030	<0.030	<0.030		
	Titanium (Ti)-Total (mg/L)	<0.010	0.199	0.039		
	Uranium (U)-Total (mg/L)	0.000329	0.000673	0.000723		
	Vanadium (V)-Total (mg/L)	<0.030	<0.030	<0.030		
	Zinc (Zn)-Total (mg/L)	<0.0040	0.0174	0.122		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0070	0.182	0.0157		
	Antimony (Sb)-Dissolved (mg/L)	0.00156	0.00166	0.0359		
	Arsenic (As)-Dissolved (mg/L)	0.0233	0.0255	0.0729		
	Barium (Ba)-Dissolved (mg/L)	<0.010	0.013	<0.010		
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050		
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10		
	Cadmium (Cd)-Dissolved (mg/L)	<0.000050	<0.000050	0.000164		
	Calcium (Ca)-Dissolved (mg/L)	9.08	9.45	29.0		
	Chromium (Cr)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Cobalt (Co)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Copper (Cu)-Dissolved (mg/L)	<0.00050	0.00086	0.0118		
	Iron (Fe)-Dissolved (mg/L)	0.086	0.252	0.041		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000177	0.000840		
	Lithium (Li)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Magnesium (Mg)-Dissolved (mg/L)	2.86	2.93	6.58		
	Manganese (Mn)-Dissolved (mg/L)	<0.0050	0.0776	0.296		
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Molybdenum (Mo)-Dissolved (mg/L)	0.000350	0.000390	0.00117		
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00264		
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	2.1		
	Selenium (Se)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		

* 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		L1008285-1	L1008285-2	L1008285-3		
Grouping Analyte						
WATER						
Dissolved Metals	Silicon (Si)-Dissolved (mg/L)	0.326	1.08	0.702		
	Silver (Ag)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Sodium (Na)-Dissolved (mg/L)	2.1	2.1	6.7		
	Strontium (Sr)-Dissolved (mg/L)	0.0327	0.0357	0.0786		
	Thallium (Tl)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Tin (Sn)-Dissolved (mg/L)	<0.030	<0.030	<0.030		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	0.015	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.000211	0.000231	0.000579		
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.030	<0.030		
	Zinc (Zn)-Dissolved (mg/L)	<0.0040	<0.0040	0.0174		

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

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
SFPL	Sample was Filtered and Preserved at the laboratory - dissolved metals

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-PCT-VA	Water	Alkalinity by Auto. 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.			
ALK-PCT-VA	Water	Alkalinity by Auto. 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.			
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.			
ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
HG-DIS-LOW-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS(Low)	EPA SW-846 3005A & EPA 245.7
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 procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and 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 (EPA Method 245.7).			
HG-TOT-LOW-CVAFS-VA	Water	Total Mercury in Water by CVAFS(Low)	EPA 245.7
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 (EPA Method 245.7).			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B
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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical			

Reference Information

emission spectrophotometry (EPA Method 6010B).

MET-DIS-LOW-ICP-VA Water Dissolved Metals in Water by ICPOES EPA 3005A/6010B

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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-LOW-ICP-VA Water Total Metals in Water by ICPOES EPA 3005A/6010B

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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

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.

OGG-LL-SF-VA Water Oil & Grease by Gravimetric BCMOE GRAVIMETRIC

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510 & 9071, published by the United States Environmental Protection Agency (EPA), "Standard Methods for the Examination of Water and Wastewater", 20th ed., Method 5520, published by the American Public Health Association, and "BC Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials," 5th ed., published by the B.C. Ministry of Environment, Lands & Parks, 1994. The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease. ALS Environmental's routine detection limit, or Limit of Reporting (LOR), for this method is 2 mg/L for a 1L sample volume. By request, a LOR of 1 mg/L is sometimes applied for this method. The 1 mg/L LOR is equal to the 99% confidence limit Method Detection Limit as defined by the US EPA. A higher degree of variability is expected at levels below 2 mg/L.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540 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-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540 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.

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.

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
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

Reference Information

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 ww - 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.

DRAFT

RUSH

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COC #

Page 1 of 3

Priority processing

Report To						Report Form						Requested (Rush for routine analysis subject to availability)																					
Company: Deton'Cho/Nuna Joint Venture AND Golder As. Ltd.						<input checked="" type="checkbox"/> Standard						Regular (Standard Turnaround Times - Business Days)																					
Contact: DCNJV: Katrina Nokleby; Golder: Justine Crowe						<input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax						<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT																					
Address:						Email 1: jcrowe@golder.com						<input checked="" type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT																					
						Email 2: hmachtans@golder.com						<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT																					
Phone: 867 669 6735 Fax:						Email 3: KatrinaN@nunalogistics.com						Analysis Request																					
Invoice To Same as Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						Client / Project Information						Please indicate below Filtered, Preserved or both (F, P, F/P)																					
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						Job #: 09-1427-0006																											
Company: Deton'Cho/Nuna Joint Venture						PO / AFE: 606989																											
Contact: Brenda Kalis						LSD:																											
Address: 9838-31st Avenue, Edmonton AB, T6N 1C5																																	
Phone: 780 408 2897 Fax: 780 408 5472						Quote #:																											
Lab Work Order # (lab use only) C1008285						ALS Contact: Can Dang						Sampler: Justine Crowe																					
Sample Identification (This description will appear on the report)						Date (dd-mm-yy)						Time (hh:mm)						Sample Type						Physical Parameters									
Reach 7 Overflow u/s Road (TOC not preserved!)						17-May-11						15:15						Surface Water						Major Ions									
Reach 7 Overflow d/s Road						17-May-11						15:00						Surface Water						Cyanide									
Reach 0 - Baker BC Mouth						17-May-11						14:15						Surface Water						Reactive Phosphorus									
																								Nutrients									
																								NH3 / TKN									
																								Oil and Grease									
																								TOC									
																								DOC									
																								Low Level Total Metals									
																								Low Level Dissolved Metals									
																								Sulphide									
																								Number of Containers									
Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details																																	
Please Analyze As and Se by Hydride*. Note - This water might contain high amounts of metals. All Samples are RUSH / EMERGENCY!!!!																																	
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 provided on a separate Excel tab.																																	
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.																																	
SHIPMENT RELEASE (client use)										SHIPMENT RECEPTION (lab use only)										SHIPMENT VERIFICATION (lab use only)													
Released by: J.Crowe Date (dd-mm-yy): May 17-11 Time (hh:mm): 16:30										Received by: J.P. Date: May 24/11 Time: 12:20 Temperature: 11 °C										Verified by: Date: Time: Observations: Yes / No ? If Yes add SIF													



Golder Associates Ltd.
ATTN: Hilary Machtans
9 - 4905 48 Street
Yellowknife NT X1A 3S3

Date Received: 18-MAY-11
Report Date: 21-MAY-11 14:16 (MT)
Version: FINAL

Client Phone: 867-873-6319

Certificate of Analysis

Lab Work Order #: L1006655
Project P.O. #: 606989
Job Reference: 09-1427-0006
Legal Site Desc:
C of C Numbers: 1

Shannon Luchka
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

		Sample ID	Description	Sampled Date	Sampled Time	Client ID
Grouping	Analyte	L1006655-1	WATER	18-MAY-11		
WATER		REACH 7 OVERFLOW U/S ROAD	REACH 7 OVERFLOW D/S ROAD	REACH 6 BC EXPOSURE POINT (ABOVE)	UPPER REACH 3 (D/S OF BRIDGE)	UPPER REACH 2 (POOL)
Physical Tests	Total Suspended Solids (mg/L)	<3.0	11.0	79.0	72.0	72.0
	Turbidity (NTU)	7.69	30.7	491	130	129

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1006655-6 WATER 18-MAY-11 UPPER REACH 1 (U/S CULVERT)	L1006655-7 WATER 18-MAY-11 SNP 43-5	L1006655-8 WATER 18-MAY-11 REACH 0 (BC MOUTH)		
Grouping	Analyte					
WATER						
Physical Tests	Total Suspended Solids (mg/L)	66.0	67.0	98.0		
	Turbidity (NTU)	117	149	160		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

1

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.



L/006655

COC #

Page of

Report To				Report Format / Distribution				Service Requested (Rush for routine analysis subject to availability)											
Company: Deton'Cho/Nuna Joint Venture AND Golder As. Ltd.				<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Other				<input type="radio"/> Regular (Standard Turnaround Times - Business Days)											
Contact: DCNJV: Katrina Nokleby; Golder: Justine Crowe				<input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax				<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT											
Address:				Email 1: jcrowe@golder.com				<input checked="" type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT											
				Email 2: hmachtans@golder.com				<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT											
Phone: 867 669 6735 Fax:				Email 3: KatrinaN@nunalogistics.com				Analysis Request											
Invoice To Same as Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				Client / Project Information				Please indicate below Filtered, Preserved or both (F, P, F/P)											
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				Job #: 09-1427-0006															
Company: Deton'Cho/Nuna Joint Venture				PO / AFE: 606989															
Contact: Brenda Kalls				LSD:															
Address: 9838-31st Avenue., Edmonton AB, T6N 1C5																			
Phone: 780 408 2897 Fax: 780 408 5472				Quote #:															
Lab Work Order # (lab use only)				ALS Contact: Can Dang		Sampler: Justine Crowe													
Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Physical Parameters	Major Ions	Cyanide	TSS and Turbidity	Nutrients	NH3 / TKN	Oil and Grease	TOC	DOC	Low Level Total Metals	Low Level Dissolved Metals	Sulphide	Number of Containers		
	Reach 7 Overflow u/s Road	18-May-11		Surface Water				X									1		
	Reach 7 Overflow d/s Road	18-May-11		Surface Water				X									1		
	Reach 6 BC Exposure Point (Above)	18-May-11		Surface Water				X									1		
	Reach 4 (Plant Pool)	18-May-11		Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	1		
	Upper Reach 3 (d/s of bridge)	18-May-11		Surface Water				X									1		
	Upper Reach 2 (pool)	18-May-11		Surface Water				X									1		
	Upper Reach 1 (u/s culvert)	18-May-11		Surface Water				X									1		
	SNP43-5	18-May-11		Surface Water				X									1		
	Reach 0 (BC Mouth)	18-May-11		Surface Water				X									1		
	SNP43-11	18-May-11		Surface Water				X									1		
Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details																			
Please Analyze As and Se by Hydride*. Note - This water might contain high amounts of metals. All Samples are RUSH / EMERGENCY!!!!																			
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 provided on a separate Excel tab.																			
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.																			
SHIPMENT RELEASE (client use)				SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)											
Released by:	Date (dd-mmm-yy)	Time (hh:mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:									
<i>J. Crowe</i>	18-May-11	16:10	<i>RJS</i>	18-May-11	16:10	6.6 °C				Yes / No ? If Yes add SIF									



GOLDER ASSOCIATES LTD
ATTN: JUSTINE CROWE
9 - 4905 48 Street
Yellowknife NT X1A 3S3

Date Received: 18-MAY-11
Report Date: 25-MAY-11 15:35 (MT)
Version: FINAL

Client Phone: 897-669-6735

Certificate of Analysis

Lab Work Order #: L1006658
Project P.O. #: 606989
Job Reference: 09-1427-0006
Legal Site Desc:
C of C Numbers: 1

Shannon Luchka
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1006658-1 WATER 18-MAY-11 REACH 4 (GIANT POOL)				
Grouping	Analyte						
WATER							
Physical Tests	Total Suspended Solids (mg/L)	72.0					
	Total Dissolved Solids (mg/L)	123					
	Turbidity (NTU)	142					
Anions and Nutrients	Acidity (as CaCO ₃) (mg/L)	<5.0					
	Alkalinity, Total (as CaCO ₃) (mg/L)	45.8					
	Ammonia (as N) (mg/L)	0.145					
	Bicarbonate (HCO ₃) (mg/L)	55.9					
	Bromide (Br) (mg/L)	<0.10					
	Carbonate (CO ₃) (mg/L)	<5.0					
	Chloride (Cl) (mg/L)	5.34					
	Conductivity (EC) (uS/cm)	160					
	Fluoride (F) (mg/L)	<0.050					
	Hardness (as CaCO ₃) (mg/L)	64.9					
	Hydroxide (OH) (mg/L)	<5.0					
	Ion Balance (%)	97.4					
	Nitrate and Nitrite (as N) (mg/L)	0.0503					
	Nitrate (as N) (mg/L)	0.0475					
	Nitrite (as N) (mg/L)	0.0028					
	Total Kjeldahl Nitrogen (mg/L)	1.03					
	pH (pH)	7.89					
	Phosphorus (P)-Total Dissolved (mg/L)	0.0080					
	Phosphorus (P)-Total (mg/L)	0.0995					
	TDS (Calculated) (mg/L)	84.2					
	Sulfate (SO ₄) (mg/L)	22.9					
	Sulphide (mg/L)	0.0027					
Cyanides	Cyanide, Total (mg/L)	0.0080					
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	11.8					
	Total Organic Carbon (mg/L)	12.5					
Total Metals	Aluminum (Al)-Total (mg/L)	2.21					
	Antimony (Sb)-Total (mg/L)	0.124					
	Arsenic (As)-Total (mg/L)	0.346					
	Barium (Ba)-Total (mg/L)	0.0177					
	Beryllium (Be)-Total (mg/L)	<0.0010					
	Bismuth (Bi)-Total (mg/L)	<0.00020					
	Boron (B)-Total (mg/L)	<0.020					
	Cadmium (Cd)-Total (mg/L)	0.00052					

* 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	L1006658-1 WATER 18-MAY-11 REACH 4 (GIANT POOL)				
Grouping	Analyte						
WATER							
Total Metals	Calcium (Ca)-Total (mg/L)	22.0					
	Chromium (Cr)-Total (mg/L)	0.00524					
	Cobalt (Co)-Total (mg/L)	0.00318					
	Copper (Cu)-Total (mg/L)	0.0342					
	Iron (Fe)-Total (mg/L)	4.17					
	Lead (Pb)-Total (mg/L)	0.0660					
	Magnesium (Mg)-Total (mg/L)	6.22					
	Manganese (Mn)-Total (mg/L)	0.447					
	Mercury (Hg)-Total (mg/L)	0.000030					
	Molybdenum (Mo)-Total (mg/L)	0.00111					
	Nickel (Ni)-Total (mg/L)	0.00969					
	Potassium (K)-Total (mg/L)	1.89					
	Selenium (Se)-Total (mg/L)	<0.00040					
	Silver (Ag)-Total (mg/L)	<0.00040					
	Sodium (Na)-Total (mg/L)	4.0					
	Strontium (Sr)-Total (mg/L)	0.0624					
	Thallium (Tl)-Total (mg/L)	<0.00010					
	Tin (Sn)-Total (mg/L)	<0.00040					
	Titanium (Ti)-Total (mg/L)	0.0430					
	Uranium (U)-Total (mg/L)	0.00048					
	Vanadium (V)-Total (mg/L)	0.00583					
	Zinc (Zn)-Total (mg/L)	0.0936					
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.014					
	Antimony (Sb)-Dissolved (mg/L)	0.0233					
	Arsenic (As)-Dissolved (mg/L)	0.0707					
	Barium (Ba)-Dissolved (mg/L)	0.00526					
	Beryllium (Be)-Dissolved (mg/L)	<0.00050					
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050					
	Boron (B)-Dissolved (mg/L)	0.0131					
	Cadmium (Cd)-Dissolved (mg/L)	0.00015					
	Calcium (Ca)-Dissolved (mg/L)	18.6					
	Chromium (Cr)-Dissolved (mg/L)	<0.00040					
	Cobalt (Co)-Dissolved (mg/L)	0.00109					
	Copper (Cu)-Dissolved (mg/L)	0.00929					
	Iron (Fe)-Dissolved (mg/L)	0.045					
	Lead (Pb)-Dissolved (mg/L)	0.00092					
	Magnesium (Mg)-Dissolved (mg/L)	4.48					

* 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		L1006658-1 WATER 18-MAY-11 REACH 4 (GIANT POOL)				
Grouping	Analyte					
WATER						
Dissolved Metals	Manganese (Mn)-Dissolved (mg/L)	0.344				
	Mercury (Hg)-Dissolved (mg/L)	<0.000020				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00098				
	Nickel (Ni)-Dissolved (mg/L)	0.00318				
	Potassium (K)-Dissolved (mg/L)	1.50				
	Selenium (Se)-Dissolved (mg/L)	<0.00040				
	Silver (Ag)-Dissolved (mg/L)	<0.00020				
	Sodium (Na)-Dissolved (mg/L)	3.7				
	Strontium (Sr)-Dissolved (mg/L)	0.0541				
	Thallium (Tl)-Dissolved (mg/L)	<0.000050				
	Tin (Sn)-Dissolved (mg/L)	<0.00020				
	Titanium (Ti)-Dissolved (mg/L)	0.00045				
	Uranium (U)-Dissolved (mg/L)	0.00040				
	Vanadium (V)-Dissolved (mg/L)	0.00021				
	Zinc (Zn)-Dissolved (mg/L)	0.0150				
Aggregate Organics	Oil and Grease (mg/L)	<1.0				

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

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects
E	Matrix Spike recovery outside ALS DQO due to analyte background in sample.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-ED	Water	Acidity (as CaCO ₃)	APHA 2310 B - Potentiometric Titration
BR-IC-ED	Water	Bromide by IC	APHA 4110 B-ION CHROMATOGRAPHY
C-DIS-ORG-ED	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
C-TOT-ORG-ED	Water	Total Organic Carbon	APHA 5310 B-Instrumental
CL-IC-ED	Water	Chloride by IC	APHA 4110 B-ION CHROMATOGRAPHY
CN-TOT-YL	Water	Cyanide, Total	APHA 4500 CN-O
Total Cyanide in Water: Simple cyanides are converted to hydrogen cyanide (HCN) by distillation. Complex cyanides are not easily decomposed. Low power UV radiation is used to break down organic, metallic and alkali complexed compounds to free cyanide. The distillation step isolates HCN from simple cyanides under specific acidic conditions. The liberated HCN is converted to cyanogen chloride with chloramine-T. This further reacts with barbituric acid and isonicotinic acid to form a highly coloured complex.			
F-IC-ED	Water	Fluoride by IC	APHA 4110 B-ION CHROMATOGRAPHY
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)	EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation	APHA 1030E
MET-D-L-ICP-ED	Water	Diss. Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
NH3-L-CFA-ED	Water	Ammonia in Water by Colour	APHA 4500 NH3-NITROGEN (AMMONIA)
This analysis is carried out using procedures adapted from APHA Method 4500 NH3 "NITROGEN (AMMONIA)". Ammonia is determined using the automated phenate colourimetric method.			
NO2+NO3-L-CFA-ED	Water	Nitrite & Nitrate in Water by Colour	APHA 4500 NO3-F
This analysis is carried out using procedures adapted from APHA Method 4500 NO3-F "Automated Cadmium Reduction Method".			
NO2-L-CFA-ED	Water	Nitrite in Water by Colour	APHA 4500 NO2-A and NO3-F
This analysis is carried out using procedures adapted from APHA Method 4500 NO3-F "Automated Cadmium Reduction Method", omitting the Cu-Cd reduction step to be selective for nitrite.			
NO3-L-CALC-ED	Water	Nitrate in Water (Calculation)	APHA 4500 NO3-F
Nitrate (as N) is a calculated parameter. Nitrate (as N) = [Nitrate and Nitrite (as N)] - Nitrite (as N).			
OGG-ED	Water	Oil and Grease-Gravimetric	APHA 5520 G HEXANE MTBE EXT. GRAVIME
P-T-L-COL-ED	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
P-TD-L-COL-ED	Water	Total Dissolved P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.			
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
SO4-L-IC-ED	Water	Sulfate by IC (Low Level)	APHA 4110 B-ION CHROMATOGRAPHY
SOLIDS-TDS-ED	Water	Total Dissolved Solids	APHA 2540 C
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
SULPHIDE-ED	Water	Sulphide	APHA 4500 -S E-Auto-Colorimetry
TKN-L-CFA-ED	Water	TKN in Water by Colour	APHA 4500-NORG (TKN)
This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined by sample digestion at 380 celcius with analysis using an automated colourimetric finish.			
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

Reference Information

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
YL	ALS ENVIRONMENTAL - YELLOWKNIFE, NW, CANADA

Chain of Custody Numbers:

1

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 ww - 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.



L1006658

COC #

Page ____ of ____

Report To		F		Service Requested (Rush for routine analysis subject to availability)															
Company: Deton/Cho/Nuna Joint Venture AND Golder As. Ltd.		<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Other		<input type="radio"/> Regular (Standard Turnaround Times - Business Days)															
Contact: DCNJV: Katrina Nokleby; Golder: Justine Crowe		<input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax		<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT															
Address:		Email 1: jcrowe@golder.com		<input checked="" type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT															
		Email 2: hmachtans@golder.com		<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT															
Phone: 867 669 6735 Fax:		Email 3: KatrinaN@nunalogistics.com		Analysis Request															
Invoice To Same as Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Client / Project Information		Please indicate below Filtered, Preserved or both (F, P, F/P)															
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Job #: 09-1427-0006																	
Company: Deton/Cho/Nuna Joint Venture		PO / AFE: 606989																	
Contact: Brenda Kalis		LSD:																	
Address: 9838-31st Avenue., Edmonton AB, T6N 1C5																			
Phone: 780 408 2897 Fax: 780 408 5472		Quote #:																	
Lab Work Order # (lab use only)		ALS Contact: Can Dang		Sampler: Justine Crowe															
Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Physical Parameters	Major Ions	Cyanide	TSS and Turbidity	Nutrients	NH3 / TKN	Oil and Grease	TOC	DOC	Low Level Total Metals	Low Level Dissolved Metals	Sulphide	Number of Containers		
	Reach 3 (Surface Water)	18-May-11		Surface Water				X									1		
	Reach 5 (Surface Water)	18-May-11		Surface Water				X									1		
	Reach 6 (BC Exposure Unit (Pilot))	18-May-11		Surface Water				X									1		
	Reach 4 (Giant Pool)	18-May-11		Surface Water	X	X	X	X	X	X	X	X	X	X	X	X	9		
	Upper Reach 1 (URS or bridge)	18-May-11		Surface Water				X									1		
	Upper Reach 2 (pool)	18-May-11		Surface Water				X									1		
	Upper Reach 1 (URS culvert)	18-May-11		Surface Water				X									1		
	SNP 10-9	18-May-11		Surface Water				X									1		
	Reach 9 (BC Mouth)	18-May-11		Surface Water				X									1		
	SNP 13-11	18-May-11		Surface Water				X									1		
Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details																			
Please Analyze As and Se by Hydride*. Note - This water might contain high amounts of metals. All Samples are RUSH / EMERGENCY!!!!																			
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 provided on a separate Excel tab.																			
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.																			
SHIPMENT RELEASE (client use)				SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)											
Released by:	Date (dd-mmm-yy)	Time (hh-mm)		Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:		Observations:							
J. Crowe	18-May	16:10			18-May	16:10	6.6 °C					Yes / No ?							
													If Yes add SIF						



Golder Associates Ltd.
ATTN: Justine Crowe
9 - 4905 48 Street
Yellowknife NT X1A 3S3

Date Received: 20-MAY-11
Report Date: 21-MAY-11 14:17 (MT)
Version: FINAL

Client Phone: 867-873-6319

Certificate of Analysis

Lab Work Order #: L1007648
Project P.O. #: 606989
Job Reference: 09-1427-0006
Legal Site Desc:
C of C Numbers:

Shannon Luchka
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1007648-1 SURFACE WATE 19-MAY-11 11:05 REACH 2 (POOL)	L1007648-2 SURFACE WATE 19-MAY-11 10:40 REACH 4 (GIANT POOL)	L1007648-3 SURFACE WATE 19-MAY-11 10:25 REACH 6 BC EXPOSURE POINT (ABOVE)	L1007648-4 SURFACE WATE 19-MAY-11 11:40 REACH 0 (BC MOUTH)	
Grouping	Analyte					
WATER						
Physical Tests	Total Suspended Solids (mg/L)	36.0	29.0	460	55.0	
	Turbidity (NTU)	63.8	53.0	468	67.9	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, 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 ww - 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.

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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.

[illegible]



DETON'CHO \ NUNA JOINT VENTURE
ATTN: KATRINA NOKLEBY AND GOLDER
GIANT MINESITE
PO BOX 2951
Yellowknife NT X1A 2R2

Date Received: 20-MAY-11
Report Date: 26-MAY-11 18:24 (MT)
Version: FINAL

Client Phone: 604-253-4188

Certificate of Analysis

Lab Work Order #: L1007649
Project P.O. #: 606989
Job Reference: 09-1427-0006
Legal Site Desc:
C of C Numbers: 1

Comments:

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1007649-1 WATER 20-MAY-11 SNP 43-5	L1007649-2 20-MAY-11 FIELD BLANK	L1007649-3 20-MAY-11 TRAVEL BLANK	L1007649-4 20-MAY-11 REACH 0 (BC MOUTH)	L1007649-5 20-MAY-11 REACH 4 (GIANT POOL)
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	74.0	0.57	<0.50		
	Total Suspended Solids (mg/L)	41.1	<1.0	<1.0	53.2	26.8
	Total Dissolved Solids (mg/L)	125	<3.0	<3.0		
	Turbidity (NTU)	47.1	0.34	0.27	48.4	30.3
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	3.2	1.8	2.9		
	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	45.6	1.1	<1.0		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	45.6	1.1	<1.0		
	Ammonia (as N) (mg/L)	0.0922	<0.0050	<0.0050		
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050		
	Chloride (Cl) (mg/L)	8.80	<0.50	<0.50		
	Fluoride (F) (mg/L)	0.074	<0.020	<0.020		
	Nitrate and Nitrite (as N) (mg/L)	0.0458	<0.0051	<0.0051		
	Nitrate (as N) (mg/L)	0.0458	<0.0050	<0.0050		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.852	<0.050	<0.050		
	Phosphorus (P)-Total Dissolved (mg/L)	0.0083	<0.0020	<0.0020		
	Phosphorus (P)-Total (mg/L)	0.0677	<0.0020	<0.0020		
	Sulfate (SO4) (mg/L)	28.7	<0.50	<0.50		
	Sulphide as S (mg/L)	<0.020	<0.020	<0.020		
Cyanides	Cyanide, Total (mg/L)	0.0059	<0.0050	<0.0050		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	11.0	<0.50	<0.50		
	Total Organic Carbon (mg/L)	12.2	0.59 ^{RRV}	0.60 ^{RRV}		
Total Metals	Aluminum (Al)-Total (mg/L)	1.37	<0.0030	<0.0030		
	Antimony (Sb)-Total (mg/L)	0.0554	<0.00010	<0.00010		
	Arsenic (As)-Total (mg/L)	0.180	<0.00010	<0.00010		
	Barium (Ba)-Total (mg/L)	0.021	<0.010	<0.010		
	Beryllium (Be)-Total (mg/L)	<0.0050	<0.0050	<0.0050		
	Bismuth (Bi)-Total (mg/L)	<0.20	<0.20	<0.20		
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10		
	Cadmium (Cd)-Total (mg/L)	0.000167	<0.000050	<0.000050		
	Calcium (Ca)-Total (mg/L)	21.9	<0.050	<0.050		
	Chromium (Cr)-Total (mg/L)	<0.010	<0.010	<0.010		
	Cobalt (Co)-Total (mg/L)	<0.010	<0.010	<0.010		
	Copper (Cu)-Total (mg/L)	0.0181	<0.00050	<0.00050		

* 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		L1007649-6 20-MAY-11 REACH 2 (POOL)	L1007649-7 20-MAY-11 REACH 6 EXPOSURE POINT (ABOVE)		
Grouping	Analyte				
WATER					
Physical Tests	Hardness (as CaCO3) (mg/L)				
	Total Suspended Solids (mg/L)	43.6	517		
	Total Dissolved Solids (mg/L)				
	Turbidity (NTU)	44.2	349		
Anions and Nutrients	Acidity (as CaCO3) (mg/L)				
	Alkalinity, Bicarbonate (as CaCO3) (mg/L)				
	Alkalinity, Carbonate (as CaCO3) (mg/L)				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)				
	Alkalinity, Total (as CaCO3) (mg/L)				
	Ammonia (as N) (mg/L)				
	Bromide (Br) (mg/L)				
	Chloride (Cl) (mg/L)				
	Fluoride (F) (mg/L)				
	Nitrate and Nitrite (as N) (mg/L)				
	Nitrate (as N) (mg/L)				
	Nitrite (as N) (mg/L)				
	Total Kjeldahl Nitrogen (mg/L)				
	Phosphorus (P)-Total Dissolved (mg/L)				
	Phosphorus (P)-Total (mg/L)				
	Sulfate (SO4) (mg/L)				
	Sulphide as S (mg/L)				
Cyanides	Cyanide, Total (mg/L)				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)				
	Total Organic Carbon (mg/L)				
Total Metals	Aluminum (Al)-Total (mg/L)				
	Antimony (Sb)-Total (mg/L)				
	Arsenic (As)-Total (mg/L)				
	Barium (Ba)-Total (mg/L)				
	Beryllium (Be)-Total (mg/L)				
	Bismuth (Bi)-Total (mg/L)				
	Boron (B)-Total (mg/L)				
	Cadmium (Cd)-Total (mg/L)				
	Calcium (Ca)-Total (mg/L)				
	Chromium (Cr)-Total (mg/L)				
	Cobalt (Co)-Total (mg/L)				
	Copper (Cu)-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	L1007649-1 WATER 20-MAY-11 SNP 43-5	L1007649-2 20-MAY-11 FIELD BLANK	L1007649-3 20-MAY-11 TRAVEL BLANK	L1007649-4 20-MAY-11 REACH 0 (BC MOUTH)	L1007649-5 20-MAY-11 REACH 4 (GIANT POOL)
Grouping	Analyte						
WATER							
Total Metals	Iron (Fe)-Total (mg/L)	2.10	<0.010	<0.010			
	Lead (Pb)-Total (mg/L)	0.0206	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.010	<0.010	<0.010			
	Magnesium (Mg)-Total (mg/L)	6.04	<0.10	<0.10			
	Manganese (Mn)-Total (mg/L)	0.335	<0.0050	<0.0050			
	Mercury (Hg)-Total (mg/L)	0.000011	<0.000010	<0.000010			
	Molybdenum (Mo)-Total (mg/L)	0.000932	<0.000050	<0.000050			
	Nickel (Ni)-Total (mg/L)	0.00638	<0.00050	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0			
	Selenium (Se)-Total (mg/L)	0.00010	<0.00010	<0.00010			
	Silicon (Si)-Total (mg/L)	2.73	<0.050	<0.050			
	Silver (Ag)-Total (mg/L)	<0.010	<0.010	<0.010			
	Sodium (Na)-Total (mg/L)	5.5	<2.0	<2.0			
	Strontium (Sr)-Total (mg/L)	0.0784	<0.0050	<0.0050			
	Thallium (Tl)-Total (mg/L)	<0.20	<0.20	<0.20			
	Tin (Sn)-Total (mg/L)	<0.030	<0.030	<0.030			
	Titanium (Ti)-Total (mg/L)	0.037	<0.010	<0.010			
	Uranium (U)-Total (mg/L)	0.000597	<0.000010	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.030	<0.030	<0.030			
	Zinc (Zn)-Total (mg/L)	0.0379	<0.0040	<0.0040			
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.0116	<0.0030	<0.0030			
	Antimony (Sb)-Dissolved (mg/L)	0.0228	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	0.0715	<0.00010	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.010	<0.010	<0.010			
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050			
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20			
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10			
	Cadmium (Cd)-Dissolved (mg/L)	0.000081	<0.000050	<0.000050			
	Calcium (Ca)-Dissolved (mg/L)	21.0	0.229	<0.050			
	Chromium (Cr)-Dissolved (mg/L)	<0.010	<0.010	<0.010			
	Cobalt (Co)-Dissolved (mg/L)	<0.010	<0.010	<0.010			
	Copper (Cu)-Dissolved (mg/L)	0.00722	<0.00050	<0.00050			
	Iron (Fe)-Dissolved (mg/L)	0.059	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	0.000741	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	<0.010	<0.010	<0.010			
	Magnesium (Mg)-Dissolved (mg/L)	5.23	<0.10	<0.10			

* 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	L1007649-6 20-MAY-11 REACH 2 (POOL)	L1007649-7 20-MAY-11 REACH 6 EXPOSURE POINT (ABOVE)		
Grouping	Analyte					
WATER						
Total Metals	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					
	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
Dissolved Metals	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)					
	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)					

* 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		L1007649-1 WATER 20-MAY-11 SNP 43-5	L1007649-2 20-MAY-11 FIELD BLANK	L1007649-3 20-MAY-11 TRAVEL BLANK	L1007649-4 20-MAY-11 REACH 0 (BC MOUTH)	L1007649-5 20-MAY-11 REACH 4 (GIANT POOL)
Grouping	Analyte					
WATER						
Dissolved Metals	Manganese (Mn)-Dissolved (mg/L)	0.300	<0.0050	<0.0050		
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		
	Molybdenum (Mo)-Dissolved (mg/L)	0.000865	<0.000050	<0.000050		
	Nickel (Ni)-Dissolved (mg/L)	0.00341	<0.00050	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30		
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0		
	Selenium (Se)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Silicon (Si)-Dissolved (mg/L)	0.550	<0.050	<0.050		
	Silver (Ag)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Sodium (Na)-Dissolved (mg/L)	5.2	<2.0	<2.0		
	Strontium (Sr)-Dissolved (mg/L)	0.0736	<0.0050	<0.0050		
	Thallium (Tl)-Dissolved (mg/L)	<0.20	<0.20	<0.20		
	Tin (Sn)-Dissolved (mg/L)	<0.030	<0.030	<0.030		
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010		
	Uranium (U)-Dissolved (mg/L)	0.000530	<0.000010	<0.000010		
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.030	<0.030		
	Zinc (Zn)-Dissolved (mg/L)	0.0088	<0.0040	<0.0040		

* 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		L1007649-6 20-MAY-11 REACH 2 (POOL)	L1007649-7 20-MAY-11 REACH 6 EXPOSURE POINT (ABOVE)			
Grouping	Analyte					
WATER						
Dissolved Metals	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)					
	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)					

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

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity
This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.			
ALK-PCT-VA	Water	Alkalinity by Auto. 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.			
ALK-PCT-VA	Water	Alkalinity by Auto. 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.			
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
ANIONS-N+N-CALC-VA	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.			
ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0
This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.			
ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B.
This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".			
AS-D-CCMS-VA	Water	Dissolved Arsenic in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
AS-T-CCMS-VA	Water	Total Arsenic in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CN-T-MID-HH-COL-VA	Water	Total Cyanide by HH Distillation	APHA 4500-CN Cyanide
This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method.			

Reference Information

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 CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-DIS-LOW-CVAFS-VA	Water	Dissolved Mercury in Water by CVAFS(Low)	EPA SW-846 3005A & EPA 245.7
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 procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and 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 (EPA Method 245.7).			
HG-TOT-LOW-CVAFS-VA	Water	Total Mercury in Water by CVAFS(Low)	EPA 245.7
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 (EPA Method 245.7).			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B
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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-DIS-LOW-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA 3005A/6010B
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 filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A
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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).			
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-TOT-LOW-ICP-VA	Water	Total Metals in Water by ICPOES	EPA 3005A/6010B
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 procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
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.			
OGG-LL-SF-VA	Water	Oil & Grease by Gravimetric	BCMOE GRAVIMETRIC
This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510 & 9071, published by the United States Environmental Protection Agency (EPA), "Standard Methods for the Examination of Water and Wastewater", 20th ed., Method 5520, published by the American Public Health Association, and "BC Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials," 5th ed., published by the B.C. Ministry of Environment, Lands & Parks, 1994. The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease. ALS Environmental's routine detection limit, or Limit of Reporting (LOR), for this method is 2 mg/L for a 1L sample volume. By request, a LOR of 1 mg/L is sometimes applied for this method. The 1 mg/L LOR is equal to the 99% confidence limit Method Detection Limit as defined by the US EPA. A higher degree of variability is expected at levels below 2 mg/L.			
P-T-COL-VA	Water	Total P in Water by Colour	APHA 4500-P Phosphorous
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorous is determined colourimetrically after persulphate digestion of the sample.			
P-TD-COL-VA	Water	Total Dissolved P in Water by Colour	APHA 4500-P Phosphorous

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Dissolved Phosphorous is determined colourimetrically after persulphate digestion of a sample that has been lab or field filtered through a 0.45 micron membrane filter.

S2-T-COL-VA Water Total Sulphide by Colorimetric APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methylene blue colourimetric method.

SE-D-CCMS-VA Water Dissolved Selenium in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

SE-T-CCMS-VA Water Total Selenium in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

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 procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540 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.

TKN-SIE-VA Water TKN in Water by SIE APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total Kjeldahl Nitrogen is determined using an ammonia selective electrode.

TSS-LOW-VA Water Total Suspended Solids by Grav. (1 mg/L) APHA 2540 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.

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.

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
VA	ALS ENVIRONMENTAL - VANCOUVER, BC, CANADA

Chain of Custody Numbers:

1

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.



Form

COC # _____

Page ____ of ____

Report To _____

Servic _____

(bblty)

Rep _____

F/P)

Ad _____

Phone: _____

Quote #: _____

Lab Work Order #

(lab use only)

L1007649

ALS

Contact:

Can Dang

Sampler:

Justine Crowe

Sample

#

Sample Identification

(This description will appear on the report)

Date

(dd-mm-yy)

Time

(hh:mm)

Sample Type

Physical Param

Major Ions

Cyanide

SS and Turbidity

Nutrients

NH3 / TKN

Oil and Grease

TOC

DOC

Low Level Total Metals

Low Level Dissolved Metals

Sulphide

Number of Containers

	X	X	X	X	X	X	X	X	X	X	X	X	X	9
Field Blank	X	X	X	X	X	X	X	X	X	X	X	X	X	9
Travel Blank	X	X	X	X	X	X	X	X	X	X	X	X	X	9
			X											1
			X											1
			X											1
			X											1

3 Tier 1 - Natural, etc) / Hazardous Details

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)

SHIPMENT RECEPTION (lab use only)

SHIPMENT VERIFICATION (lab use only)

Released by:	Date (dd-mm-yy)	Time (hh:mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations:
J. Crowe	May 20 11	13:50	TLB	22-May-11	13:50	5 °C				Yes / No ? If Yes add SIF

GENE 18 01 Front



GOLDER ASSOCIATES LTD
ATTN: Justine Crowe
9 - 4905 48 Street
Yellowknife NT X1A 3S3

Date Received: 24-MAY-11
Report Date: 27-MAY-11 20:37 (MT)
Version: FINAL

Client Phone: 867-873-6319

Certificate of Analysis

Lab Work Order #: L1008512
Project P.O. #: 606989
Job Reference: 09-1427-0006-20000-20500
Legal Site Desc:
C of C Numbers: 1

Shannon Luchka
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1008512-1 WATER 24-MAY-11 YK BACK BAY 1	L1008512-2 WATER 24-MAY-11 YK BACK BAY 2	L1008512-3 WATER 24-MAY-11 SNP 43-5 (ABOVE)	L1008512-4 WATER 24-MAY-11 REACH 4 (D/S GIANT POOL)	L1008512-5 WATER 24-MAY-11 REACH 2 (POOL)
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	28.4	26.8	68.1		
	Total Suspended Solids (mg/L)	<3.0	<3.0	37.0	70.0	72.0
	Turbidity (NTU)	5.78	5.48	37.7	53.1	51.4
Total Metals	Aluminum (Al)-Total (mg/L)	0.172	0.161	1.06		
	Antimony (Sb)-Total (mg/L)	0.00080	0.00068	0.0314		
	Arsenic (As)-Total (mg/L)	0.00294	0.00299	0.133		
	Barium (Ba)-Total (mg/L)	0.00843	0.00880	0.0194		
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.0010		
	Bismuth (Bi)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Boron (B)-Total (mg/L)	<0.020	<0.020	<0.020		
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020		
	Calcium (Ca)-Total (mg/L)	7.28	5.08	18.2		
	Chromium (Cr)-Total (mg/L)	<0.00080	<0.00080	<0.00080		
	Cobalt (Co)-Total (mg/L)	<0.00020	<0.00020	0.00191		
	Copper (Cu)-Total (mg/L)	0.0012	0.0012	0.0125		
	Iron (Fe)-Total (mg/L)	0.182	0.123	1.57		
	Lead (Pb)-Total (mg/L)	0.00020	0.00024	0.00734		
	Magnesium (Mg)-Total (mg/L)	2.54	1.74	4.99		
	Manganese (Mn)-Total (mg/L)	0.0060	0.0052	0.267		
	Mercury (Hg)-Total (mg/L)	0.000057	<0.000020	<0.000020		
	Molybdenum (Mo)-Total (mg/L)	0.00014	0.00013	0.00116		
	Nickel (Ni)-Total (mg/L)	0.00069	<0.00020	0.00703		
	Potassium (K)-Total (mg/L)	1.10	0.74	1.54		
	Selenium (Se)-Total (mg/L)	<0.00040	<0.00040	<0.00040		
	Silver (Ag)-Total (mg/L)	<0.00040	<0.00040	<0.00040		
	Sodium (Na)-Total (mg/L)	2.5	1.8	4.5		
	Strontium (Sr)-Total (mg/L)	0.0295	0.0307	0.0745		
	Thallium (Tl)-Total (mg/L)	<0.00010	<0.00010	<0.00010		
	Tin (Sn)-Total (mg/L)	0.00072	<0.00040	<0.00040		
	Titanium (Ti)-Total (mg/L)	<0.0050	0.0052	0.0333		
	Uranium (U)-Total (mg/L)	0.00026	0.00028	0.00060		
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	0.00260		
	Zinc (Zn)-Total (mg/L)	<0.0040	<0.0040	0.0179		
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.016	0.013	0.011		
	Antimony (Sb)-Dissolved (mg/L)	0.00047	<0.00040	0.0246		
	Arsenic (As)-Dissolved (mg/L)	0.00201	0.00454 ^{RRV}	0.0905		
	Barium (Ba)-Dissolved (mg/L)	0.00684	0.00716	0.0111		

* 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		L1008512-1 WATER 24-MAY-11 YK BACK BAY 1	L1008512-2 WATER 24-MAY-11 YK BACK BAY 2	L1008512-3 WATER 24-MAY-11 SNP 43-5 (ABOVE)	L1008512-4 WATER 24-MAY-11 REACH 4 (D/S GIANT POOL)	L1008512-5 WATER 24-MAY-11 REACH 2 (POOL)
Grouping	Analyte					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.0035	0.0039	0.0120		
	Cadmium (Cd)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010		
	Calcium (Ca)-Dissolved (mg/L)	7.28	6.94	19.2		
	Chromium (Cr)-Dissolved (mg/L)	0.00177	0.00177	0.00157		
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00108		
	Copper (Cu)-Dissolved (mg/L)	0.00077	0.00078	0.00481		
	Iron (Fe)-Dissolved (mg/L)	0.014	<0.010	0.065		
	Lead (Pb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00055		
	Magnesium (Mg)-Dissolved (mg/L)	2.49	2.31	4.90		
	Manganese (Mn)-Dissolved (mg/L)	0.0026	0.0031	0.267		
	Mercury (Hg)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Molybdenum (Mo)-Dissolved (mg/L)	<0.00010	0.00011	0.00111		
	Nickel (Ni)-Dissolved (mg/L)	<0.0001	<0.0001	0.00630		
	Potassium (K)-Dissolved (mg/L)	1.08	1.03	1.48		
	Selenium (Se)-Dissolved (mg/L)	<0.00040	<0.00040	<0.00040		
	Silver (Ag)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Sodium (Na)-Dissolved (mg/L)	2.55	2.42	4.70		
	Strontium (Sr)-Dissolved (mg/L)	0.0306	0.0315	0.0806		
	Thallium (Tl)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Titanium (Ti)-Dissolved (mg/L)	0.00032	<0.00030	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.00024	0.00024	0.00055		
	Vanadium (V)-Dissolved (mg/L)	<0.00010	<0.00010	0.00023		
	Zinc (Zn)-Dissolved (mg/L)	0.0073	<0.0010	0.0051		

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

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)	EPA 245.7 / EPA 245.1
MET-D-ICP-ED	Water	Dissolved Metals in Water by ICPOES	APHA 3120 B-ICP-OES
MET-D-L-ICP-ED	Water	Diss. Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

1

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.

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Page of

Report To					
Company:	Deton/Cho/Nuna Joint Venture AND Golder As. Ltd.				
Contact:	DCNUJ: Katrina Nokleby; Golder: Justine Crowe				
Address:					
Phone:	867 669 6735 Fax:				
Invoice To	Same as Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Hardcopy of Invoice with Report?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Company:	Deton/Cho/Nuna Joint Venture				
Contact:	Brenda Kalis				
Address:	9838-31st Avenue., Edmonton AB, T6N 1C5				
Phone:	780 408 2897 Fax: 780 408 5472				
Lab Work Order #	(lab use only) L1008512				
Sample #	Sample Identification (This description will appear on the report)	ALS Contact:	Can Dang	Sampler:	Justine Crowe
			Date (dd-mm-yy)	Time (hh:mm)	Sample Type
	YK Back Bay 1		24-May-11		Surface Water
	YK Back Bay 2		24-May-11		Surface Water
	Reach 0 (d/s Mount)		24-May-11		Surface Water
	SNP43-5 (above)		24-May-11		Surface Water
	Reach 4 (d/s Giant Pool)		24-May-11		Surface Water
	Reach 2 (Pool)		24-May-11		Surface Water
Special Instructions / Regulations with water or land use (GCME-Freshwater Aquatic Life/BC CSR - Commercial/LAB Tier 1 - Natural, etc) / Hazardous Details					
Please Analyze As and Se by Hydride*. Please include Mercury in the metals analysis. Note - This water might contain high amounts of metals. All Samples are RUSH / EMERGENCY!!!!!! 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 provided on a separate Excel tab. Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.					
SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			
Released by:	J. Crowe	Date (dd-mm-yy)	4 May 11	Time (hh:mm)	Received by:
					24 May 11
					16:50
					5 °C
Verified by:		Date:		Time:	
Observations: Yes / No ? If Yes add SIF					
SHIPMENT VERIFICATION (lab use only)					



GOLDER ASSOCIATES LTD
ATTN: Justine Crowe
9 - 4905 48 Street
Yellowknife NT X1A 3S3

Date Received: 25-MAY-11
Report Date: 28-MAY-11 17:01 (MT)
Version: DRAFT REV. 2

Client Phone: 867-873-6319

Certificate of Analysis

Lab Work Order #: L1009010
Project P.O. #: 606989
Job Reference: 09-1427-0006-20000-20500
Legal Site Desc:
C of C Numbers: 1

Shannon Luchka
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1009010-1	REACH 6 (GIANT FALLS)							
Sampled By:	JC on 25-MAY-11							
Matrix:	WATER							
Hardness								
Dissolved Metals in Water by ICPOES								
Calcium (Ca)-Dissolved		10.6		0.50	mg/L		27-MAY-11	R2194912
Magnesium (Mg)-Dissolved		3.22		0.10	mg/L		27-MAY-11	R2194912
Hardness (from Dissolved Ca and Mg)								
Hardness (as CaCO3)		39.7		1.3	mg/L		27-MAY-11	
Dissolved Metals								
Diss. Metals in Water by ICPOES (Low)								
Calcium (Ca)-Dissolved		10.6		0.50	mg/L		27-MAY-11	R2194912
Iron (Fe)-Dissolved		0.051		0.010	mg/L		27-MAY-11	R2194912
Magnesium (Mg)-Dissolved		3.22		0.10	mg/L		27-MAY-11	R2194912
Manganese (Mn)-Dissolved		0.0392		0.0020	mg/L		27-MAY-11	R2194912
Potassium (K)-Dissolved		1.04		0.10	mg/L		27-MAY-11	R2194912
Sodium (Na)-Dissolved		2.52		0.50	mg/L		27-MAY-11	R2194912
Total Metals								
Total Metals in Water by ICPOES (Low)								
Calcium (Ca)-Total		10.7		0.50	mg/L		27-MAY-11	R2194913
Iron (Fe)-Total		0.211		0.010	mg/L		27-MAY-11	R2194913
Magnesium (Mg)-Total		3.17		0.10	mg/L		27-MAY-11	R2194913
Manganese (Mn)-Total		0.0481		0.0020	mg/L		27-MAY-11	R2194913
Potassium (K)-Total		1.11		0.10	mg/L		27-MAY-11	R2194913
Sodium (Na)-Total		2.8		1.0	mg/L		27-MAY-11	R2194913
Miscellaneous Parameters								
Mercury (Hg)-Total		<0.000020		0.000020	mg/L		28-MAY-11	R2195281
Mercury (Hg)-Dissolved		<0.000020		0.000020	mg/L		28-MAY-11	R2195281
Total Suspended Solids		<3.0		3.0	mg/L		27-MAY-11	R2194886
Turbidity		2.56		0.10	NTU		27-MAY-11	R2194859
L1009010-2	REACH 4 (D/S GIANT POOL)							
Sampled By:	JC on 25-MAY-11							
Matrix:	WATER							
Miscellaneous Parameters								
Total Suspended Solids		4.0		3.0	mg/L		27-MAY-11	R2194886
Turbidity		9.02		0.10	NTU		27-MAY-11	R2194859
L1009010-3	REACH 2 (POOL)							
Sampled By:	JC on 25-MAY-11							
Matrix:	WATER							
Miscellaneous Parameters								
Total Suspended Solids		33.0		3.0	mg/L		27-MAY-11	R2194886
Turbidity		40.3		0.10	NTU		27-MAY-11	R2194859
L1009010-4	SNP 43-5 (ABOVE)							
Sampled By:	JC on 25-MAY-11							
Matrix:	WATER							
Miscellaneous Parameters								
Total Suspended Solids		18.0		3.0	mg/L		27-MAY-11	R2194886
Turbidity		32.7		0.10	NTU		27-MAY-11	R2194859
L1009010-5	REACH 0 (BC MOUTH)							
Sampled By:	JC on 25-MAY-11							
Matrix:	WATER							
Miscellaneous Parameters								
Total Suspended Solids		23.0		3.0	mg/L		27-MAY-11	R2194886

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)	EPA 245.7 / EPA 245.1
MET-D-ICP-ED	Water	Dissolved Metals in Water by ICPOES	APHA 3120 B-ICP-OES
MET-D-L-ICP-ED	Water	Diss. Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

1

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

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

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

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.



Page ____ of ____

[illegible]



GOLDER ASSOCIATES LTD
ATTN: JUSTINE CROWE
9 - 4905 48 Street
Yellowknife NT X1A 3S3

Date Received: 27-MAY-11
Report Date: 30-MAY-11 16:00 (MT)
Version: FINAL

Client Phone: 897-669-6735

Certificate of Analysis

Lab Work Order #: L1010143
Project P.O. #: 606989
Job Reference: 09-1427-0006-20000-20500
Legal Site Desc:
C of C Numbers: 1

Shannon Luchka
Account Manager

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ADDRESS: 9936-67 Avenue, Edmonton, AB T6E 0P5 Canada | Phone: +1 780 413 5227 | Fax: +1 780 437 2311
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ALS ENVIRONMENTAL ANALYTICAL REPORT

30-MAY-11 16:00 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L1010143-1 WATER 27-MAY-11 REACH 6 (GIANT FALLS)	L1010143-2 WATER 27-MAY-11 REACH 5 (D/S POND)	L1010143-3 WATER 27-MAY-11 REACH 4 (D/S GIANT POOL)	L1010143-4 WATER 27-MAY-11 REACH 4 (D/S GIANT POOL) DUP	L1010143-5 WATER 27-MAY-11 REACH 4 (UNDER ICE)
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	33.1	45.4	51.4	51.6	44.5
	Total Suspended Solids (mg/L)	7.0	5.0	5.0	7.0	20.0
	Turbidity (NTU)	2.33	8.76	8.54	6.97	17.3
Total Metals	Aluminum (Al)-Total (mg/L)	0.102	0.231	0.239	0.247	0.481
	Antimony (Sb)-Total (mg/L)	0.00176	0.0178	0.0219	0.0221	0.0186
	Arsenic (As)-Total (mg/L)	0.0251	0.0869	0.0905	0.0935	0.0741
	Barium (Ba)-Total (mg/L)	0.00976	0.0110	0.0104	0.0108	0.0108
	Beryllium (Be)-Total (mg/L)	0.0012	0.0013	0.0010	0.0011	0.0017
	Bismuth (Bi)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Boron (B)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	9.47	11.7	12.9	12.9	12.0
	Chromium (Cr)-Total (mg/L)	<0.00080	<0.00080	<0.00080	<0.00080	0.00110
	Cobalt (Co)-Total (mg/L)	<0.00020	0.00089	0.00094	0.00099	0.00100
	Copper (Cu)-Total (mg/L)	<0.0010	0.0092	0.0095	0.0096	0.0089
	Iron (Fe)-Total (mg/L)	0.183	0.421	0.433	0.423	0.691
	Lead (Pb)-Total (mg/L)	0.00026	0.00483	0.00276	0.00295	0.00341
	Magnesium (Mg)-Total (mg/L)	2.94	3.48	3.69	3.64	3.46
	Manganese (Mn)-Total (mg/L)	0.0427	0.122	0.150	0.149	0.155
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Molybdenum (Mo)-Total (mg/L)	0.00065	0.00093	0.00123	0.00138	0.00116
	Nickel (Ni)-Total (mg/L)	0.00087	0.00324	0.00595	0.00630	0.00632
	Potassium (K)-Total (mg/L)	0.99	1.18	1.25	1.24	1.19
	Selenium (Se)-Total (mg/L)	<0.0020 ^{DLM}	<0.00040	<0.00040	<0.00040	<0.00040
	Silver (Ag)-Total (mg/L)	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
	Sodium (Na)-Total (mg/L)	2.1	2.9	3.3	3.2	3.0
	Strontium (Sr)-Total (mg/L)	0.0370	0.0525	0.0577	0.0595	0.0493
	Thallium (Tl)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
	Titanium (Ti)-Total (mg/L)	<0.0050	0.0079	0.0078	0.0084	0.0169
	Uranium (U)-Total (mg/L)	0.00026	0.00029	0.00036	0.00041	0.00036
	Vanadium (V)-Total (mg/L)	0.00057	0.00087	0.00093	0.00092	0.00138
	Zinc (Zn)-Total (mg/L)	0.0044	0.0147	0.0087	0.0101	0.0149
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.016	0.018
	Antimony (Sb)-Dissolved (mg/L)	0.00151	0.0159	0.0199	0.0193	0.0210
	Arsenic (As)-Dissolved (mg/L)	0.0178	0.0667	0.0697	0.0687	0.0669
	Barium (Ba)-Dissolved (mg/L)	0.00768	0.00978	0.00924	0.00875	0.00876

* 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		L1010143-6 WATER 27-MAY-11 REACH 2 (POOL)	L1010143-7 WATER 27-MAY-11 SNP 43-5 (ABOVE)	L1010143-8 WATER 27-MAY-11 REACH 0 (BC MOUTH)	L1010143-9 WATER 21-MAY-11 REACH 6 EXPOSURE POINT (ABOVE)	
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	53.1	59.6	55.3		
	Total Suspended Solids (mg/L)	11.0	10.0	12.0		
	Turbidity (NTU)	11.2	9.88	10.9		
Total Metals	Aluminum (Al)-Total (mg/L)	0.412	0.446	0.395	1.76	
	Antimony (Sb)-Total (mg/L)	0.0240	0.0279	0.0261	0.127	
	Arsenic (As)-Total (mg/L)	0.103	0.114	0.113	0.445	
	Barium (Ba)-Total (mg/L)	0.0127	0.0128	0.0126	0.0408	
	Beryllium (Be)-Total (mg/L)	<0.0010	0.0018	0.0017	0.0011	
	Bismuth (Bi)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Boron (B)-Total (mg/L)	<0.020	<0.020	<0.020	0.146	
	Cadmium (Cd)-Total (mg/L)	<0.00020	0.00021	<0.00020	0.00038	
	Calcium (Ca)-Total (mg/L)	12.5	16.1	14.8	50.0	
	Chromium (Cr)-Total (mg/L)	0.00088	0.00097	0.00097	0.00435	
	Cobalt (Co)-Total (mg/L)	0.00117	0.00151	0.00150	0.00698	
	Copper (Cu)-Total (mg/L)	0.0105	0.0100	0.0118	0.0242	
	Iron (Fe)-Total (mg/L)	0.541	0.733	0.604	3.65	
	Lead (Pb)-Total (mg/L)	0.00374	0.00334	0.00299	0.0497	
	Magnesium (Mg)-Total (mg/L)	3.45	4.29	3.94	16.5	
	Manganese (Mn)-Total (mg/L)	0.152	0.232	0.217	0.613	
	Mercury (Hg)-Total (mg/L)	<0.000020	<0.000020	<0.000020	0.000038	
	Molybdenum (Mo)-Total (mg/L)	0.00146	0.00167	0.00156	0.00280	
	Nickel (Ni)-Total (mg/L)	0.00753	0.00820	0.00810	0.0160	
	Potassium (K)-Total (mg/L)	1.09	1.20	1.29	3.74	
	Selenium (Se)-Total (mg/L)	<0.00040	<0.00040	0.00079	0.00079	
	Silver (Ag)-Total (mg/L)	<0.00040	<0.00040	<0.00040	<0.00040	
	Sodium (Na)-Total (mg/L)	3.2	3.8	3.8	15.9	
	Strontium (Sr)-Total (mg/L)	0.0640	0.0711	0.0715	0.215	
	Thallium (Tl)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Total (mg/L)	<0.00040	<0.00040	<0.00040	<0.00040	
	Titanium (Ti)-Total (mg/L)	0.0141	0.0143	0.0138	0.0208	
	Uranium (U)-Total (mg/L)	0.00044	0.00045	0.00048	0.00204	
	Vanadium (V)-Total (mg/L)	0.00123	0.00144	0.00124	0.00546	
	Zinc (Zn)-Total (mg/L)	0.0122	0.0108	0.0113	0.0646	
Dissolved Metals	Aluminum (Al)-Dissolved (mg/L)	0.014	0.011	0.011		
	Antimony (Sb)-Dissolved (mg/L)	0.0220	0.0242	0.0240		
	Arsenic (As)-Dissolved (mg/L)	0.0753	0.0824	0.0793		
	Barium (Ba)-Dissolved (mg/L)	0.00882	0.00968	0.00928		

* 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		L1010143-1 WATER 27-MAY-11 REACH 6 (GIANT FALLS)	L1010143-2 WATER 27-MAY-11 REACH 5 (D/S POND)	L1010143-3 WATER 27-MAY-11 REACH 4 (D/S GIANT POOL)	L1010143-4 WATER 27-MAY-11 REACH 4 (D/S GIANT POOL) DUP	L1010143-5 WATER 27-MAY-11 REACH 4 (UNDER ICE)
Grouping	Analyte					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Bismuth (Bi)-Dissolved (mg/L)	0.000080	0.000100	0.000070	0.000050	0.000075
	Boron (B)-Dissolved (mg/L)	0.0114	0.0158	0.0168	0.0166	0.0186
	Cadmium (Cd)-Dissolved (mg/L)	0.00023	0.00025	0.00010	0.00025	0.00024
	Calcium (Ca)-Dissolved (mg/L)	8.86	12.4	14.1	14.2	12.3
	Chromium (Cr)-Dissolved (mg/L)	<0.00040	0.00046	0.00051	0.00062	0.00083
	Cobalt (Co)-Dissolved (mg/L)	0.00013	0.00070	0.00084	0.00076	0.00076
	Copper (Cu)-Dissolved (mg/L)	0.00061	0.00529	0.00572	0.00590	0.00595
	Iron (Fe)-Dissolved (mg/L)	0.030	0.059	0.071	0.091	0.054
	Lead (Pb)-Dissolved (mg/L)	0.00027	0.00079	0.00125	0.00102	0.00080
	Magnesium (Mg)-Dissolved (mg/L)	2.66	3.52	3.96	3.93	3.38
	Manganese (Mn)-Dissolved (mg/L)	0.0084	0.106	0.152	0.147	0.140
	Mercury (Hg)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Molybdenum (Mo)-Dissolved (mg/L)	0.00079	0.00115	0.00139	0.00135	0.00160
	Nickel (Ni)-Dissolved (mg/L)	0.00074	0.00296	0.00579	0.00564	0.00652
	Potassium (K)-Dissolved (mg/L)	0.86	1.21	1.34	1.26	1.04
	Selenium (Se)-Dissolved (mg/L)	<0.0020 ^{DLM}	<0.00040	<0.00040	0.00049	0.00059
	Silver (Ag)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Sodium (Na)-Dissolved (mg/L)	1.92	3.03	3.47	3.46	2.88
	Strontium (Sr)-Dissolved (mg/L)	0.0315	0.0528	0.0590	0.0567	0.0599
	Thallium (Tl)-Dissolved (mg/L)	0.000265	0.000135	0.000120	0.000095	0.000090
	Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Titanium (Ti)-Dissolved (mg/L)	0.00181	0.00206	0.00231	0.00245	0.00220
	Uranium (U)-Dissolved (mg/L)	0.00022	0.00032	0.00041	0.00039	0.00041
	Vanadium (V)-Dissolved (mg/L)	0.00049	0.00056	0.00051	0.00056	0.00057
	Zinc (Zn)-Dissolved (mg/L)	0.0034	0.0058	0.0090	0.0070	0.0045

* 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		L1010143-6 WATER 27-MAY-11 REACH 2 (POOL)	L1010143-7 WATER 27-MAY-11 SNP 43-5 (ABOVE)	L1010143-8 WATER 27-MAY-11 REACH 0 (BC MOUTH)	L1010143-9 WATER 21-MAY-11 REACH 6 EXPOSURE POINT (ABOVE)	
Grouping	Analyte					
WATER						
Dissolved Metals	Beryllium (Be)-Dissolved (mg/L)	0.00234	0.00204	0.00205		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		
	Boron (B)-Dissolved (mg/L)	0.0189	0.0186	0.0192		
	Cadmium (Cd)-Dissolved (mg/L)	0.00021	0.00023	0.00023		
	Calcium (Ca)-Dissolved (mg/L)	14.7	16.7	15.5		
	Chromium (Cr)-Dissolved (mg/L)	0.00099	0.00124	0.00126		
	Cobalt (Co)-Dissolved (mg/L)	0.00089	0.00121	0.00118		
	Copper (Cu)-Dissolved (mg/L)	0.00585	0.00540	0.00527		
	Iron (Fe)-Dissolved (mg/L)	0.072	0.093	0.073		
	Lead (Pb)-Dissolved (mg/L)	0.00061	0.00073	0.00062		
	Magnesium (Mg)-Dissolved (mg/L)	3.96	4.36	4.02		
	Manganese (Mn)-Dissolved (mg/L)	0.168	0.230	0.216		
	Mercury (Hg)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020		
	Molybdenum (Mo)-Dissolved (mg/L)	0.00158	0.00163	0.00173		
	Nickel (Ni)-Dissolved (mg/L)	0.00691	0.00708	0.00716		
	Potassium (K)-Dissolved (mg/L)	1.24	1.33	1.23		
	Selenium (Se)-Dissolved (mg/L)	<0.00040	<0.00040	<0.00040		
	Silver (Ag)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Sodium (Na)-Dissolved (mg/L)	3.52	3.91	3.74		
	Strontium (Sr)-Dissolved (mg/L)	0.0643	0.0697	0.0698		
	Thallium (Tl)-Dissolved (mg/L)	0.000065	0.000065	0.000055		
	Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		
	Titanium (Ti)-Dissolved (mg/L)	0.00220	0.00141	0.00208		
	Uranium (U)-Dissolved (mg/L)	0.00040	0.00046	0.00045		
	Vanadium (V)-Dissolved (mg/L)	0.00052	0.00055	0.00051		
	Zinc (Zn)-Dissolved (mg/L)	0.0088	0.0060	0.00330		

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

Reference Information

Qualifiers for Sample Submission Listed:

Qualifier	Description
SRUL	Sample Received Unpreserved. Results may be biased low for indicated parameter(s) - dissolved metal
SFPL	Sample was Filtered and Preserved at the laboratory - dissolved metal

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted For Sample Matrix Effects

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ETL-HARDNESS-DIS-ED	Water	Hardness (from Dissolved Ca and Mg)	APHA 2340 B-Calculation
HG-D-L-CVAA-ED	Water	Mercury (Hg) - Dissolved	EPA 245.7 / EPA 245.1
HG-T-L-CVAA-ED	Water	Mercury (Hg)	EPA 245.7 / EPA 245.1
MET-D-L-ICP-ED	Water	Diss. Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-D-L-MS-ED	Water	Diss. Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
MET-T-L-ICP-ED	Water	Total Metals in Water by ICPOES (Low)	APHA 3120 B-ICP-OES
MET-T-L-MS-ED	Water	Total Metals in Water by ICPMS (Low)	SW 846 - 6020-ICPMS
SOLIDS-TOTSUS-ED	Water	Total Suspended Solids	APHA 2540 D-Gravimetric
TURBIDITY-ED	Water	Turbidity	APHA 2130 B-Nephelometer

** 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
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

1

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 ww - 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.



Report To			Report Format / Distribution			Service Requested (Rush for routine analysis subject to availability)												
Company: Deton'Cho/Nuna Joint Venture AND Golder As. Ltd.			<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Other			<input type="radio"/> Regular (Standard Turnaround Times - Business Days)												
Contact: DCNJV: Katrina Nokleby; Golder: Justine Crowe			<input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax			<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT												
Address:			Email 1: jcrowe@golder.com			<input checked="" type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT												
			Email 2: hmachtans@golder.com			<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT												
Phone: 867 669 6735 Fax:			Email 3: KatrinaN@munalogistics.com			Analysis Request												
Invoice To Same as Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Client / Project Information			Please indicate below Filtered, Preserved or both (F, P, F/P)												
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Job #: 09-1427-0006-20000-20500															
Company: Deton'Cho/Nuna Joint Venture			PO / AFE: 606989															
Contact: Brenda Kalis			LSD:															
Address: 9838-31st Avenue., Edmonton AB, T6N 1C5																		
Phone: 780 408 2897 Fax: 780 408 5472			Quote #:															
Lab Work Order # L1010143 (lab use only)			ALS Contact: Can Dang		Sampler: <i>Mitch Stacey</i> <i>Justine Crowe</i>													
Sample #	Sample Identification (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	Physical Parameters: Major Ions	Cyanide	Hardness	TSS and Turbidity	Nutrients	NH3 / TKN	Oil and Grease	TOC	DOC	Low Level Total Metals	Low Level Dissolved Metals	Sulphide	Number of Containers	
	Reach 6 (Giant Falls)	27-May-11		Surface Water			X	X						X	X		3	
	Reach 5 (d/s Pond)	27-May-11		Surface Water			X	X						X	X		3	
	Reach 4 (d/s Giant Pool)	27-May-11		Surface Water			X	X						X	X		3	
	Reach 4 (d/s Giant Pool) DUP	27-May-11		Surface Water			X	X						X	X		3	
	Reach 4 (Under ice)	27-May-11		Surface Water			X	X						X	X		3	
	Reach 2 (Pool)	27-May-11		Surface Water			X	X						X	X		3	
	SNP43-5 (above)	27-May-11		Surface Water			X	X						X	X		3	
	Reach 0 (BC Mouth)	27-May-11		Surface Water			X	X						X	X		3	
	Reach 6 Exposure Point (Above)	21-May-11		Surface Water										X			1	
Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details																		
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.																		
SHIPMENT RELEASE (client use)				SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)										
Released by: <i>M. Stacey</i>	Date (dd-mm-yy): 27-May-11	Time (hh:mm):		Received by: <i>T. Smith</i>	Date: 27-May-11	Time: 16:35	Temperature: 18 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF							

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

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