Appendix 9-C

Crown Mountain Property
Baseline Groundwater Investigation Results

Crown Mountain Property Baseline Groundwater Investigation Results

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Norwest Corporation
Suite 1900, 555 – 4th Avenue S.W.
Calgary, Alberta T2P 3E7
Tel: (403) 237-7763
Fax: (403) 263-4086
calgary@norwestcorp.com

Author:
Sara Wilkins, P.Geo

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1 INTRODUCTION

1.1 Background

NWP Coal Canada Ltd (NWP Coal), a fully owned Canadian subsidiary of Jameson Coal of Sydney, Australia, is investigating the potential development of coal reserves at the Crown Mountain property. NWP Coal holds a 100% interest in five adjacent coal licences that cover a combined Elk Valley Coal field area of 2,588 ha in the East Kootenay region of southeast British Columbia. The centre of the property is located approximately 30 km northeast of Sparwood, British Columbia (latitude 114° 43.6'W, longitude 49° 48.4'N), as shown on Figure 1-1.

Norwest Corporation (Norwest) was retained by NWP Coal to conduct a baseline bedrock groundwater investigation and monitoring program in the proposed Crown Mountain north and south block mine development areas (Site), as an extension to a resource drilling and coring program completed in 2013.

1.2 Purpose and Scope

The purpose of the groundwater investigation phase was to install bedrock groundwater monitoring wells in selected resource core-holes. taking advantage of the 2013 drilling program being completed in the north and south block of the planned mine. Following installation of the monitoring wells a two-year groundwater monitoring program was completed. The following tasks were included:

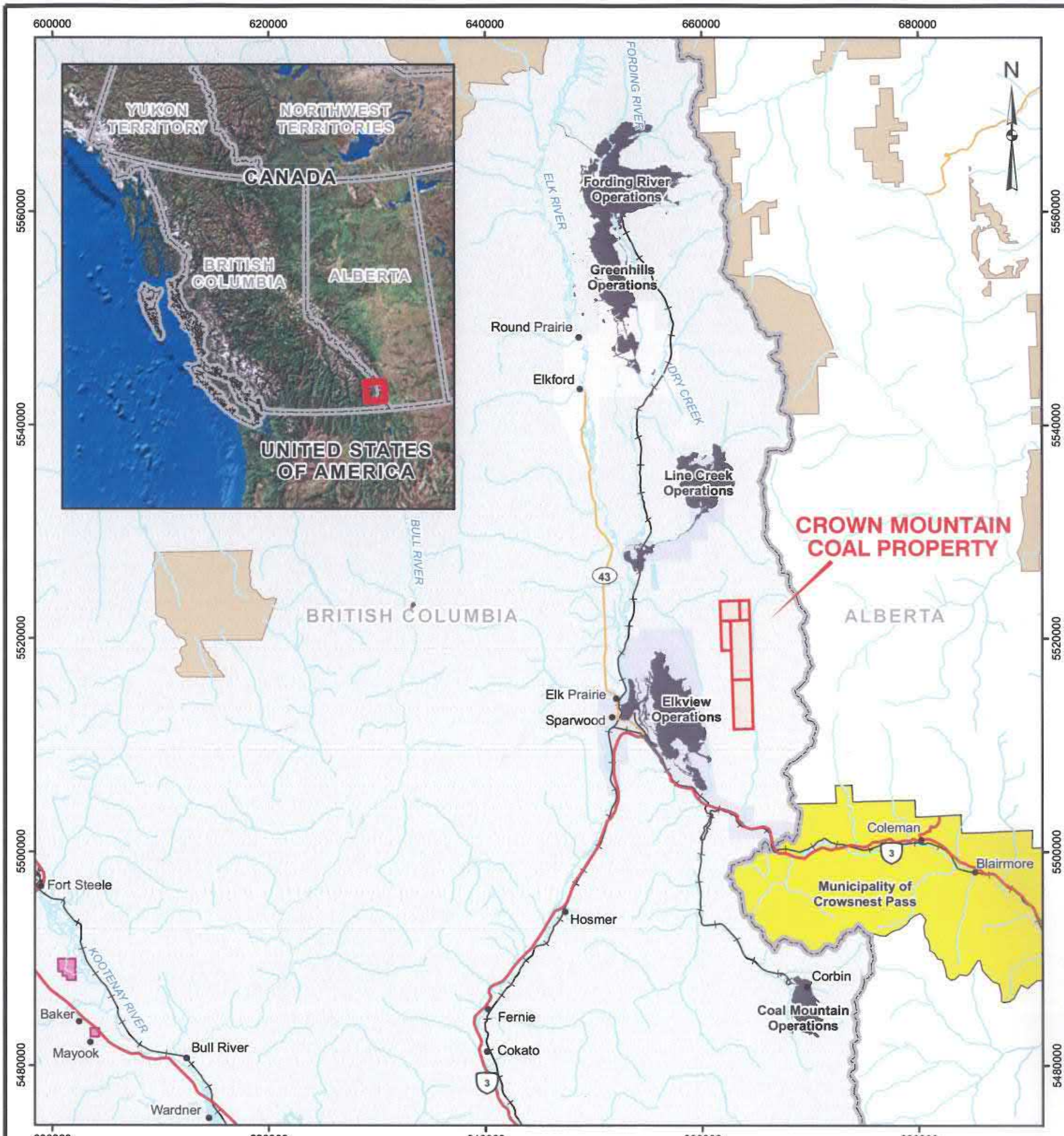
- The installation and development of five bedrock aquifer groundwater monitoring wells (three in the north block and two in the south block).
- Two years of continuous water level measurements with confirmatory manual readings.
- Winter and summer aquifer tests to estimate the hydraulic conductivity of the bedrock groundwater-bearing units.
- Sampling and laboratory analysis of groundwater samples to establish bedrock baseline groundwater chemistry (quarterly for first year followed by two annual fall samples).

These programs satisfy a significant portion of the baseline groundwater data gathering requirements specified by the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE, 2011). The installations, near-wellbore hydraulic testing, water chemistry samples and continuous water level data collection satisfy Norwest's interpretation of the bedrock aquifer Environmental Assessment (EA) baseline data collection requirements, based on project scope definition to-date. Further groundwater investigations and monitoring are recommended to satisfy all of the EA requirements: specifically, shallow overburden aquifer monitoring once facilities and dump locations are selected and a pumping test if groundwater is determined to be a potential water source for the project.

This report serves to document the data gathered during the year of quarterly baseline monitoring at the five well locations, followed by two subsequent fall sampling events.

1.3 Report Organization

The main body of this report describes the results of the groundwater investigation and monitoring events. Monitoring well completion diagrams can be found in Appendix A, and the laboratory groundwater geochemistry results can be found in Appendix B.



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KILOMETRES

LEGEND

- CITY / TOWN / COMMUNITY
- PROJECT LOCATION
- CANADIAN PACIFIC RAILWAY
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- WATERCOURSE
- COAL MINING OPERATION
- EAST KOOTENAY REGIONAL DISTRICT
- FIRST NATIONS RESERVE
- PROVINCIAL PARK
- WATERBODY

MUNICIPAL DISTRICT

- ELKFORD MUNICIPAL DISTRICT
- SPARWOOD MUNICIPAL DISTRICT
- JAMESON COAL LICENSE

REFERENCE

Provincial boundaries, cities, First Nations Reserves and transportation data obtained from ESRI and DMTI. Protected areas obtained from Geogratis. Hydrography data obtained from IHS Energy. Imagery obtained from WorldSat International.

Projection: UTM Zone 11 Datum: NAD 83

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BASELINE GROUNDWATER INVESTIGATION

PROJECT LOCATION MAP

FIGURE 1-1

DRAWN BY: A.W. CHK'D BY: A.P. DATE: 13 11 26	FILE: Fig 1-1 Project Location Map.dwg 284-1_Crown Mountain\Disc\Water\ Report Figures	NORWEST APEGGA Permit P05015

2 SETTING

2.1 Physiography

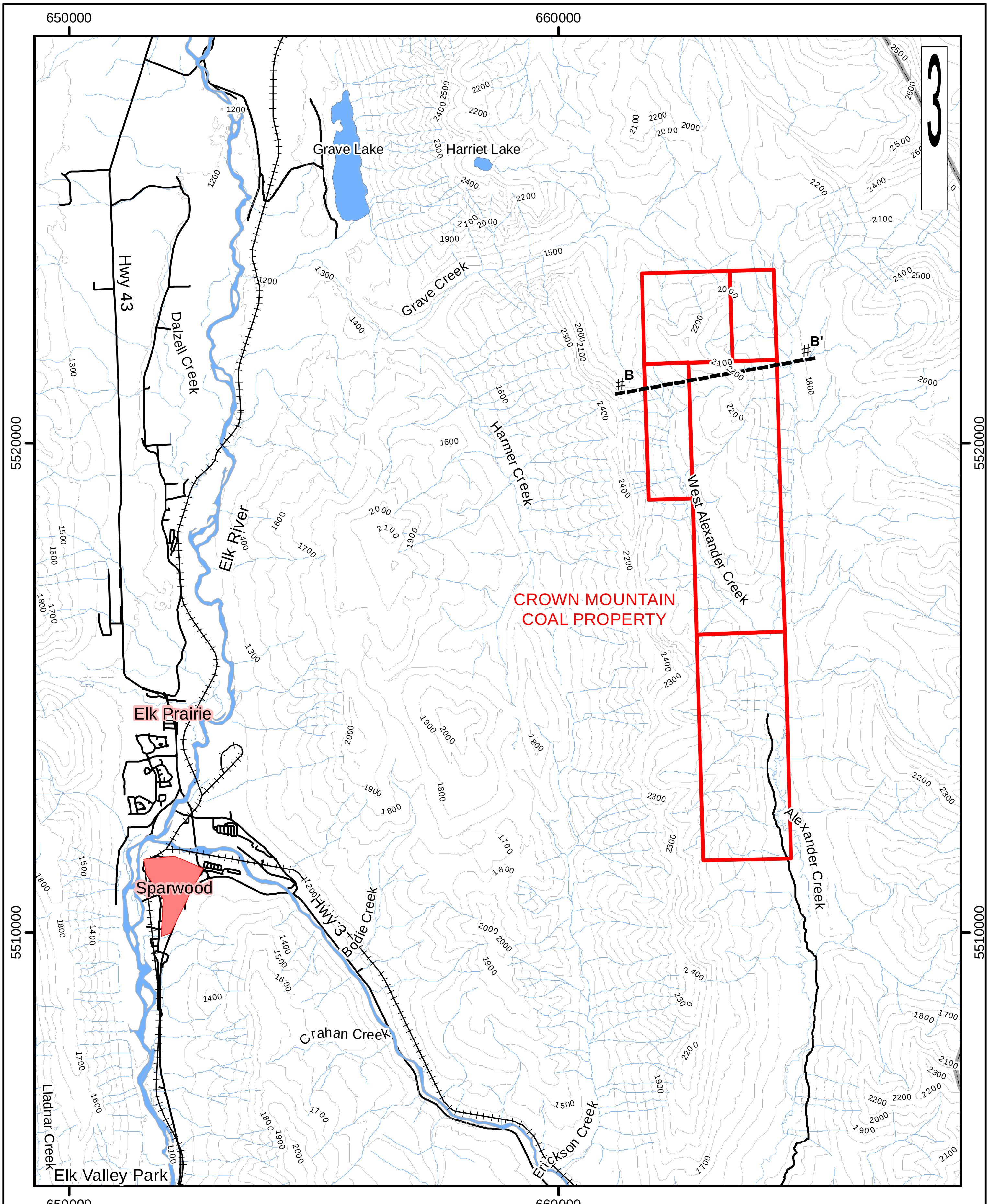
The Site is located in the Rocky Mountains within the Montane Spruce and Engelmann Spruce-Subalpine Fir biogeoclimatic zones. The Elk River Valley is located approximately 2 km to the west of the proposed mine development area; it flows in a southerly direction and is located at an elevation of approximately 1,150 masl. Elevations in the mine development area vary from approximately 1,750 masl to 2,250 masl. The Site is accessed by a steep and winding road that connects Elk Valley Highway 43 to the Site. Figure 2-1 shows the topography and major water bodies in the area.

The Site is located in a highly mountainous area and is characterized by steep grades and very little level ground. Total relief is on the order of 500 m and the mine development area is located more than 600 m above the Elk Valley floor. Several watercourses drain the Site, the most prominent of which are Grave Creek and West Alexander Creek and their tributaries. Grave Creek and its tributaries drain much of the northern part of the Site and West Alexander Creek and its tributaries drain much of the southern part of the Site (Norwest, 2013).

2.2 Climate

The Site is located in a humid, continental climatic region with cool summers and long, snow-covered winters. Due to the dramatic topography of the area, climate varies significantly at different elevations. Mean annual temperatures at the nearby climate station in Sparwood range from a high of 15.4°C in July to a low of -7.7°C in December (Environment Canada, 2013). Total annual precipitation at the Sparwood weather station averages 603.3 mm; 405.7 mm falls as rain and 197.6 mm falls as snow.

The proposed mine development area is located at significantly higher elevations than Sparwood. As a result, a weather station has been operational at the Site since September 2013. Norwest does not have access to this data at this time; however temperatures are expected to be significantly lower and precipitation significantly higher than those recorded at the Sparwood weather station.



Legend

- Jameson Coal License
- Cross Section Line
- Highway/Road
- Canadian Pacific Railway
- Lakes
- City/Town
- Park
- AB/BC Border

0 0.5 1 2 3 4
Kilometers

Reference:
Spatial data from Geogratis, BC Ministry of Energy and Divestco
Projection NAD83 Datum UTM Zone 11 North

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TOPOGRAPHY AND DRAINAGE

FIGURE 2-1

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2.3 Geology

Quaternary Deposits

From the higher elevations to the valley floor, the Quaternary deposits in the mine development area vary in thickness from absent to more than 50 m, and are summarized as follows:

- Thin deposits of colluvium and/or organic soils are present sporadically over the uplands and peaks; a large proportion of the uplands comprises bedrock outcrop.
- Colluvium drapes over flanks of the mountain ranges trending in a north-south direction. Colluvium is thickest over draws and is mostly absent over ridges.
- Thick deposits of till and alluvium are present over the valley floors.

The quaternary deposits are relevant to the hydrogeology of the mine development area as colluvium and alluvium are typically in direct hydraulic connection to the water bodies in the area. A large proportion of snow-melt and runoff is conveyed by relatively permeable deposits that drape the flanks of the mountain slopes.

Bedrock Stratigraphy

The general stratigraphic succession is shown on Figure 2-2. The Jurassic-Cretaceous Kootenay Group includes, from top to base, the Elk Formation, the Mist Mountain Formation and the Morrissey Formation (Grieve and Kilby, 1989). The major coal-bearing unit is the Mist Mountain Formation. The Kootenay Group conformably overlies the Fernie Group and is overlain by the Blairmore Group.

The Mist Mountain Formation encompasses all of the economic coal seams. It conformably overlies the Moose Mountain Member of the Morrissey Formation. Except where controlled by faulting in the northernmost part of the South Block, the Mist Mountain Formation is the formation which crops out at the surface. The Morrissey Formation conformably overlies the Fernie Formation; these units are separated by a transitional zone of interbedded shale and sandstone with the former having the same characteristics as those of the Fernie Formation.

Figure 2-3 shows a representative structural cross section through the property (shown as Cross Section B-B`); two primary structural trends are shown in the figure, as follows:

- a syncline, which is present over the majority of the North Block where mining activities would be initiated; and
- a monocline that dips to the west, which is present over most of the South Block.

An east-trending thrust fault separates the two primary structures and results in a secondary mineable coal development to the east of the North Block.

PERIOD	GROUP	FORMATION MEMBER	ROCK TYPES
Lower Cretaceous	BLAIRMORE GROUP	Upper Blairmore (Undivided)	Massive bedded sandstones and conglomerates
		Cadomin Formation	
Lower Cretaceous to Upper Jurassic	KOOTENAY GROUP	Elk Formation	Sandstone, siltstone, shale, mudstone, chert pebble conglomerate and minor coal seams.
		Mist Mountain Formation	Sandstone, siltstone, shale, mudstone, and thick coal seams.
		Morrissey Formation	Medium to coarse grained, slightly ferruginous quartz-chert sandstone.
Jurassic	FERNIE GROUP	Fernie Formation	Shale, siltstone, fine-grained sandstone.

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STRATIGRAPHIC SEQUENCE

FIGURE 2-2

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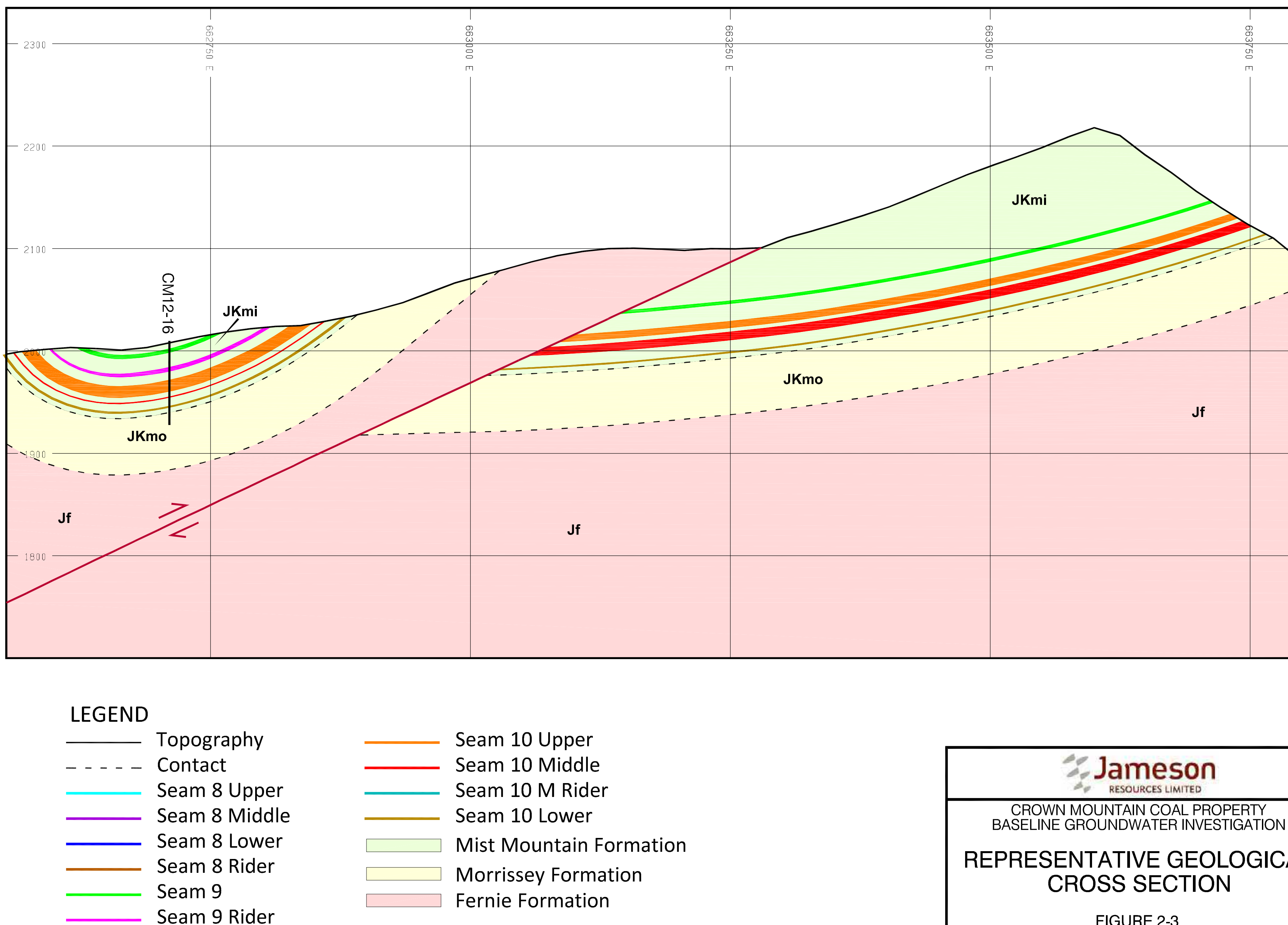

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BASELINE GROUNDWATER INVESTIGATION

REPRESENTATIVE GEOLOGICAL CROSS SECTION

FIGURE 2-3

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2.4 Hydrogeology

Groundwater Flow

Table 2.1 summarizes the anticipated hydrogeological characteristics of the primary geological units in the mine development area. Regionally, the Quaternary deposits transmit the majority of groundwater flow, especially during snow-melt and during periods of high rainfall that serve to recharge the surficial groundwater. Surface colluvium provides the major aquifers in the alpine region and along the flanks of the valley slopes. Groundwater flow in the colluvium can vary seasonally. Alluvial deposits along the creek beds and within the Elk Valley floor represent year-round aquifers that serve to regulate flow in the major water courses. Tills, lacustrine deposits and organic soils in the Quaternary are expected to behave as aquitards.

Groundwater flow in the underlying bedrock units is expected to occur in major fault zones and within secondary structures (e.g., fractures and joints) within the relatively competent sandstone deposits (Teck, 2011). Siltstone and shale deposits are expected to be self-annealing and to act as aquitards. Coal seams can display a wide range of hydraulic conductivity values, but, in general, they are expected to allow significant groundwater flow.

Groundwater flow is heavily influenced by topography, with recharge occurring in the alpine regions and discharge occurring in the valley floors.

Regional Groundwater Quality

Groundwater samples collected from monitoring wells at neighbouring properties exhibit total dissolved solids (TDS) concentrations ranging from 400 mg/L to 6,000 mg/L, depending on depth. Shallow groundwater is relatively fresh, and is a calcium-magnesium-bicarbonate hydro-chemical type. The deeper groundwater is brackish and trends towards a sodium-bicarbonate hydro-chemical type. This deeper water chemistry is influenced by a longer residence time in the ground as well as the pore fluids in the resident formations. Surface water is expected to be fresh and of high quality.

Groundwater Use

The British Columbia Ministry of Environment Water Well Database was searched to identify groundwater users in the area. Four registered water wells are located within the neighbouring Line Creek Mine, which is owned and operated by Teck Coal Limited (Teck). Line Creek uses one of these registered water wells as a domestic water supply well (Teck, 2011). The registered wells range in depth from approximately 20 mbgs to 30 mbgs. Review of the locations in the well records suggests that three wells are completed in shallow alluvial and one is completed in bedrock.

Table 2.1

Hydrogeological Characterization of Geological Strata

Period	Group	Formation	Description	Anticipated Hydrogeological Properties
Lower Cretaceous	Blairmore	Cadomin	Interbedded massive chert conglomerate and sandstone.	Aquifer, with primary permeability associated with pore space and secondary permeability associated with fractures.
Jurassic Lower Cretaceous	Kootenay	Elk	Interbedded and relatively thinly bedded shale, siltstone, sandstone, conglomerate and minor coal seams.	Secondary permeability associated with fractures and faults. Minimal primary permeability.
		Mist Mountain	Interbedded and relatively thinly bedded shale, siltstone, sandstone and thicker coal seams.	Secondary permeability associated with fractures and faults with coal and sandstone. Minimal primary permeability.
		Morrisey	Medium- to coarse-grained, quartz-chert sandstone.	Secondary permeability associated with fractures and faults within sandstone.
Jurassic	Fernie	Fernie	Shale with interbedded siltstone and fine-grained sandstone.	Aquitard with consistently low permeability.

3 INVESTIGATION AND MONITORING PROGRAM

3.1 General

The bedrock groundwater monitoring network was installed as an extension to the 2013 geological exploration investigation. The objective of the groundwater investigation was to install bedrock monitoring wells in the north and south block mine zones that are expected to be water-bearing. Figure 3-1 shows the monitoring well installations completed as part of this investigation. These well installations serve to provide preliminary and baseline information regarding bedrock groundwater conditions, levels and quality.

3.2 Geological Investigation

Drilling Program

The 2013 drilling program was completed between August 15 and September 10, 2013 by Foraco Drilling Ltd. (Foraco) using reverse circulation and 6-inch core drilling. A total of 13 boreholes were drilled on 11 sites: four in the North Block, three in the East Pit, and six in the South Block. Of the 13 holes, seven were drilled as core holes, and six as reverse circulation holes. Samples were collected and logged by Norwest’s field geologist, and were packaged for transport to Calgary for analysis.

The core drilling method allows for relatively undisturbed samples to be retrieved. The coring drill bit is attached to hollow rods, which cut a cylindrical sample of material. As the material is cut, a basket retainer allows the core to move into the tube. The core barrel is pulled out of the hole and the material is removed from the barrel. The 6-inch diameter core sample is then described and samples are collected for coal quality analysis.

The reverse circulation method uses a dual-wall drill rod, with an outer drill rod and inner tubes. The inner tubes provide a continuously sealed pathway for drill cuttings to be transferred to the surface. The circulating air and water enters the annulus between the drill rod and inner tube via an air swivel, and travels down to the drilling tool. Once in the rotating head, the fluid and cuttings are transported through the inner tube and out of a sample hose to the cyclone. The cyclone slows the sample, and separates it from the air. The sample returns are then logged to establish the geological record.

Geologic Sampling and Analysis

Uncontaminated, representative samples using core drilling methods were described in terms of lithology, cementation, grain size, colour and fractures. These descriptions were recorded on a geological core log sheet for each change in lithology or variance in coal quality. All samples were packaged, labelled and shipped to Calgary for analysis.

Uncontaminated, representative samples using reverse circulation drilling methods were collected every 3 m from the cyclone to identify coal tops. Once it was verified that drilling had advanced into a coal zone, samples were collected every 0.5 m. Lithological descriptions of the samples and sample numbers were written on borehole logging sheets.

The presence of water was monitored by Foraco, as well as Norwest representatives, with the goal of identifying water-bearing zones at depth to determine locations where groundwater monitoring wells could be installed.

3.3 Groundwater Investigation

Monitoring Well Construction

Five monitoring wells were installed in aquifers identified within the Mist Mountain Formation, at five locations, as shown on Figure 3-1. Completion intervals were selected based on anticipated hydraulic conductivity as inferred from formation behaviour during drilling, and geophysical logs responses. Three wells were installed in water bearing formations identified in the North Block, two were installed in zones identified in the South Block, and no wells were installed in the East Pit as no water bearing formations were identified during drilling.

The wells were installed in accordance with the following procedures outlined in the British Columbia Field Sampling Manual 2003 Edition:

- Four monitoring wells were installed using 50 mm diameter, Schedule 40 PVC flush-threaded riser pipe, well screen and bottom cap with 0.5 mm machine-slotted screen.
- One monitoring well was installed using 100 mm diameter, Schedule 40 PVC flush-threaded riser pipe, with 0.5 mm machine-slotted screen and well cap.
- A bottom seal was typically constructed by placing bentonite chips in the bottom of the borehole, to the depth of the base of the PVC casing.
- No. 10 to 20 bedding sand was placed above the bottom seal up to the base of the well casing (approximately 200 mm to 300 mm thick).
- No. 10 to 20 bedding sand (typical) was placed in the annulus between the borehole wall and the well casing to a level approximately 500 mm above the screened interval.
- The casing was screened (3 m length for the 50 mm monitoring wells, and 6 m length for the 100 mm monitoring well) to match the depth interval of the water-bearing zone.

- Above the sand pack, the borehole was backfilled with bentonite chips that were hydrated when placed above the groundwater level.
- The monitoring well was topped with a vented locking cap, and was flush-mounted in a casing protector.
- Surface drainage was directed away from the casing and the flush-mounted casing protector and well marker boxes were grouted into place.

Well Development

Each monitoring well that yielded sufficient water was developed by using Waterra tubing to pump groundwater out of the well until the following conditions were observed:

- The field-measured, water quality parameters (pH, electrical conductivity, temperature and turbidity) stabilized.
- Few fine particles remained in suspension and the water was clarified, although these criteria could be relaxed if not obtainable.

Pre- and post-development static groundwater levels and the total volume purged during well development were recorded. A handheld, multi-parameter reader was used to record parameters during development.

Additional well development was completed using an air compressor to air lift the wells and clean out the screened sections in the summer of 2014.

Aquifer Tests

Due to slow well recovery following development, insufficient water was present in the monitoring wells to perform aquifer tests in September 2013. The wells were re-visited in the spring of 2014 to complete single-well response tests. Aquifer tests were completed once again following airlift development in August 2014. Aquifer test results are presented in Section 4.4.

3.4 Groundwater Sampling and Analysis

Wells were monitored and sampled on seven occasions (September 2013, January 2014, April 2014, August 2014, November 2014, October 2015, and June 2016). Groundwater levels were measured in all site groundwater monitoring wells that were accessible during each trip. Water levels were recorded using an electronic water level tape before any samples were taken and before developing and purging the wells.

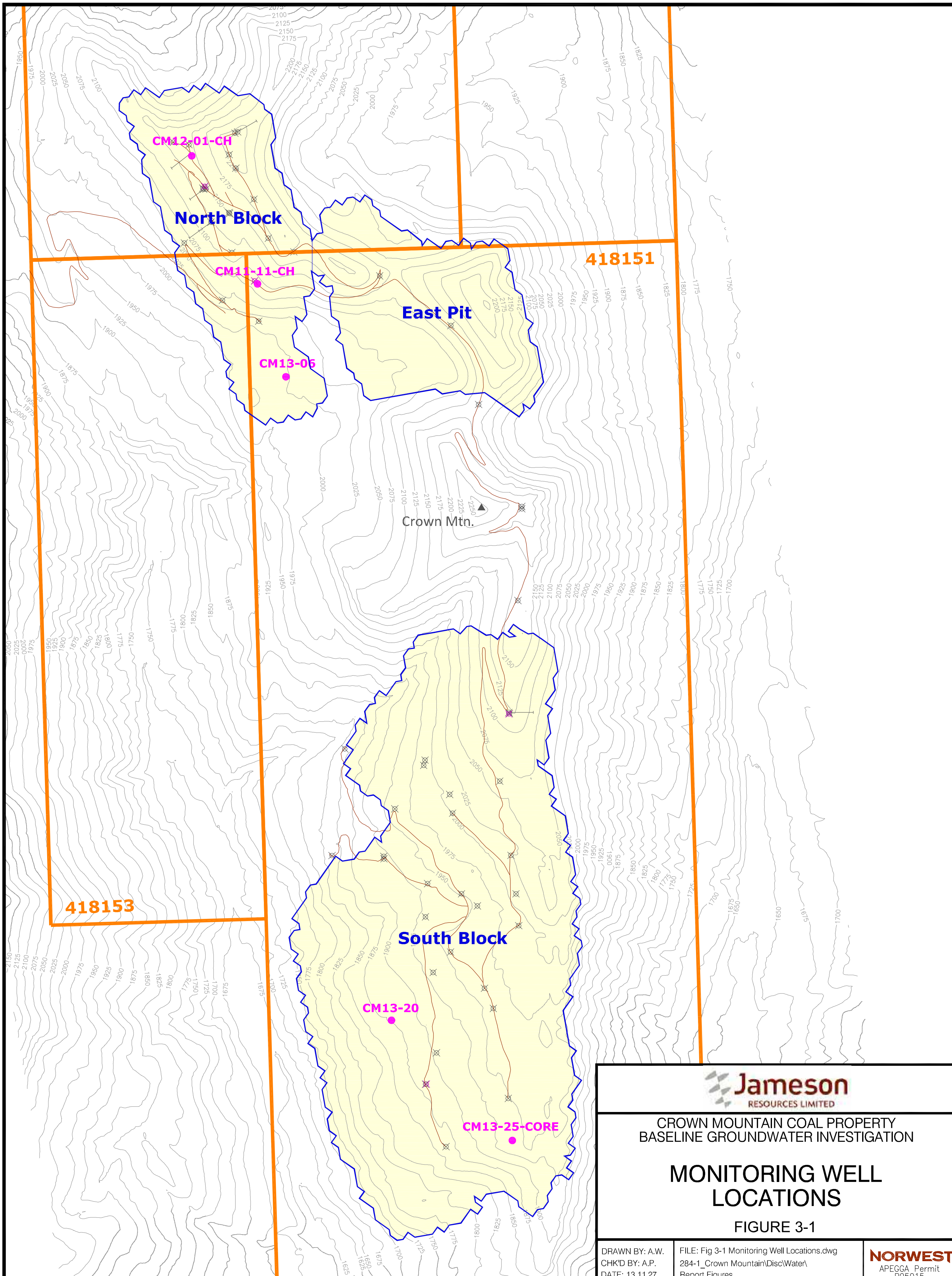
During the Sept. 2013, January 2014 and April 2014 sampling events, all wells then purged of three well volumes or until dry. Once each well had recovered to a sufficient static water level for sampling, a disposable bailer was used to collect the groundwater samples. For the sample collection dates of November 2014, October 2015, and June 2016, all of the wells were sampled with a HydraSleeve SS interval sampler. This method reduced field time by eliminating purging and the need for well recovery.

Standard sampling, filtering and sample preservation protocols were followed. Samples were secured in coolers to maintain appropriate temperatures and transported to the Maxxam Analytics Inc. laboratory in Calgary under standard chain-of-custody documentation. As of and including June 2016, all water samples have been collected by O'Kane Consultants Inc. of Cranbrook British Columbia (BC) and laboratory samples have been submitted to the ALS Burnaby, BC laboratory.

Laboratory analyses include the following parameters:

- routine potability parameters, including major ions;
- dissolved selected heavy metals;
- total selected heavy metals;
- selected hydrocarbon compounds; and
- cyanide.

A complete copy of the laboratory analyses can be found in Appendix B. Analytical results are summarized in Table 4.3 through Table 4.6 in Section 4.



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BASELINE GROUNDWATER INVESTIGATION

MONITORING WELL LOCATIONS

FIGURE 3-1

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4 RESULTS

4.1 Geology

A full geological description of the Site and formations encountered by the drilling program is presented under separate cover (Norwest, 2013). The borehole logs for the drill holes completed as monitoring wells can be found in Appendix A. Table 4.1 summarizes the lithology of the completion intervals for each of the monitoring wells. Most boreholes encountered interbedded sandstone, siltstone, shale and coal of the Mist Mountain Formation. Efforts were made to complete the monitoring wells across zones that were expected to produce water based on material properties and their observed behavior during drilling. The completion intervals typically spanned sandstone layers or coal seams which were interbedded with shale; however shale zones are not expected to be water-bearing.

Table 4.1
Hydrogeological Characterization of Geological Strata

Monitoring Well	Location	Ground Surface (masl)	Completion Interval (mbgs)	Completion Formation
CM11-11	North Block	2,087	119 - 126	Sandstone and Coal - Mist Mountain Formation
CM12-01	North Block	2,142	117 - 125	Sandstone and Shale - Mist Mountain Formation
CM13-06	North Block	1,998	31 - 36	Sandstone and Shale - Mist Mountain Formation
CM13-20	South Block	1,877	19 - 24	Sandstone and Shale - Mist Mountain Formation
CM13-25	South Block	1,936	87 - 92	Coal and Shale - Mist Mountain Formation

4.2 Groundwater Occurrence and Seasonal Variations

The groundwater conditions encountered at Crown Mountain are consistent with expected regional conditions within the bedrock. Groundwater was observed primarily in the bedding fractures and joints in bedrock and coal seams. Groundwater flow directions are expected to reflect surface topography and to be strongly influenced by rock structure (such as the primary thrust fault that traverses the Crown Mountain area). Considerable variability in hydraulic connection and conductivity is inferred from formation behavior observed during drilling. Wells were completed across intervals that were suspected of taking on fluids during drilling.

Groundwater levels in the wells were measured quarterly on six occasions (September 2013, January 2014, April 2014, August 2014, November 2014, October 2015 and June 2016) using a sonic depth sounder. Depth to the groundwater surface varies from approximately 10 mbgs to 85 mbgs. Measurements are presented in Table 4.2.

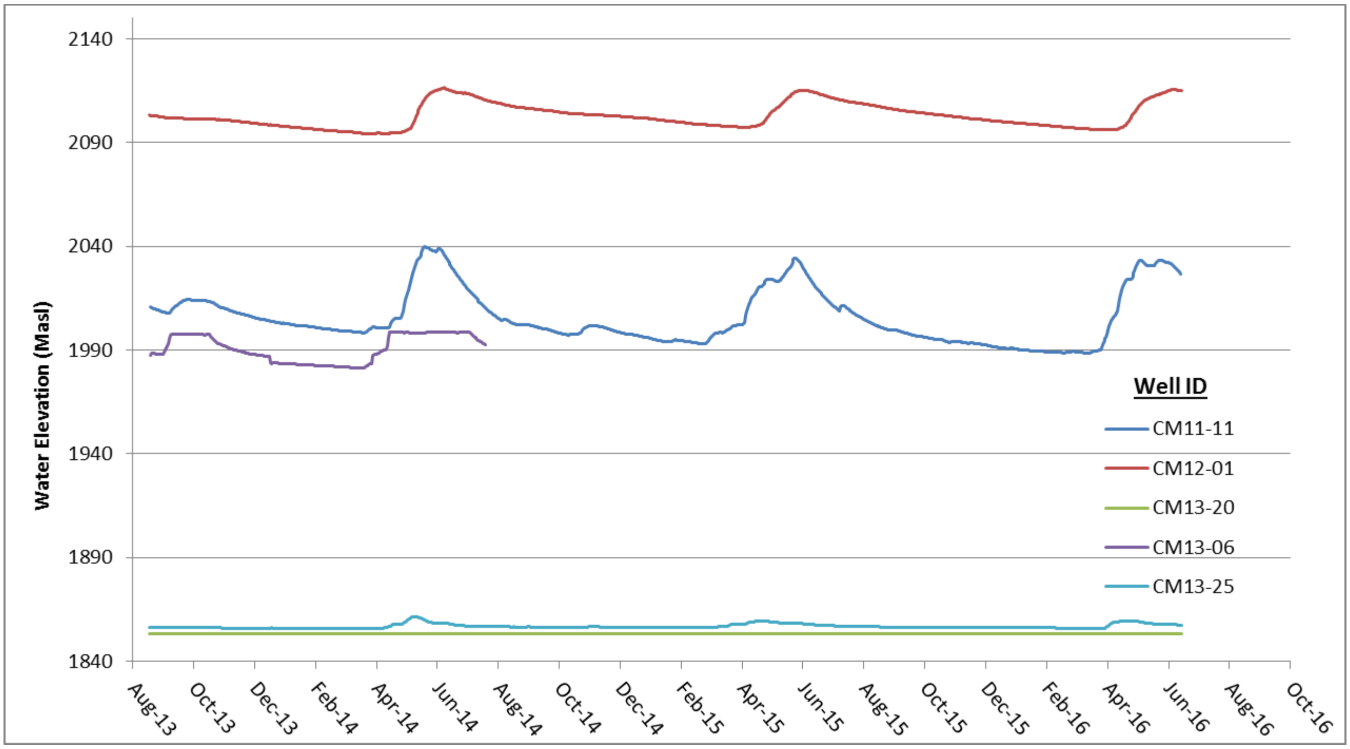
Long-term monitoring transducers were deployed the groundwater wells in September 2013. InSitu™ Level TROLL 500 transducers affixed to vented direct connect cables were used, with a data recording frequency of once per day. Pressure, temperature, and water depth above the transducer were recorded. Transducer water depth has been converted to meters above sea level in Figure 4-1, with corrections applied to anchor the values to manual water levels taken during quarterly sampling and download events. The most recent transducer downloads occurred during the June 2016 visit.

Overall, water levels displayed typical seasonal fluctuations of minimums at the end of winter, and relatively sharp increases during the spring melt. Wells installed at lower elevations saw an earlier groundwater level rise due to spring melt than those installed at higher, later-thawing, elevations. Deep north block wells CM11-11 and CM12-01 followed similar seasonal trends. South block well CM13-25 was less affected by seasonal fluctuations; CM13-20 has been consistently 'dry' with no water levels detected via manual recordings or with the transducer since installation. The following bullet points summarize the major observations from the transducer data:

- CM11-11 reached a maximum groundwater elevation of 2,039.73 masl on June 8, 2014 and a minimum of 1,988.49 masl on March 21, 2016 (41.5 m annual fluctuation),
- CM12-01 reached a maximum groundwater elevation of 2,116.48 masl on June 26, 2014 and a minimum of 2,093.98 on April 20, 2014 (22.5 m annual fluctuation),
- CM13-25 reached a maximum groundwater elevation of 1,861.57 masl on May 28, 2014 and a minimum of 1,855.52 masl on April 7, 2014 (6.1 m annual fluctuation).
- CM13-06 became artesian from October 1 to November 5, 2013 and again from May 3 to July 19, 2014 (seen as plateaus on Figure 4-1 as water reaches the collar elevation of ≈1,998 masl). Therefore, a maximum potentiometric surface elevation cannot be assigned. However, a minimum groundwater elevation of 1,981.24 masl was observed on April 8, 2014. Transducer data for 13-06 was not collected in, or after, October 2015 due to an equipment failure. A splice to the cable or a direct connection to the transducer will be needed to collect this data in the future.

Figure 4-1

Pressure Head Transducer Data: Sept 2013-June 2016



4.3 Groundwater Quality

The results of the field and laboratory analyses of groundwater quality samples are summarized in Table 4.3 (field-measured parameters), Table 4.4 (routine parameters and major ions), Table 4.5a and Table 4.5b (dissolved and total metals, respectively) and Table 4.6 (hydrocarbon compounds). Surface water samples were also collected and the results are included in the tables. The results of these analyses are included in the laboratory data sheets provided in Appendix B. Water quality measurements were compared to Canadian Drinking Water Quality Guideline (CDWQG) and British Columbia Approved Water Quality Guidelines (BCAWQG) concentrations for reference purposes.

Preliminary water quality samples collected from the wells demonstrated high total suspended solids (TSS) concentrations, which could be indicative of wells that require further development. As such, re-development was completed on all wells in August 2014 with an air compressor. Subsequent water samples exhibited lower TSS concentrations, indicating less contamination with fines or drilling fluids. Data from pre- and post-development are included in the chemistry tables; however, the chemistry discussion in this report focuses mainly on post-development trends. The following sections summarize observations made for each of the analytical groups.

Field-Measured Parameters

- Electrical conductivity varied from 24 uS/cm to 258 uS/cm across the well locations on all sampling events, which is indicative of fresh, recently recharged groundwater.
- pH varied from 6.4 to 8.4 across the well locations on different sampling events, demonstrating generally neutral characteristics.

Routine Parameters and Major Ions

- TDS (computed) varied from 20 mg/L to 220 mg/L, which is indicative of fresh water.
- All routine potability parameters comply with both BCAWQG AL and CDWQG MAC criteria.

The relatively low levels of mineralization likely indicate that groundwater is regularly recharged or, less likely due to the depth and consistency across all wells, that meteoric water is seeping into the monitoring wells through the annulus grout. Figure 4-3 shows a Piper diagram of the water chemistry results; a review of this figure indicates that the majority of wells display a calcium bicarbonate signature (indicative of higher levels of recharge and fresher groundwater), with the following exceptions:

- Some samples from well CM12-01 displayed a sodium chloride signature, indicative of deeper, more saline groundwater. However, all of the samples exhibiting those characteristics were taken before the August 2014 well development efforts; all samples taken since re-development displayed chemical characteristics similar to the other wells.
- The most recent sample (June 2016) from well CM11-11 displayed a sodium bicarbonate signature, which differs from all of the previous samples collected at that well. Unfortunately, there has not been another sampling event at CM11-11 at the same time of the year, so it is difficult to draw conclusions whether the result is indicative of a seasonal trend, a statistical outlier, or the result of an issue with the sampling methodology.

Dissolved Metals

- Dissolved iron was found to exceed guidelines for the October 2015 sampling event from wells CM13-25 and CM11-11. Well CM13-25 also had a dissolved iron exceedance for the June 2016 sampling event.
- Dissolved aluminium was found to exceed guidelines for the June 2016 sampling event from well CM13-06.

- Dissolved antimony was found to exceed guidelines from well CM11-11 for the November 2014 sampling and from well CM13-25 for the June 2016 sampling event.

Total Metals

- There were exceedances of arsenic, copper, iron, lead, mercury, silver, and zinc in well CM13-06.
- There were exceedances of antimony and iron in well CM11-11.
- There were exceedances of arsenic, antimony, barium, cadmium, copper, iron, mercury, and selenium in well CM13-25.
- Aside from iron, the June 2016 sampling event did not demonstrate any total metal exceedances.

Hydrocarbon Compounds

- Acridine exceedances were observed in many of the sampling events across all wells except CM13-06.
- Well CM13-25 demonstrated elevated levels of phenanthrene and pyrene for the August 2014 and October 2015 sampling events. Benzo[a]pyrene and naphthalene concentrations also exceeded guidelines for the October 2015 sampling event. These compounds were below guidelines for the June 2016 sampling event.

Quality Assurance and Quality Control

Duplicate samples have been taken throughout the project to help evaluate laboratory precision and reliability. The measured concentrations in the duplicate samples were commonly within 5% of the measured concentrations of the base sample. A review of the analytical reports indicates that all standard laboratory QA/QC test procedures were followed.

4.4 Aquifer Testing

Single well response tests were completed in the accessible wells in spring and summer 2014. The tests were completed using manual weighted slugs and well responses were recorded for both the drawdown and recovery portions of the tests. The data collected was used to calculate the near-wellbore hydraulic conductivity of the materials surrounding the wells. The Hvorslev method was used to interpret the data.

Wells at CM12-01, CM11-11 and CM13-06, which are all in the north block of the site, were tested in April 2014. Tests were not completed on the wells in the south block during this time as they were inaccessible. These tests indicate hydraulic conductivity values of 1.30×10^{-7} m/s,

7.56×10^{-8} m/s and 5.79×10^{-7} m/s, respectively, for north block wells CM12-01, CM11-11 and CM13-06.

Slug tests were completed during the August 2014 site visit at north block locations CM12-01, CM11-11, and south block location CM13-25 (CM13-20 was dry); results were 3.38×10^{-7} m/s, 9.71×10^{-8} m/s, and 2.24×10^{-8} m/s, respectively. Results for locations CM12-01 and CM11-11 were in the same order of magnitude as tests previously completed in April 2014.

Table 4.2

Groundwater Elevations and Monitoring Well Construction Details

Well ID	Date	Northing	Easting	Completion Information									
				Groundwater Surface Elevations and Piezometer Construction Details									
				As-Built Ground Elevation	Depth to Bottom of well	Top of Screen	Bottom of Screen	Length of Screen	Top of Sand	Bottom of Sand	Depth to Water	Elevation of Groundwater Surface	Hydraulic Conductivity
				masl	mbtoc	mbg	mbg	m	mbg	mbg	mbtoc	masl	m/sec
CM12-01	9-Sep-13	5522037	662429	2,143	124.17	118.5	124.5	6	117	125	39.94	2,103.37	NM
CM12-01	7-Jan-14	5522037	662429	2,143	124.17	118.5	124.5	6	117	125	44.77	2,098.54	NM
CM12-01	18-Apr-14	5522037	662429	2,143	124.17	118.5	124.5	6	117	125	49.17	2,094.14	1.30E-07
CM12-01	9-Aug-14	5522037	662429	2,143	124.17	118.5	124.5	6	117	125	33.32	2,109.99	3.38E-07
CM12-01	5-Nov-14	5522037	662429	2,143	124.17	118.5	124.5	6	117	125	39.67	2,103.64	NM
CM12-01	15-Oct-15	5522037	662429	2,143	124.17	118.5	124.5	6	117	125	39.54	2,103.77	NM
CM12-01	21-Jun-15	5522037	662429	2,143	124.17	118.5	124.5	6	117	125	28.42	2,103.77	NM
CM11-11	10-Sep-13	5521503	662704	2,088	125.02	120.0	123.0	3	119	123	77.00	2,010.83	NM
CM11-11	7-Jan-14	5521503	662704	2,088	125.02	120.0	123.0	3	119	123	84.00	2,003.83	NM
CM11-11	17-Apr-14	5521503	662704	2,088	125.02	120.0	123.0	3	119	123	87.11	2,000.71	7.56E-08
CM11-11	9-Aug-14	5521503	662704	2,088	125.02	120.0	123.0	3	119	123	81.33	2,006.50	9.71E-08
CM11-11	5-Nov-14	5521503	662704	2,088	125.02	120.0	123.0	3	119	123	83.72	2,004.11	NM
CM11-11	15-Oct-15	5521503	662704	2,088	125.02	120.0	123.0	3	119	123	85.70	2,002.14	NM
CM11-11	21-Jun-15	5521503	662704	2,088	125.02	120.0	123.0	3	119	123	55.30	2,002.14	NM
CM13-06	10-Sep-13	5521114	662823	1,998	35.47	31.7	34.7	3	31	35	10.47	1,987.45	NM
CM13-06	6-Jan-14	5521114	662823	1,998	35.47	31.7	34.7	3	31	35	24.00	1,973.91	NM
CM13-06	17-Apr-14	5521114	662823	1,998	35.47	31.7	34.7	3	31	35	10.65	1,987.26	5.79E-07
CM13-06	9-Aug-14	5521114	662823	1,998	35.47	31.7	34.7	3	31	35	35.02	1,962.89	NM
CM13-06	5-Nov-14	5521114	662823	1,998	35.47	31.7	34.7	3	31	35	0.00	1,997.91	NM
CM13-06	15-Oct-15	5521114	662823	1,998	35.47	31.7	34.7	3	31	35	10.41	1,987.50	NM
CM13-06	21-Jun-15	5521114	662823	1,998	35.47	31.7	34.7	3	31	35	0.00	1,987.50	NM
CM13-20	9-Sep-13	5518426	663264	1,877	23.84	20.8	23.8	3	19	24	23.80	1,853.10	NM
CM13-20	8-Jan-14	5518426	663264	1,877	23.84	20.8	23.8	3	19	24	23.84	1,853.06	NM
CM13-20	9-Aug-14	5518426	663264	1,877	23.84	20.8	23.8	3	19	24	23.82	1,853.08	NM
CM13-20	9-Aug-14	5518426	663264	1,877	23.84	20.8	23.8	3	19	24	23.84	1,853.06	NM
CM13-20	21-Jun-15	5518426	663264	1,877	23.84	20.8	23.8	3	19	24	dry	1,853.06	NM
CM13-25	9-Sep-13	5517924	663769	1,938	90.12	87.1	90.1	3	87	90	81.30	1,856.37	NM
CM13-25	8-Jan-14	5517924	663769	1,938	90.12	87.1	90.1	3	87	90	82.10	1,855.58	NM
CM13-25	9-Aug-14	5517924	663769	1,938	90.12	87.1	90.1	3	87	90	80.89	1,856.78	2.24E-08
CM13-25	9-Aug-14	5517924	663769	1,938	90.12	87.1	90.1	3	87	90	82.09	1,855.68	2.24E-08
CM13-25	21-Jun-15	5517924	663769	1,938	90.12	87.1	90.1	3	87	90	82.13	1,855.68	2.24E-08

Note: NM indicates that the well was not measured on this visit

Table 4.3
Summary of Field-Measured Parameters

Sampling Location	Date Sampled	Field Results			
		Reading Type: YSI Multimeter			
		Conductivity	pH	Temperature	Total Dissolved Solids
		µS/cm	-	°C	mg/L
CM12-01	9-Sep-13	395	8.25	15.1	198
CM12-01	5-Nov-14	313	7.63	2.5	-
CM12-01 *	15-Oct-15	219	7.17	6.8	-
CM12-01 *	21-Jun-16	211	7.27	5.1	221
CM11-11	10-Sep-13	254	8.12	9.0	128
CM11-11	5-Nov-14	330	7.00	2.9	-
CM11-11 *	15-Oct-15	242	6.86	4.9	-
CM11-11 *	21-Jun-16	240	6.82	4.3	258
CM13-06	10-Sep-13	52	7.60	7.1	26
CM13-06	19-Apr-14	31	5.51	4.0	0.019
CM13-06 *	15-Oct-15	31	7.42	2.0	-
CM13-06 *	21-Jun-16	24	8.21	4.9	24.9
CM13-25	9-Sep-13	392	7.83	11.0	198
CM13-25 *	15-Oct-15	247	6.74	8.1	-
CM13-25 *	21-Jun-16	180	7.18	4.91	190
GCDWQ MAC		NG	NG	NG	NG
GCDWQ AO		NG	6.5 - 8.5	15	500

- *Reading from smarTROLL Multiparameter Handheld meter
- GCDWQ MAC: Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations
- **GCDWQ MAC:** Highlighted value exceeds GCDWQ MAC
- NG: No Guideline
- - : No Groundwater Sampled

Table 4.4
Summary of Routine Parameters and Major Ions

Lab Results – General and Inorganic Parameters

Sampling Location	Date Sampled	Sample Type	Alkalinity (bicarbonate, as CaCO3)	Alkalinity (carbonate, as CaCO3)	Alkalinity (hydroxide, as CaCO3)	Alkalinity (phenolphthalein, as CaCO3)	Alkalinity (total, as CaCO3)	Ammonia (total, as N)	Ammonia, total (dissolved as N)	Anion - Cation Percent Difference	Total Anions	Bicarbonate (HCO3)	Bromide	Carbonate (CO3)	Total Cations	Chemical Oxygen Demand	Chemical Oxygen Demand (dissolved)	Chloride	Colour
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	meq/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L	mg/L	CU
CM11-11	8-Sep-13	Normal	-	-	-	<0.50	160	-	-	-	3.5	190	-	<0.50	3.0	16	-	1.4	-
CM11-11	7-Jan-14	Normal	-	-	-	<0.50	140	0.31	0.30	-	3.4	170	-	<0.50	3.8	8.0	9.0	1.3	<2.0
CM11-11	9-Aug-14	Normal	-	-	-	<0.50	150	0.81	-	-	3.2	180	-	<0.50	3.4	<5.0	-	<1.0	-
CM11-11	5-Nov-14	Normal	-	-	-	<0.50	150	0.79	-	-	3.3	180	-	<0.50	3.6	<5.0	<5.0	1.2	-
CM11-11	15-Oct-15	Normal	145	<1.0	<1.0	<2.0	145	0.809	-	1.6	3.25	176.9	0.062	<1.0	3.35	23	-	0.63	-
CM11-11	15-Oct-15	Duplicate	151	<1.0	<1.0	<2.0	151	0.834	-	-1.9	3.68	184.2	0.062	<1.0	3.54	<20	-	1.06	-
CM11-11	21-Jun-16	Normal	180	<1.0	<1.0	<2.0	180	0.872	-	-1.2	4.23	219	<0.050	<1.0	4.12	<20	-	0.73	-
CM12-01	8-Sep-13	Normal	-	-	-	<0.50	95	-	-	-	4.5	120	-	<0.50	7.2	15	-	3.5	-
CM12-01	8-Sep-13	Duplicate	-	-	-	<0.50	99	-	-	-	4.4	120	-	<0.50	8.5	16	-	3.2	-
CM12-01	7-Jan-14	Normal	-	-	-	<0.50	100	0.054	<0.50	-	-	140	-	<0.50	-	13	9.0	3.6	13
CM12-01	7-Jan-14	Duplicate	-	-	-	<0.50	110	<0.050	<0.050	-	-	140	-	<0.50	-	13	8.0	3.7	9.6
CM12-01	20-Apr-14	Normal	-	-	-	<0.50	140	0.066	-	-	7.0	170	-	<0.50	6.8	9.0	-	6.6	-
CM12-01	9-Aug-14	Normal	-	-	-	<0.50	150	0.37	-	-	3.3	180	-	<0.50	3.3	8.0	-	<1.0	-
CM12-01	9-Aug-14	Duplicate	-	-	-	<0.50	150	0.41	-	-	3.3	180	-	<0.50	3.3	6.0	-	<1.0	-
CM12-01	5-Nov-14	Normal	-	-	-	<0.50	150	0.42	-	-	3.9	190	-	<0.50	4.2	<5.0	<5.0	<1.0	-
CM12-01	5-Nov-14	Duplicate	-	-	-	<0.50	150	0.40	-	-	4.0	190	-	<0.50	4.2	10	<5.0	<1.0	-
CM12-01	15-Oct-15	Normal	166	<1.0	<1.0	<2.0	166	0.259	-	-4.5	3.92	202.5	0.052	<1.0	3.58	<20	-	<0.50	-
CM12-01	21-Jun-16	Normal	156	<1.0	<1.0	<2.0	156	0.316	-	1.3	3.45	191	<0.050	<1.0	3.54	<20	-	<0.50	-
CM13-06	8-Sep-13	Normal	-	-	-	<0.50	23	-	-	-	0.72	29	-	<0.50	4.0	660	-	1.0	-
CM13-06	6-Jan-14	Normal	-	-	-	<0.50	16	0.073	<0.050	-	-	20	-	<0.50	-	11	5.0	1.7	99
CM13-06	19-Apr-14	Normal	-	-	-	<0.50	21	0.071	-	-	0.58	26	-	<0.50	0.55	<5.0	-	1.1	-
CM13-06	5-Nov-14	Normal	-	-	-	<0.50	16	<0.050	-	-	0.38	19	-	<0.50	0.44	11	<5.0	<1.0	-
CM13-06	15-Oct-15	Normal	23.2	<1.0	<1.0	<2.0	23.2	0.0050	-	-4.3	0.54	28.3	<0.050	<1.0	0.50	125	-	<0.50	-
CM13-06	21-Jun-16	Normal	19.3	<1.0	<1.0	<2.0	19.3	0.0154	-	-4.4	0.43	23.5	<0.050	<1.0	0.40	242	-	<0.50	-
CM13-06	21-Jun-16	Duplicate	19.2	<1.0	<1.0	<2.0	19.2	0.0071	-	-5.5	0.43	23.4	<0.050	<1.0	0.39	248	-	<0.50	-
CM13-25	8-Sep-13	Normal	-	-	-	<0.50	230	-	-	-	5.3	280	-	<0.50	5.3	170	-	1.9	-
CM13-25	9-Aug-14	Normal	-	-	-	<0.50	160	0.11	-	-	3.5	200	-	<0.50	3.6	6.0	-	<1.0	-
CM13-25	15-Oct-15	Normal	176	<1.0	<1.0	<2.0	176	0.123	-	0.6	3.88	214.7	<0.050	<1.0	3.92	882	-	<0.50	-
CM13-25	21-Jun-16	Normal	148	<1.0	<1.0	<2.0	148	0.0719	-	0.5	3.14	181	<0.050	<1.0	3.17	32	-	<0.50	-
Creek	19-Apr-14	Normal	-	-	-	<0.50	150	<0.050	-	-	3.7	180	-	<0.50	3.9	<5.0	-	1.2	-
Creek	19-Apr-14	Duplicate	-	-	-	<0.50	150	<0.050	-	-	3.8	190	-	<0.50	3.9	<5.0	-	1.2	-
Creek	9-Aug-14	Normal	-	-	-	0.66	150	0.086	-	-	3.6	190	-	0.79	3.8	5.0	-	<1.0	-
Creek	5-Nov-14	Normal	-	-	-	0.90	140	<0.050	-	-	3.5	170	-	1.1	3.8	<5.0	<5.0	1.2	-
BCAWQG AL			NG	NG	NG	NG	NG	Calc [1.1]	NG	NG	NG	NG	NG	NG	NG	NG	NG	600 [1.2]	N [1.3]
GCDWQ MAC			NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG

Sampling Location	Date Sampled	Sample Type	Conductivity	Total cyanide	Dissolved organic carbon	Fluoride	Hardness, total (dissolved as CaCO3)	Hydroxide (OH)	Ion balance	Nitrate (as N)	Nitrate (as NO3)	Nitrate + Nitrite (as N)	Nitrate + Nitrite (as N) (calculated)	Nitrite (as N)	Nitrite (as NO2)	Total nitrogen	Total kjeldahl nitrogen	Dissolved Kjeldahl Nitrogen	Orthophosphate (dissolved, as P)	Oxidation reduction potential	pH	Sodium (dissolved)	Sodium (total)	Sulphate	Total dissolved solids	Total dissolved solids (computed)	Total inorganic carbon	Total organic carbon	Total suspended solids	Turbidity
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mV		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
CM11-11	8-Sep-13	Normal	310	-	1.6	-	130	<0.50	0.87	0.16	0.70	0.16	0.16	0.0038	0.012	-	-	-	-	-	7.78	10	-	15	-	170	-	-	-	-
CM11-11	7-Jan-14	Normal	350	<0.0050	1.4	-	140	<0.50	1.1	0.060	0.26	0.077	0.078	0.018	0.057	0.47	0.39	0.37	<0.0030	160	7.69	21	18	27	200	180	-	1.2	51	44
CM11-11	9-Aug-14	Normal	310	<0.0020	2.4	-	140	<0.50	1.1	0.022	0.097	0.022	0.022	<0.010	<0.033	0.83	0.80	-	0.0040	49	7.67	12	12	10	-	160	34.6	0.57	-	-
CM11-11	5-Nov-14	Normal	330	<0.0020	2.1	-	140	<0.50	1.1	0.024	0.11	0.024	0.024	<0.010	<0.033	0.75	0.73	0.85	0.0030	140	7.91	15	15	14	160	170	40	0.92	3.3	10
CM11-11	15-Oct-15	Normal	279	<0.0050	1.18	0.145	131	-	-	<0.0050	-	<0.0051	<0.005	0.0013	-	0.939	0.982	-	<0.0010	-	7.66	12.2	11.7	15.2	159	-	30.4	4.64	-	-
CM11-11	15-Oct-15	Duplicate	314	<0.0050	1.25	0.126	128	-	-	0.0062	-	0.0062	0.0062	<0.0010	-	0.941	0.984	-	<0.0010	-	7.71	17.8	21.8	30.3	190	-	34.9	3.68	-	-
CM11-11	21-Jun-16	Normal	382	<0.0050	2.63	0.164	68.3	-	-	<0.0050	-	<0.0051	<0.005	0.0010	-	0.929	0.932	-	<0.0010	-	7.63	60.4	58.6	29.2	253	-	46.6	2.43	-	-
CM12-01	8-Sep-13	Normal	53	-	1.7	-	130	<0.50	1.6	0.94	4.2	0.94	0.94	<0.0030	<0.0099	-	-	-	-	-	6.93	98	-	120	-	340	-	-	-	-
CM12-01	8-Sep-13	Duplicate	53	-	1.6	-	150	<0.50	1.9	0.92	4.1	0.92	0.92	<0.0030	<0.0099	-	-	-	-	-	7.00	120	-	110	-	360	-	-	-	-
CM12-01	7-Jan-14	Normal	490	<0.0050	<5.0	-	17	<0.50	1.0	0.78	3.4	0.80	0.80	0.018	0.059	1.9	1.1	<0.050	<0.030	142	7.82	96	100	110	1800	280	-	1.9	370	650
CM12-01	7-Jan-14	Duplicate	480	<0.0050	3.2	-	18	<0.50	1.0	0.80	3.6	0.82	0.82	0.018	0.058	2.1	1.3	<0.050	0.011	151	7.78	97	100	110	1600	290	-	2.2	360	640
CM12-01	20-Apr-14	Normal	720	0.0020	2.0	-	20	<0.50	0.98	0.90	4.0	1.4	1.42	0.52	1.7	1.4	<0.50	-	-	299	8.22	150	150	190	1200	440	-	<5.0	560	610
CM12-01	9-Aug-14	Normal	310	<0.0020	<0.50	-	160	<0.50	1.0	0.012	0.053	0.012	<0.014	<0.010	<0.033	0.46	0.44	-	0.0050	72	7.89	4.1	4.0	14	-	160	33.9	<0.50	-	-
CM12-01	9-Aug-14	Duplicate	310	<0.0020	0.96	-	150	<0.50	1.0	0.010	0.044	0.010	<0.014	<0.010	<0.033	0.49	0.48	-	<0.0030	95	7.91	4.1	4.1	14	-	160	33.2	<0.50	-	-
CM12-01	5-Nov-14	Normal	390	<0.0020	1.5	-	150	<0.50	1.1	0.067	0.30	0.067	0.067	<0.010	<0.033	0.59	0.52	0.57	0.0040	130	8.11	25	40	41	220	210	40	<0.50	2.7	3.0
CM12-01	5-Nov-14	Duplicate	400	<0.0020	0.65	-	150	<0.50	1.1	0.070	0.31	0.070	0.070	<0.010	<0.033	0.51	0.44	0.40	0.0030	140	8.11	26	36	45	220	220	40	<0.50	5.3	2.9
CM12-01	15-Oct-15	Normal	324	<0.0050	2.44	0.209	153	-	-	0.148	-	0.170	0.170	0.0221	-	0.444	0.342	-	<0.0010	-	8.00	10.9	18.2	27.7	192	-	37.3	1.80	-	-
CM12-01	21-Jun-16	Normal	320	<0.0050	0.92	0.201	154	-	-	0.110	-	0.113	0.113	0.0029	-	0.473	0.349	-	<0.0010	-	7.81	9.43	9.81	14.8	192	-	40.2	0.86	-	-
CM13-06	8-Sep-13	Normal	73	-	3.0	-	140	<0.50	5.6	0.089	0.39	0.089	0.089	<0.0030	<0.0099	-	-	-	-	-	7.20	20	-	10	-	110	-	-	-	-
CM13-06	6-Jan-14	Normal	54	<0.0050	<5.0	-	28	<0.50	1.1	0.055	0.24	0.055	0.055	<0.0030	<0.0099	14	14	<0.050	0.073	271	6.80	2.9	<5.0	14	1900	41	-	2.4	9900	>1000
CM13-06	19-Apr-14	Normal	57	<0.0020	2.0	-	26	<0.50	0.96	0.038	0.17	0.038	0.038	<0.010	<0.033	<0.050	<0.50	-	-	357	6.78	0.56	0.55	5.9	46	30	-	1.5	68	110
CM13-06	5-Nov-14	Normal	43	<0.0020	3.3	-	22	<0.50	1.2	0.037	0.16	0.037	0.037	<0.010	<0.033	0.33	0.29	0.17	0.035	170	6.93	<0.50	<0.50	2.6	<10	20	5.1	2.7	37	73
CM13-06	15-Oct-15	Normal	50.3	<0.0050	2.51	0.034	23.0	-	-	0.0442	-	0.0442	0.0442	<0.0010	-	0.75	1.54	-	0.0375	-	6.37	0.394	0.689	3.64	62	-	4.09	44.4	-	-
CM13-06	21-Jun-16	Normal	37.7	<0.0050	2.93	0.041	17.9	-	-	0.0226	-	0.0226	0.0226	<0.0010	-	1.5	3.08	-	0.0418	-	6.46	0.29	0.61	2.12	130	-	4.13	79.2	-	-
CM13-06	21-Jun-16	Duplicate	37.3	<0.0050	3.01	0.041	18.1	-	-	0.0266	-	0.0266	0.0266	<0.0010	-	<1.5	3.28	-	0.0418	-	6.37	0.25	0.58	2.12	136	-	5.24	84.9	-	-
CM13-25	8-Sep-13	Normal	470	-	4.1	-	200	<0.50	1.0	0.23	1.0	0.24	0.24	0.013	0.043	-	-	-	-	-	7.85	28	-	31	-	270	-	-	-	-
CM13-25	9-Aug-14	Normal	330	<0.0020	0.83	-	160	<0.50	1.0	0.021	0.091	0.021	0.021	<0.010	<0.033	1.3	1.3	-	<0.0030	69	7.32	6.0	6.3	13	-	170	37.2	0.89	-	-
CM13-25	15-Oct-15	Normal	321	<0.0050	1.24	0.192	168	-	-	<0.0050	-	<0.0051	<0.0051	<0.0010	-	0.85	6.82	-	<0.0010	-	7.14	10.3	11.1	17.0	184	-	45.9	247	-	-
CM13-25	21-Jun-16	Normal	289	<0.0050	3.52	0.182	150	-	-	<0.0050	-	<0.0051	<0.0051	<0.0010	-	0.282	0.371	-	<0.0010	-	7.11	1.85	1.82	7.82	169	-	39.9	6.47	-	-
Creek	19-Apr-14	Normal	360	<0.0020	0.75	-	190	<0.50	1.1	0.078	0.35	0.078	0.078	<0.010	<0.033	0.078	<0.050	-	-	295	8.24	3.9	3.9	33	230	190	-	0.65	<1.0	0.24
Creek	19-Apr-14	Duplicate	360	<0.0020	0.96	-	190	<0.50	1.0	0.080	0.35	0.080	0.080	<0.010	<0.033	0.080	<0.050	-	-	265	8.28	3.9	3.9	33	190	190	-	0.77	<1.0	0.22
Creek	9-Aug-14	Normal	340	<0.0020	2.4	-	180	<0.50	1.1	0.052	0.23	0.052	0.052	<0.010	<0.033	0.19	0.14	-	0.0060	40	8.34	2.5	2.4	25	-	180	33.4	0.78	-	-
Creek	5-Nov-14	Normal	330	<0.0020	2.1	-	180	<0.50	1.1	0.068	0.30	0.068	0.068	<0.010	<0.033	0.38	0.31	0.28	0.0040	120	8.39	2.8	2.6	26	160	180	36	1.2	2.0	2.8
BCAWQG AL			NG	0.010 [1.4]	N [1.5]	Calc [1.6]	NG	NG	NG	32.8 [1.7]	145.3 [1.8]	32.8 [1.9]	32.8 [1.10]	Calc [1.11]	Calc [1.12]	NG	NG	NG	NG	NG	N [1.13]	NG	NG	Calc [1.14]	NG	NG	NG	N [1.15]	N [1.16]	N [1.17]
GCDWQ MAC			NG	0.2 [2.1]	NG	1.5	NG	NG	NG	10	45	10 [2.2]	10 [2.3]	1	3	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	N [2.4]

Table 4.4: Guideline Notes for Reports for Crown Mountain Water Quality Results

1. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (BCAWQG AL)

General Notes:

The Water Quality Guidelines (Criteria) Reports by BC Ministry of Environment were used as references for the guidelines. (Internet address: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html . Overview Reports (BC MOE) were used as the references for the guidelines unless the note for specific analyte indicates that the Technical Appendix (BC MOE) was used. / For some parameters, guidelines are specified as two values: the maximum value or the acute criterion, and the 30-day average value or the chronic criterion. The maximum value was used in this report for parameters that have both guideline values.

Note 1.1 for Ammonia (total, as N):

The maximum guideline for ammonia varies as a function of pH and temperature. See Table 3 in Overview Report Update September 2009.
The 30-day average guideline for ammonia varies as a function of pH and temperature. See Table 4 in Overview Report Update September 2009. / The lab pH and field temperature results were used for determining the maximum ammonia for this report. If a lab pH result was not available then the field pH result was used.

Note 1.2 for Chloride:

To protect freshwater aquatic life from acute and lethal effects, the maximum concentration of chloride (mg/L as NaCl) at any time should not exceed 600 mg/L.
To protect freshwater aquatic life from chronic effects, the average (arithmetic mean computed from five weekly samples collected over a 30-day period) concentration of chloride (mg/L as NaCl) should not exceed 150 mg/L.

Note 1.3 for Colour:

30-day average true colour of filtered water samples shall not exceed background levels by more than 5 colour units in clearwater systems or 20% in coloured systems. See BC MOE Overview Report for additional details.

Note 1.4 for Total cyanide:

The maximum concentration of weak-acid dissociable cyanide (expressed as CN) in unfiltered samples should not exceed 10 µg/L at any time.
In a 30-day period the average concentration (based on a minimum of 5 weekly samples) of weak-acid dissociable cyanide (expressed as CN) in unfiltered samples should not exceed 5 µg/L.
A maximum of 10 µg/L was used, in this report, to identify exceedances for total cyanide as a means for determining the potential for exceeding the weak-acid dissociable cyanide guideline.

Note 1.5 for Dissolved organic carbon:

Recommended guideline for dissolved organic carbon (DOC) is 30-day median ± 20% of the median background concentration.

Note 1.6 for Fluoride:

Correction by BC MOE Sept. 2011: The criteria for Fluoride (total) in mg/L is 0.4 as a maximum where the water hardness (as CaCO3) is less than or equal to 10 mg/L. Otherwise use the equation:
LC50 fluoride = -51.73 + 92.57 log10 (Hardness) and multiply by 0.01.
Hardness is as CaCO3 in units mg/L.

Note 1.7 for Nitrate (as N):

The guideline maximum for nitrate (as N) is 32.8 mg/l.
The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period.
Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.

Note 1.8 for Nitrate (as NO3):

The guideline maximum for nitrate as nitrogen is 32.8 mg/l. This is equivalent to 145.3 mg/L Nitrate as NO3.

Note 1.9 for Nitrate + Nitrite (as N):

The guideline maximum for nitrate (as N) is 32.8 mg/l.
The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period.
Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.

Note 1.10 for Nitrate + Nitrite (as N) (calculated):

The guideline maximum for nitrate (as N) is 32.8 mg/l.
The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period.
Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.

Note 1.11 for Nitrite (as N):

The guideline maximum for nitrite as N is:

- 0.06 mg/L if chloride less than 2 mg/L
- 0.12 mg/L if chloride is 2 to 4 mg/L
- 0.18 mg/L if chloride is 4 to 6 mg/L
- 0.24 mg/L if chloride is 6 to 8 mg/L
- 0.30 mg/L if chloride is 8 to 10 mg/L
- 0.60 mg/L if chloride is greater than 10 mg/L.

The guideline 30-day average for nitrite as N is:

- 0.02 mg/L if chloride less than 2 mg/L
- 0.04 mg/L if chloride is 2 to 4 mg/L
- 0.06 mg/L if chloride is 4 to 6 mg/L
- 0.08 mg/L if chloride is 6 to 8 mg/L
- 0.10 mg/L if chloride is 8 to 10 mg/L
- 0.20 mg/L if chloride is greater than 10 mg/L.

Note 1.12 for Nitrite (as NO2):

The guideline maximum for nitrite as NO2 is:

- 0.20 mg/L if chloride less than 2 mg/L
- 0.39 mg/L if chloride is 2 to 4 mg/L
- 0.59 mg/L if chloride is 4 to 6 mg/L
- 0.79 mg/L if chloride is 6 to 8 mg/L
- 0.99 mg/L if chloride is 8 to 10 mg/L
- 1.97 mg/L if chloride is greater than 10 mg/L

Table 4.4(cont'd): Guideline Notes for Reports for Crown Mountain Water Quality Results

Note 1.13 for pH:
pH less than 6.5: No statistically significant decrease in pH from background.
pH from 6.5 to 9.0: Unrestricted change permitted within this range.
pH over 9.0: No statistically significant increase in pH from background.
See BC MOE Overview Report for additional details.
For screening purposes in this report, exceedance were flagged for sulphate greater than 429 mg/L at hardness greater than 250 mg/L as CaCO3.

Note 1.14 for Sulphate:
The approved 30-day average (minimum of 5 evenly-spaced samples collected in 30 days) water quality guidelines to protect aquatic life in BC for sulphate are:

128 mg/L at hardness of 0 to 30 mg/L as CaCO3
218 mg/L at hardness of 31 to 75 mg/L as CaCO3
309 mg/L at hardness of 76 to 180mg/L as CaCO3
429 mg/L at hardness 181 to 250 mg/L as CaCO3

Need to determine guideline based on site water for hardness greater than 250 mg/L as CaCO3.

Note 1.15 for Total organic carbon:
Recommended guideline for total organic carbon (TOC) is 30-day median ± 20% of the median background concentration.

Note 1.16 for Total suspended solids:
Maximum Induced Suspended Sediments - mg/L or % of background:

- 25 mg/L in 24 hours when background is less than or equal to 25;
- Mean of 5 mg/L in 30 days when background is less than or equal to 25;
- 25 mg/L when background is between 25 and 250;
- 10% when background is greater than or equal to 250.

Note 1.17 for Turbidity:
When background is less than or equal to 8 NTU:

- Maximum Induced Turbidity of 8 NTU in 24 hours.
- For sediment inputs that last between 24 hours and 30 days (daily sampling preferred) the mean turbidity should not exceed background by more than 2 NTU.

Maximum Induced Turbidity of 5 NTU when background is between 8 and 50 NTU.
Maximum Induced Turbidity of 10% when background is greater than 50 NTU.

2. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)

Note 2.1 for Total cyanide:
The GCDWQ MAC for free cyanide is 0.2 mg/L. A maximum of 0.2 mg/L was used, in this report, to identify exceedances for total cyanide as a means for determining the potential for exceeding the free cyanide guideline.

Note 2.2 for Nitrate + Nitrite (as N):
The MAC for Nitrate (as N) is 10 mg/L

Note 2.3 for Nitrate + Nitrite (as N) (calculated):
The MAC for Nitrate (as N) is 10 mg/L

Note 2.4 for Turbidity:
Waterworks systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet health-based turbidity limits, as defined for specific treatment technologies. Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters should meet the requirements described in GCDWQ.
For systems that use groundwater that is not under the direct influence of surface water, which are considered less vulnerable to faecal contamination, turbidity should generally be below 1.0 NTU.
For effective operation of the distribution system, it is good practice to ensure that water entering the distribution system has turbidity levels below 1.0 NTU.

Table 4.5a
Summary of Dissolved Metals

Sampling Location	Date Sampled	Sample Type	Aluminum (dissolved)	Antimony (dissolved)	Arsenic (dissolved)	Barium (dissolved)	Beryllium (dissolved)	Bismuth (dissolved)	Boron (dissolved)	Cadmium (dissolved)	Calcium (dissolved)	Chromium (dissolved)	Cobalt (dissolved)	Copper (dissolved)	Iron (dissolved)	Lead (dissolved)	Lithium (dissolved)	Magnesium (dissolved)	Manganese (dissolved)
			Lab Results – Dissolved Metals																
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CM11-11	9-Aug-14	Normal	<0.0030	0.00061	0.0011	0.30	<0.0010	-	0.036	<0.000020	32	<0.0010	<0.00030	<0.00020	0.32	<0.00020	0.022	14	0.076
CM11-11	5-Nov-14	Normal	0.0030	**0.012**	0.00039	0.29	<0.0010	-	0.036	0.000023	33	<0.0010	0.00031	0.00071	<0.060	<0.00020	0.029	14	0.079
CM11-11	15-Oct-15	Normal	0.0013	0.00252	0.00029	0.420	<0.000020	<0.00010	0.033	<0.0000050	31.7	<0.00010	0.00013	<0.00020	1.74	<0.000050	0.0176	12.5	0.0574
CM11-11	15-Oct-15	Duplicate	0.0044	0.00262	0.00031	0.396	<0.000020	<0.000050	0.035	<0.0000050	30.7	<0.00010	0.00012	<0.00020	1.47	<0.000050	0.0204	12.5	0.0554
CM11-11	21-Jun-16	Normal	<0.0010	0.00208	0.00172	0.116	<0.00010	<0.000050	0.036	<0.0000050	16.0	<0.00010	0.00031	<0.00020	0.307	<0.000050	0.0385	6.87	0.0652
CM12-01	9-Aug-14	Normal	<0.0030	<0.00060	<0.00020	0.27	<0.0010	-	<0.020	<0.000020	37	<0.0010	<0.00030	0.00023	<0.060	<0.00020	<0.020	15	0.038
CM12-01	9-Aug-14	Duplicate	<0.0030	<0.00060	<0.00020	0.26	<0.0010	-	<0.020	<0.000020	37	<0.0010	<0.00030	0.00028	<0.060	<0.00020	<0.020	15	0.038
CM12-01	5-Nov-14	Normal	<0.0030	<0.00060	0.00073	0.24	<0.0010	-	0.021	<0.000020	38	<0.0010	<0.00030	<0.00020	<0.060	<0.00020	<0.020	14	0.043
CM12-01	5-Nov-14	Duplicate	<0.0030	<0.00060	0.00074	0.24	<0.0010	-	<0.020	<0.000020	38	<0.0010	<0.00030	<0.00020	<0.060	<0.00020	<0.020	14	0.044
CM12-01	15-Oct-15	Normal	0.0014	0.00175	0.00034	0.257	<0.000020	<0.000050	0.020	<0.0000050	37.8	<0.00010	<0.00010	0.00054	0.041	<0.000050	0.0124	14.3	0.0278
CM12-01	21-Jun-16	Normal	<0.0010	0.00177	0.00047	0.266	<0.00010	<0.000050	0.020	<0.0000050	37.1	<0.00010	<0.00010	<0.00020	0.235	<0.000050	0.0138	14.8	0.0549
CM13-06	5-Nov-14	Normal	0.065	<0.00060	0.00024	0.038	<0.0010	-	<0.020	0.000037	6.0	<0.0010	<0.00030	0.0020	0.067	<0.00020	<0.020	1.7	<0.0040
CM13-06	15-Oct-15	Normal	0.0380	0.00036	0.00023	0.0476	<0.000020	<0.000050	<0.010	0.0000228	6.20	<0.00010	0.00028	0.00046	0.039	<0.000050	<0.0010	1.84	0.00358
CM13-06	21-Jun-16	Normal	0.136	<0.00020	0.00029	0.0365	<0.00020	<0.00010	<0.020	0.000021	4.92	0.00020	<0.00020	0.00086	0.088	<0.00010	<0.0020	1.36	0.00246
CM13-06	21-Jun-16	Duplicate	0.0526	<0.00020	0.00026	0.0377	<0.00020	<0.00010	<0.020	0.000013	4.86	<0.00020	<0.00020	0.00045	0.036	<0.00010	<0.0020	1.46	0.00232
CM13-25	9-Aug-14	Normal	<0.0030	0.0022	0.00050	0.17	<0.0010	-	<0.020	0.000040	33	<0.0010	0.0025	0.00059	<0.060	<0.00020	<0.020	19	0.18
CM13-25	15-Oct-15	Normal	0.0048	0.00182	0.00143	0.185	<0.000020	<0.000050	0.014	<0.0000050	34.0	<0.00010	0.00176	<0.00020	1.48	<0.000050	0.0141	20.2	0.0683
CM13-25	21-Jun-16	Normal	0.0013	**0.00705**	0.00108	0.177	<0.00010	<0.000050	0.015	<0.0000050	30.4	<0.00010	0.00128	0.00037	0.895	<0.000050	0.0122	18.0	0.0491
Creek	9-Aug-14	Normal	<0.0030	<0.00060	<0.00020	0.079	<0.0010	-	<0.020	<0.000020	47	<0.0010	<0.00030	0.00022	<0.060	<0.00020	<0.020	16	<0.0040
Creek	5-Nov-14	Normal	0.0037	<0.00060	<0.00020	0.077	<0.0010	-	<0.020	<0.000020	47	<0.0010	<0.00030	<0.00020	<0.060	<0.00020	<0.020	16	<0.0040
BCAWQG AL			Calc [1.1]	NG	0.005 [1.2]	NG	NG	NG	1.2 [1.3]	Calc [1.4]	NG	NG	0.110 [1.5]	Calc [1.6]	0.35	Calc [1.7]	NG	NG	Calc [1.8]
GCDWQ MAC			NG	0.006	0.010 [2.1]	1.0	NG	NG	5	0.005	NG	0.05	NG	NG	NG	0.010	NG	NG	NG

Sampling Location	Date Sampled	Sample Type	Mercury (dissolved)	Molybdenum (dissolved)	Nickel (dissolved)	Phosphorus (dissolved, by ICPMS/ICPOES)	Phosphorus (dissolved, APHA 4500-P)	Potassium (dissolved)	Selenium (dissolved)	Silicon (dissolved, as Si)	Silver (dissolved)	Strontium (dissolved)	Sulphur (dissolved)	Thallium (dissolved)	Tin (dissolved)	Titanium (dissolved)	Tungsten (dissolved)	Uranium (dissolved)	Vanadium (dissolved)	Zinc (dissolved)	Zirconium (dissolved)
			Lab Results – Dissolved Metals																		
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CM11-11	9-Aug-14	Normal	-	0.0019	0.0012	<0.10	-	1.6	<0.00020	2.7	<0.00010	0.092	3.1	<0.00020	<0.0010	<0.0010	-	0.00045	<0.0010	<0.0030	-
CM11-11	5-Nov-14	Normal	-	0.0024	0.0014	<0.10	-	1.7	0.00079	2.9	<0.00010	0.096	4.4	<0.00020	<0.0010	<0.0010	-	0.00056	<0.0010	0.0097	-
CM11-11	15-Oct-15	Normal	<0.0000050	0.00223	0.00063	<0.050	-	2.32	0.000083	2.69	<0.00050	0.0701	6.8	<0.000010	<0.00010	<0.00030	-	0.000308	<0.00050	0.0039	<0.00030
CM11-11	15-Oct-15	Duplicate	<0.0000050	0.00407	<0.00050	<0.050	-	2.49	0.000112	2.76	<0.000010	0.0709	11.0	<0.000010	<0.00010	<0.00030	-	0.000358	<0.00050	<0.0010	<0.00030
CM11-11	21-Jun-16	Normal	<0.0000050	0.00675	0.00062	<0.050	-	2.01	<0.000050	4.22	<0.000010	0.0710	10.3	0.000022	<0.00010	<0.00030	0.00016	0.00184	<0.00050	0.0034	<0.00030
CM12-01	9-Aug-14	Normal	-	0.0010	<0.00050	<0.10	-	1.2	<0.00020	2.5	<0.00010	0.044	4.2	<0.00020	<0.0010	<0.0010	-	0.00022	<0.0010	<0.0030	-
CM12-01	9-Aug-14	Duplicate	-	0.0010	<0.00050	<0.10	-	1.2	<0.00020	2.5	<0.00010	0.044	4.2	<0.00020	<0.0010	<0.0010	-	0.00023	<0.0010	<0.0030	-
CM12-01	5-Nov-14	Normal	-	0.0055	<0.00050	<0.10	-	1.1	<0.00020	3.1	<0.00010	0.056	13	<0.00020	<0.0010	<0.0010	-	0.0014	<0.0010	<0.0030	-
CM12-01	5-Nov-14	Duplicate	-	0.0059	<0.00050	<0.10	-	1.1	<0.00020	3.1	<0.00010	0.057	14	<0.00020	<0.0010	<0.0010	-	0.0015	<0.0010	<0.0030	-
CM12-01	15-Oct-15	Normal	<0.0000050	0.00279	<0.00050	<0.050	-	1.22	0.000148	2.82	<0.000010	0.0497	7.28	0.000078	<0.00010	<0.00030	-	0.000654	<0.00050	0.0053	<0.00030
CM12-01	21-Jun-16	Normal	<0.0000050	0.00202	<0.00050	<0.050	-	1.18	<0.000050	2.95	<0.000010	0.0488	5.09	0.000047	<0.00010	<0.00030	<0.00010	0.000585	<0.00050	0.0029	<0.00030
CM13-06	5-Nov-14	Normal	-	<0.00020	0.0025	<0.10	-	<0.30	<0.00020	1.9	<0.00010	<0.020	0.98	<0.00020	<0.0010	<0.0010	-	<0.00010	<0.0010	0.028	-
CM13-06	15-Oct-15	Normal	0.0000112	<0.000050	0.00281	<0.050	-	0.54	0.000130	1.90	<0.000010	0.0230	1.31	0.000025	<0.00010	0.00173	-	<0.000010	<0.00050	0.0097	<0.00030
CM13-06	21-Jun-16	Normal	0.0000084	<0.00010	0.0027	<0.10	-	0.21	0.00012	1.93	<0.000020	0.0159	<1.0	<0.000020	<0.00020	0.00755	<0.00020	<0.000020	<0.0010	0.0095	<0.00060
CM13-06	21-Jun-16	Duplicate	0.0000081	<0.00010	0.0028	<0.10	-	0.19	<0.00010	1.69	<0.000020	0.0166	<1.0	<0.000020	<0.00020	0.00206	<0.00020	<0.000020	<0.0010	0.0058	<0.00060
CM13-25	9-Aug-14	Normal	-	0.0022	0.0038	<0.10	-	1.0	<0.00020	2.7	<0.00010	0.051	4.1	<0.00020	<0.0010	<0.0010	-	0.00038	<0.0010	0.0077	-
CM13-25	15-Oct-15	Normal	<0.0000050	0.00165	0.00370	<0.050	-	0.91	0.000094	2.92	<0.000010	0.0545	6.09	<0.000010	<0.00010	<0.00030	-	0.000449	<0.00050	0.0127	<0.00030
CM13-25	21-Jun-16	Normal	<0.0000050	0.00109	0.00282	<0.050	-	1.44	<0.000050	2.85	<0.000010	0.0516	2.79	0.000036	<0.00010	<0.00030	0.00070	0.000105	<0.00050	0.0073	<0.00030
Creek	9-Aug-14	Normal	-	0.0013	<0.00050	<0.10	-	0.68	0.0011	2.6	<0.00010	0.13	7.6	<0.00020	<0.0010	<0.0010	-	0.00070	<0.0010	<0.0030	-
Creek	5-Nov-14	Normal	-	0.0012	<0.00050	0.11	-	0.46	0.00083	2.6	<0.00010	0.14	7.7	<0.00020	<0.0010	<0.0010	-	0.00054	<0.0010	<0.0030	-
BCAWQG AL			0.000020 [1.9]	2 [1.10]	NG	N [1.11]	N [1.12]	NG	0.002 [1.13]	NG	Calc [1.14]	NG	NG	NG	NG	NG	NG	NG	NG	Calc [1.15]	NG
GCDWQ MAC			0.001	NG	NG	NG	NG	NG	0.05	NG	NG	NG	NG	NG	NG	NG	NG	0.02	NG	NG	NG

Guideline Notes for Reports for Crown Mountain Water Quality Results

1. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (BCAWQG AL)
General Notes:
The Water Quality Guidelines (Criteria) Reports by BC Ministry of Environment were used as references for the guidelines. (Internet address: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html). Overview Reports (BC MOE) were used as the references for the guidelines unless the note for specific analyte indicates that the Technical Appendix (BC MOE) was used. / For some parameters, guidelines are specified as two values: the maximum value or the acute criterion, and the 30-day average value or the chronic criterion. The maximum value was used in this report for parameters that have both guideline values.
Note 1.1 for Aluminum (dissolved):
The maximum concentration of dissolved aluminum at any time should not exceed:
1. 0.10 mg/L when the pH is greater than or equal to 6.5
2. The value (in mg/L) determined by the following relationship if pH less than 6.5
Dissolved Aluminum = e (1.209-2.426 (pH) + 0.286 $(pH)^2$)
The 30-day average concentration of dissolved aluminum (based on a minimum of 5 approximately weekly samples) should not exceed:
1. 0.05 mg/L when the median pH over 30 days is greater than or equal to 6.5
2. the value determined by the following relationship at median pH less than 6.5
Dissolved Aluminum = e (1.6-3.327 (median pH) + 0.402 $(\text{median pH})^2$)
Note 1.2 for Arsenic (dissolved):
The recommended guideline is for total arsenic.
Note 1.3 for Boron (dissolved):
The recommended guideline is for total boron.
Note 1.4 for Cadmium (dissolved):
The guideline for cadmium is determined on a site-specific basis according to the local water hardness. The guideline for cadmium (dissolved) in µg/L is determined by the following equations for short term exposure:
1. If hardness (as CaCO3) is less than 7 mg/L then maximum is 0.0380 µg/L
2. If hardness (as CaCO3) is from 7 to 45 mg/L then maximum is based on equation:
e to the power of {1.03[ln(hardness)] - 5.274}
3. If hardness (as CaCO3) is greater than 455 mg/L then maximum is 2.8 µg/L.
When water hardness is greater than the upper bound (i.e., highest water hardness tested), a site-specific assessment may be required.
Note 1.5 for Cobalt (dissolved):
The interim maximum concentration for total cobalt is 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt.
The interim 30-day average concentration for total cobalt (based on five weekly samples) is 4 µg/L to protect aquatic life from chronic effects of cobalt.
Note 1.6 for Copper (dissolved):
The maximum concentration of total copper should not exceed at any time the numerical value (in µg/L) given by the formula "0.094(hardness)+2", where water hardness is reported as mg/L CaCO3.
The 30-day average concentration of total copper (based on a minimum of 5 approximately weekly samples) should not exceed 2 µg/L when average water hardness over the same period (expressed as mg/L CaCO3) is less than 50 mg/L. When average water hardness is greater than 50 mg/L the 30-day average concentration should not exceed the numerical value (in µg/L) given by the formula "0.04(average hardness)", where water hardness is reported as mg/L CaCO3.
Note 1.7 for Lead (dissolved):
The maximum guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is set at 3.0 µg/L. When water hardness exceeds 8.0 mg/L CaCO3 the maximum guideline for lead at any time is given by the following equation:
Maximum Criteria (µg/L) = exp (1.273 ln(hardness) - 1.460).
The 30-day average guideline for total lead in water, when water hardness exceeds 8 mg/L as CaCO3, is as follows:
30-Day Average (µg/L) is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704).
For hardness less than or equal to 8.0 mg/L there is no 30-day average guideline; hence the maximum concentration of 3.0 µg/L is used.
Note 1.8 for Manganese (dissolved):
The maximum concentration of total manganese in mg/L at any time should not exceed the value as determined by the following relationship:
0.01102 hardness + 0.54
where water hardness is reported as mg/L of CaCO3.
The 30-day mean concentration of total manganese in mg/L should be less than or equal to the value as determined by the following relationship:
0.0044 hardness + 0.605 where water hardness is reported as mg/L of CaCO3.
Note 1.9 for Mercury (dissolved):
The average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples) should not exceed 0.02 µg/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted as indicated in the Table 1 and Table 4 of the BC MOE Overview Report - First Update, February 2001.
There is no guideline maximum for total mercury in water, for freshwater aquatic life.
Note 1.10 for Molybdenum (dissolved):
The maximum concentration for total molybdenum is 2 mg/L.
The 30-day average concentration for total molybdenum (based on at least five weekly samples in a period of 30 days) is less than or equal to 1 mg/L.
Note 1.11 for Phosphorus (dissolved, by ICPMS/ICPOES):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.
Note 1.12 for Phosphorus (dissolved, APHA 4500-P):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.13 for Selenium (dissolved):
The 30-day average water quality guideline for protection of aquatic life is 2 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.
The 30-day average alert concentration for the protection of aquatic life in sensitive ecosystems is 1 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.
Note 1.14 for Silver (dissolved):
The guideline maximum for total silver is:
0.1 µg/L maximum if hardness less than or equal to 100 mg/L
3.0 µg/L maximum if hardness greater than 100 mg/L.
The guideline 30-day average for total silver is:
0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L
1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.
Note 1.15 for Zinc (dissolved):
The maximum concentration of total zinc (µg/L) at any time should not exceed 33 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
33 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The 30-day average concentration of total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
7.5 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
2. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)
Note 2.1 for Arsenic (dissolved):
Every effort should be made to maintain arsenic levels in drinking water as low as reasonably achievable.

Table 4.5b
Summary of Total Metals

Sampling Location	Date Sampled	Sample Type	Aluminum (total)	Antimony (total)	Arsenic (total)	Barium (total)	Beryllium (total)	Bismuth (total)	Boron (total)	Cadmium (total)	Calcium (total)	Cesium (total)	Chromium (total)	Cobalt (total)	Copper (total)	Iron (total)	Lead (total)	Lithium (total)	Magnesium (total)	Manganese (total)	Mercury (total)	Molybdenum (total)	Nickel (total)	Phosphorus (total, by ICPMS/CPOES)	Phosphorus (total, APHA 4500-P)	Potassium (total)	Rubidium (total)	Selenium (total)	Silicon (total, as Si)	Silver (total)	Strontium (total)	Sulphur (total)	Tellurium (total)	Thallium (total)	Thorium (total)	Tin (total)	Titanium (total)	Tungsten (total)	Uranium (total)	Vanadium (total)	Zinc (total)	Zirconium (total)
			Lab Results — Total Metals																																							
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CM11-11	7-Jan-14	Normal	0.20	**0.044**	0.0017	0.23	<0.0010	-	<0.020	0.00016	35	-	0.0021	0.0021	0.0032	0.49	0.0032	<0.020	13	0.13	-	0.0095	0.010	<0.10	<0.0030	1.7	-	0.030	2.7	<0.00010	0.086	7.6	-	0.00043	-	0.0041	0.019	-	0.012	0.0040	0.020	-
CM11-11	9-Aug-14	Normal	0.53	0.0027	0.0017	0.31	<0.0010	-	0.034	0.000039	32	-	<0.0010	0.00054	0.0014	0.98	0.0023	0.022	14	0.085	-	0.0019	0.0020	<0.10	0.044	1.7	-	0.00021	3.9	<0.00010	0.094	3.1	-	<0.00020	-	0.0017	0.024	-	0.0012	0.0035	0.0083	-
CM11-11	5-Nov-14	Normal	0.026	**0.012**	0.00095	0.27	<0.0010	-	0.034	0.000032	31	-	<0.0010	0.00041	0.0013	0.20	0.00051	<0.020	13	0.080	-	0.0027	0.0016	0.19	0.012	1.4	-	0.0011	2.8	<0.00010	0.091	4.3	-	<0.00020	-	0.0020	<0.0010	-	0.00061	<0.0010	0.010	-
CM11-11	15-Oct-15	Normal	0.149	**0.0160**	0.00042	0.423	0.000028	<0.000050	0.039	0.0000251	31.1	-	<0.00080	0.00018	0.00242	1.92	0.000699	0.0168	12.2	0.0585	<0.0000050	0.00328	0.00068	<0.050	0.0172	2.23	-	0.000363	2.98	0.000016	0.0699	5.11	-	0.000124	-	0.00194	0.00338	-	0.000412	<0.00050	0.0092	<0.00030
CM11-11	15-Oct-15	Duplicate	0.211	**0.0132**	0.00044	0.377	0.000047	<0.000050	0.038	0.0000258	30.0	-	<0.00070	0.00018	0.00238	1.57	0.000819	0.0195	12.0	0.0581	<0.0000050	0.00552	0.00067	<0.050	0.0186	2.29	-	0.000398	3.23	0.000013	0.0682	10.4	-	0.000102	-	0.00157	0.00743	-	0.000548	<0.00050	0.0081	<0.00030
CM11-11	21-Jun-16	Normal	0.198	**0.00646**	0.00185	0.130	<0.00010	<0.000050	0.037	0.0000240	16.0	0.000110	0.00085	0.00041	0.00285	1.45	0.000512	0.0364	6.71	0.0711	<0.0000050	0.00713	0.00130	<0.050	0.0198	1.99	0.00393	0.000055	4.56	<0.000010	0.0717	10.0	<0.00020	0.000081	0.00038	0.00068	0.00434	<0.00010	0.00201	<0.00050	0.0091	<0.00030
CM12-01	7-Jan-14	Normal	18	**0.0069**	0.010	0.25	0.0054	-	<0.20	0.0011	33	-	0.020	0.0049	0.031	16	**0.084**	<0.20	11	0.71	-	0.0062	0.017	<1.0	0.44	<3.0	-	0.0021	49	0.00024	0.44	33	-	0.00020	-	0.013	0.12	-	**0.027**	0.015	0.28	-
CM12-01	7-Jan-14	Duplicate	18	0.0057	0.0099	0.26	0.0054	-	<0.20	0.0011	33	-	0.021	0.0049	0.032	16	**0.085**	<0.20	11	0.70	-	0.0063	0.018	<1.0	0.45	<3.0	-	0.0020	52	0.00024	0.43	33	-	<0.00020	-	0.014	0.10	-	**0.027**	0.015	0.35	-
CM12-01	20-Apr-14	Normal	13	0.0036	**0.011**	0.12	<0.0050	-	0.023	0.00042	25	-	0.0076	0.0029	0.0088	10	**0.056**	0.061	8.9	0.47	-	0.014	0.0094	0.33	0.38	2.6	-	0.0023	38	<0.00050	0.36	54	-	<0.0010	-	<0.0050	0.097	-	**0.028**	0.0062	0.099	-
CM12-01	9-Aug-14	Normal	0.041	<0.00060	<0.00020	0.26	<0.0010	-	<0.020	<0.000020	36	-	<0.0010	<0.00030	0.00095	0.094	<0.00020	<0.020	14	0.037	-	0.0010	<0.00050	<0.10	0.0080	1.2	-	<0.00020	2.5	<0.00010	0.043	4.1	-	<0.00020	-	0.0015	<0.0010	-	0.00023	0.0013	<0.0030	-
CM12-01	9-Aug-14	Duplicate	0.058	<0.00060	<0.00020	0.26	<0.0010	-	<0.020	0.000022	37	-	<0.0010	<0.00030	0.00093	0.11	0.00025	<0.020	15	0.038	-	0.0010	<0.00050	<0.10	0.0090	1.3	-	<0.00020	2.6	<0.00010	0.044	4.1	-	<0.00020	-	0.0025	0.0019	-	0.00024	0.0015	0.0035	-
CM12-01	5-Nov-14	Normal	0.035	0.00095	0.0016	0.19	<0.0010	-	<0.020	<0.000020	33	-	<0.0010	<0.00030	0.00058	0.20	0.0022	<0.020	13	0.077	-	0.010	<0.00050	<0.10	0.014	1.1	-	0.00025	3.4	<0.00010	0.063	19	-	<0.00020	-	<0.0010	0.0021	-	0.0024	<0.0010	<0.0030	-
CM12-01	5-Nov-14	Duplicate	0.033	0.0010	0.0014	0.20	<0.0010	-	<0.020	<0.000020	34	-	<0.0010	<0.00030	0.00058	0.18	0.00079	<0.020	13	0.071	-	0.0092	<0.00050	0.18	0.010	0.95	-	0.00023	3.3	<0.00010	0.061	18	-	<0.00020	-	<0.0010	<0.0010	-	0.0022	<0.0010	<0.0030	-
CM12-01	15-Oct-15	Normal	0.0626	0.00229	0.00130	0.209	<0.000020	<0.000050	0.024	0.0000193	36.1	-	<0.00030	0.00014	0.00136	0.368	0.00136	0.0146	13.6	0.0712	<0.0000050	0.00449	<0.00050	<0.050	0.0225	1.29	-	0.000062	3.23	<0.000010	0.0556	9.70	-	0.000057	-	0.00106	0.00180	-	0.00116	<0.00050	0.0066	<0.00030
CM12-01	21-Jun-16	Normal	0.0360	0.00257	0.00051	0.258	<0.00010	<0.000050	0.020	0.0000129	37.1	0.000040	0.00030	0.00010	0.00165	0.331	0.000721	0.0127	14.4	0.0606	<0.0000050	0.00213	<0.00050	<0.050	0.0156	1.22	0.00259	<0.000050	3.03	<0.000010	0.0500	5.29	<0.00020	0.000066	<0.00010	0.00044	0.00078	<0.00010	0.000583	<0.00050	0.0046	<0.00030
CM13-06	6-Jan-14	Normal	110	0.0012	**0.20**	**7.8**	0.038	-	<0.20	**0.014**	120	-	**0.18**	0.36	0.67	550	**0.54**	<0.20	31	2.8	-	0.0098	1.1	19	19	29	-	0.0066	140	0.020	0.68	12	-	0.0046	-	0.0019	0.10	-	**0.043**	0.46	5.2	-
CM13-06	19-Apr-14	Normal	0.68	0.0042	0.0010	0.070	<0.0010	-	<0.020	0.000077	7.2	-	0.0018	0.0015	0.0069	1.1	0.0058	<0.020	2.1	0.011	-	<0.00020	0.0048	<0.10	0.13	0.46	-	0.00025	2.2	<0.00010	0.025	1.6	-	<0.00020	-	<0.0010	0.084	-	0.00018	0.0033	0.020	-
CM13-06	5-Nov-14	Normal	0.64	0.0012	0.0012	0.060	<0.0010	-	<0.020	0.000064	5.7	-	0.0015	0.0011	0.0038	1.6	0.0022	<0.020	1.7	0.010	-	<0.00020	0.0055	<0.10	0.19	0.56	-	0.00022	2.9	<0.00010	<0.020	0.89	-	<0.00020	-	<0.0010	0.0055	-	0.00017	0.0023	0.030	-
CM13-06	15-Oct-15	Normal	23.4	0.00080	**0.0242**	0.779	0.00441	0.000627	0.030	0.00140	18.0	-	0.0272	0.0483	0.0730	54.7	**0.0646**	0.0145	5.73	0.609	0.00042	0.00133	0.113	2.05	0.96	5.87	-	0.00179	26.6	0.00172	0.101	2.13	-	0.00194	-	0.00102	0.387	-	0.00789	0.0630	0.472	0.0106
CM13-06	21-Jun-16	Normal	23.7	0.00074	**0.0319**	0.773	0.00448	0.00058	0.024	0.00168	15.5	0.00930	0.0295	0.0519	0.0823	60.0	**0.0686**	0.0138	5.22	0.526	0.00060	0.00153	0.119	2.21	2.06	7.13	0.0577	0.00186	34.1	0.00183	0.0946	1.4	<0.00040	0.00223	0.0130	0.00053	0.200	<0.00020	0.00719	0.0731	0.564	0.00344
CM13-06	21-Jun-16	Duplicate	22.3	0.00076	**0.0315**	0.745	0.00444	0.00057	0.023	0.00161	15.5	0.00929	0.0273	0.0497	0.0834	59.8	**0.0682**	0.0137	5.13	0.485	0.00065	0.00159	0.118	1.95	2.40	6.79	0.0558	0.00180	33.3	0.00181	0.0952	1.3	<0.00040	0.00221	0.0126	0.00051	0.171	<0.00020	0.00702	0.0720	0.555	0.00306
CM13-25	9-Aug-14	Normal	2.2	**0.022**	0.0033	0.37	<0.0010	-	<0.020	0.0012	37	-	0.0043	0.0063	0.031	6.2	**0.012**	<0.020	21	0.26	-	0.0030	0.017	0.50	0.32	2.8	-	0.00085	4.7	0.00029	0.063	4.2	-	0.00020	-	0.0065	0.015	-	0.0012	0.015	0.15	-
CM13-25	15-Oct-15	Normal	10.1	0.00297	**0.0114**	**1.16**	0.00203	0.000492	0.036	**0.00732**	42.9	-	0.0183	0.0135	0.107	28.2	**0.0501**	0.0190	23.4	0.254	0.00039	0.00297	0.0530	2.05	1.89	4.82	-	0.00291	16.3	0.000817	0.109	6.97	-	0.000684	-	0.00076	0.0484	-	0.00432	0.0583	0.412	0.00127
CM13-25	21-Jun-16	Normal	0.631	**0.0314**	0.00185	0.198	<0.00010	<0.000050	0.017	0.000141	30.1	0.000242	0.00118	0.00159	0.00449	1.89	0.00134	0.0121	17.8	0.0533	<0.0000050	0.00143	0.00423	0.065	0.0581	1.67	0.00315	0.000089	3.82	0.000034	0.0535	2.94	<0.00020	0.000261	0.00020	0.00101	0.00853	<0.00010	0.000221	0.00262	0.0401	<0.00030
Creek	19-Apr-14	Normal	0.0051	<0.00060	<0.00020	0.080	<0.0010	-	<0.020	0.0000080	48	-	<0.0010	<0.00030	0.00034	<0.060	<0.00020	<0.020	17	<0.0040	-	0.0015	<0.00050	<0.10	0.0050	0.43	-	0.0012	2.5	<0.00010	0.15	9.8	-	<0.00020	-	<0.0010	<0.0010	-	0.00071	<0.0010	<0.0030	-
Creek	19-Apr-14	Duplicate	0.0054	<0.00060	<0.00020	0.080	<0.0010	-	<0.020	0.0000072	48	-	<0.0010	<0.00030	0.00035	<0.060	<0.00020	<0.020	17	<0.0040	-	0.0015	<0.00050	<0.10	0.0060	0.41	-	0.0013	2.4	<0.00010	0.14	9.7	-	<0.00020	-	<0.0010	<0.0010	-	0.00071	<0.0010	<0.0030	-
Creek	9-Aug-14	Normal	0.035	<0.00060	0.00027	0.078	<0.0010	-	<0.020	<0.000020	45	-	<0.0010	<0.00030	0.00047	<0.060	<0.00020	<0.020	16	<0.0040	-	0.0014	<0.00050	<0.10	0.0060	0.68	-	0.0011	2.7	<0.00010	0.13	7.4	-	<0.00020	-	<0.0010	<0.0010	-	0.00069	0.0021	<0.0030	-
Creek	5-Nov-14	Normal	0.060	<0.00060	0.00031	0.072	<0.0010	-	<0.020	<0.000020	43	-	<0.0010	<0.00030	0.00020	<0.060	<0.00020	<0.020	15	<0.0040	-	0.0012	<0.00050	0.11	0.0060	0.36	-	0.00082	2.6	<0.00010	0.14	7.2	-	<0.00020	-	<0.0010	<0.0010	-	0.00060	<0.0010	<0.0030	-
BCAWQG AL			NG	NG	0.005	NG	NG	NG	1.2	NG	NG	NG	NG	0.110 [1.1]	Calc [1.2]	1.0	Calc [1.3]	NG	NG	Calc [1.4]	0.000020 [1.5]	2 [1.6]	NG	N [1.7]	N [1.8]	NG	NG	0.002 [1.9]	NG	Calc [1.10]	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	Calc [1.11]	NG
GCDWQ MAC			NG	0.006	0.010 [2.1]	1.0	NG	NG	5	0.005	NG	NG	0.05	NG	NG	NG	0.010	NG	NG	NG	0.001	NG	NG	NG	NG	NG	NG	0.05	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	0.02	NG	NG	NG

Table 4.5b: Guideline Notes for Reports for Crown Mountain Water Quality Results

1. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (BCAWQG AL)
General Notes:
The Water Quality Guidelines (Criteria) Reports by BC Ministry of Environment were used as references for the guidelines. (Internet address: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html). Overview Reports (BC MOE) were used as the references for the guidelines unless the note for specific analyte indicates that the Technical Appendix (BC MOE) was used. / For some parameters, guidelines are specified as two values: the maximum value or the acute criterion, and the 30-day average value or the chronic criterion. The maximum value was used in this report for parameters that have both guideline values.
Note 1.1 for Cobalt (total):
The interim maximum concentration for total cobalt is 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt.
The interim 30-day average concentration for total cobalt (based on five weekly samples) is 4 µg/L to protect aquatic life from chronic effects of cobalt.
Note 1.2 for Copper (total):
The maximum concentration of total copper should not exceed at any time the numerical value (in µg/L) given by the formula "0.094(hardness)+2", where water hardness is reported as mg/L CaCO3.
The 30-day average concentration of total copper (based on a minimum of 5 approximately weekly samples) should not exceed 2 µg/L when average water hardness over the same period (expressed as mg/L CaCO3) is less than 50 mg/L. When average water hardness is greater than 50 mg/L the 30-day average concentration should not exceed the numerical value (in µg/L) given by the formula "0.04(average hardness)", where water hardness is reported as mg/L CaCO3.
Note 1.3 for Lead (total):
The maximum guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is set at 3.0 µg/L. When water hardness exceeds 8.0 mg/L CaCO3 the maximum guideline for lead at any time is given by the following equation:
Maximum Criteria (µg/L) = exp (1.273 ln(hardness) - 1.460).
The 30-day average guideline for total lead in water, when water hardness exceeds 8 mg/L as CaCO3, is as follows:
30-Day Average (µg/L) is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704).
For hardness less than or equal to 8.0 mg/L there is no 30-day average guideline; hence the maximum concentration of 3.0 µg/L is used.
Note 1.4 for Manganese (total):
The maximum concentration of total manganese in mg/L at any time should not exceed the value as determined by the following relationship:
0.01102 hardness + 0.54
where water hardness is reported as mg/L of CaCO3.
The 30-day mean concentration of total manganese in mg/L should be less than or equal to the value as determined by the following relationship:
0.0044 hardness + 0.605
where water hardness is reported as mg/L of CaCO3.
Note 1.5 for Mercury (total):
The average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples) should not exceed 0.02 µg/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted as indicated in the Table 1 and Table 4 of the BC MOE Overview Report - First Update, February 2001.
There is no guideline maximum for total mercury in water, for freshwater aquatic life.
Note 1.6 for Molybdenum (total):
The maximum concentration for total molybdenum is 2 mg/L.
The 30-day average concentration for total molybdenum (based on at least five weekly samples in a period of 30 days) is less than or equal to 1 mg/L.
Note 1.7 for Phosphorus (total, by ICPMS/ICPOES):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.8 for Phosphorus (total, APHA 4500-P):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.
Note 1.9 for Selenium (total):
The 30-day average water quality guideline for protection of aquatic life is 2 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.
The 30-day average alert concentration for the protection of aquatic life in sensitive ecosystems is 1 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.
Note 1.10 for Silver (total):
The guideline maximum for total silver is:
0.1 µg/L maximum if hardness less than or equal to 100 mg/L
3.0 µg/L maximum if hardness greater than 100 mg/L.
The guideline 30-day average for total silver is:
0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L
1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.
Note 1.11 for Zinc (total):
The maximum concentration of total zinc (µg/L) at any time should not exceed 33 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
33 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The 30-day average concentration of total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
7.5 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
2. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)
Note 2.1 for Arsenic (total):
Every effort should be made to maintain arsenic levels in drinking water as low as reasonably achievable.

Table 4.6
Summary of Hydrocarbon Compounds

			Hydrocarbons										Other Organics	Polycyclic Aromatic Hydrocarbons (PAHs)																							
Sampling Location	Date Sampled	Sample Type	Benzene	Ethylbenzene	F1 (C6-C10)	F1-BTEX	F2 (>C10-C16)	Styrene	Toluene	m,p-Xylene	o-Xylene	Xylenes	Phenols (4AAP)	Acenaphthene	Acenaphthylene	Acridine	Anthracene	Benz[a]anthracene	Benzo[a]pyrene	Benzo[b]fluoranthene	Benzo[b]fluoranthene + Benzo[j]fluoranthene	Benzo[c]phenanthrene	Benzo[e]pyrene	Benzo[g,h,i]perylene	Benzo[k]fluoranthene	Chrysene	Dibenz[a,h]anthracene	Fluoranthene	Fluorene	Indeno[1,2,3-cd]pyrene	2-Methylnaphthalene	Naphthalene	Carcinogenic PAHs (as B(a)P TPE)	Perylene	Phenanthrene	Pyrene	Quinoline
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CM11-11	7-Jan-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	0.00029	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM11-11	9-Aug-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	0.0035	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	0.00027	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM11-11	5-Nov-14	Normal	<0.00040	<0.00040	<0.100	<0.100	0.11	<0.00050	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	0.00098	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM11-11	15-Oct-15	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	0.000611	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM11-11	15-Oct-15	Duplicate	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	0.000548	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM11-11	21-Jun-16	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	0.000362	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM12-01	7-Jan-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	0.00093	0.0011	0.00045	0.0015	0.0029	<0.00010	<0.00010	0.00099	<0.000010	<0.0000085	<0.0000075	-	0.000012	<0.000050	<0.000050	<0.0000085	<0.0000085	0.000021	<0.0000075	0.000015	0.000056	<0.0000085	0.00051	0.00040	0.000010	<0.000050	0.00025	0.000023	<0.00020
CM12-01	7-Jan-14	Duplicate	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	0.0011	0.0013	0.00060	0.0019	0.0030	<0.00010	<0.00010	0.00080	<0.000010	<0.0000085	<0.0000075	-	0.000011	<0.000050	<0.000050	<0.0000085	<0.0000085	0.000020	<0.0000075	0.000014	0.000053	<0.0000085	0.00047	0.00038	0.000010	<0.000050	0.00023	0.000021	<0.00020
CM12-01	20-Apr-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	0.0020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM12-01	9-Aug-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	0.0044	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	0.00019	0.00070	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM12-01	9-Aug-14	Duplicate	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	0.0033	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	0.00018	0.00068	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM12-01	5-Nov-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM12-01	5-Nov-14	Duplicate	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM12-01	15-Oct-15	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	0.000178	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM12-01	21-Jun-16	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	0.000162	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM13-06	6-Jan-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	0.000012	<0.000050	<0.000050	<0.0000085	<0.0000085	0.000026	<0.0000075	<0.000010	<0.000050	<0.0000085	0.00063	0.00064	0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM13-06	19-Apr-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM13-06	5-Nov-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
CM13-06	15-Oct-15	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM13-06	21-Jun-16	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM13-06	21-Jun-16	Duplicate	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
CM13-25	9-Aug-14	Normal	<0.00040	<0.00040	<0.100	<0.100	0.12	-	<0.00040	<0.00080	<0.00040	<0.00080	0.0023	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	0.000014	<0.0000075	0.000017	0.000089	<0.0000085	0.00068	0.00045	<0.000010	<0.000050	0.00037	0.000024	<0.00020
CM13-25	15-Oct-15	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.00020	<0.000050	<0.0010	<0.000070	<0.000060	**0.000040**	0.000133	-	-	-	0.000050	<0.000050	<0.00030	<0.000050	0.000084	0.000524	<0.000050	-	0.00115	-	-	0.00190	0.000167	<0.000050
CM13-25	21-Jun-16	Normal	<0.00050	<0.00050	<0.10	<0.10	<0.30	<0.00050	<0.00050	<0.00050	<0.00050	<0.00075	<0.0010	<0.000050	<0.000050	0.000825	<0.000050	<0.000050	<0.000010	<0.000050	-	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-	-	<0.000050	<0.000050	<0.000050
Creek	19-Apr-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
Creek	19-Apr-14	Duplicate	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
Creek	9-Aug-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	-	<0.00040	<0.00080	<0.00040	<0.00080	0.0021	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
Creek	5-Nov-14	Normal	<0.00040	<0.00040	<0.100	<0.100	<0.10	<0.00050	<0.00040	<0.00080	<0.00040	<0.00080	<0.0020	<0.00010	<0.00010	<0.00020	<0.000010	<0.0000085	<0.0000075	-	<0.0000085	<0.000050	<0.000050	<0.0000085	<0.0000085	<0.0000085	<0.0000075	<0.000010	<0.000050	<0.0000085	<0.00010	<0.00010	<0.000010	<0.000050	<0.000050	<0.000020	<0.00020
BCAWQG AL			0.040	0.20	NG	NG	NG	NG	0.0005	NG	NG	0.03	0.0045 [1.1]	0.006 [1.2]	NG	0.00005 [1.3]	0.0001 [1.4]	0.0001 [1.5]	0.00001 [1.6]	NG	NG	NG	NG	NG	NG	NG	NG	0.0002 [1.7]	0.012 [1.8]	NG	NG	0.001 [1.9]	NG	NG	0.0003 [1.10]	0.00002 [1.11]	NG
GCDWQ MAC			0.005	0.14	NG	NG	NG	NG	0.06	NG	NG	0.09	NG	NG	NG	NG	NG	NG	0.00001	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG

Table 4.6
Summary of Hydrocarbon Compounds

Sampling Location	Date Sampled	Sample Type	Bromodichloromethane	Bromoform	Carbon tetrachloride	Chloroethane	Chloroform	Chloromethane	Dibromochloromethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethylene	cis-1,2-Dichloroethylene	trans-1,2-Dichloroethylene	Dichloromethane	1,2-Dichloropropane	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Ethylene dibromide	Methyl bromide	Methyl methacrylate	Methyl tert-butyl ether (MTBE)	Monochlorobenzene	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethylene	Total Trihalomethanes	Total Trihalomethanes (calculated)	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,3,5-Trichlorobenzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethylene	Trichlorofluoromethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Vinyl chloride
			Lab Results																																						
			Volatile Organic Compounds																																						
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CM11-11	7-Jan-14	Normal	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
CM11-11	9-Aug-14	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM11-11	5-Nov-14	Normal	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
CM11-11	15-Oct-15	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM11-11	15-Oct-15	Duplicate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM11-11	21-Jun-16	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM12-01	7-Jan-14	Normal	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00059	<0.00050	<0.00050
CM12-01	7-Jan-14	Duplicate	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00051	<0.00050	<0.00050
CM12-01	20-Apr-14	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM12-01	9-Aug-14	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM12-01	9-Aug-14	Duplicate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM12-01	5-Nov-14	Normal	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
CM12-01	5-Nov-14	Duplicate	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
CM12-01	15-Oct-15	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM12-01	21-Jun-16	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM13-06	6-Jan-14	Normal	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
CM13-06	19-Apr-14	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM13-06	5-Nov-14	Normal	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
CM13-06	15-Oct-15	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM13-06	21-Jun-16	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM13-06	21-Jun-16	Duplicate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM13-25	9-Aug-14	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM13-25	15-Oct-15	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CM13-25	21-Jun-16	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Creek	19-Apr-14	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Creek	19-Apr-14	Duplicate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Creek	9-Aug-14	Normal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Creek	5-Nov-14	Normal	<0.00050	<0.00050	<0.00050	<0.0010	<0.00050	<0.0020	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.00050	<0.0020	<0.00050	<0.00050	<0.00050	<0.0020	<0.0020	<0.00050	<0.0020	<0.0013	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
BCAWQG AL			NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	3.4	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
GCDWQ MAC			0.100 [2.1]	0.100 [2.2]	0.002	NG	0.100 [2.3]	NG	0.100 [2.4]	0.2	NG	0.005	NG	0.005	0.014	NG	NG	0.05	NG	NG	NG	NG	NG	NG	NG	0.08	NG	NG	0.010	0.100 [2.5]	0.100 [2.6]	NG	NG	NG	NG	NG	0.005	NG	NG	NG	0.002 [2.7]

Table 4.6: Guideline Notes for Reports for Crown Mountain Water Quality Results

1. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (BCAWQG AL)
General Notes:
The Water Quality Guidelines (Criteria) Reports by BC Ministry of Environment were used as references for the guidelines. (Internet address: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html). Overview Reports (BC MOE) were used as the references for the guidelines unless the note for specific analyte indicates that the Technical Appendix (BC MOE) was used. / For some parameters, guidelines are specified as two values: the maximum value or the acute criterion, and the 30-day average value or the chronic criterion. The maximum value was used in this report for parameters that have both guideline values.
Note 1.1 for Phenols (4AAP):
The guidelines for freshwater aquatic life are as follows: The maximum concentration of 4-hydroxyphenol should not exceed 4.5 µg/L. The maximum concentration of 3-hydroxyphenol should not exceed 12.5 µg/L, and the maximum concentration of the total of all other nonhalogenated phenols should not exceed 50 µg/L.
The guideline maximum of 4.5 µg/L was used, in this report, to identify exceedances for Phenols (4AAP) (Total Phenols) as a means for determining the potential for exceeding the above guidelines.
Note 1.2 for Acenaphthene:
Maximum for "Fresh Water (chronic)".
Note 1.3 for Acridine:
Maximum for "Fresh Water (Phototoxic)".
Note 1.4 for Anthracene:
Maximum for "Fresh Water (Phototoxic)".
Note 1.5 for Benz[a]anthracene:
Maximum for "Fresh Water (Phototoxic)".
Note 1.6 for Benzo[a]pyrene:
Maximum for "Fresh Water (chronic)".
Note 1.7 for Fluoranthene:
Maximum for "Fresh Water (Phototoxic)".
Note 1.8 for Fluorene:
Maximum for "Fresh Water (chronic)".
Note 1.9 for Naphthalene:
Overview Report Update July 2007
Note 1.10 for Phenanthrene:
Maximum for "Fresh Water (chronic)".
Note 1.11 for Pyrene:
Maximum for "Fresh Water (Phototoxic)".
2. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)
Note 2.1 for Bromodichloromethane:
The maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water is 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels. Trihalomethanes refers to the total of chloroform, bromodichloromethane, dibromochloromethane and bromoform compounds.
Note 2.2 for Bromoform:
The maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water is 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels. Trihalomethanes refers to the total of chloroform, bromodichloromethane, dibromochloromethane and bromoform compounds.
Note 2.3 for Chloroform:
The maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water is 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels. Trihalomethanes refers to the total of chloroform, bromodichloromethane, dibromochloromethane and bromoform compounds.
Note 2.4 for Dibromochloromethane:
The maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water is 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels. Trihalomethanes refers to the total of chloroform, bromodichloromethane, dibromochloromethane and bromoform compounds.
Note 2.5 for Total Trihalomethanes:
Trihalomethanes refers to the total of chloroform, bromodichloromethane, dibromochloromethane and bromoform compounds. The maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water is 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels. Utilities should make every effort to maintain concentrations as low as reasonably achievable without compromising the effectiveness of disinfection.
Note 2.6 for Total Trihalomethanes (calculated):
Trihalomethanes refers to the total of chloroform, bromodichloromethane, dibromochloromethane and bromoform compounds. The maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water is 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels. Utilities should make every effort to maintain concentrations as low as reasonably achievable without compromising the effectiveness of disinfection.
Note 2.7 for Vinyl chloride:
Every effort should be made to maintain vinyl chloride levels in drinking water as low as reasonably achievable.

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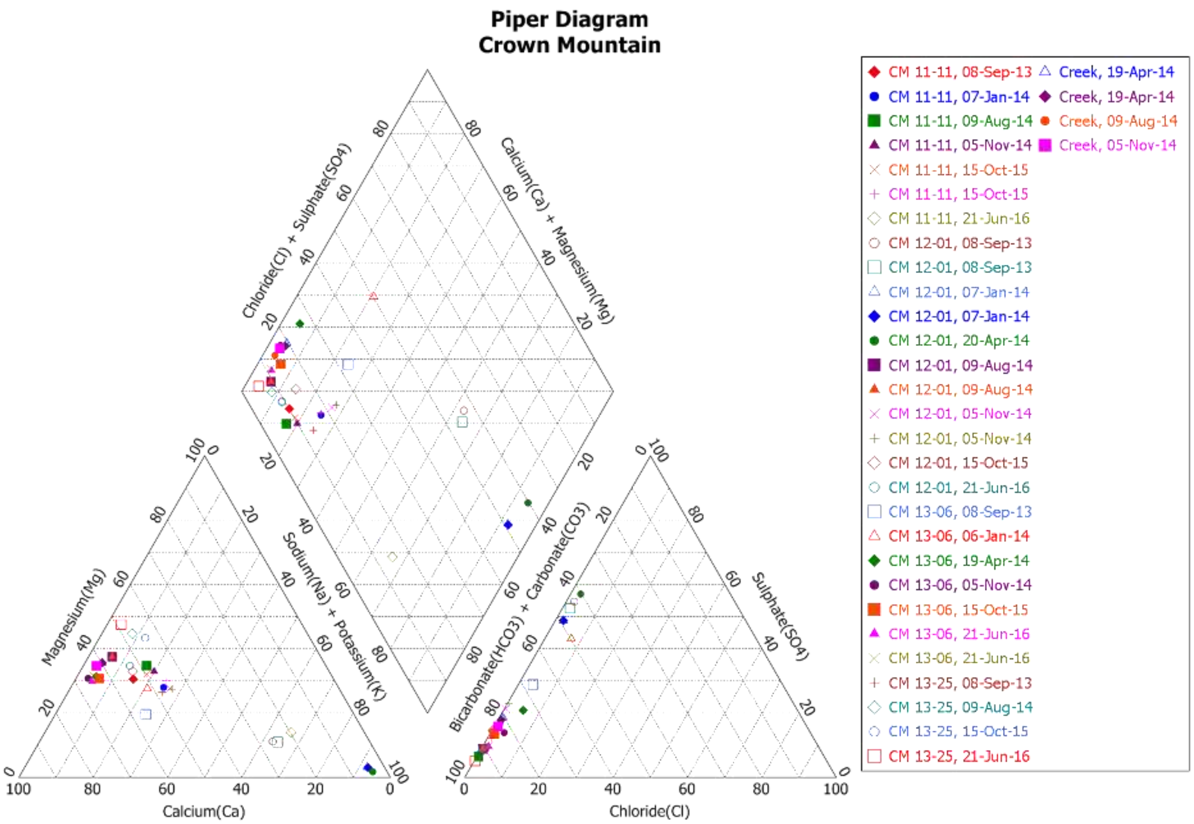
Figure 4-2

Summary of Major Ion Analysis



4.5 Discussion

Five groundwater monitoring well installations were selected to characterize the property's bedrock aquifers identified during the 2013 geological exploration program. The groundwater investigation and subsequent baseline bedrock aquifer data collection program was completed in partial fulfillment of the *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators* (BC MOE, 2011). The data also provides baseline information to support an Environmental Assessment (EA) of the mine development, should the Crown Mountain project proceed to the Application stage.

The following observations can be made based on the results of the September 2013, January 2014, April 2014, August 2014, November 2014, October 2015, and June 2016 groundwater quality monitoring events:

- Bedrock groundwater monitoring well water levels displayed seasonal fluctuations of minimums at the end of winter, and relatively sharp increases during the spring melt. Groundwater levels diminished from September to January, which is consistent with anticipated low levels of recharge in the uplands during winter. Wells installed at lower elevations saw an earlier spring rise in groundwater elevation than wells installed at higher elevations.
- The redevelopment of the wells in August 2014 was important in reducing the effects of TSS and drilling mud in the groundwater samples. The sharp reduction in TSS concentrations is a clear indication of the efficacy of the redevelopment. Three post-development sampling events have confirmed certain water chemistry trends; however, it is recommended that further seasonal sampling events, one summer and one winter, be performed to confirm the presence or absence of these observed post- development trends.
- Post-redevelopment of the wells, groundwater generally displays fresh characteristics, suggesting that groundwater is recharged by atmospheric water, or less likely, that atmospheric water is seeping into the wells.
- Detection of dissolved and total metals and PAHs in groundwater samples is likely associated with coal contact.

5 REFERENCES

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6 CLOSURE

This report has been prepared for NWP Coal Canada Ltd. and documents the results of investigation work carried out by Norwest regarding the Crown Mountain Coal Property, located near Sparwood, British Columbia. This report represents the opinion of Norwest Corporation based on data collected during the site investigation, information provided by NWP Coal Canada Ltd. and observations made during site visits.

All data contained herein has been reviewed and interpreted by, or generated under the direct supervision of, Sara Wilkins, P.Geol.

"original signed and sealed by author"

August 18, 2016

____

Sara Wilkins, P.Geol
Manager, Water Resources
Norwest Corporation

Appendix A

Borehole Logs

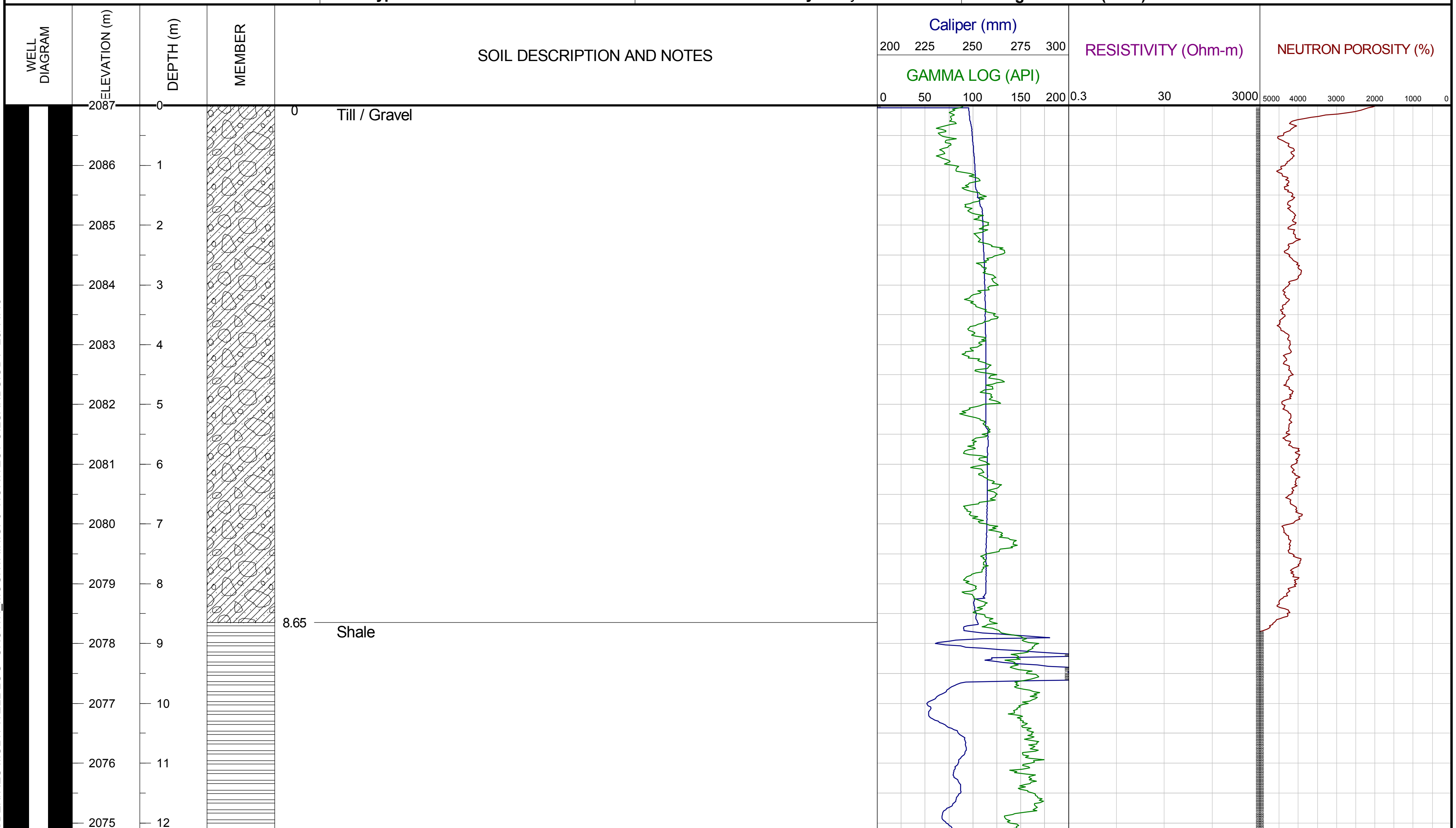
NORWEST CORPORATION

Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM11-11-CH

Easting/Northing: 662704 m/5521503 m **NAD:**

Project No: 284-1	**Drilling Contractor:** Foraco	**Date Drilled:** August 17, 2013	**Ground Elevation (masl):** 2088
Project: Crown Mountain	**Total Depth (m):** 126.4	**Hole Diameter (mm):**	**Logged by:** Michelle E/Lyndsey P
Client: Jameson	**Drill Type:** Core	**Instrument Installed By:** Amy Perrin	**Casing Elevation (masl):** 2088



MEMBERS:

TILL SANDSTONE
SHALE COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

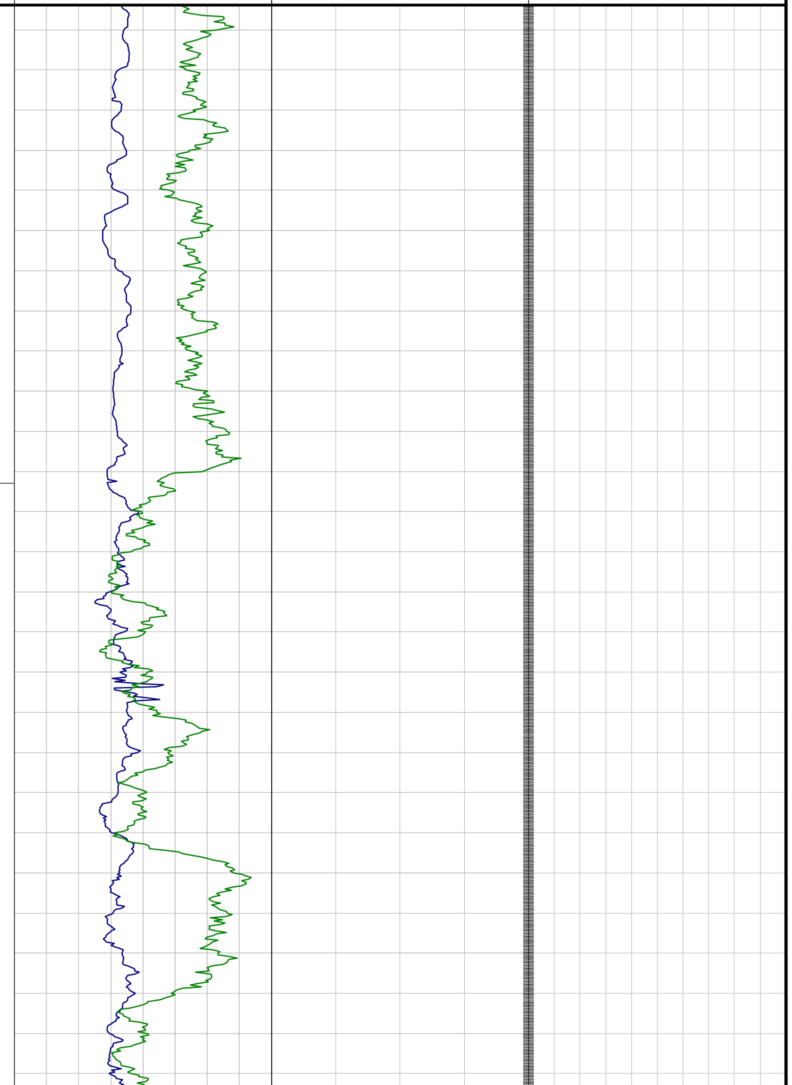
BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE
GROUT Slough Backfill

OILSANDS GAMMA/DEN/RES MULTI-WELL LOG CROWN_MOUNTAIN.GPJ NORWEST OILSANDS.GDT 28/11/13

NORWEST
CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM11-11-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
			Shale	Shale *(continued)*
	2074	13		
	2073	14		
	2072	15		
	2071	16		
	2070	17		
	2069	18		
		18.15	Sandstone	Sandstone
	2068	19		
	2067	20		
	2066	21		
	2065	22		
	2064	23		
	2063	24		
	2062	25		



MEMBERS:

- TILL
- SANDSTONE
- SHALE
- COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

- BENTONITE
- 10-20 SILICA SAND
- 0.5mm SLOTTED SCREEN
- STAND PIPE
- GROUT
- Slough Backfill

NORWEST
CORPORATION
Norwest Corporation
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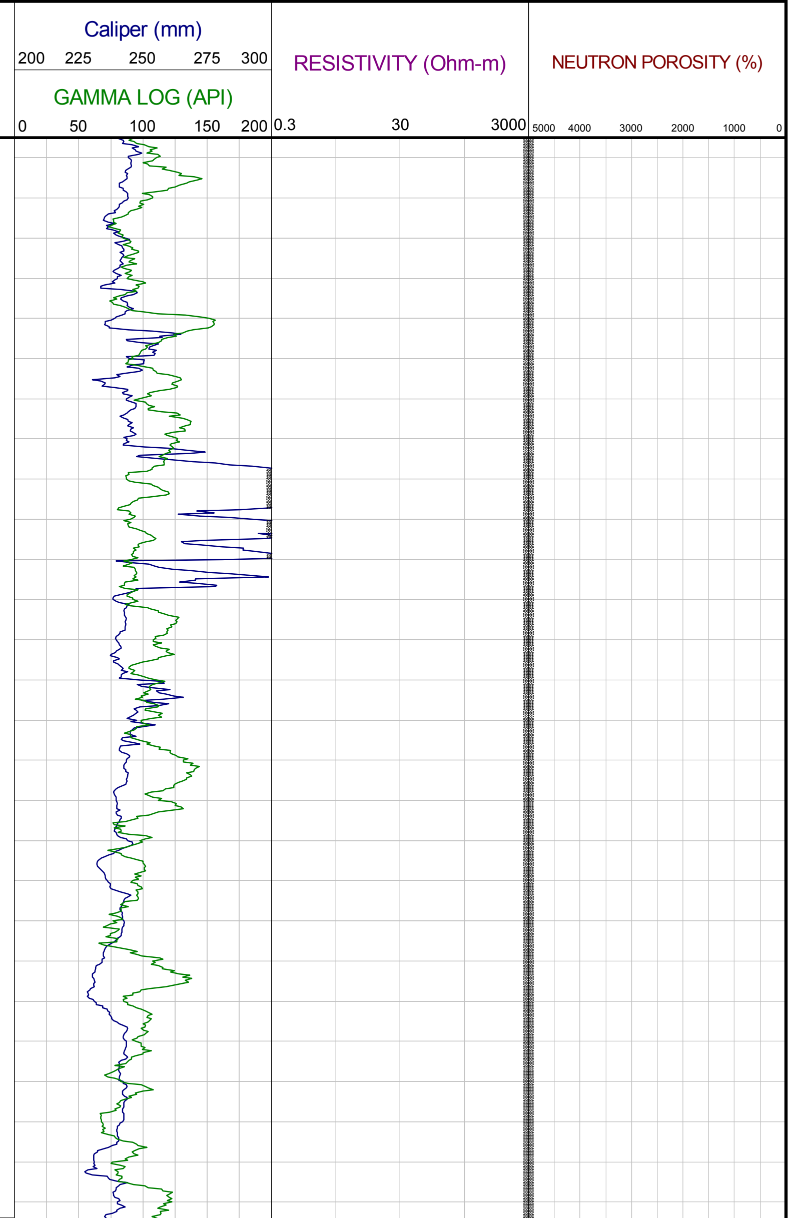
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM11-11-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2061	26		Sandstone *(continued)*
	2060	27		
	2059	28		
	2058	29		
	2057	30		
	2056	31		
	2055	32		
	2054	33		
	2053	34		
	2052	35		
	2051	36		
	2050	37		
	2049	38		
	2048	39		
		39.2		



MEMBERS:

TILL SANDSTONE
SHALE COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE
GROUT Slough Backfill

NORWEST CORPORATION

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Calgary AB T2G 4Y5
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Borehole CM11-11-CH

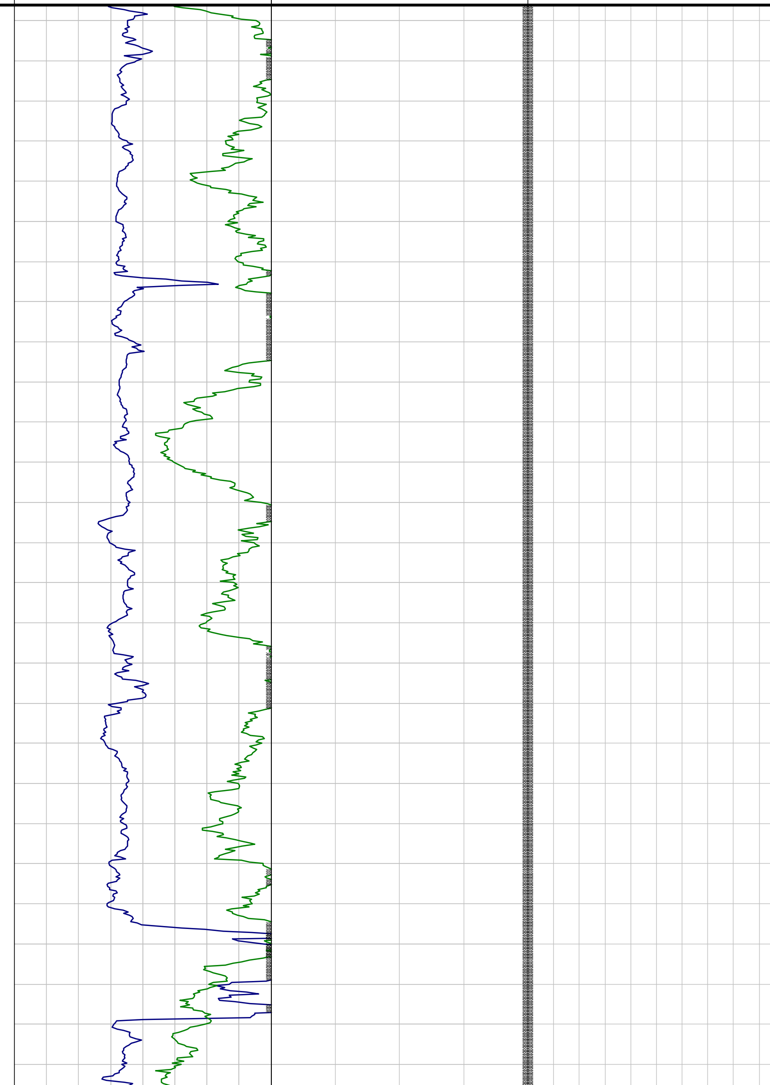
WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Shale interbedded with siltstone *(continued)*
	2047	40		
	2046	41		
	2045	42		
	2044	43		
	2043	44		
	2042	45		
	2041	46		
	2040	47		
	2039	48		
	2038	49		
	2037	50		
	2036	51		
	2035	52		

Caliper (mm)
200 225 250 275 300

GAMMA LOG (API)
0 50 100 150 200

RESISTIVITY (Ohm-m)
0.3 30 3000

NEUTRON POROSITY (%)
5000 4000 3000 2000 1000 0



MEMBERS:

TILL
SANDSTONE
SHALE
COAL

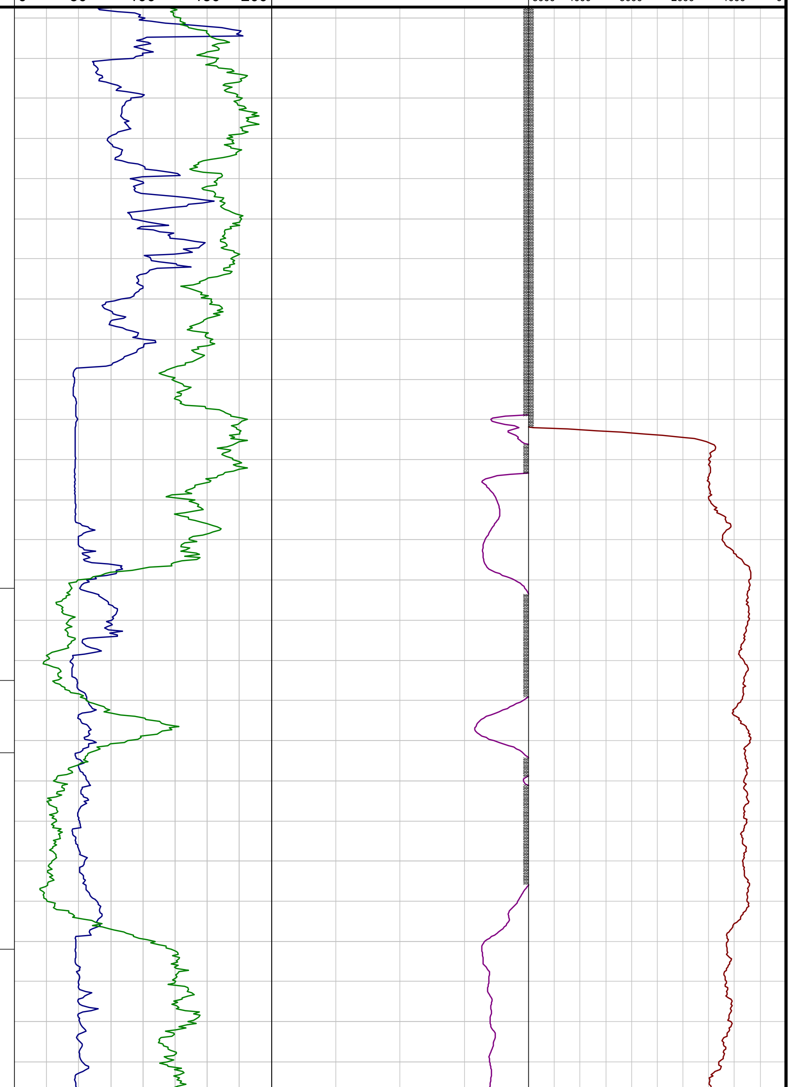
GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2034	53	Shale	Shale interbedded with siltstone *(continued)*
	2033	54	Shale	
	2032	55	Shale	
	2031	56	Shale	
	2030	57	Shale	
	2029	58	Shale	
	2028	59	Shale	
	2027	60	Shale	
		60.1	Coal	Coal
	2026	61	Coal	
		61.25	Shale	Shale
	2025	62	Shale	
		62.15	Coal	Coal
	2024	63	Coal	
	2023	64	Coal	
		64.6	Shale	Shale
	2022	65	Shale	
	2021	66	Shale	

Caliper (mm): 200, 225, 250, 275, 300
GAMMA LOG (API): 0, 50, 100, 150, 200
RESISTIVITY (Ohm-m): 0.3, 30, 3000
NEUTRON POROSITY (%): 5000, 4000, 3000, 2000, 1000, 0



MEMBERS:
TILL
SANDSTONE
SHALE
COAL

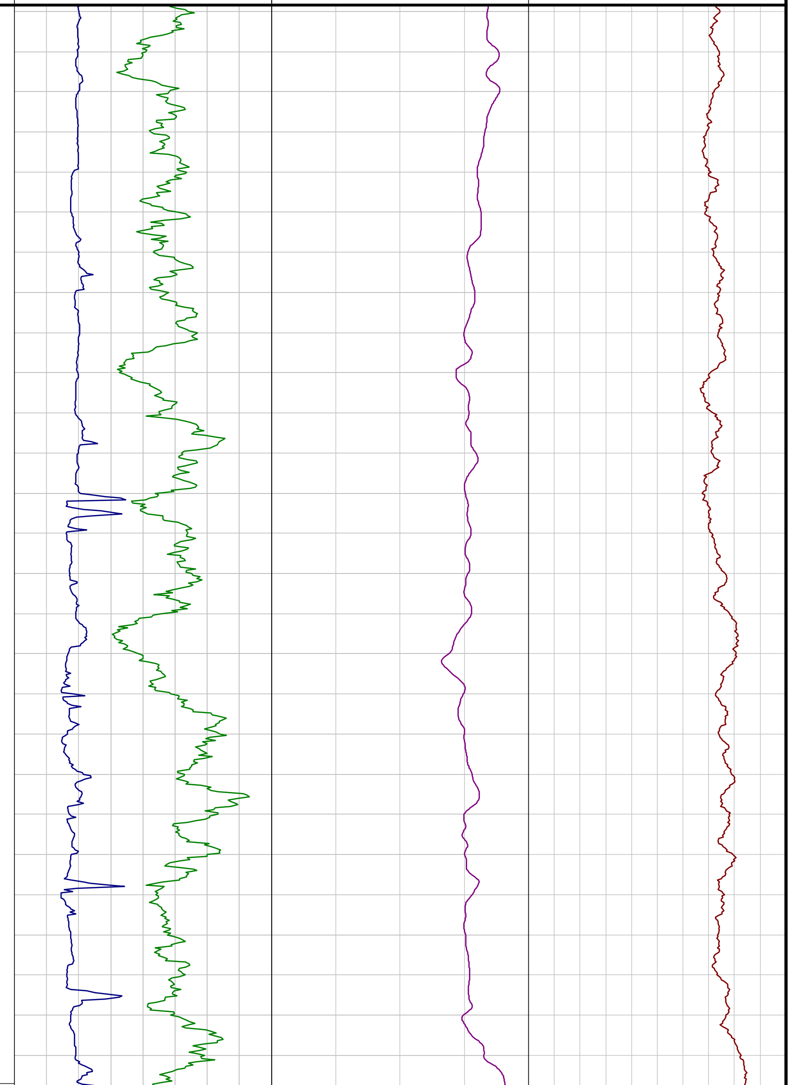
GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM11-11-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Shale *(continued)*
	2020	67		
	2019	68		
	2018	69		
	2017	70		
	2016	71		
	2015	72		
	2014	73		
	2013	74		
	2012	75		
	2011	76		
	2010	77		
	2009	78		
	2008	79		
				79.85



MEMBERS:
TILL
SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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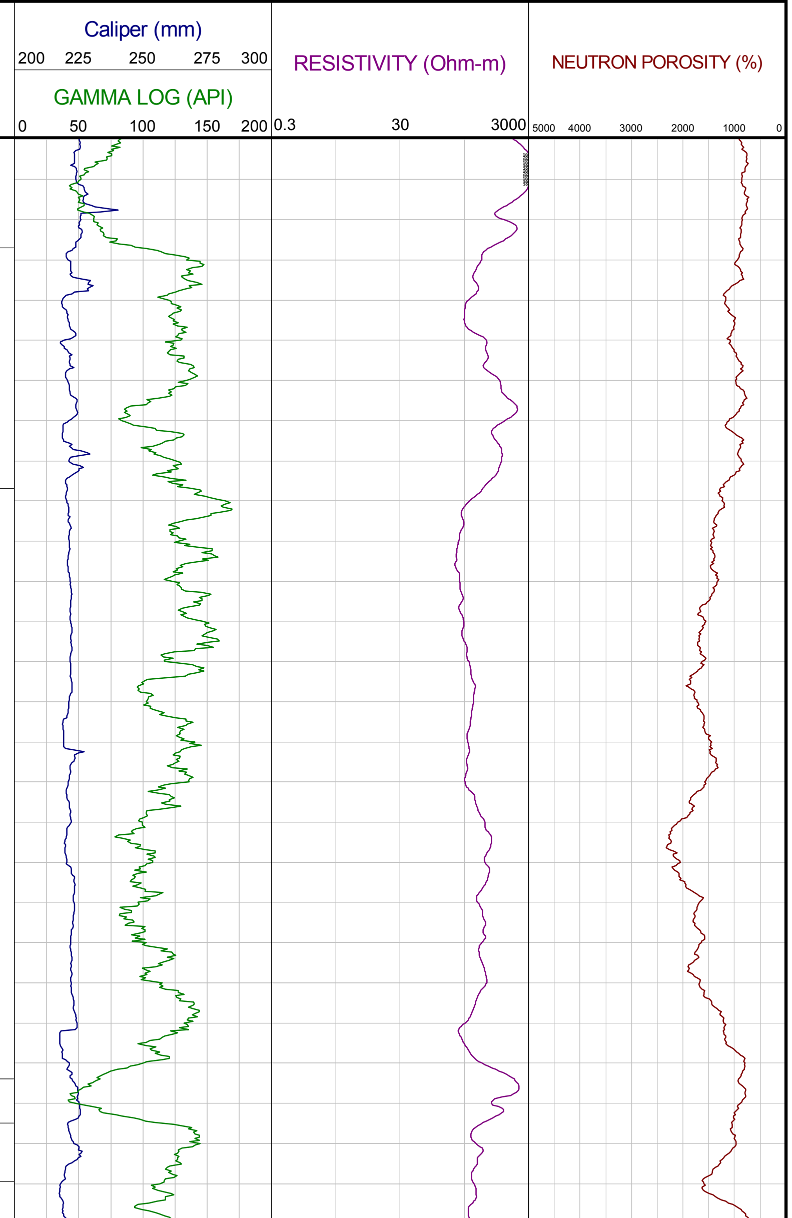
Borehole CM11-11-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2007	80	Coal	Coal *(continued)*
		81.35	Shale	Carbonaceous shale
		84.35	Shale	Shale
		91.7	Coal	Coal
		92.25	Shale	Shale
		92.97	Shale	Shale
		93.45		

Elevation scale (m): 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996, 1995, 1994

Depth scale (m): 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93



MEMBERS:

TILL, SANDSTONE, SHALE, COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

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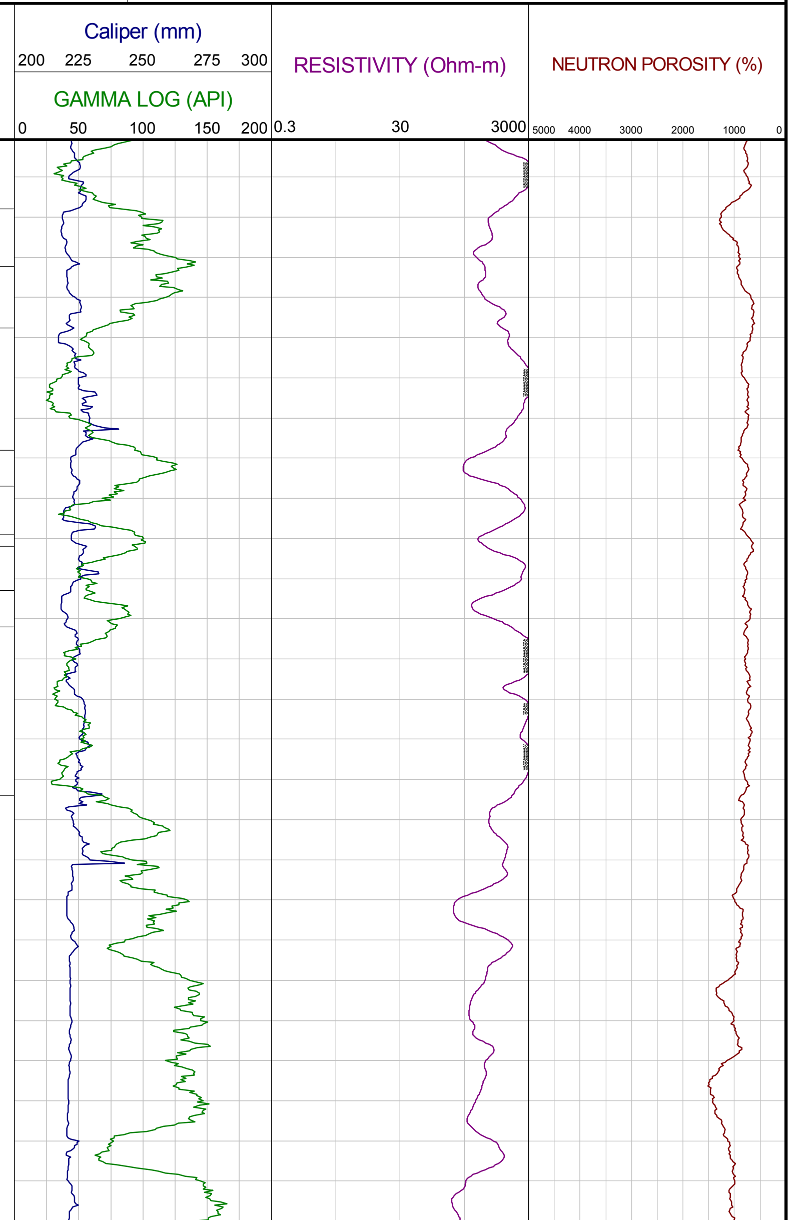
Borehole CM11-11-CH

ELEVATION (m)	DEPTH (m)	SOIL DESCRIPTION AND NOTES
		Coal *(continued)*
1993	94	
	94.4	Shale
1992	95	
	95.11	Shale
	95.88	Coal
1991	96	
1990	97	
	97.4	Carbonaceous shale
	97.85	Coal
1989	98	
	98.45	Carbonaceous shale
	98.6	Dirty Coal
1988	99	
	99.15	Carbonaceous shale
	99.6	Coal
1987	100	
1986	101	
	101.7	Shale
1985	102	
1984	103	
1983	104	
1982	105	
1981	106	
1980	107	



MEMBERS:
TILL, SANDSTONE, SHALE, COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

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Calgary AB T2G 4Y5
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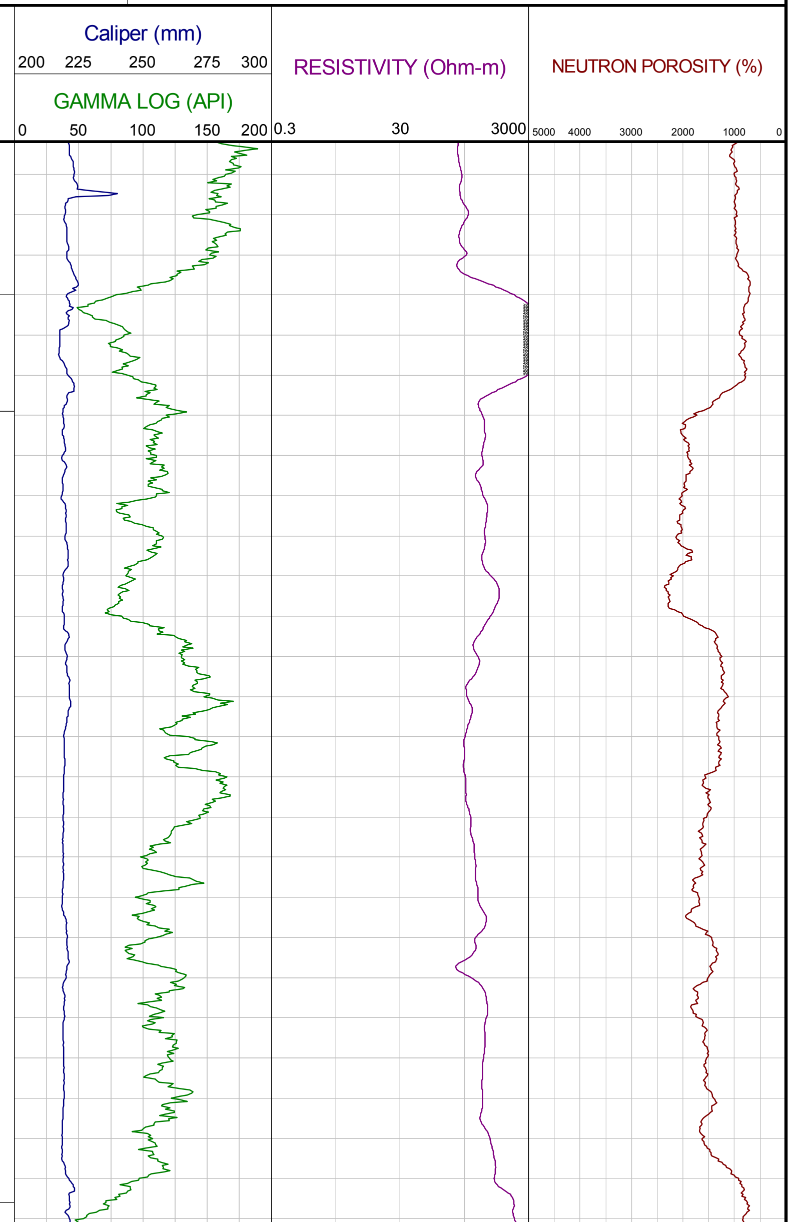
Borehole CM11-11-CH

ELEVATION (m)	DEPTH (m)	SOIL DESCRIPTION AND NOTES
		Shale *(continued)*
1979	108	
1978	109	109 Coal
1977	110	
		110.45 Sandstone interbedded with carbonaceous shale, fractured
1976	111	
1975	112	
1974	113	
1973	114	
1972	115	
1971	116	
1970	117	
1969	118	
1968	119	
1967	120	
		120.3 Coal, fractured

Columns: WELL DIAGRAM | ELEVATION (m) | DEPTH (m) | MEMBER | SOIL DESCRIPTION AND NOTES | Caliper (mm) / GAMMA LOG (API) | RESISTIVITY (Ohm-m) | NEUTRON POROSITY (%)



MEMBERS:

TILL, SANDSTONE, SHALE, COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

NORWEST CORPORATION

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Calgary AB T2G 4Y5
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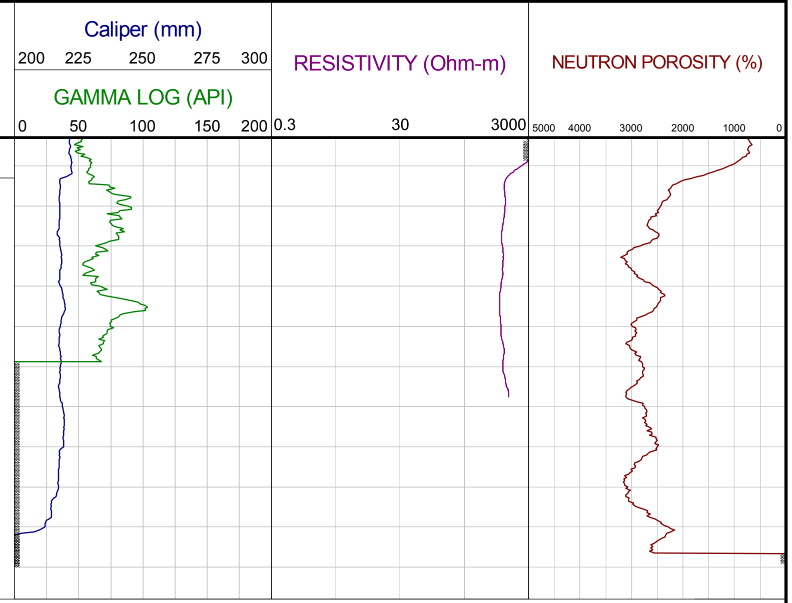
Borehole CM11-11-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Coal, fractured *(continued)*
	1966	121		
			121.15	Sandstone, fine to medium grained, multiple fractures
	1965	122		
	1964	123		
	1963	124		
	1962	125		
	1961	126		
				Actual bottom of borehole at 126.4 m.



MEMBERS:

TILL
SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

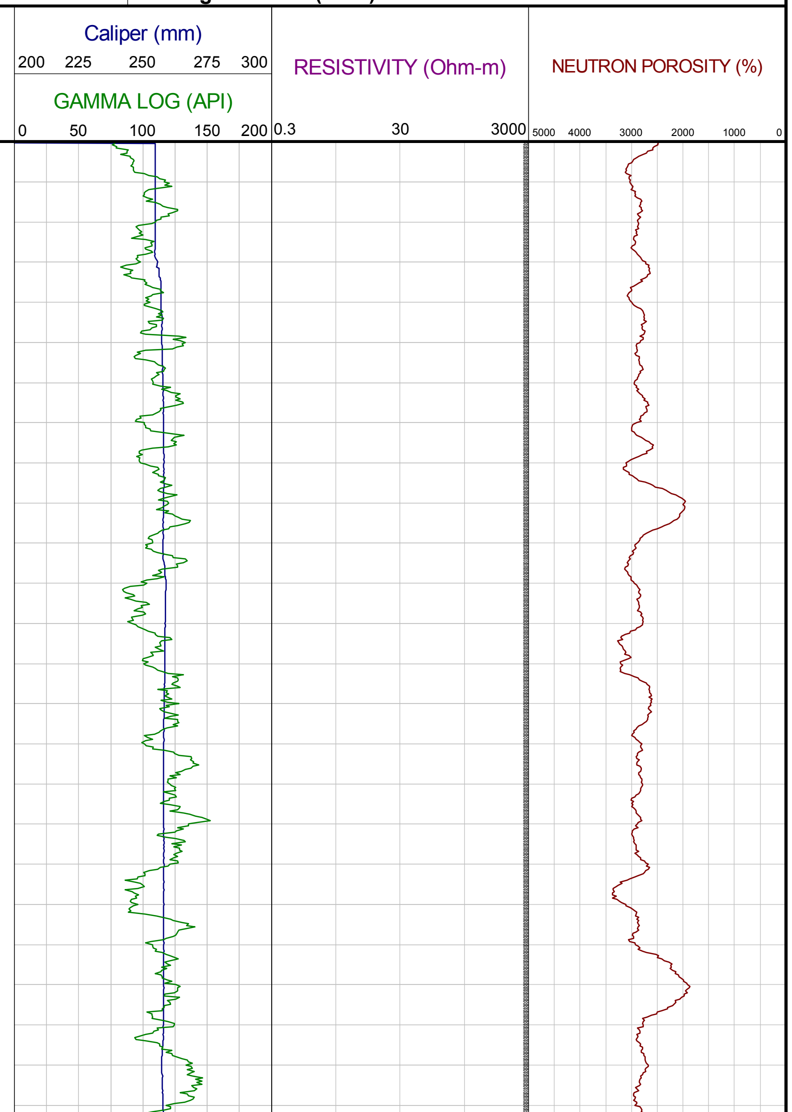
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM12-01-CH

			Easting/Northing: 662429 m/5522037 m **NAD:**
Project No: 284-1	**Drilling Contractor:** Foraco	**Date Drilled:** August 21, 2013	**Ground Elevation (masl):** 2143
Project: Crown Mountain	**Total Depth (m):** 152	**Hole Diameter (mm):**	**Logged by:** Michelle E/Lyndsey P
Client: Jameson	**Drill Type:** Core	**Instrument Installed By:** Amy Perrin	**Casing Elevation (masl):** 2143

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2142	0		0 Shale/Siltstone
	2141	1		
	2140	2		
	2139	3		
	2138	4		
	2137	5		
	2136	6		
	2135	7		
	2134	8		
	2133	9		
	2132	10		
	2131	11		
	2130	12		



MEMBERS:
SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST CORPORATION
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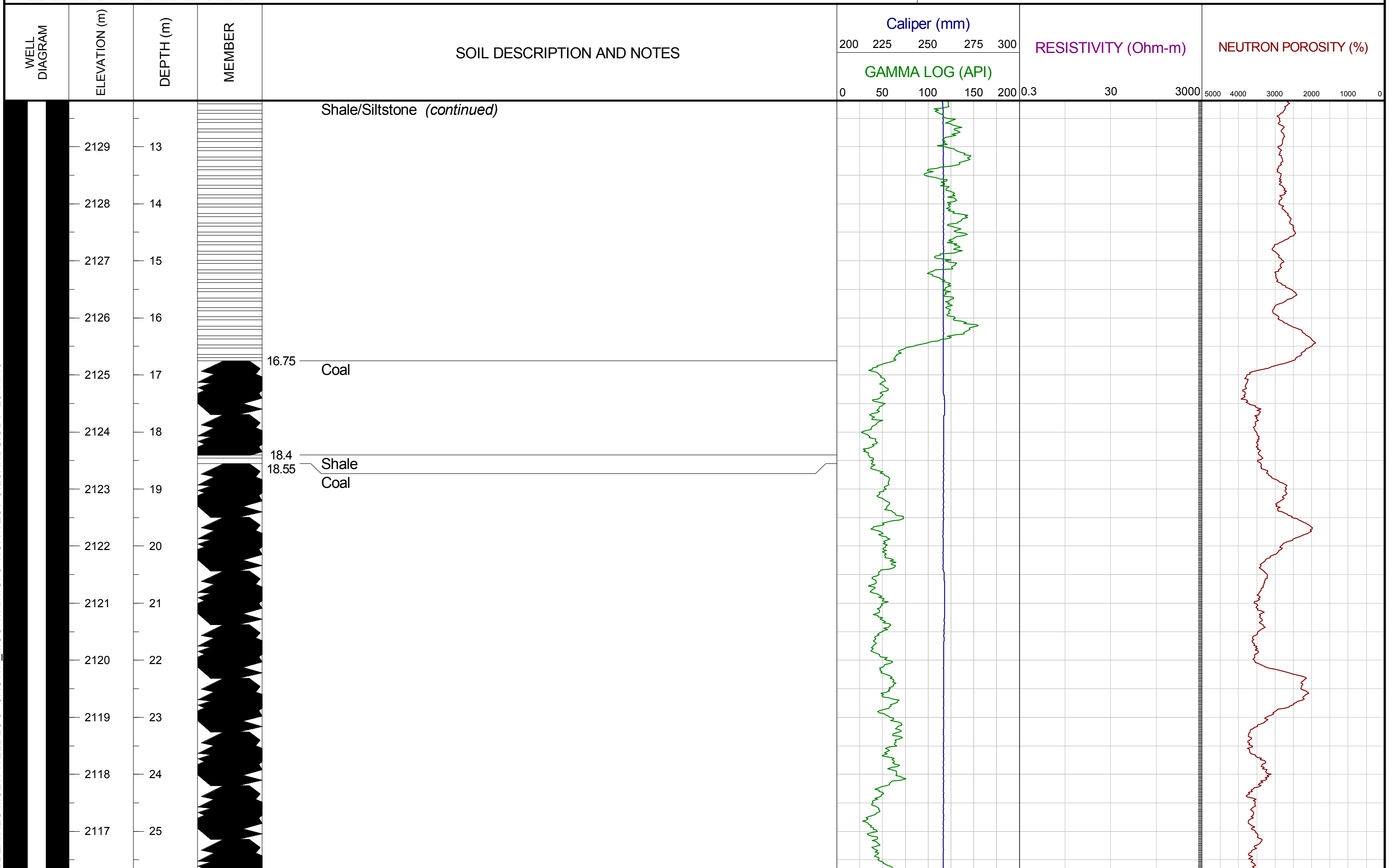
Borehole CM12-01-CH



MEMBERS:

SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST CORPORATION

Norwest Corporation
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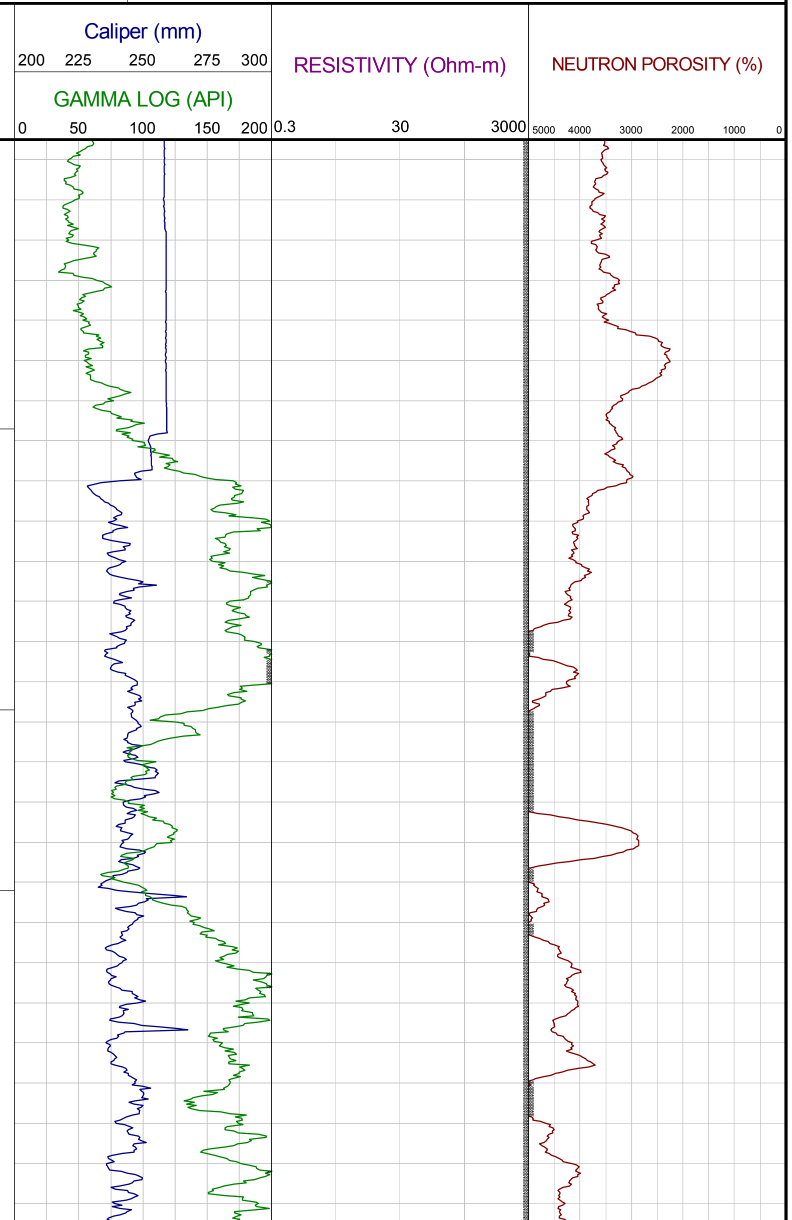
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM12-01-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2116	26	Coal	Coal *(continued)*
	2115	27	Coal	
	2114	28	Coal	
	2113	29	Coal	
		29.35	Shale	Shale
	2112	30	Shale	
	2111	31	Shale	
	2110	32	Shale	
		32.85	Coal	Coal
	2109	33	Coal	
	2108	34	Coal	
	2107	35	Coal	
		35.1	Shale	Shale
	2106	36	Shale	
	2105	37	Shale	
	2104	38	Shale	
	2103	39	Shale	



MEMBERS:

SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
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GROUT
Slough Backfill

NORWEST CORPORATION
Norwest Corporation
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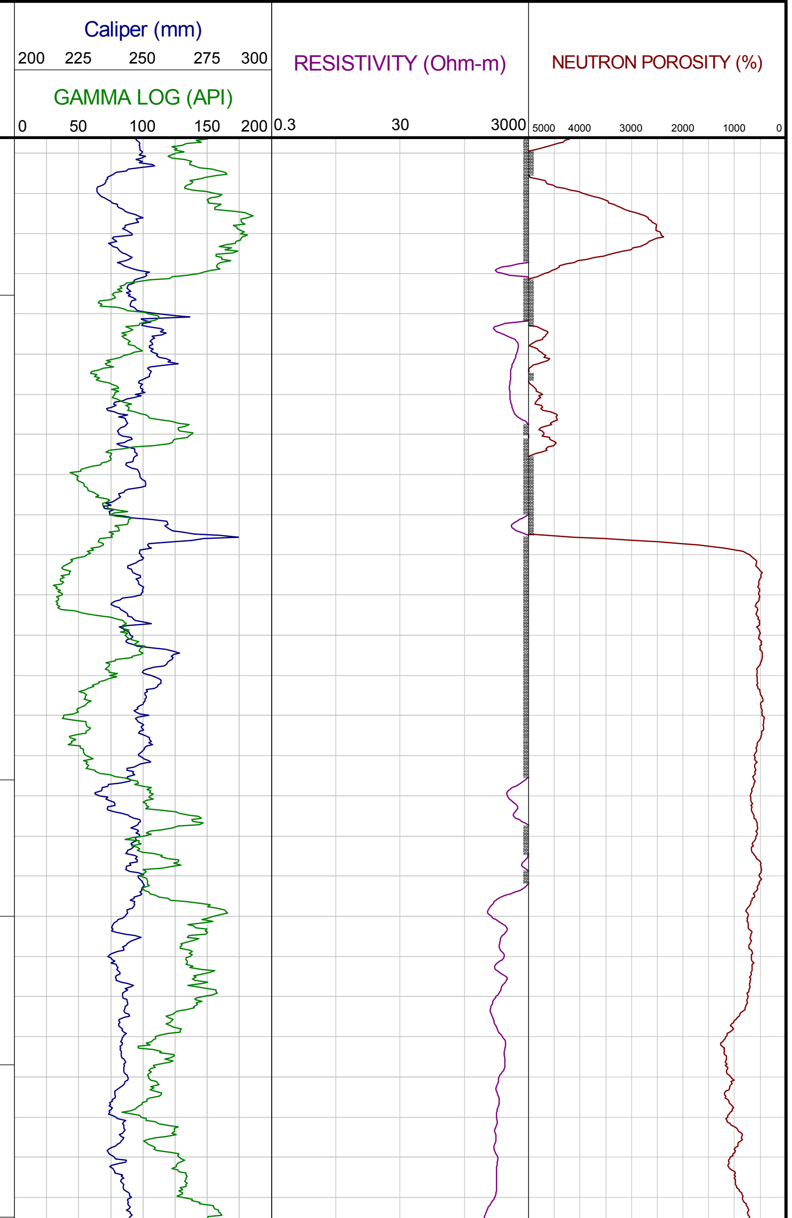
Borehole CM12-01-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Shale *(continued)*
	2102	40		
	2101	41		
				41.27 Coal
	2100	42		
	2099	43		
	2098	44		
	2097	45		
	2096	46		
	2095	47		
				47.3 Shale/Carb Shale
	2094	48		
	2093	49		49 Shale
	2092	50		
				50.85 Sandstone
	2091	51		
	2090	52		
				52.75



MEMBERS:
- SHALE
- SANDSTONE
- COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
- BENTONITE
- 10-20 SILICA SAND
- 0.5mm SLOTTED SCREEN
- STAND PIPE
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- Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
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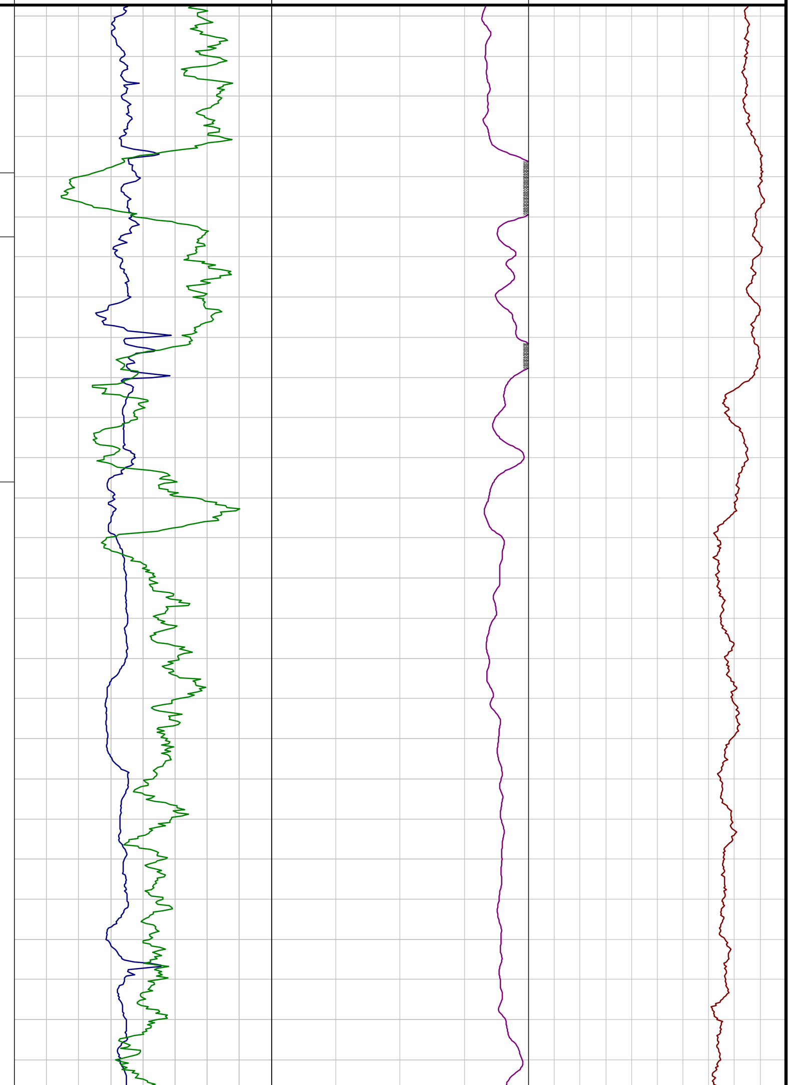
Borehole CM12-01-CH

ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
2089	53	Shale	Shale *(continued)*
2088	54		
2087	55	Coal	54.95 Coal
2086	56	Shale	55.75 Shale/Carb Shale
2085	57		
2084	58		
2083	59	Shale	58.8 Shale
2082	60		
2081	61		
2080	62		
2079	63		
2078	64		
2077	65		
2076	66		

Caliper (mm): 200 225 250 275 300
GAMMA LOG (API): 0 50 100 150 200
RESISTIVITY (Ohm-m): 0.3 30 3000
NEUTRON POROSITY (%): 5000 4000 3000 2000 1000 0



MEMBERS:
SHALE
SANDSTONE
COAL

GENERAL NOTES:

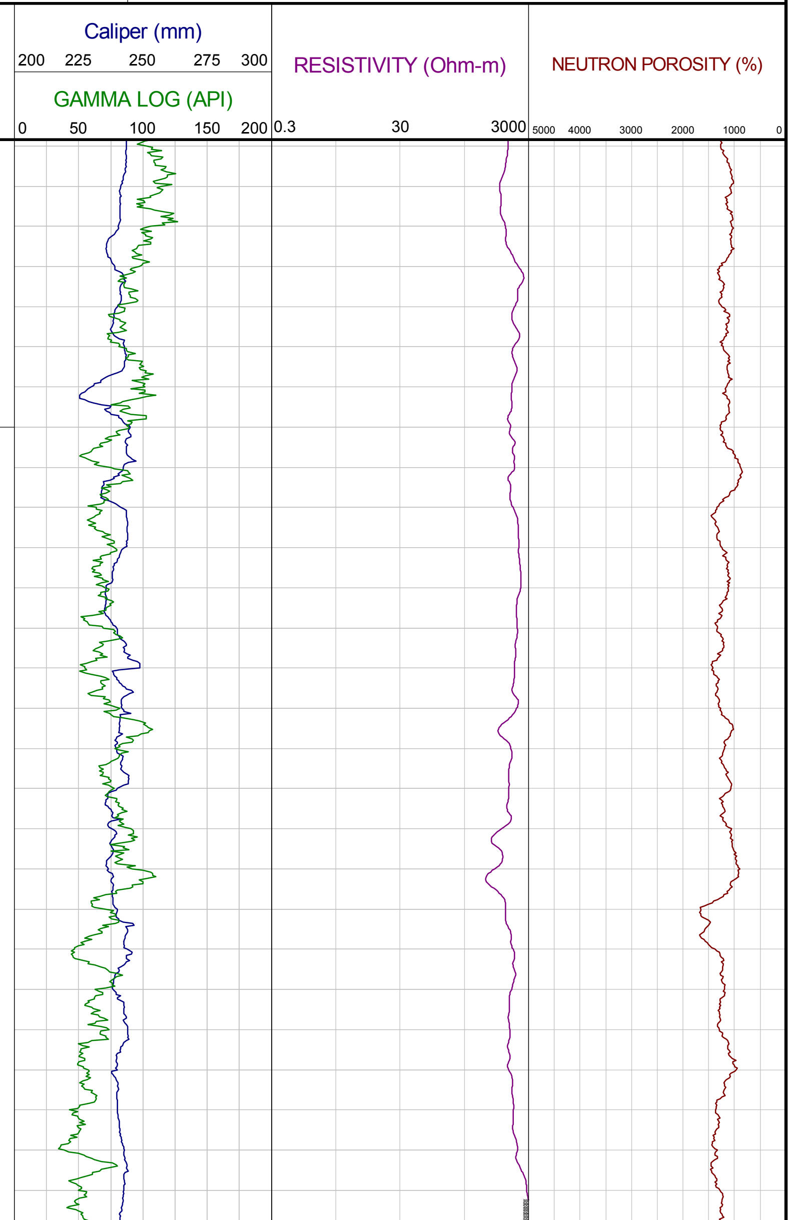
WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST
CORPORATION

Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM12-01-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2075	67		Shale *(continued)*
	2074	68		
	2073	69		
	2072	70		70 Sandstone
	2071	71		
	2070	72		
	2069	73		
	2068	74		
	2067	75		
	2066	76		
	2065	77		
	2064	78		
	2063	79		



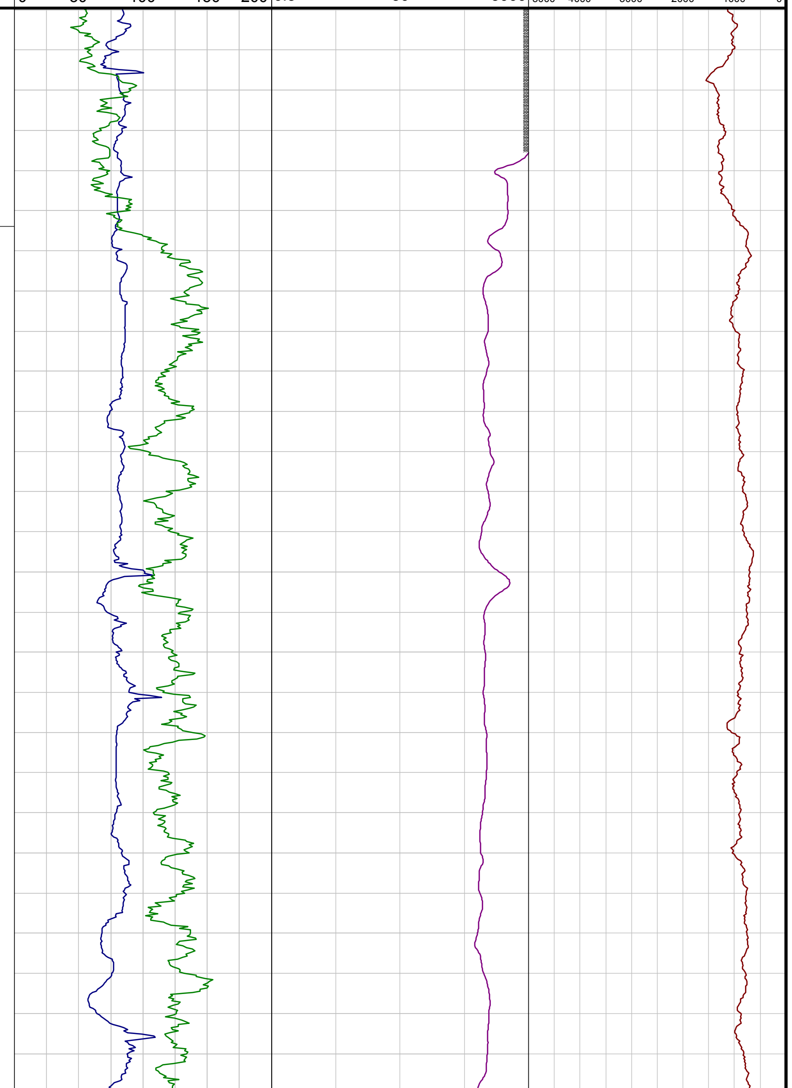
MEMBERS:
SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2062	80		Sandstone *(continued)*
	2061	81		
	2060	82		
				82.7 Shale
	2059	83		
	2058	84		
	2057	85		
	2056	86		
	2055	87		
	2054	88		
	2053	89		
	2052	90		
	2051	91		
	2050	92		
	2049	93		

Caliper (mm): 200 225 250 275 300
GAMMA LOG (API): 0 50 100 150 200
RESISTIVITY (Ohm-m): 0.3 30 3000
NEUTRON POROSITY (%): 5000 4000 3000 2000 1000 0



MEMBERS:

SHALE SANDSTONE COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE GROUT Slough Backfill

NORWEST CORPORATION

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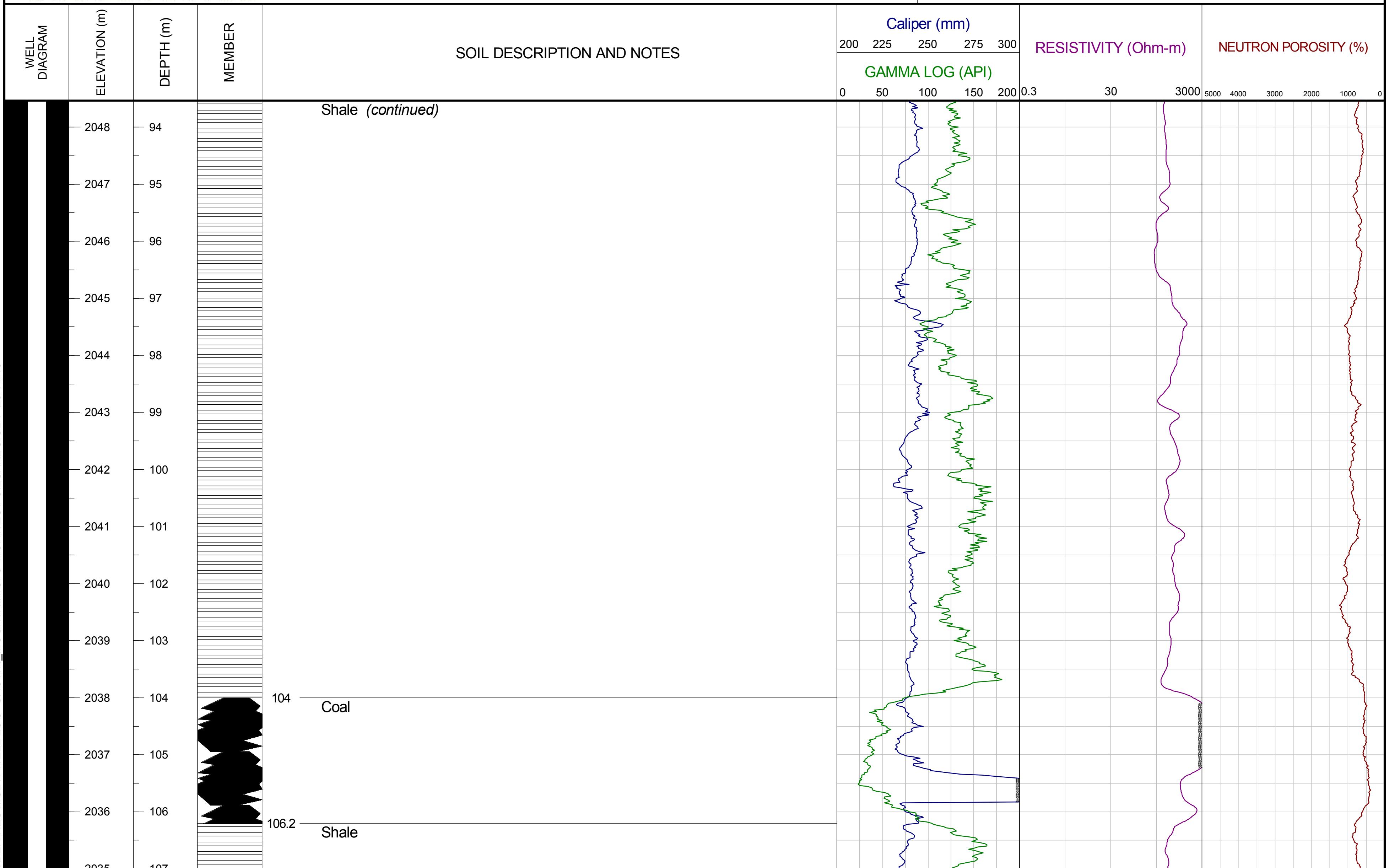
Borehole CM12-01-CH



MEMBERS:

SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

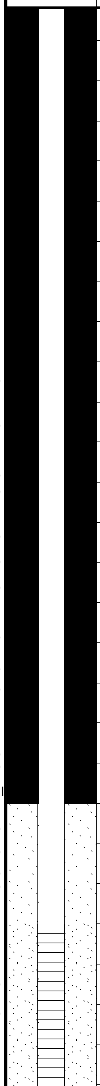
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

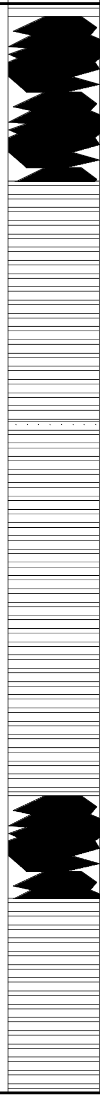
NORWEST
CORPORATION

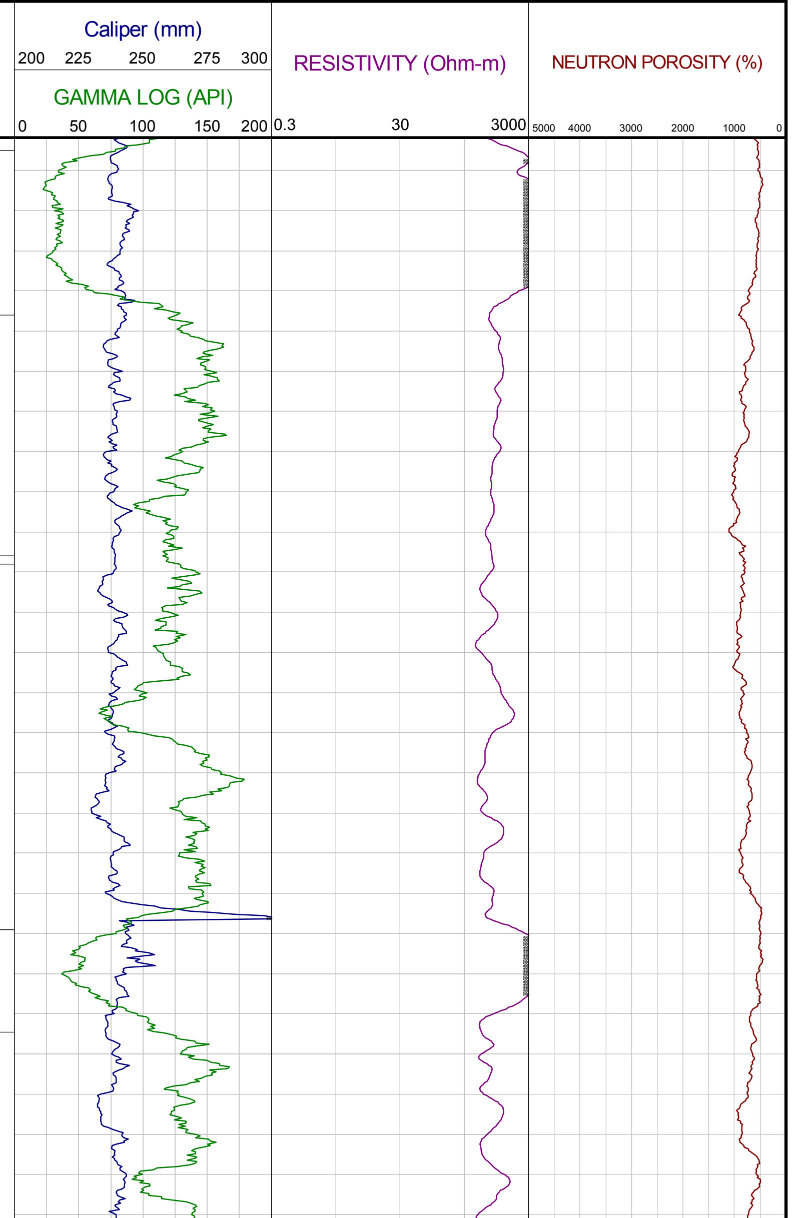
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM12-01-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2034	108		107.25 Coal
	2033	109		
				109.3 Shale
	2032	110		
	2031	111		
	2030	112		
				112.3 Sandstone
				112.4 Shale
	2029	113		
	2028	114		
	2027	115		
	2026	116		
				116.95 Coal
	2025	117		
	2024	118		
				118.23 Shale
	2023	119		
	2022	120		







MEMBERS:

- SHALE
- SANDSTONE
- COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

- BENTONITE
- 10-20 SILICA SAND
- 0.5mm SLOTTED SCREEN
- STAND PIPE
- GROUT
- Slough Backfill

NORWEST CORPORATION

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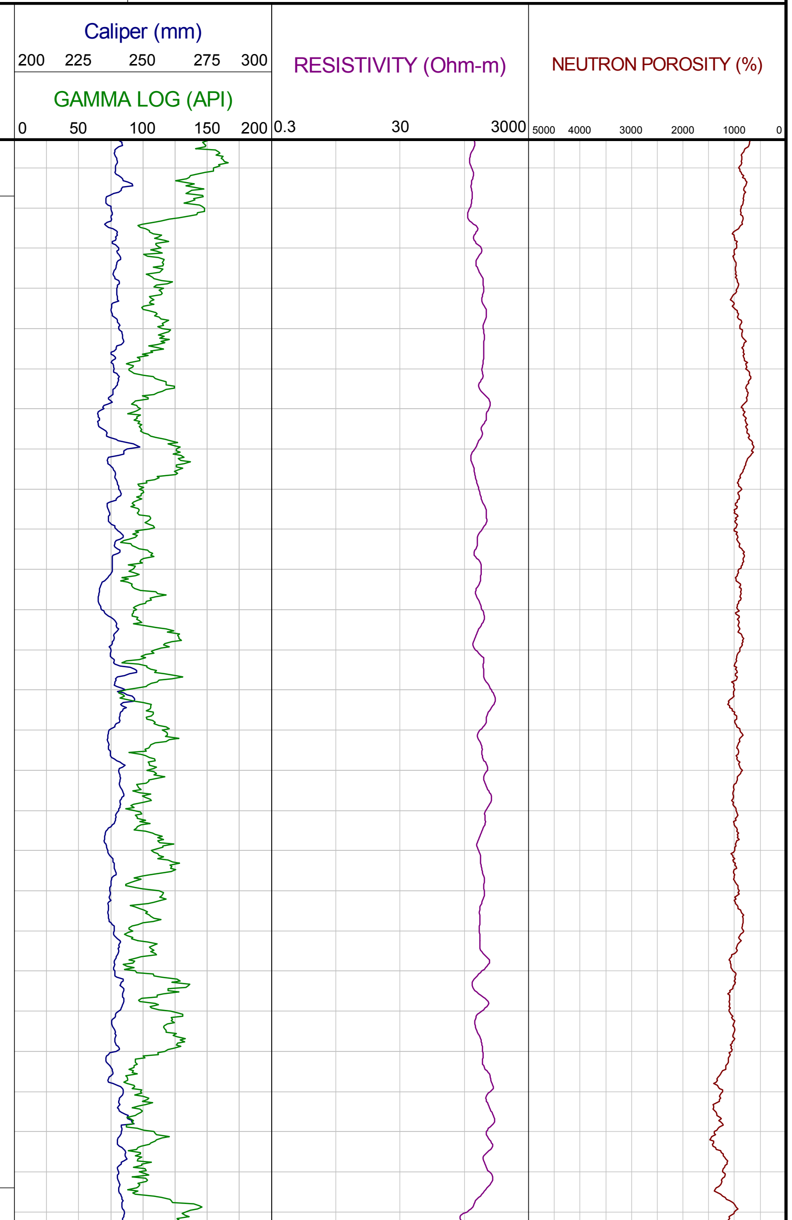
Borehole CM12-01-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2021	121		Shale *(continued)*
		121.35		Sandstone
	2020	122		
	2019	123		
	2018	124		
	2017	125		
	2016	126		
	2015	127		
	2014	128		
	2013	129		
	2012	130		
	2011	131		
	2010	132		
	2009	133		
		133.7		Shale
	2008	134		



MEMBERS:

SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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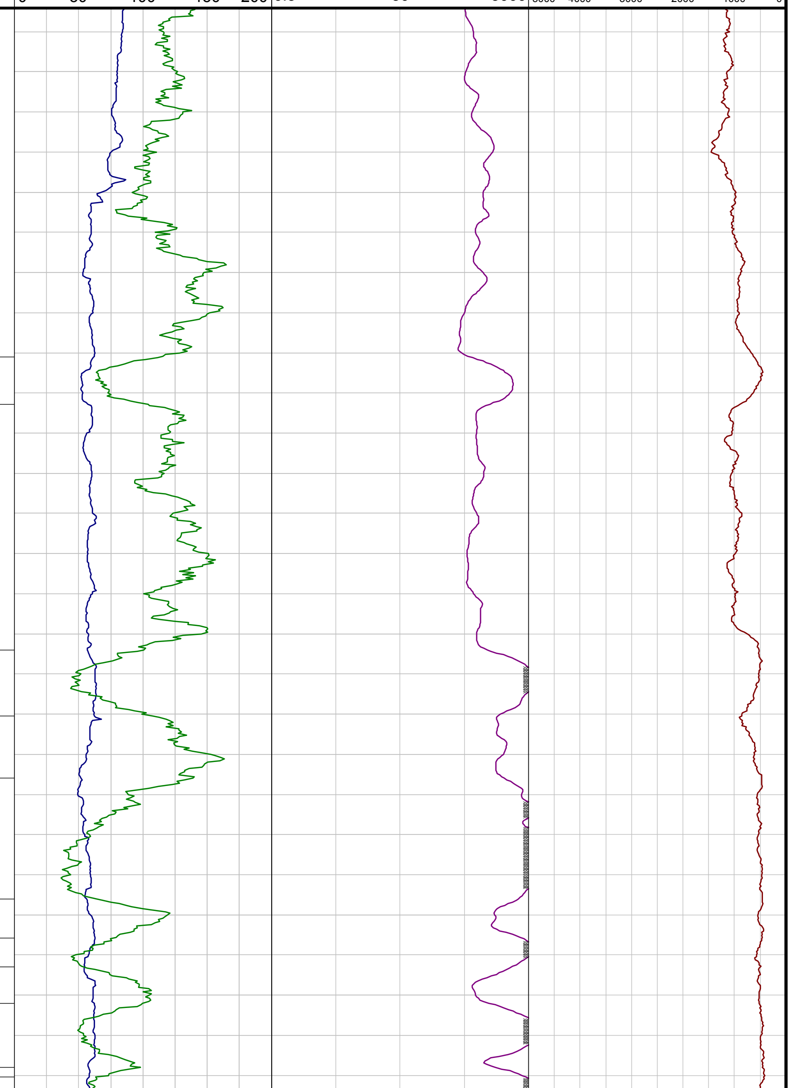
Borehole CM12-01-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	2007	135		Shale *(continued)*
	2006	136		
	2005	137		
	2004	138		
		138.55		Coal
	2003	139		
		139.14		Shale
	2002	140		
	2001	141		
	2000	142		
		142.2		Coal
	1999	143		
		143.02		Shale
		143.8		Coal
	1998	144		
	1997	145		
		145.3		Carbonaceous shale
		145.79		Coal
	1996	146		
		146.15		Carbonaceous shale
		146.6		Coal
	1995	147		
		147.4		Shale
		147.52		



MEMBERS:

SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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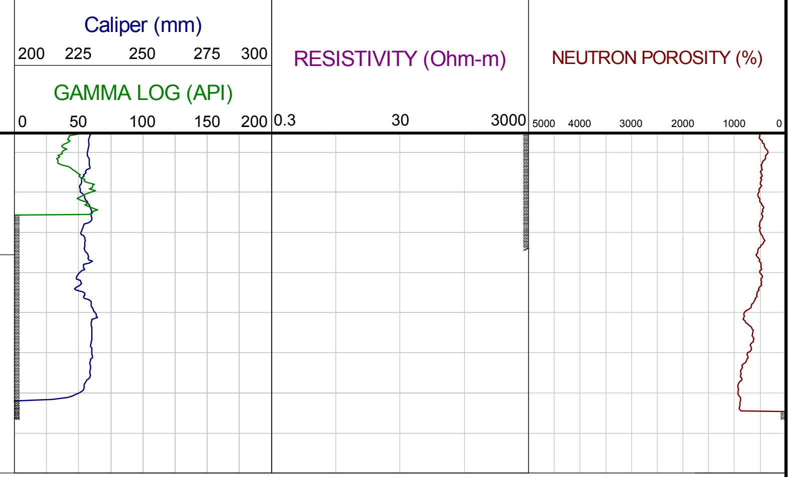
Borehole CM12-01-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1994	148		Coal *(continued)*
	1993	149	149.28	
	1992	150		Shale
	1991	151		
	1990	152		Actual bottom of borehole at 152 m.



MEMBERS:

SHALE
SANDSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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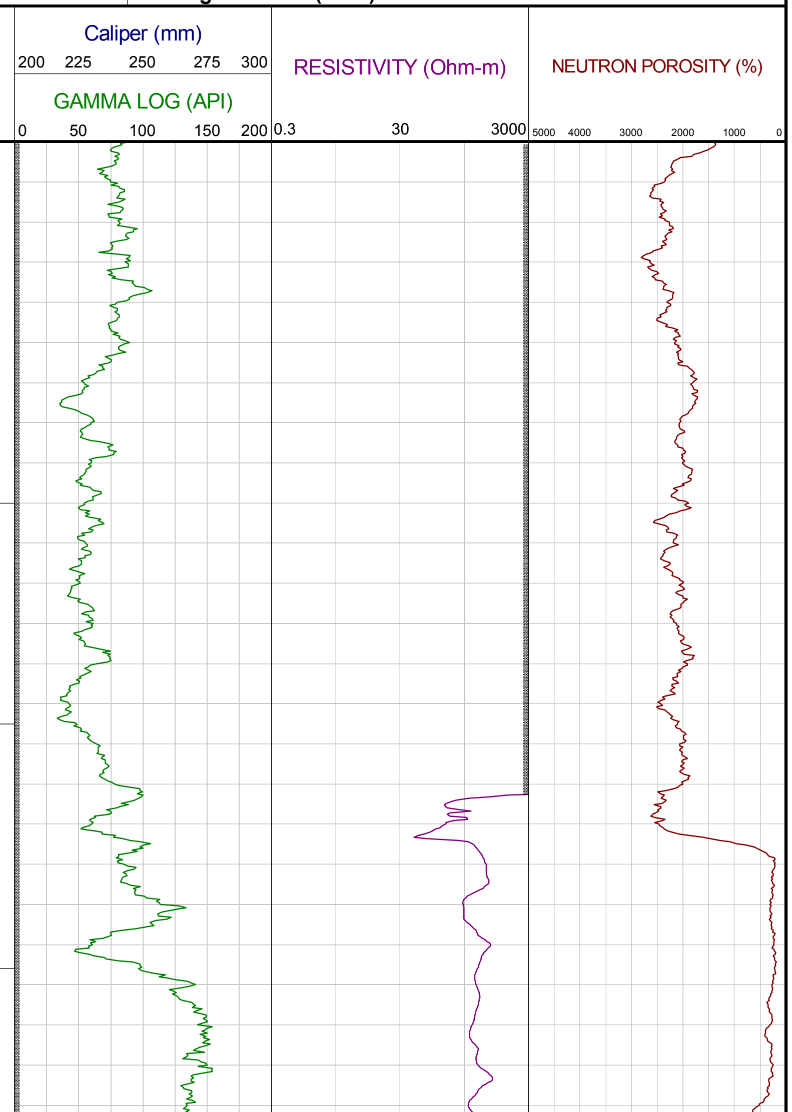
Borehole CM13-06

			Easting/Northing: 662823 m/5521114 m **NAD:**
Project No: 284-1	**Drilling Contractor:** Foraco	**Date Drilled:** August 16, 2013	**Ground Elevation (masl):** 1998
Project: Crown Mountain	**Total Depth (m):** 54.15	**Hole Diameter (mm):**	**Logged by:** Michelle E/Lyndsey P
Client: Jameson	**Drill Type:** RC	**Instrument Installed By:** Amy Perrin	**Casing Elevation (masl):** 1998

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1998	0	Sandstone	0 Sandstone/Siltstone
	1997	1		
	1996	2		
	1995	3		
	1994	4		
			Coal	4.5 Coal
	1993	5		
	1992	6		
	1991	7		
			Shale	7.25 Shale/Carb Shale
	1990	8		
	1989	9		
	1988	10		
			Shale	10.3 Shale
	1987	11		
	1986	12		



MEMBERS:
SANDSTONE, SHALE, COAL, SILTSTONE

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

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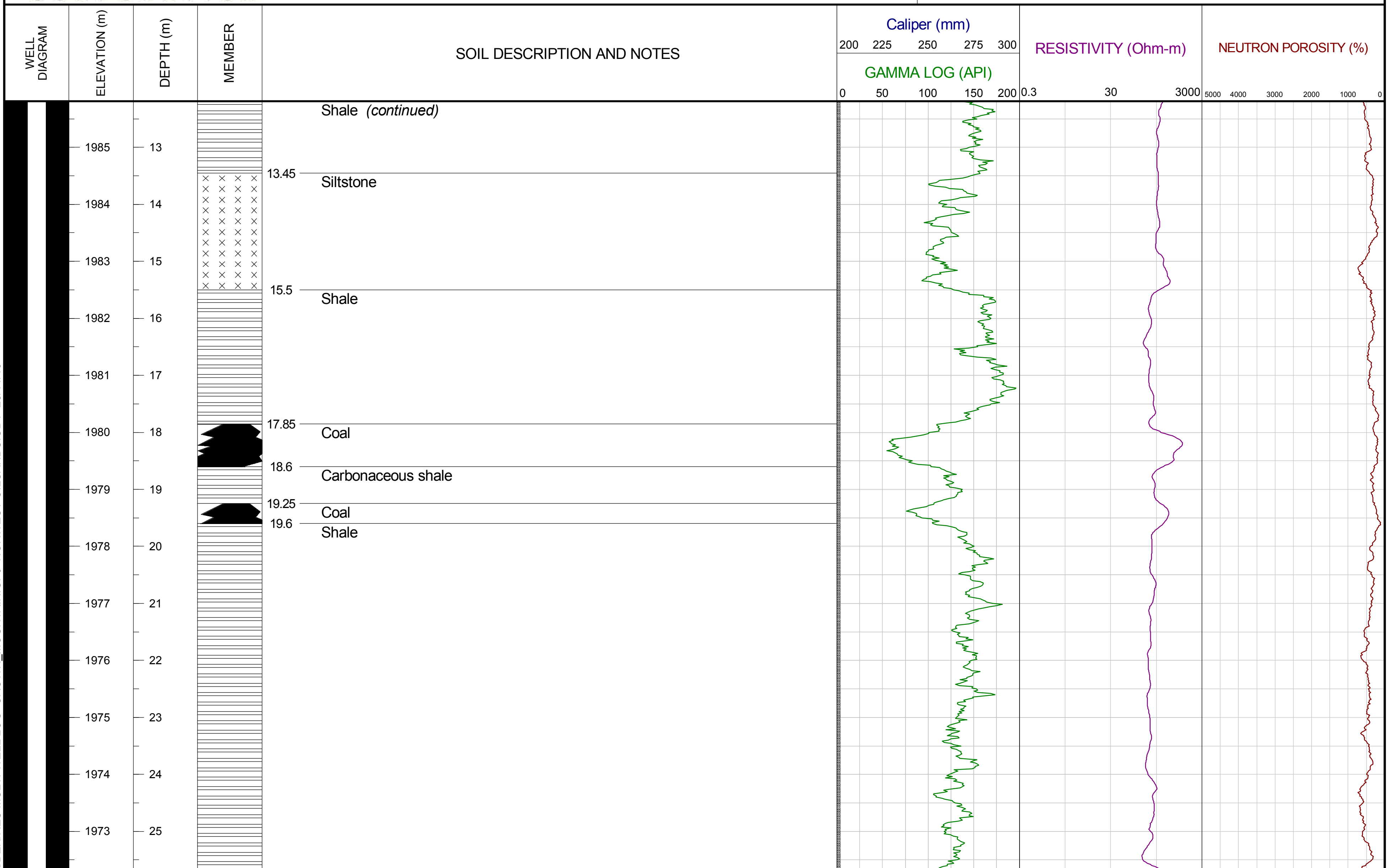
Borehole CM13-06



MEMBERS:

SANDSTONE, SHALE, COAL, SILTSTONE

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

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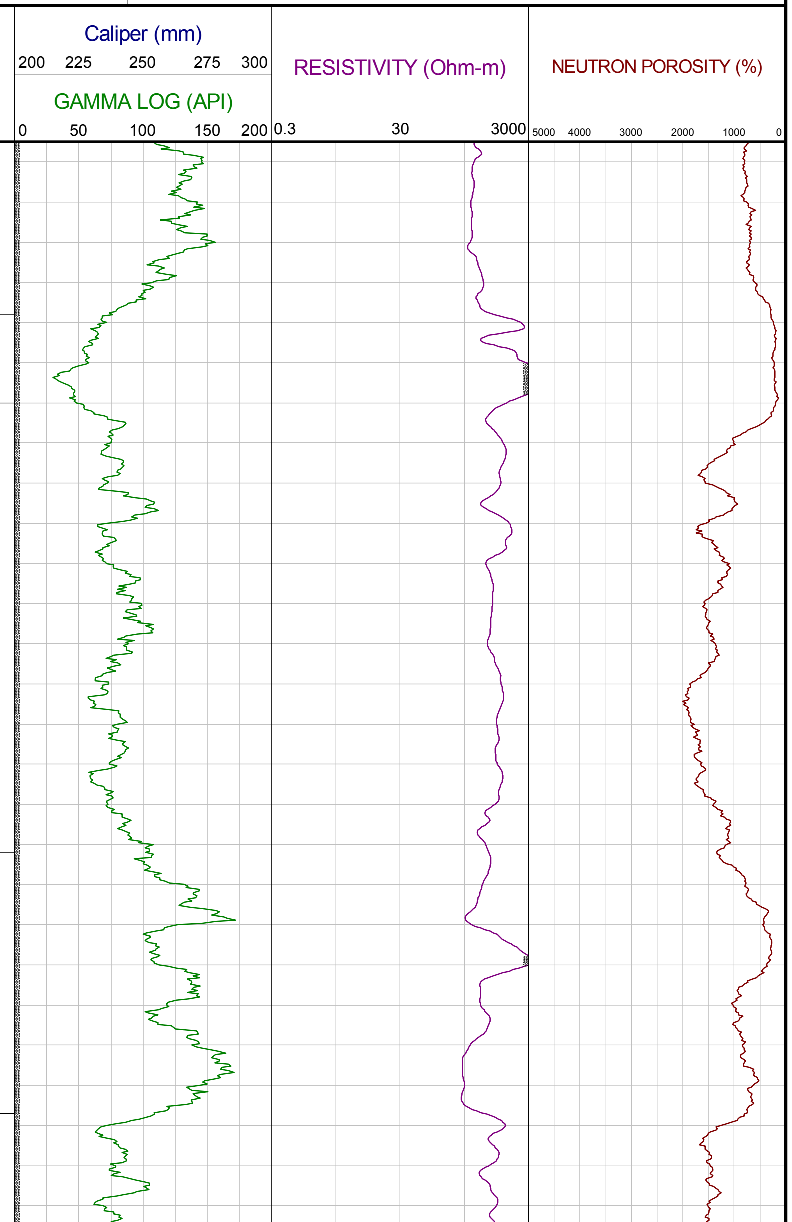
Borehole CM13-06

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1972	26		Shale *(continued)*
	1971	27		
	1970	28	27.9	Coal
	1969	29	29	Sandstone - trace coal, med. grained
	1968	30		
	1967	31		
	1966	32		
	1965	33		
	1964	34		
	1963	35	34.6	Shale/Carb Shale
	1962	36		
	1961	37		
	1960	38	37.85	Sandstone - med. grained
	1959	39		



MEMBERS:
SANDSTONE, SHALE, COAL, SILTSTONE

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

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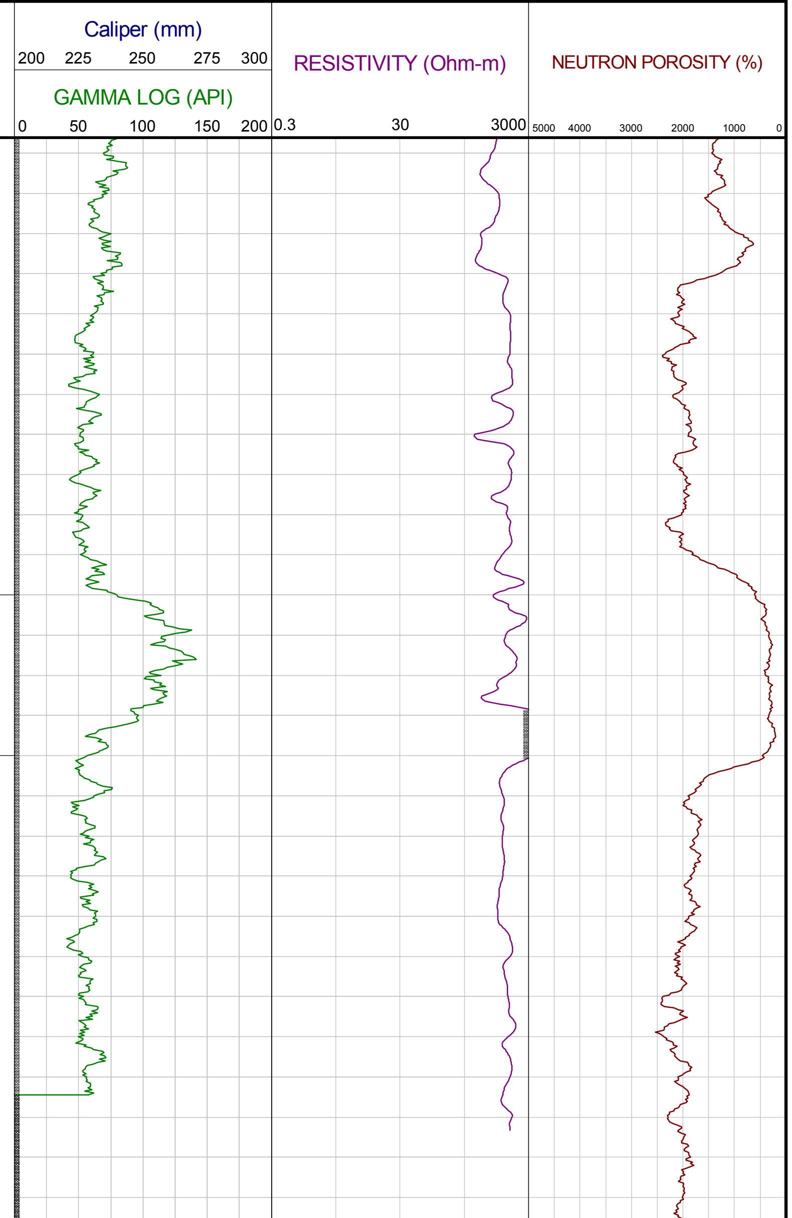
Borehole CM13-06

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Sandstone - med. grained *(continued)*
	1958	40		
	1957	41		
	1956	42		
	1955	43		
	1954	44		
	1953	45	45	Dirty coal
	1952	46		
	1951	47	47	Sandstone
	1950	48		
	1949	49		
	1948	50		
	1947	51		
	1946	52		



MEMBERS:
SANDSTONE
SHALE
COAL
SILTSTONE

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
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GROUT
Slough Backfill

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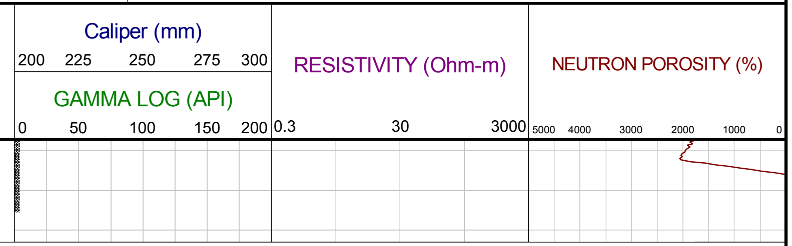
Borehole CM13-06

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1945	53		Sandstone *(continued)*
	1944	54		
				Actual bottom of borehole at 54.15 m.



MEMBERS:

SANDSTONE
SHALE
COAL
SILTSTONE

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

OILSANDS GAMMA/DEN/RES MULTI-WELL LOG CROWN_MOUNTAIN.GPJ NORWEST OILSANDS.GDT 28/11/13

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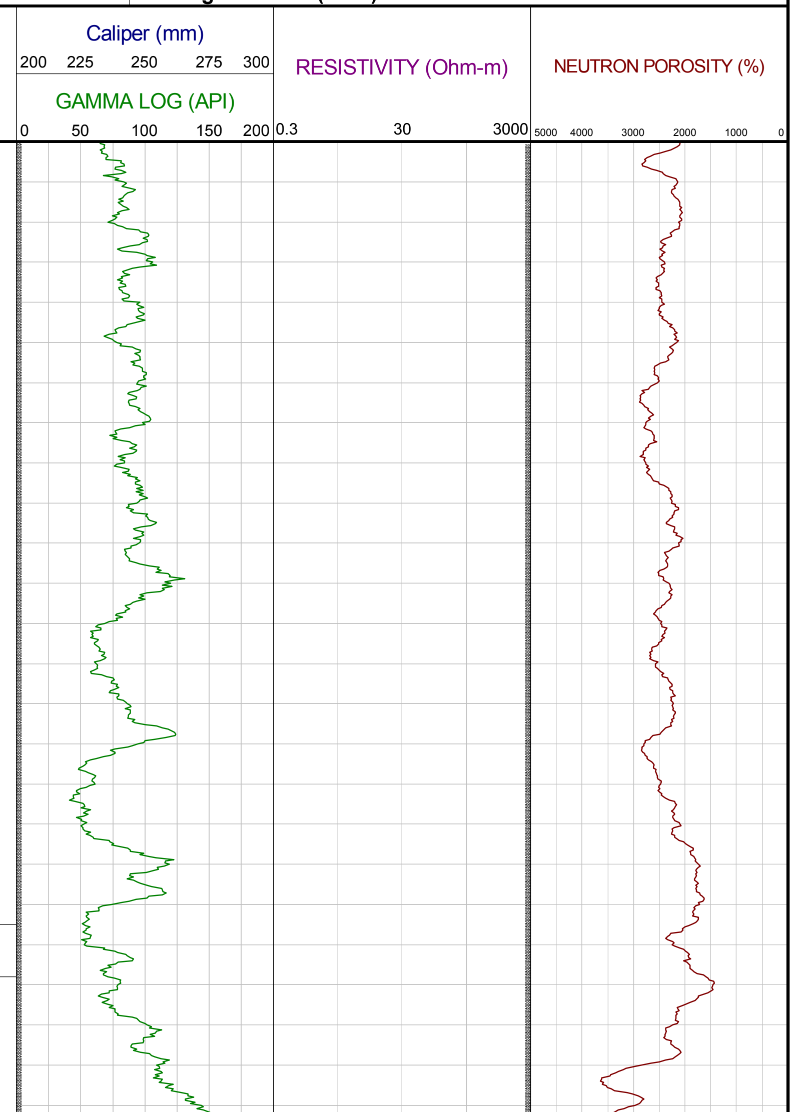
Borehole CM13-20

			Easting/Northing: 663264 m/5518426 m **NAD:**
Project No: 284-1	**Drilling Contractor:** Foraco	**Date Drilled:** August 31, 2013	**Ground Elevation (masl):** 1877
Project: Crown Mountain	**Total Depth (m):** 158	**Hole Diameter (mm):**	**Logged by:** Lauren B/Jeremy L
Client: Jameson	**Drill Type:** RC	**Instrument Installed By:** Amy Perrin	**Casing Elevation (masl):** 1877

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1877	0		0 Sandstone/Siltstone
	1876	1		
	1875	2		
	1874	3		
	1873	4		
	1872	5		
	1871	6		
	1870	7		
	1869	8		
	1868	9		
				9.75 Coal
	1867	10		
				10.4 Shale/Carb Shale
	1866	11		
	1865	12		



MEMBERS:
SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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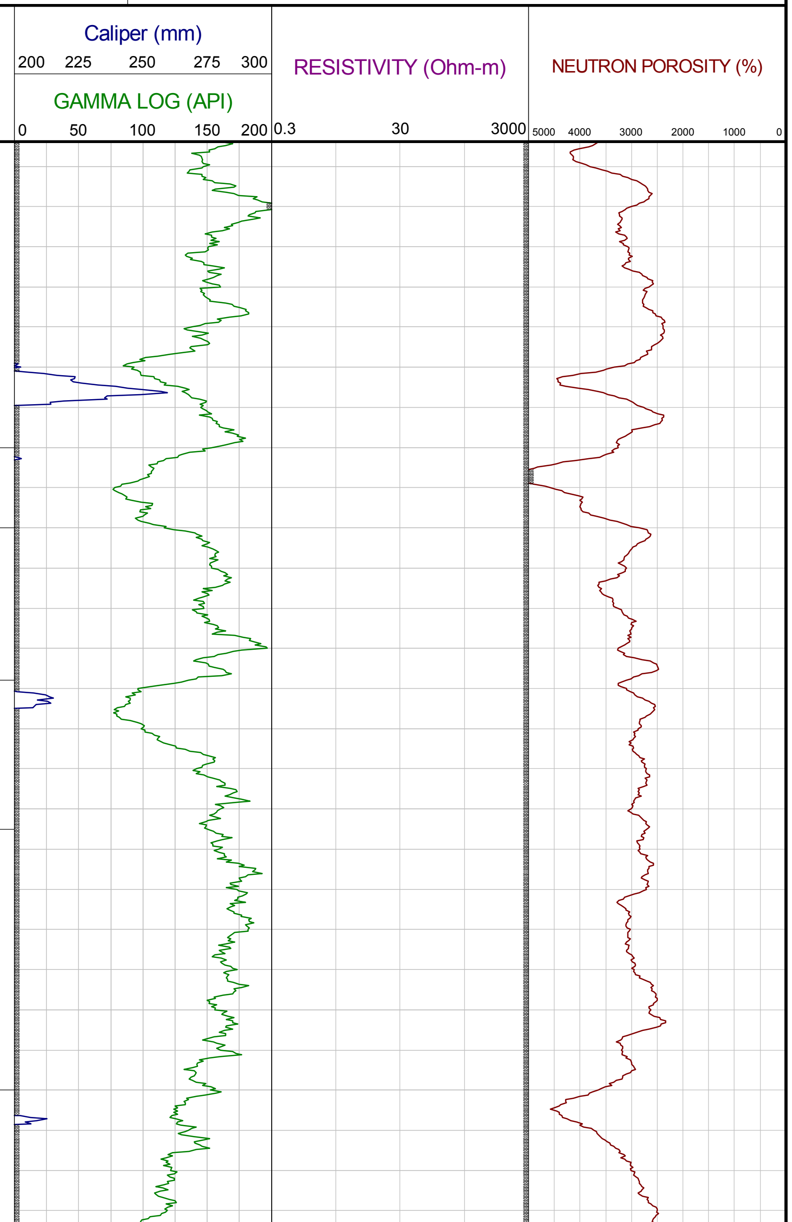
Borehole CM13-20

ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
			Shale/Carb Shale *(continued)*
1864	13		
1863	14		
1862	15		
1861	16	16	Shale/Carb Shale
1860	17	17	Shale
1859	18		
1858	19	18.9	Sandstone
1857	20		
1856	21	20.75	Shale
1855	22		
1854	23		
1853	24	24	Sandstone
1852	25		



MEMBERS:

SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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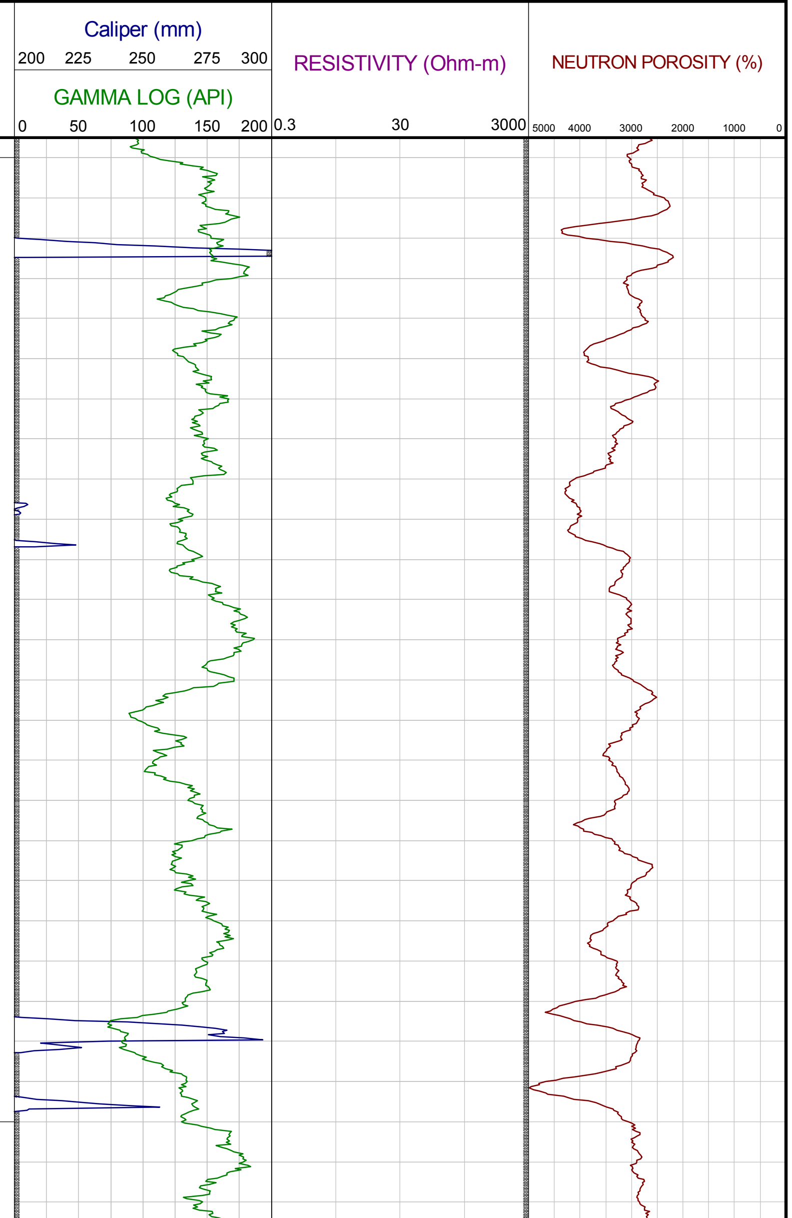
Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1851	26		26 Sandstone/Siltstone
	1850	27		
	1849	28		
	1848	29		
	1847	30		
	1846	31		
	1845	32		
	1844	33		
	1843	34		
	1842	35		
	1841	36		
	1840	37		
	1839	38		38 Shale
	1838	39		



MEMBERS:
SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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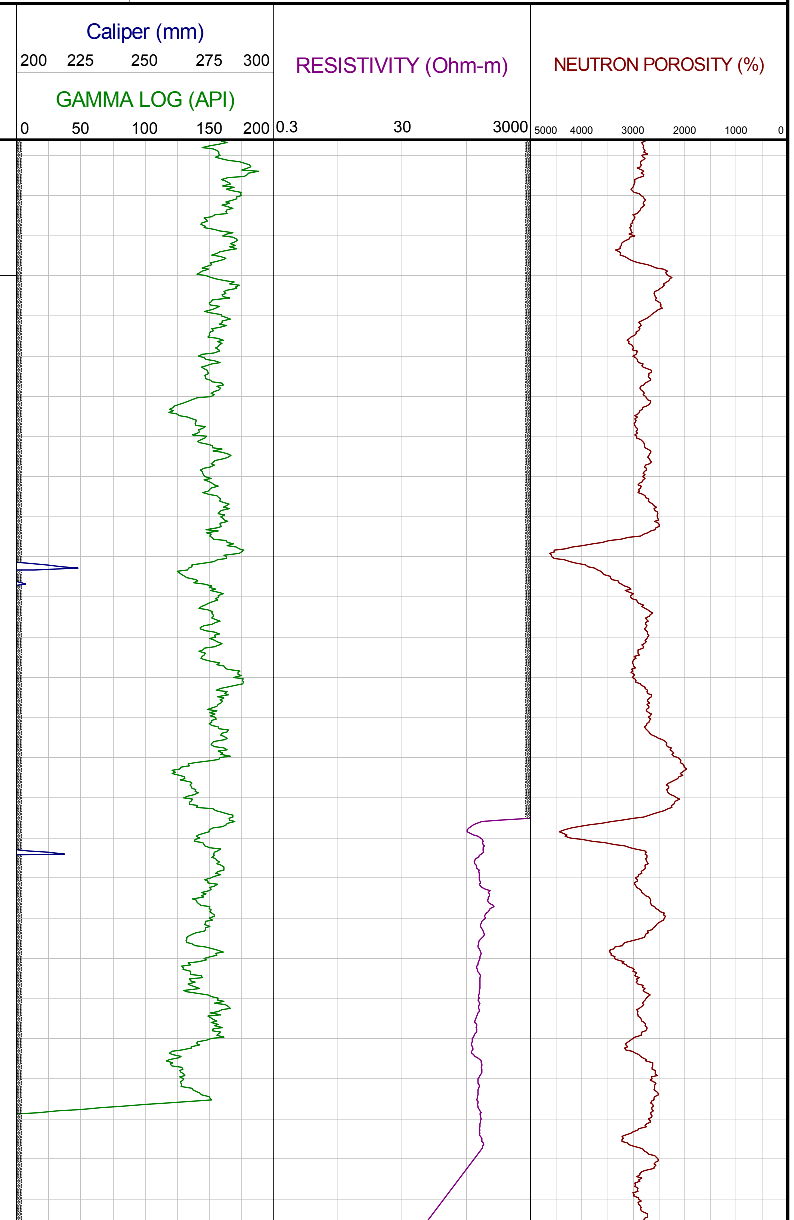
Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Shale *(continued)*
	1837	40		
	1836	41		41 shale/siltstone
	1835	42		
	1834	43		
	1833	44		
	1832	45		
	1831	46		
	1830	47		
	1829	48		
	1828	49		
	1827	50		
	1826	51		
	1825	52		



MEMBERS:
SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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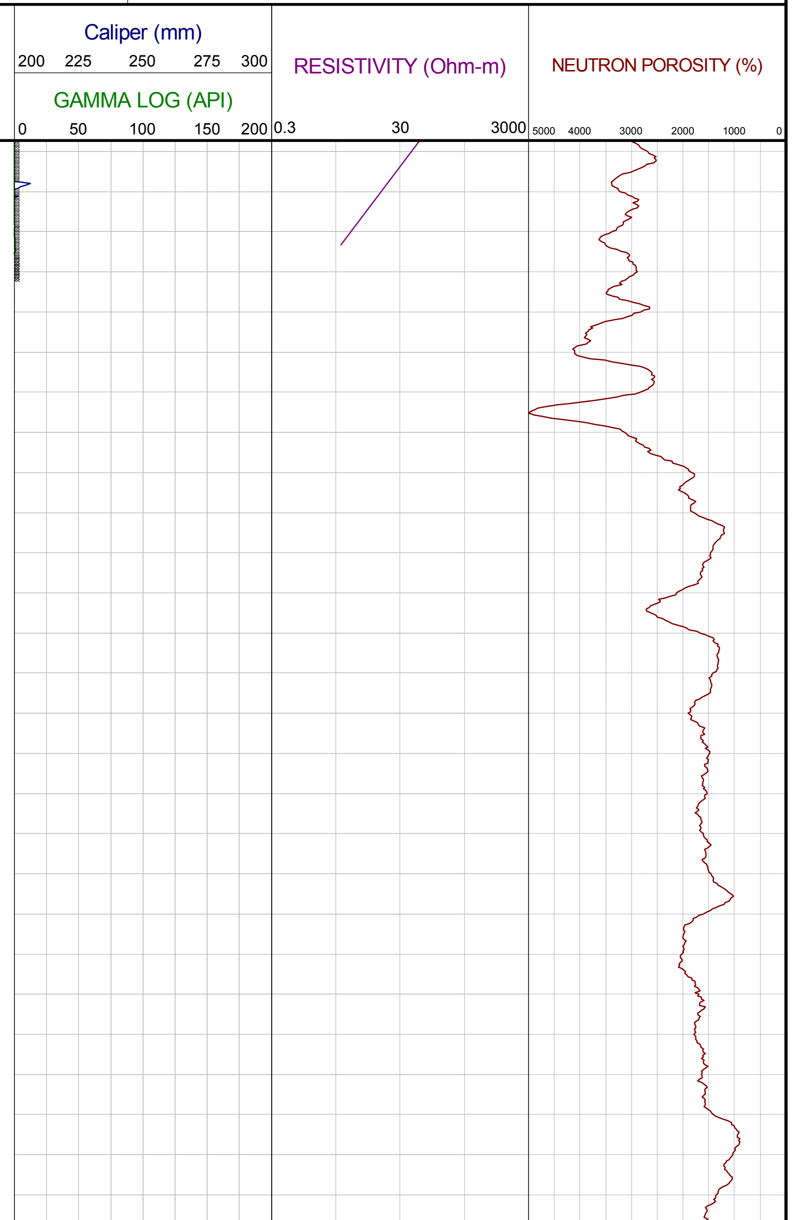
Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1824	53		shale/siltstone *(continued)*
	1823	54		
	1822	55		
	1821	56		
	1820	57		
	1819	58		
	1818	59		
	1817	60		
	1816	61		
	1815	62		
	1814	63		
	1813	64		
	1812	65		
	1811	66		



MEMBERS:
SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

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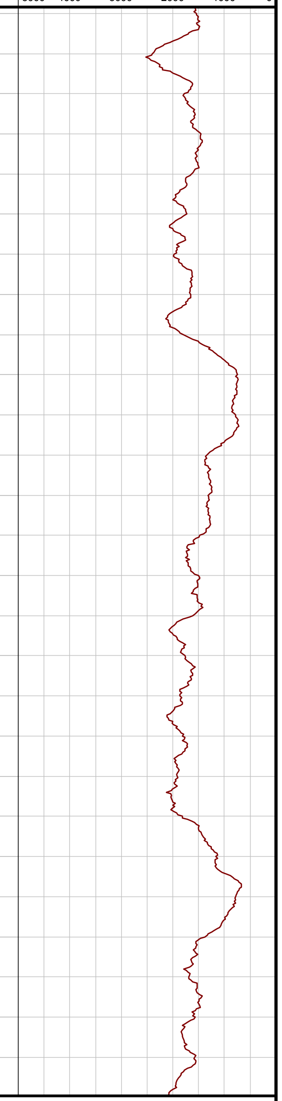
Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES	Caliper (mm) 200 225 250 275 300 / GAMMA LOG (API) 0 50 100 150 200	RESISTIVITY (Ohm-m) 0.3 30 3000	NEUTRON POROSITY (%) 5000 4000 3000 2000 1000 0
	1810	67		shale/siltstone *(continued)*			
	1809	68					
	1808	69					
	1807	70					
	1806	71					
	1805	72					
	1804	73					
	1803	74		74 Sandstone			
	1802	75					
	1801	76					
	1800	77					
	1799	78					
	1798	79					



MEMBERS:

SANDSTONE SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE
GROUT Slough Backfill

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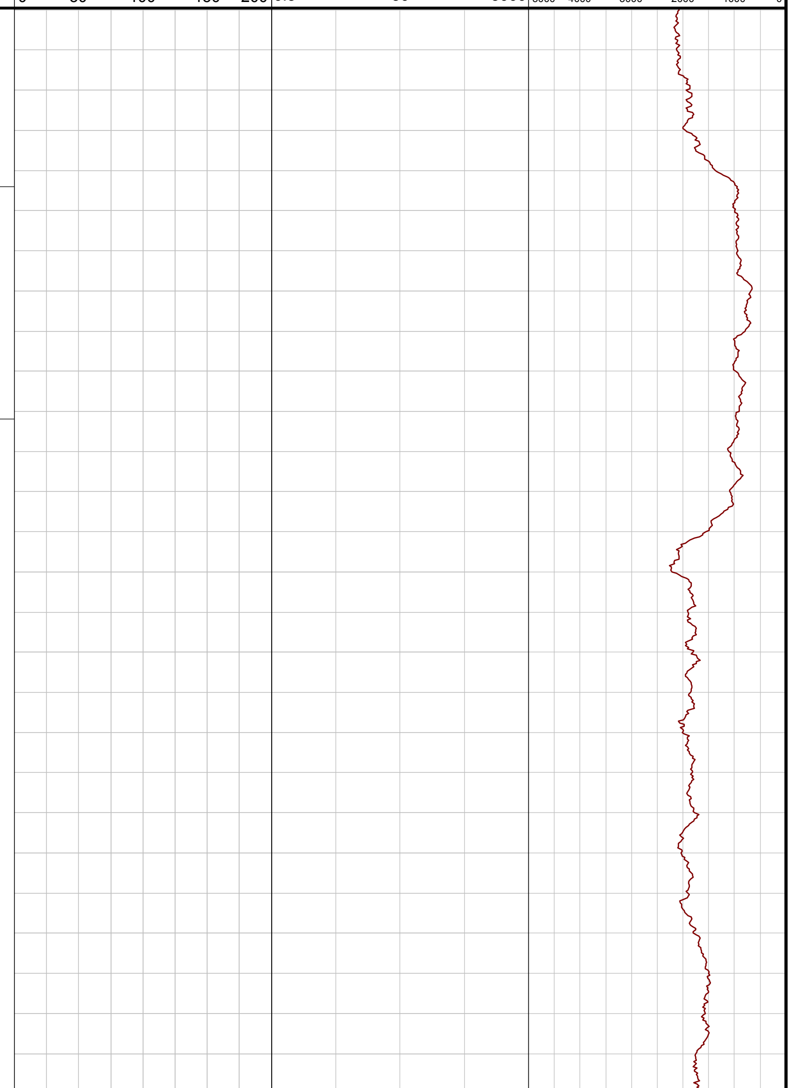
Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER		SOIL DESCRIPTION AND NOTES
	1797	80	Sandstone		Sandstone *(continued)*
	1796	81			
	1795	82			
			Coal	82.2	Coal
	1794	83			
	1793	84			
	1792	85			
			Sandstone	85.1	Sandstone/Siltstone
	1791	86			
	1790	87			
	1789	88			
	1788	89			
	1787	90			
	1786	91			
	1785	92			
	1784	93			

Caliper (mm): 200 225 250 275 300
GAMMA LOG (API): 0 50 100 150 200
RESISTIVITY (Ohm-m): 0.3 30 3000
NEUTRON POROSITY (%): 5000 4000 3000 2000 1000 0



MEMBERS:
SANDSTONE
SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
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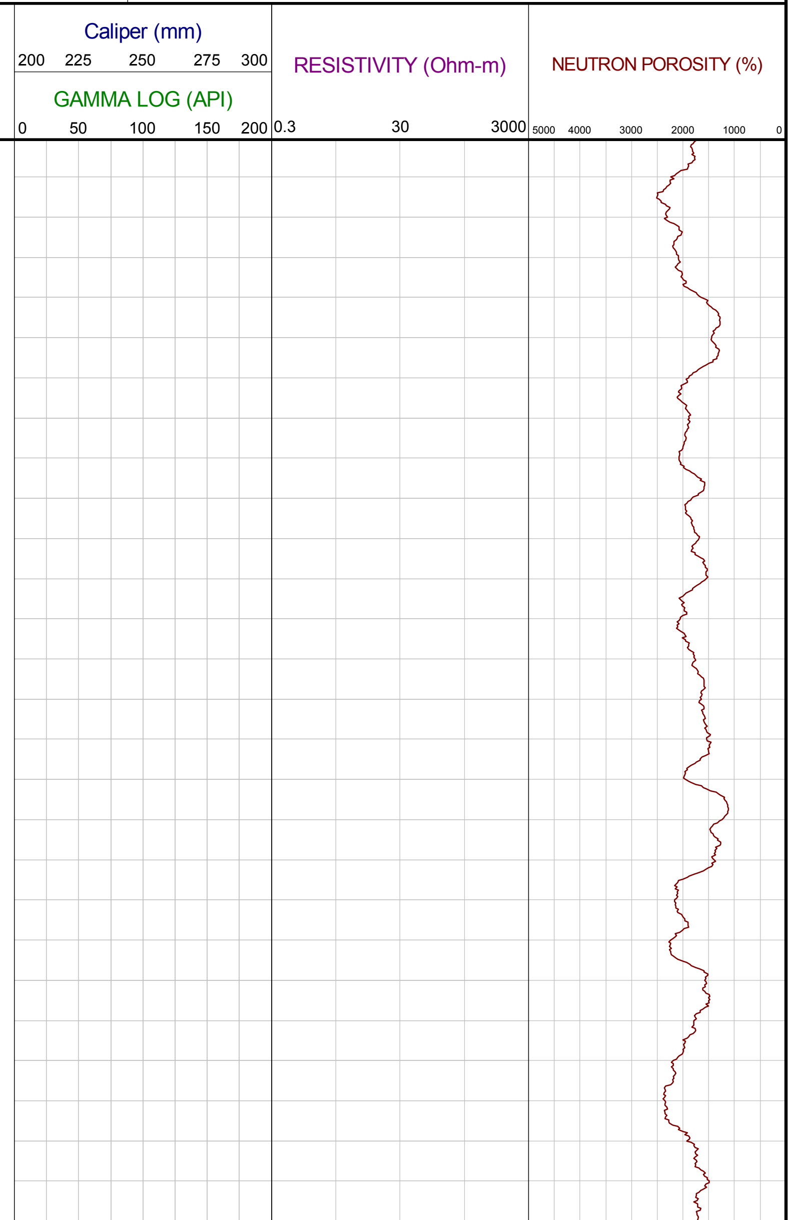
Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Sandstone/Siltstone *(continued)*
	1783	94		
	1782	95		
	1781	96		
	1780	97		
	1779	98		
	1778	99		
	1777	100		
	1776	101		
	1775	102		
	1774	103		
	1773	104		
	1772	105		
	1771	106		
	1770	107		



MEMBERS:

SANDSTONE SHALE

COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE

GROUT Slough Backfill

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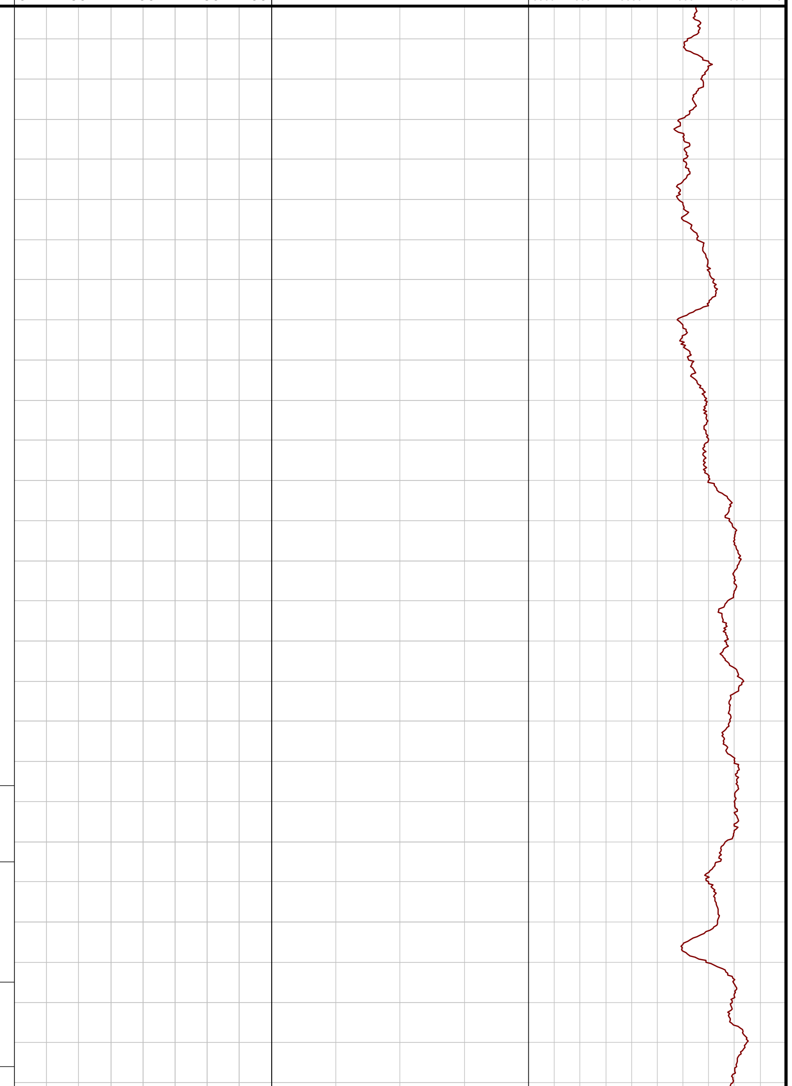
Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Sandstone/Siltstone *(continued)*
	1769	108		
	1768	109		
	1767	110		
	1766	111		
	1765	112		
	1764	113		
	1763	114		
	1762	115		
	1761	116		
			116.8	Coal
	1760	117		
			117.75	Shale
	1759	118		
	1758	119		
			119.25	Coal
	1757	120		
			120.3	shale/siltstone

Caliper (mm): 200 225 250 275 300
GAMMA LOG (API): 0 50 100 150 200
RESISTIVITY (Ohm-m): 0.3 30 3000
NEUTRON POROSITY (%): 5000 4000 3000 2000 1000 0



MEMBERS:
SANDSTONE SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE
GROUT Slough Backfill

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Norwest Corporation
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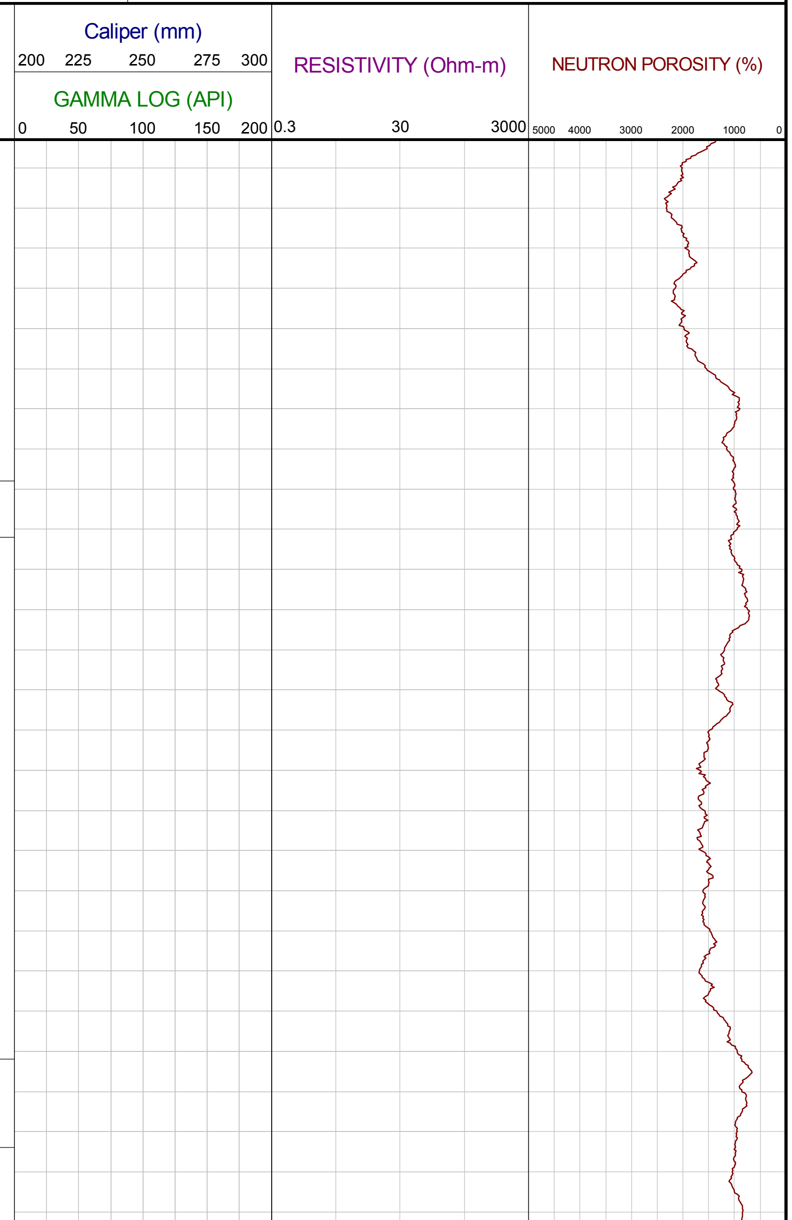
Telephone: (403) 237-7763

Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1756	121	Shale	shale/siltstone *(continued)*
	1755	122	Shale	
	1754	123	Shale	
	1753	124	Shale	
	1752	125	Coal	124.9 Coal
	1751	126	Shale	125.6 Shale
	1750	127	Shale	
	1749	128	Shale	
	1748	129	Shale	
	1747	130	Shale	
	1746	131	Shale	
	1745	132	Coal	132.1 Coal
	1744	133	Coal	133.2 Coal
	1743	134	Coal	



MEMBERS:
SANDSTONE
SHALE
COAL

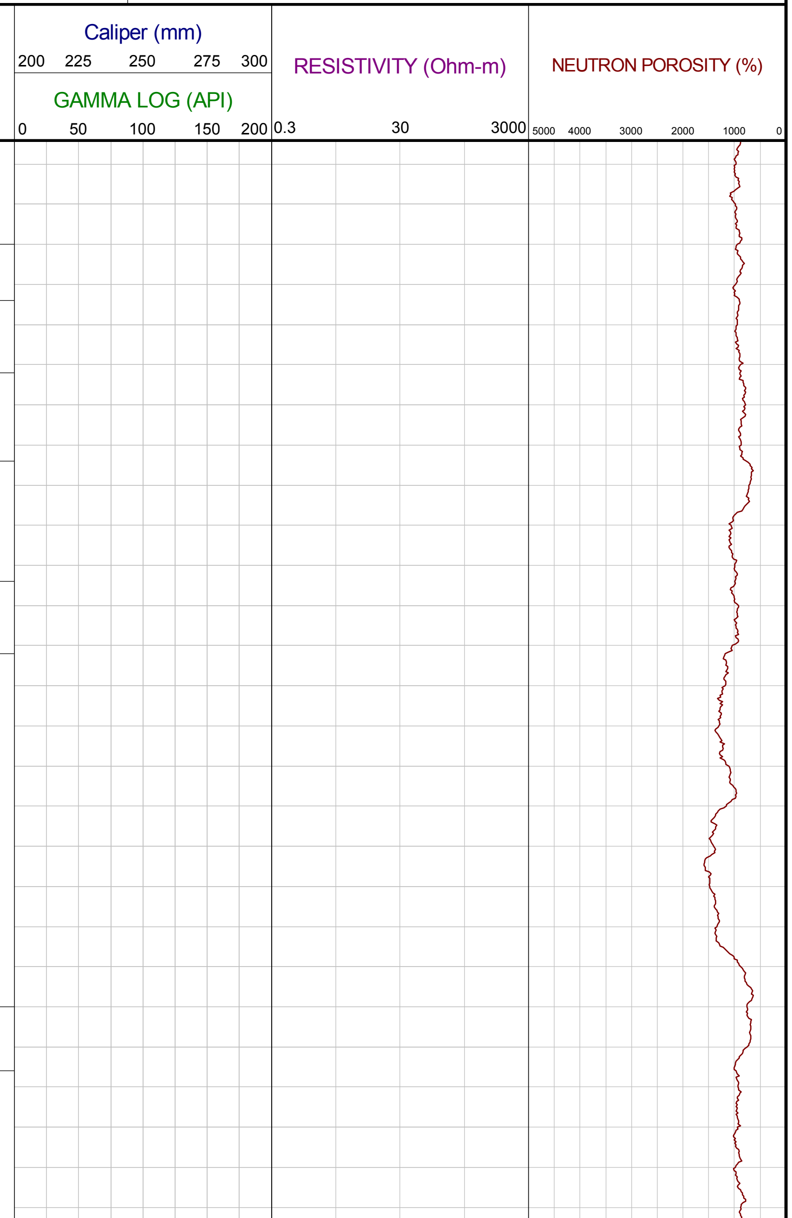
GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Coal *(continued)*
	1742	135		
		135.5		Dirty Coal
	1741	136		
		136.2		Dirty Coal
	1740	137		
		137.1		Coal
	1739	138		
		138.2		Coal
	1738	139		
		139.7		Dirty Coal
	1737	140		
		140.6		Dirty Coal
	1736	141		
	1735	142		
	1734	143		
	1733	144		
	1732	145		
		145		Coal
		145.8		Sandstone/Siltstone
	1731	146		
	1730	147		



MEMBERS:

SANDSTONE SHALE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

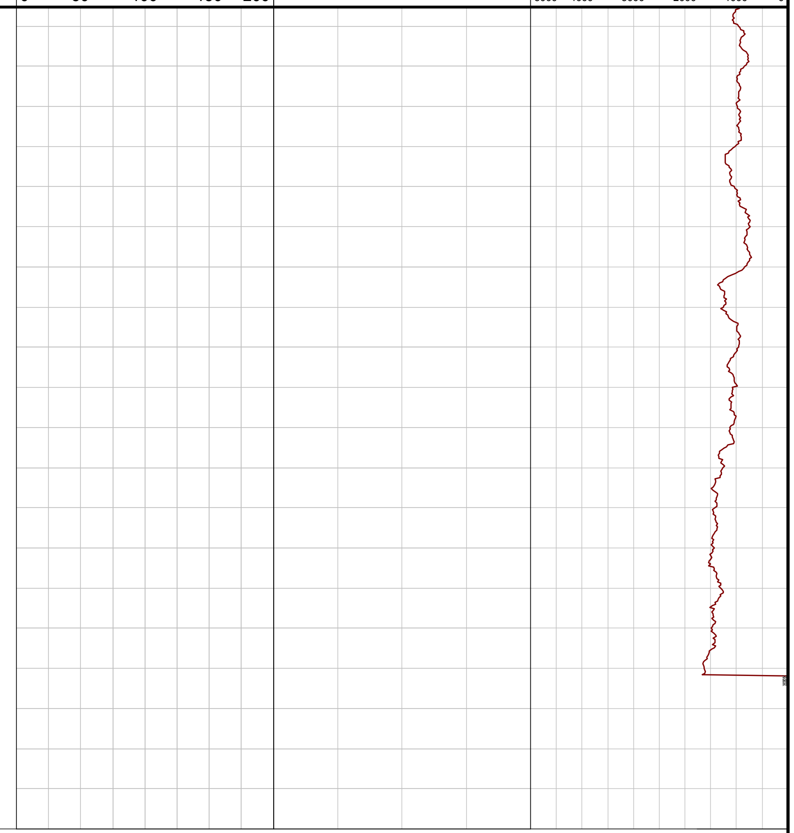
BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE
GROUT Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-20

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1729	148		Sandstone/Siltstone *(continued)*
	1728	149		
	1727	150		
	1726	151		
	1725	152		
	1724	153		
	1723	154		
	1722	155		
	1721	156		
	1720	157		
	1719	158		Actual bottom of borehole at 158 m.

Caliper (mm): 200 225 250 275 300
GAMMA LOG (API): 0 50 100 150 200
RESISTIVITY (Ohm-m): 0.3 30 3000
NEUTRON POROSITY (%): 5000 4000 3000 2000 1000 0



MEMBERS:
SANDSTONE
SHALE
COAL

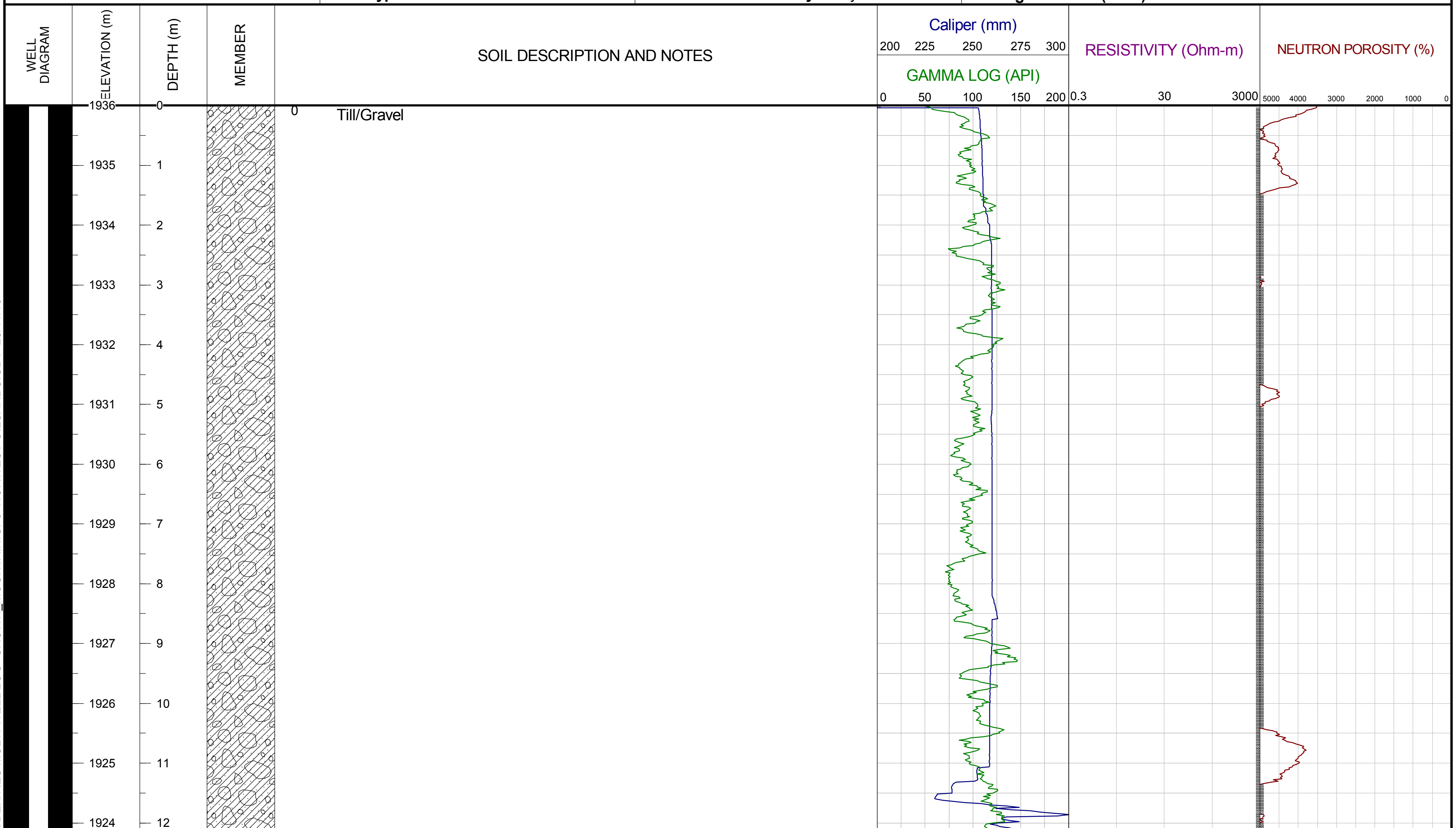
GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

			Easting/Northing: 663769 m/5517924 m **NAD:**
Project No: 284-1	**Drilling Contractor:** Foraco	**Date Drilled:** September 5, 2013	**Ground Elevation (masl):** 1938
Project: Crown Mountain	**Total Depth (m):** 102.5	**Hole Diameter (mm):**	**Logged by:** Lauren B/Jeremy L
Client: Jameson	**Drill Type:** Core	**Instrument Installed By:** Amy Perrin	**Casing Elevation (masl):** 1938



MEMBERS:

TILL, SHALE, SANDSTONE, SILTSTONE, COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

NORWEST
CORPORATION

Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

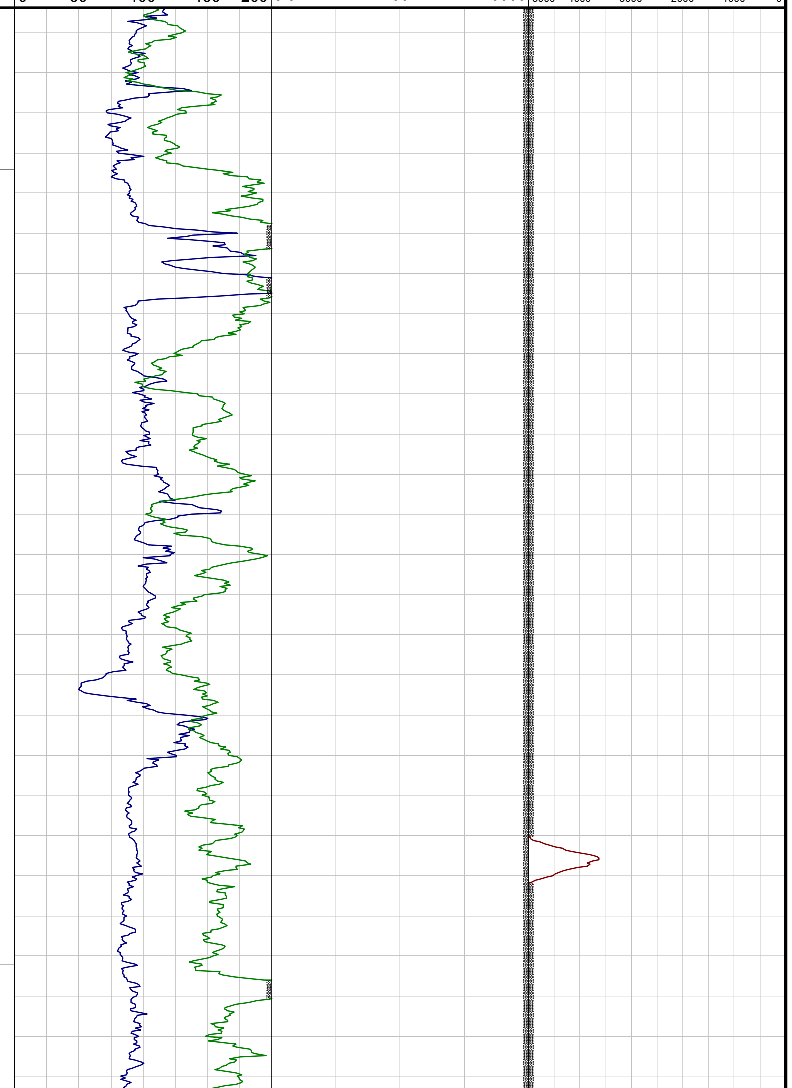
WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
			Till	Till/Gravel *(continued)*
	1923	13		
	1922	14		
		14.2	Siltstone	Siltstone
	1921	15		
	1920	16		
	1919	17		
	1918	18		
	1917	19		
	1916	20		
	1915	21		
	1914	22		
	1913	23		
	1912	24		
		24.1	Shale	Shale
	1911	25		

Caliper (mm): 200 225 250 275 300

GAMMA LOG (API): 0 50 100 150 200

RESISTIVITY (Ohm-m): 0.3 30 3000

NEUTRON POROSITY (%): 5000 4000 3000 2000 1000 0



MEMBERS:

TILL, SHALE, SANDSTONE, SILTSTONE, COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

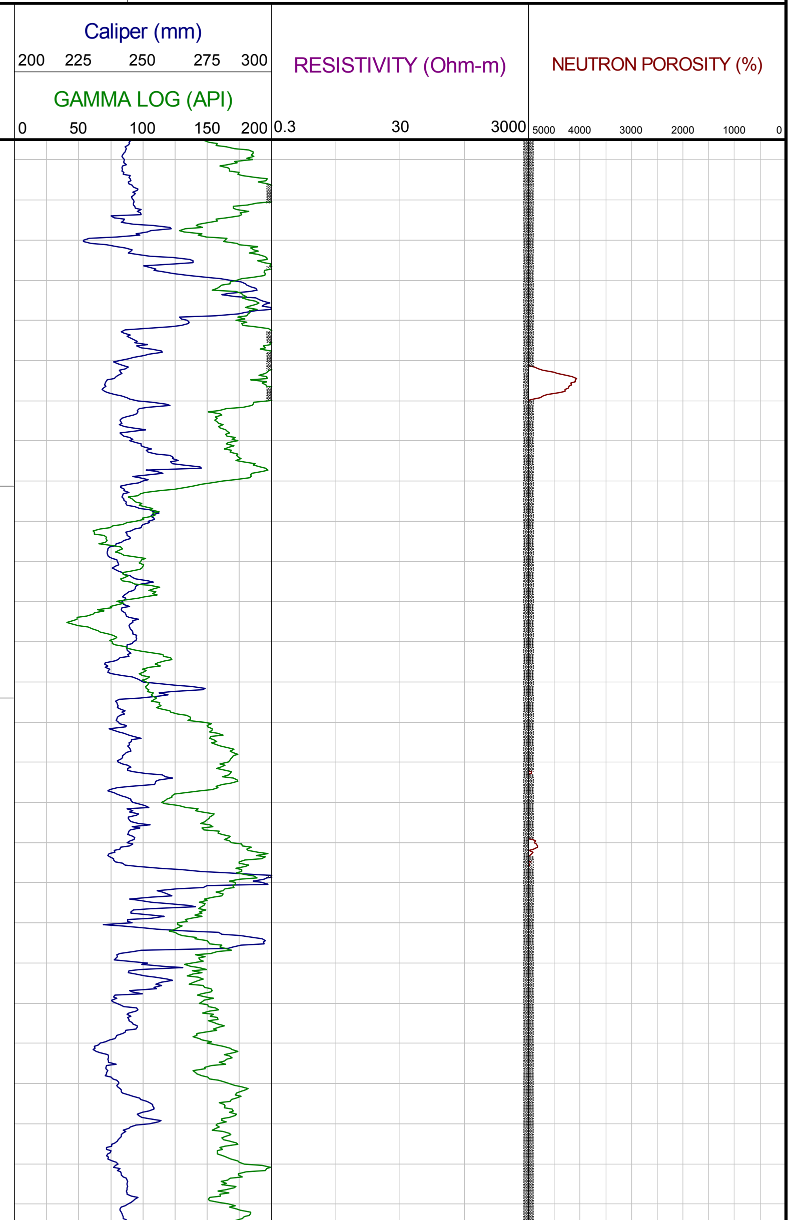
BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

NORWEST
CORPORATION

Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1910	26		Shale *(continued)*
	1909	27		
	1908	28		
	1907	29		
	1906	30		
		30.06		Coal
	1905	31		
	1904	32		
		32.7		Shale
	1903	33		
	1902	34		
	1901	35		
	1900	36		
	1899	37		
	1898	38		
	1897	39		



MEMBERS:

TILL, SHALE, SANDSTONE, SILTSTONE, COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

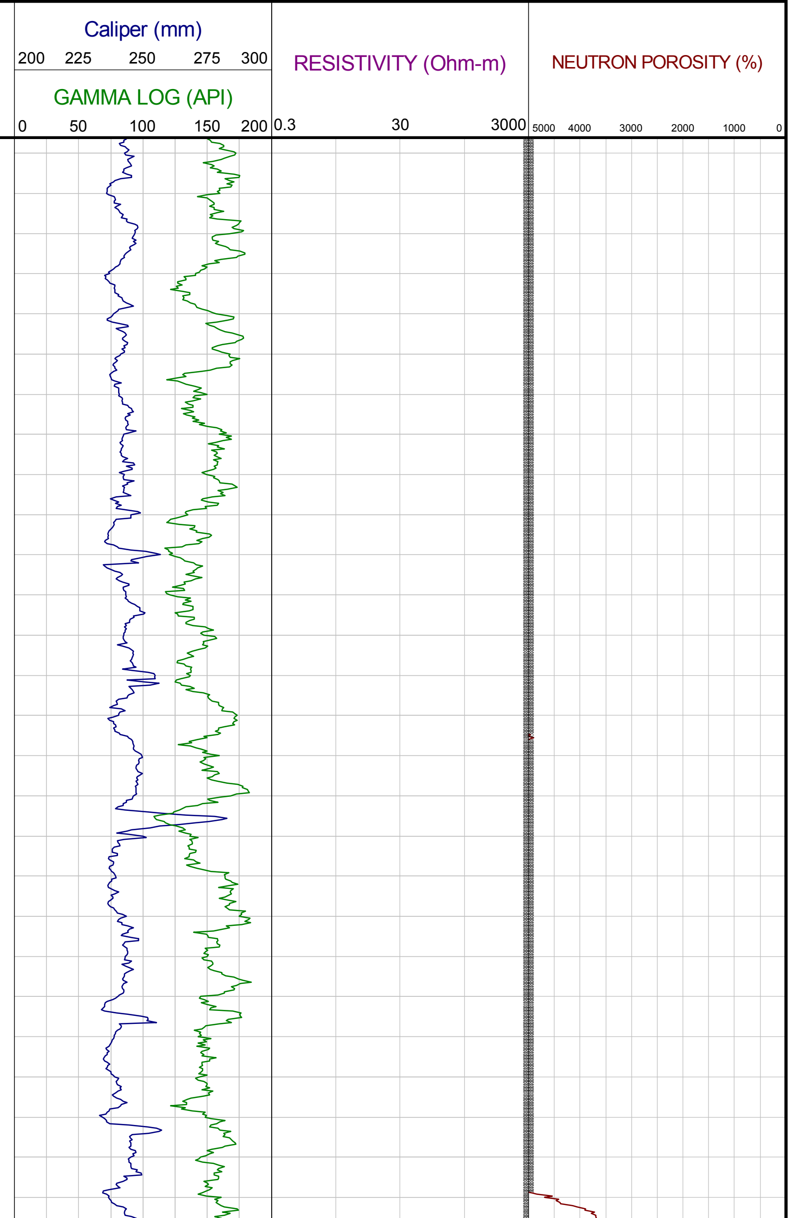
BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

NORWEST
CORPORATION

Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Shale *(continued)*
	1896	40		
	1895	41		
	1894	42		
	1893	43		
	1892	44		
	1891	45		
	1890	46		
	1889	47		
	1888	48		
	1887	49		
	1886	50		
	1885	51		
	1884	52		



MEMBERS:

TILL | SHALE | SANDSTONE | SILTSTONE | COAL

GENERAL NOTES:

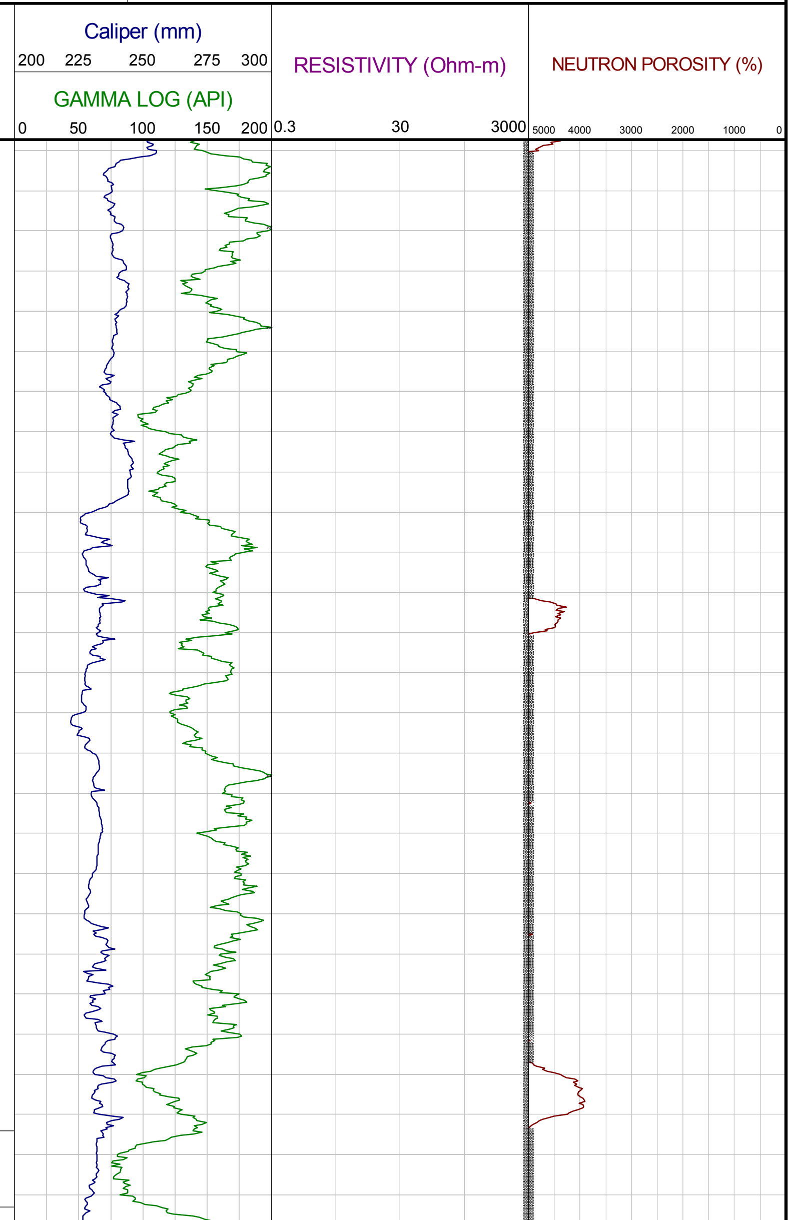
WELL DIAGRAM LEGEND:

BENTONITE | 10-20 SILICA SAND | 0.5mm SLOTTED SCREEN | STAND PIPE | GROUT | Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1883	53		Shale *(continued)*
	1882	54		
	1881	55		
	1880	56		
	1879	57		
	1878	58		
	1877	59		
	1876	60		
	1875	61		
	1874	62		
	1873	63		
	1872	64		
	1871	65		
		65.2		Coal
	1870	66		
		66.15		Shale



MEMBERS:
TILL
SHALE
SANDSTONE
SILTSTONE
COAL

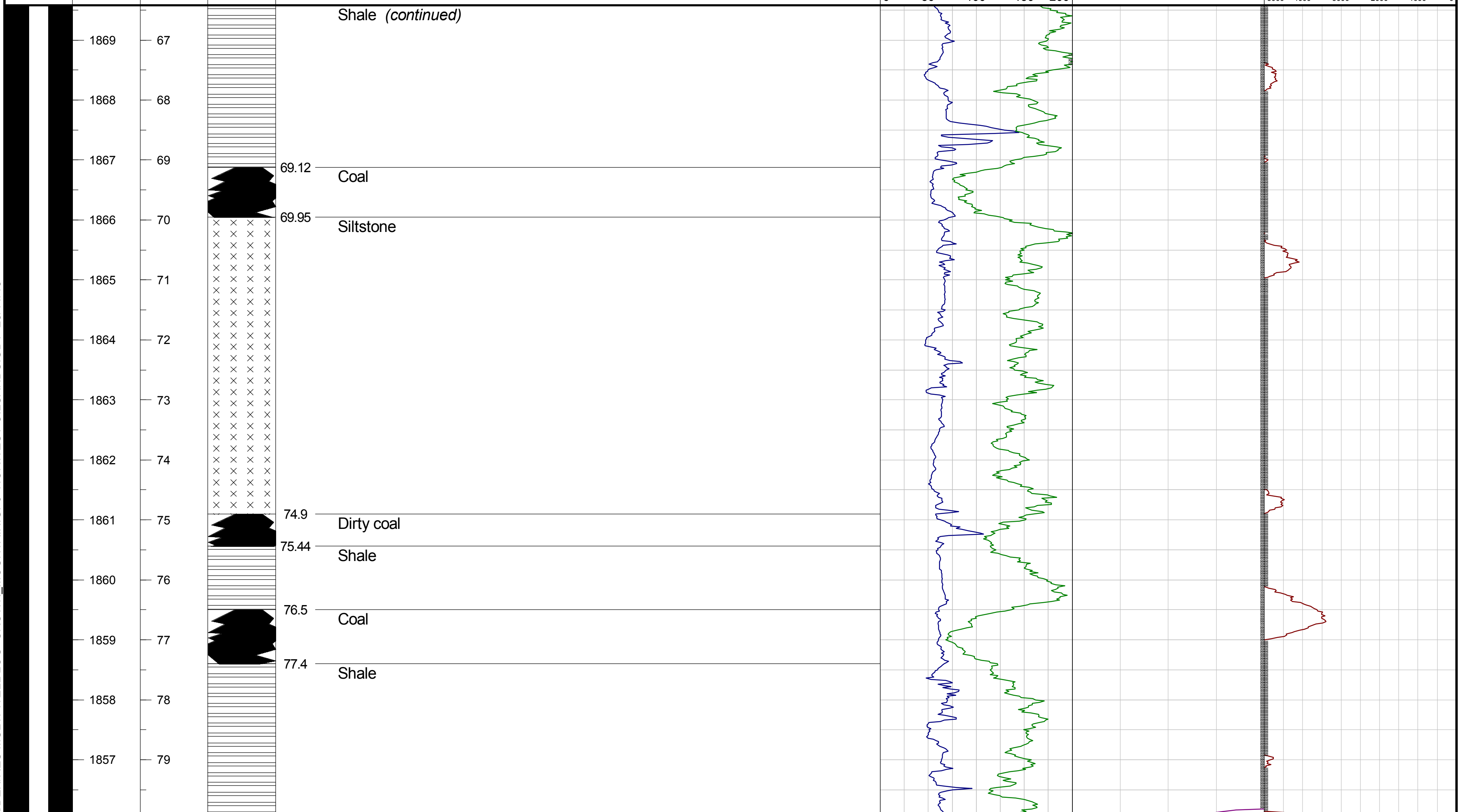
GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

NORWEST
CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
				Shale *(continued)*
		69.12		Coal
		69.95		Siltstone
		74.9		Dirty coal
		75.44		Shale
		76.5		Coal
		77.4		Shale



MEMBERS:

TILL, SHALE, SANDSTONE, SILTSTONE, COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:

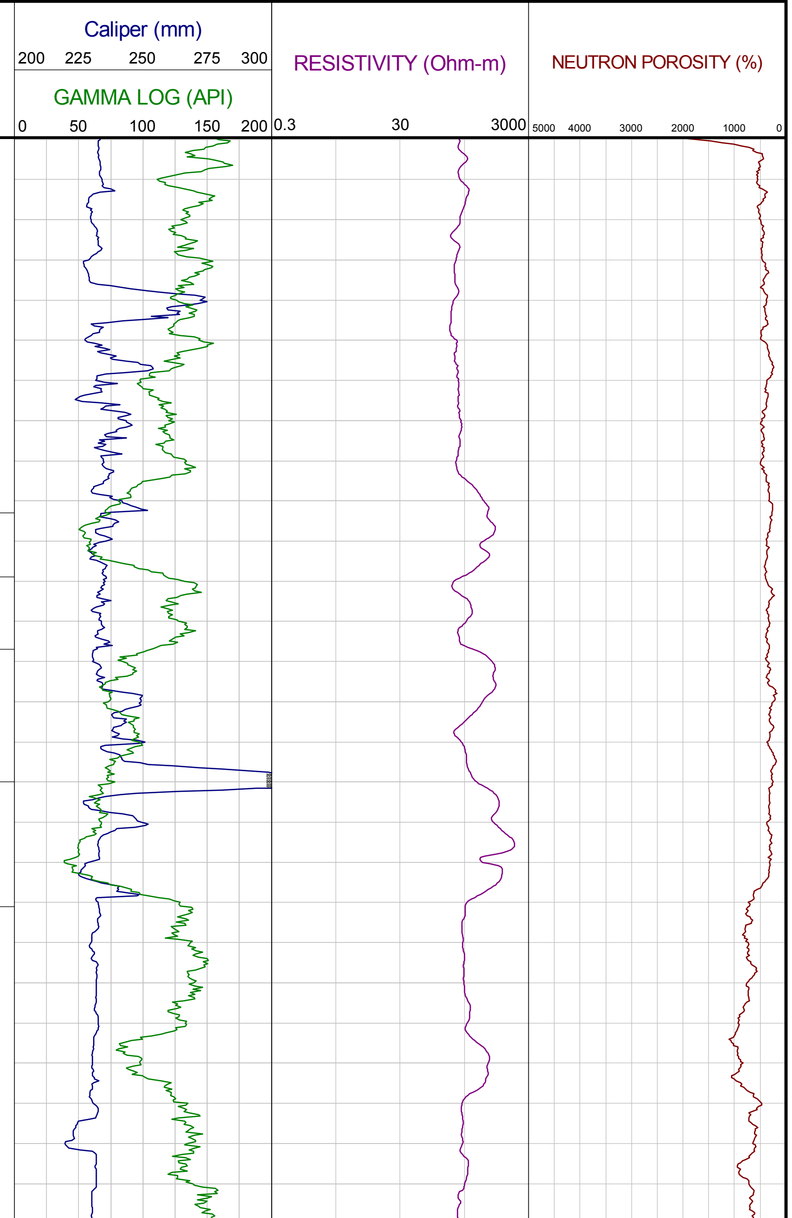
BENTONITE, 10-20 SILICA SAND, 0.5mm SLOTTED SCREEN, STAND PIPE, GROUT, Slough Backfill

NORWEST
CORPORATION

Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1856	80		Shale *(continued)*
	1855	81		
	1854	82		
	1853	83		
	1852	84		
		84.65		Coal
	1851	85		
		85.45		Carbonaceous shale
	1850	86		
		86.35		Dirty coal
	1849	87		
	1848	88		Coal
	1847	89		
		89.55		Shale
	1846	90		
	1845	91		
	1844	92		
	1843	93		



MEMBERS:

TILL SHALE SANDSTONE
SILTSTONE COAL

GENERAL NOTES:

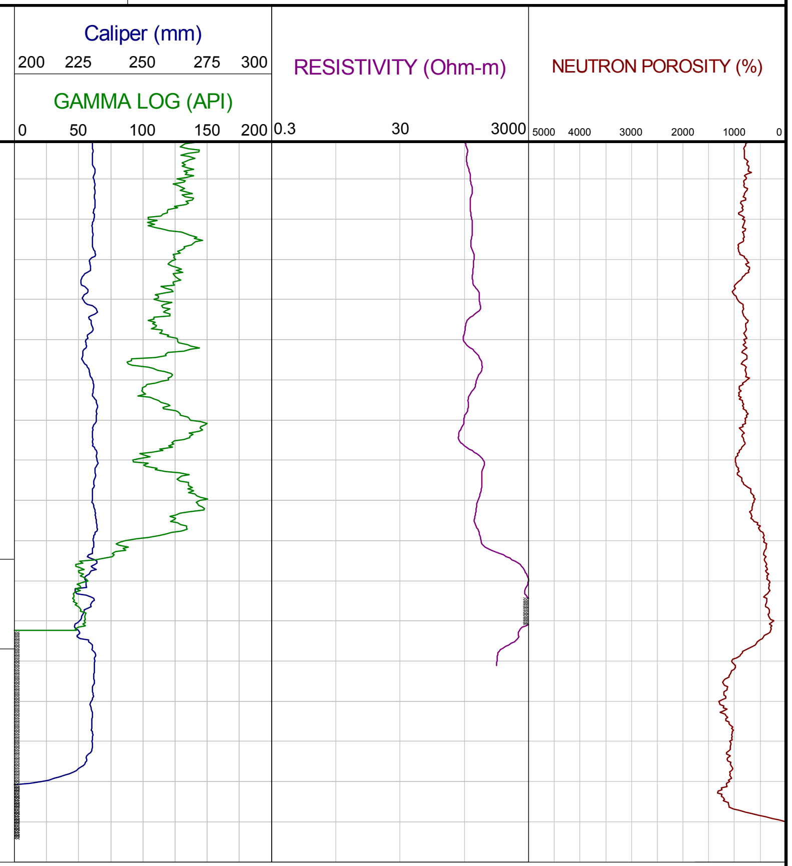
WELL DIAGRAM LEGEND:

BENTONITE 10-20 SILICA SAND 0.5mm SLOTTED SCREEN STAND PIPE
GROUT Slough Backfill

NORWEST CORPORATION
Norwest Corporation
#2700 411 - 1st Street S.E.
Calgary AB T2G 4Y5
Telephone: (403) 237-7763

Borehole CM13-25-CH

WELL DIAGRAM	ELEVATION (m)	DEPTH (m)	MEMBER	SOIL DESCRIPTION AND NOTES
	1842	94		Shale *(continued)*
	1841	95		
	1840	96		
	1839	97		
	1838	98		
			98.73	Coal
	1837	99		
			99.85	Sandstone
	1836	100		
	1835	101		
	1834	102		
				Actual bottom of borehole at 102.5 m.



MEMBERS:
TILL
SHALE
SANDSTONE
SILTSTONE
COAL

GENERAL NOTES:

WELL DIAGRAM LEGEND:
BENTONITE
10-20 SILICA SAND
0.5mm SLOTTED SCREEN
STAND PIPE
GROUT
Slough Backfill

Appendix B
Groundwater Analysis Laboratory Data Sheets

CERTIFICATE OF ANALYSIS

September, 2013

Maxxam

Success Through Science®

Your Project #: 284-1/CROWN MOUNTAIN
Site Location: SPONWOOD, BC
Your C.O.C. #: A099777

Attention: AMY PERRIN
NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2013/09/17

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B381872
Received: 2013/09/11, 14:02

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	5	N/A	2013/09/13	AB SOP-00005	SM 2320-B
Cadmium - low level CCME - Dissolved	5	N/A	2013/09/17	AB SOP-00043	EPA 200.8
Chloride by Automated Colourimetry	5	N/A	2013/09/14	AB SOP-00020	SSMA 4500 CL- E
Chemical Oxygen Demand	5	N/A	2013/09/16	AB SOP-00016	SM 5220-D
Carbon (DOC)	5	N/A	2013/09/16	CAL SOP-00077	MMCW 119
Conductivity @25C	5	N/A	2013/09/13	AB SOP-00005	SM 2510-B
Hardness	5	N/A	2013/09/17	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	5	N/A	2013/09/17	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved	5	N/A	2013/09/13	AB SOP-00043	EPA 200.8
Ion Balance	5	N/A	2013/09/13	AB WI-00065	SM 1030E
Sum of cations, anions	5	N/A	2013/09/17	AB WI-00065	SM 1030E
Nitrate and Nitrite	5	N/A	2013/09/16	AB SOP-00023	SM4110B
Nitrate + Nitrite-N (calculated)	5	N/A	2013/09/16	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	5	N/A	2013/09/13	AB SOP-00023	SM 4110-B
pH @25°C (Alkalinity titrator)	5	N/A	2013/09/13	AB SOP-00005	SM 4500-H+B
Sulphate by Automated Colourimetry	5	N/A	2013/09/14	AB SOP-00018	SM 4500 SO4-E
Total Dissolved Solids (Calculated)	5	N/A	2013/09/17	AB WI-00065	SM 1030E

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Carissa Sumka, Project Manager
Email: CSumka@maxxam.ca
Phone# (403) 291-3077

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam

Maxxam Job #: B381872
Report Date: 2013/09/17

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPONWOOD, BC
Sampler Initials: AP

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		HL8657	HL8658		HL8659	HL8660		
Sampling Date		2013/09/08 08:30	2013/09/08 13:50		2013/09/08 13:30	2013/09/08 17:00		
COC Number		A099777	A099777		A099777	A099777		
	UNITS	**CM 11-11**	**CM 12-01**	**QC Batch**	**CM 13-06**	**QC1**	**RDL**	**QC Batch**
Calculated Parameters								
Anion Sum	meq/L	3.5	4.5	7161894	0.72	4.4	N/A	7163501
Cation Sum	meq/L	3.0	7.2	7161894	4.0	8.5	N/A	7163501
Hardness (CaCO3)	mg/L	130	130	7161892	140	150	0.50	7163499
Ion Balance	N/A	0.87	1.6	7161893	5.6	1.9	0.010	7163500
Dissolved Nitrate (NO3)	mg/L	0.70	4.2	7162734	0.39	4.1	0.013	7162734
Nitrate plus Nitrite (N)	mg/L	0.16	0.94	7163092	0.089	0.92	0.0030	7163092
Dissolved Nitrite (NO2)	mg/L	0.012	<0.0099	7162734	<0.0099	<0.0099	0.0099	7162734
Total Dissolved Solids	mg/L	170	340	7161896	110	360	10	7163502
Misc. Inorganics								
Conductivity	uS/cm	310	53	7164366	73	53	1.0	7164366
pH	N/A	7.78	6.93	7164367	7.20	7.00	N/A	7164367
Low Level Elements								
Dissolved Cadmium (Cd)	ug/L	0.091	0.45	7162627	1.7	0.49	0.0050	7162627
Anions								
Alkalinity (PP as CaCO3)	mg/L	<0.50	<0.50	7164361	<0.50	<0.50	0.50	7164361
Alkalinity (Total as CaCO3)	mg/L	160	95	7164361	23	99	0.50	7164361
Bicarbonate (HCO3)	mg/L	190	120	7164361	29	120	0.50	7164361
Carbonate (CO3)	mg/L	<0.50	<0.50	7164361	<0.50	<0.50	0.50	7164361
Hydroxide (OH)	mg/L	<0.50	<0.50	7164361	<0.50	<0.50	0.50	7164361
Dissolved Sulphate (SO4)	mg/L	15	120	7169129	10	110	1.0	7169129
Dissolved Chloride (Cl)	mg/L	1.4	3.5	7169128	1.0	3.2	1.0	7169128
Nutrients								
Dissolved Nitrite (N)	mg/L	0.0038	<0.0030	7167019	<0.0030	<0.0030	0.0030	7167019
Dissolved Nitrate (N)	mg/L	0.16	0.94	7167019	0.089	0.92	0.0030	7167019
Elements								
Dissolved Aluminum (Al)	mg/L	0.0086	0.85	7163850	1.9	0.85	0.0030	7163850
Dissolved Antimony (Sb)	mg/L	0.016	<0.00060	7163850	<0.00060	<0.00060	0.00060	7163850
Dissolved Arsenic (As)	mg/L	0.00086	0.0069	7163850	0.0042	0.0072	0.00020	7163850
Dissolved Barium (Ba)	mg/L	0.19	0.16	7171652	1.3	0.18	0.010	7171652
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0060	7163850	0.0061	0.0063	0.0010	7163850
Dissolved Boron (B)	mg/L	<0.020	<0.020	7171652	<0.020	<0.020	0.020	7171652
Dissolved Calcium (Ca)	mg/L	32	36	7171652	42	41	0.30	7171652

RDL = Reportable Detection Limit

Maxxam

Success Through Science®

Maxxam Job #: B381872
Report Date: 2013/09/17

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPONWOOD, BC
Sampler Initials: AP

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		HL8657	HL8658		HL8659	HL8660		
Sampling Date		2013/09/08 08:30	2013/09/08 13:50		2013/09/08 13:30	2013/09/08 17:00		
COC Number		A099777	A099777		A099777	A099777		
	UNITS	**CM 11-11**	**CM 12-01**	**QC Batch**	**CM 13-06**	**QC1**	**RDL**	**QC Batch**
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	7163850	<0.0010	<0.0010	0.0010	7163850
Dissolved Cobalt (Co)	mg/L	0.0018	0.0032	7163850	0.027	0.0034	0.00030	7163850
Dissolved Copper (Cu)	mg/L	0.00090	0.0051	7163850	0.062	0.0058	0.00020	7163850
Dissolved Iron (Fe)	mg/L	<0.060	8.7	7171652	7.1	10	0.060	7171652
Dissolved Lead (Pb)	mg/L	<0.00020	0.066	7163850	0.042	0.067	0.00020	7163850
Dissolved Lithium (Li)	mg/L	<0.020	0.051	7171652	<0.020	0.062	0.020	7171652
Dissolved Magnesium (Mg)	mg/L	11	9.3	7171652	8.9	11	0.20	7171652
Dissolved Manganese (Mn)	mg/L	0.098	0.83	7171652	0.75	0.99	0.0040	7171652
Dissolved Molybdenum (Mo)	mg/L	0.0059	0.00056	7163850	<0.00020	0.00065	0.00020	7163850
Dissolved Nickel (Ni)	mg/L	0.010	0.0093	7163850	0.075	0.0099	0.00050	7163850
Dissolved Phosphorus (P)	mg/L	<0.10	0.51	7171652	1.9	0.55	0.10	7171652
Dissolved Potassium (K)	mg/L	0.96	2.0	7171652	1.6	2.3	0.30	7171652
Dissolved Selenium (Se)	mg/L	0.041	0.0014	7163850	0.0011	0.0014	0.00020	7163850
Dissolved Silicon (Si)	mg/L	2.2	16	7171652	7.8	18	0.10	7171652
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	7163850	0.00010	<0.00010	0.00010	7163850
Dissolved Sodium (Na)	mg/L	10	98	7171652	20	120	0.50	7171652
Dissolved Strontium (Sr)	mg/L	0.072	0.52	7171652	0.22	0.64	0.020	7171652
Dissolved Sulphur (S)	mg/L	4.9	31	7171652	5.6	35	0.20	7171652
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	7163850	0.00029	<0.00020	0.00020	7163850
Dissolved Tin (Sn)	mg/L	0.0011	<0.0010	7163850	<0.0010	<0.0010	0.0010	7163850
Dissolved Titanium (Ti)	mg/L	<0.0010	0.013	7163850	0.0036	0.013	0.0010	7163850
Dissolved Uranium (U)	mg/L	0.011	0.022	7163850	0.0083	0.022	0.00010	7163850
Dissolved Vanadium (V)	mg/L	<0.0010	0.0024	7163850	0.0078	0.0025	0.0010	7163850
Dissolved Zinc (Zn)	mg/L	0.013	0.12	7163850	0.28	0.14	0.0030	7163850

RDL = Reportable Detection Limit

Success Through Science®

Maxxam Job #: B381872
Report Date: 2013/09/17

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPONWOOD, BC
Sampler Initials: AP

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		HL8661		
Sampling Date		2013/09/08 17:00		
COC Number		A099777		
	UNITS	**CM 13-25**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	meq/L	5.3	N/A	7163501
Cation Sum	meq/L	5.3	N/A	7163501
Hardness (CaCO3)	mg/L	200	0.50	7163499
Ion Balance	N/A	1.0	0.010	7163500
Dissolved Nitrate (NO3)	mg/L	1.0	0.013	7162734
Nitrate plus Nitrite (N)	mg/L	0.24	0.0030	7163092
Dissolved Nitrite (NO2)	mg/L	0.043	0.0099	7162734
Total Dissolved Solids	mg/L	270	10	7163502
Misc. Inorganics				
Conductivity	uS/cm	470	1.0	7164366
pH	N/A	7.85	N/A	7164367
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	0.46	0.0050	7162627
Anions				
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	7164361
Alkalinity (Total as CaCO3)	mg/L	230	0.50	7164361
Bicarbonate (HCO3)	mg/L	280	0.50	7164361
Carbonate (CO3)	mg/L	<0.50	0.50	7164361
Hydroxide (OH)	mg/L	<0.50	0.50	7164361
Dissolved Sulphate (SO4)	mg/L	31	1.0	7169129
Dissolved Chloride (Cl)	mg/L	1.9	1.0	7169128
Nutrients				
Dissolved Nitrite (N)	mg/L	0.013	0.0030	7167019
Dissolved Nitrate (N)	mg/L	0.23	0.0030	7167019
Elements				
Dissolved Aluminum (Al)	mg/L	0.0087	0.0030	7163850
Dissolved Antimony (Sb)	mg/L	0.0013	0.00060	7163850
Dissolved Arsenic (As)	mg/L	0.00032	0.00020	7163850
Dissolved Barium (Ba)	mg/L	0.49	0.010	7171652
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	7163850
Dissolved Boron (B)	mg/L	0.025	0.020	7171652
Dissolved Calcium (Ca)	mg/L	51	0.30	7171652

RDL = Reportable Detection Limit

Maxxam Job #: B381872
Report Date: 2013/09/17

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPONWOOD, BC
Sampler Initials: AP

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		HL8661		
Sampling Date		2013/09/08 17:00		
COC Number		A099777		
	UNITS	**CM 13-25**	**RDL**	**QC Batch**
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	7163850
Dissolved Cobalt (Co)	mg/L	0.0028	0.00030	7163850
Dissolved Copper (Cu)	mg/L	0.00099	0.00020	7163850
Dissolved Iron (Fe)	mg/L	<0.060	0.060	7171652
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	7163850
Dissolved Lithium (Li)	mg/L	0.029	0.020	7171652
Dissolved Magnesium (Mg)	mg/L	17	0.20	7171652
Dissolved Manganese (Mn)	mg/L	0.38	0.0040	7171652
Dissolved Molybdenum (Mo)	mg/L	0.0049	0.00020	7163850
Dissolved Nickel (Ni)	mg/L	0.0060	0.00050	7163850
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	7171652
Dissolved Potassium (K)	mg/L	4.6	0.30	7171652
Dissolved Selenium (Se)	mg/L	0.0016	0.00020	7163850
Dissolved Silicon (Si)	mg/L	3.2	0.10	7171652
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	7163850
Dissolved Sodium (Na)	mg/L	28	0.50	7171652
Dissolved Strontium (Sr)	mg/L	0.19	0.020	7171652
Dissolved Sulphur (S)	mg/L	10	0.20	7171652
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	7163850
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	7163850
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	7163850
Dissolved Uranium (U)	mg/L	0.0031	0.00010	7163850
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	7163850
Dissolved Zinc (Zn)	mg/L	0.0056	0.0030	7163850

RDL = Reportable Detection Limit

Maxxam Job #: B381872
Report Date: 2013/09/17

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPONWOOD, BC
Sampler Initials: AP

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		HL8657	HL8658		HL8659		
Sampling Date		2013/09/08 08:30	2013/09/08 13:50		2013/09/08 13:30		
COC Number		A099777	A099777		A099777		
	UNITS	**CM 11-11**	**CM 12-01**	**RDL**	**CM 13-06**	**RDL**	**QC Batch**
Demand Parameters							
Total Chemical Oxygen Demand	mg/L	16	15	5.0	660 (1)	50	7170944
Misc. Inorganics							
Dissolved Organic Carbon (C)	mg/L	1.6	1.7	0.50	3.0	0.50	7170976

RDL = Reportable Detection Limit
(1) Detection limits raised due to matrix interference.

Maxxam ID		HL8660	HL8661		
Sampling Date		2013/09/08 17:00	2013/09/08 17:00		
COC Number		A099777	A099777		
	UNITS	**QC1**	**CM 13-25**	**RDL**	**QC Batch**
Demand Parameters					
Total Chemical Oxygen Demand	mg/L	16	170	5.0	7170944
Misc. Inorganics					
Dissolved Organic Carbon (C)	mg/L	1.6	4.1	0.50	7170976

RDL = Reportable Detection Limit

Package 1	9.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Sample HL8657-01: Cation anion balance investigated, data quality confirmed

Sample HL8658-01: Anion - Cation balance exceeds normal acceptance limits, due to the low concentrations of ions being measured.

Sample HL8659-01: Anion - Cation balance exceeds normal acceptance limits, due to the low concentrations of ions being measured.

Sample HL8660-01: Anion - Cation balance exceeds normal acceptance limits, due to the low concentrations of ions being measured.

ROUTINE WATER & DISS. REGULATED METALS (WATER) Comments

Sample HL8658-03 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample HL8659-03 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Sample HL8660-03 Elements by ICPMS - Dissolved: Client supplied DM bottle contained particulate.

Results relate only to the items tested.

NORWEST CORPORATION
Attention: AMY PERRIN
Client Project #: 284-1/CROWN MOUNTAIN
P.O. #:
Site Location: SPONWOOD, BC

Quality Assurance Report

Maxxam Job Number: CB381872

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7163850 HC7	Matrix Spike	Dissolved Aluminum (Al)	2013/09/13		110	%	80 - 120
		Dissolved Antimony (Sb)	2013/09/13		112	%	80 - 120
		Dissolved Arsenic (As)	2013/09/13		103	%	80 - 120
		Dissolved Beryllium (Be)	2013/09/13		115	%	80 - 120
		Dissolved Chromium (Cr)	2013/09/13		99	%	80 - 120
		Dissolved Cobalt (Co)	2013/09/13		98	%	80 - 120
		Dissolved Copper (Cu)	2013/09/13		98	%	80 - 120
		Dissolved Lead (Pb)	2013/09/13		98	%	80 - 120
		Dissolved Molybdenum (Mo)	2013/09/13		115	%	80 - 120
		Dissolved Nickel (Ni)	2013/09/13		100	%	80 - 120
		Dissolved Selenium (Se)	2013/09/13		104	%	80 - 120
		Dissolved Silver (Ag)	2013/09/13		89	%	80 - 120
		Dissolved Thallium (Tl)	2013/09/13		98	%	80 - 120
		Dissolved Tin (Sn)	2013/09/13		111	%	80 - 120
		Dissolved Titanium (Ti)	2013/09/13		110	%	80 - 120
		Dissolved Uranium (U)	2013/09/13		110	%	80 - 120
		Dissolved Vanadium (V)	2013/09/13		106	%	80 - 120
		Dissolved Zinc (Zn)	2013/09/13		100	%	80 - 120
	Spiked Blank	Dissolved Aluminum (Al)	2013/09/13		119	%	80 - 120
		Dissolved Antimony (Sb)	2013/09/13		92	%	80 - 120
		Dissolved Arsenic (As)	2013/09/13		95	%	80 - 120
		Dissolved Beryllium (Be)	2013/09/13		95	%	80 - 120
		Dissolved Chromium (Cr)	2013/09/13		89	%	80 - 120
		Dissolved Cobalt (Co)	2013/09/13		90	%	80 - 120
		Dissolved Copper (Cu)	2013/09/13		92	%	80 - 120
		Dissolved Lead (Pb)	2013/09/13		91	%	80 - 120
		Dissolved Molybdenum (Mo)	2013/09/13		96	%	80 - 120
		Dissolved Nickel (Ni)	2013/09/13		94	%	80 - 120
		Dissolved Selenium (Se)	2013/09/13		97	%	80 - 120
		Dissolved Silver (Ag)	2013/09/13		97	%	80 - 120
		Dissolved Thallium (Tl)	2013/09/13		92	%	80 - 120
		Dissolved Tin (Sn)	2013/09/13		98	%	80 - 120
		Dissolved Titanium (Ti)	2013/09/13		94	%	80 - 120
		Dissolved Uranium (U)	2013/09/13		94	%	80 - 120
		Dissolved Vanadium (V)	2013/09/13		93	%	80 - 120
		Dissolved Zinc (Zn)	2013/09/13		97	%	80 - 120
	Method Blank	Dissolved Aluminum (Al)	2013/09/13	<0.0030		mg/L	
		Dissolved Antimony (Sb)	2013/09/13	<0.00060		mg/L	
		Dissolved Arsenic (As)	2013/09/13	<0.00020		mg/L	
		Dissolved Beryllium (Be)	2013/09/13	<0.0010		mg/L	
		Dissolved Chromium (Cr)	2013/09/13	<0.0010		mg/L	
		Dissolved Cobalt (Co)	2013/09/13	<0.00030		mg/L	
		Dissolved Copper (Cu)	2013/09/13	<0.00020		mg/L	
		Dissolved Lead (Pb)	2013/09/13	<0.00020		mg/L	
		Dissolved Molybdenum (Mo)	2013/09/13	<0.00020		mg/L	
		Dissolved Nickel (Ni)	2013/09/13	<0.00050		mg/L	
		Dissolved Selenium (Se)	2013/09/13	<0.00020		mg/L	
		Dissolved Silver (Ag)	2013/09/13	<0.00010		mg/L	
		Dissolved Thallium (Tl)	2013/09/13	<0.00020		mg/L	
		Dissolved Tin (Sn)	2013/09/13	<0.0010		mg/L	
		Dissolved Titanium (Ti)	2013/09/13	<0.0010		mg/L	
		Dissolved Uranium (U)	2013/09/13	<0.00010		mg/L	
		Dissolved Vanadium (V)	2013/09/13	<0.0010		mg/L	
		Dissolved Zinc (Zn)	2013/09/13	<0.0030		mg/L	
	RPD	Dissolved Aluminum (Al)	2013/09/13	NC		%	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone(403) 291-3077 Fax(403) 291-9468

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NORWEST CORPORATION
Attention: AMY PERRIN
Client Project #: 284-1/CROWN MOUNTAIN
P.O. #:
Site Location: SPONWOOD, BC

Quality Assurance Report (Continued)

Maxxam Job Number: CB381872

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7163850 HC7	RPD	Dissolved Antimony (Sb)	2013/09/13	NC		%	20
		Dissolved Arsenic (As)	2013/09/13	0.04		%	20
		Dissolved Beryllium (Be)	2013/09/13	NC		%	20
		Dissolved Chromium (Cr)	2013/09/13	NC		%	20
		Dissolved Cobalt (Co)	2013/09/13	1.4		%	20
		Dissolved Copper (Cu)	2013/09/13	NC		%	20
		Dissolved Lead (Pb)	2013/09/13	NC		%	20
		Dissolved Molybdenum (Mo)	2013/09/13	0.6		%	20
		Dissolved Nickel (Ni)	2013/09/13	0.2		%	20
		Dissolved Selenium (Se)	2013/09/13	NC		%	20
		Dissolved Silver (Ag)	2013/09/13	NC		%	20
		Dissolved Thallium (Tl)	2013/09/13	NC		%	20
		Dissolved Tin (Sn)	2013/09/13	NC		%	20
		Dissolved Titanium (Ti)	2013/09/13	NC		%	20
		Dissolved Uranium (U)	2013/09/13	9.5		%	20
		Dissolved Vanadium (V)	2013/09/13	NC		%	20
		Dissolved Zinc (Zn)	2013/09/13	NC		%	20
7164361 FT2	Spiked Blank	Alkalinity (Total as CaCO3)	2013/09/13		101	%	80 - 120
	Method Blank	Alkalinity (PP as CaCO3)	2013/09/13	<0.50		mg/L	
		Alkalinity (Total as CaCO3)	2013/09/13	<0.50		mg/L	
		Bicarbonate (HCO3)	2013/09/13	<0.50		mg/L	
		Carbonate (CO3)	2013/09/13	<0.50		mg/L	
		Hydroxide (OH)	2013/09/13	<0.50		mg/L	
	RPD	Alkalinity (PP as CaCO3)	2013/09/13	NC		%	20
		Alkalinity (Total as CaCO3)	2013/09/13	0.5		%	20
		Bicarbonate (HCO3)	2013/09/13	0.5		%	20
		Carbonate (CO3)	2013/09/13	NC		%	20
		Hydroxide (OH)	2013/09/13	NC		%	20
7164366 FT2	Spiked Blank	Conductivity	2013/09/13		99	%	90 - 110
	Method Blank	Conductivity	2013/09/13	<1.0		uS/cm	
	RPD	Conductivity	2013/09/13	1.8		%	20
7164367 FT2	Spiked Blank	pH	2013/09/13		100	%	97 - 102
	RPD	pH	2013/09/13	0.4		%	5
7167019 CT6	Matrix Spike	Dissolved Nitrite (N)	2013/09/16		99	%	80 - 120
		Dissolved Nitrate (N)	2013/09/16		101	%	80 - 120
	Spiked Blank	Dissolved Nitrite (N)	2013/09/13		102	%	90 - 110
		Dissolved Nitrate (N)	2013/09/13		104	%	90 - 110
	Method Blank	Dissolved Nitrite (N)	2013/09/13	<0.0030		mg/L	
		Dissolved Nitrate (N)	2013/09/13	<0.0030		mg/L	
	RPD	Dissolved Nitrite (N)	2013/09/13	NC		%	20
		Dissolved Nitrate (N)	2013/09/13	NC		%	20
7169128 KP9	Matrix Spike	Dissolved Chloride (Cl)	2013/09/14		NC	%	80 - 120
	Spiked Blank	Dissolved Chloride (Cl)	2013/09/14		103	%	80 - 120
	Method Blank	Dissolved Chloride (Cl)	2013/09/14	<1.0		mg/L	
	RPD	Dissolved Chloride (Cl)	2013/09/14	1.2		%	20
7169129 KP9	Matrix Spike	Dissolved Sulphate (SO4)	2013/09/14		NC	%	80 - 120
	Spiked Blank	Dissolved Sulphate (SO4)	2013/09/14		108	%	80 - 120
	Method Blank	Dissolved Sulphate (SO4)	2013/09/14	<1.0		mg/L	
	RPD	Dissolved Sulphate (SO4)	2013/09/14	1.9		%	20
7170944 RGO	Matrix Spike	Total Chemical Oxygen Demand	2013/09/16		95	%	80 - 120
	Spiked Blank	Total Chemical Oxygen Demand	2013/09/16		98	%	80 - 120
	Method Blank	Total Chemical Oxygen Demand	2013/09/16	8.0, RDL=5.0		mg/L	
	RPD	Total Chemical Oxygen Demand	2013/09/16	NC		%	20
7170976 AP1	Matrix Spike	Dissolved Organic Carbon (C)	2013/09/16		NC	%	80 - 120
	Spiked Blank	Dissolved Organic Carbon (C)	2013/09/16		100	%	80 - 120

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NORWEST CORPORATION
Attention: AMY PERRIN
Client Project #: 284-1/CROWN MOUNTAIN
P.O. #:
Site Location: SPONWOOD, BC

Quality Assurance Report (Continued)

Maxxam Job Number: CB381872

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7170976 AP1	Method Blank	Dissolved Organic Carbon (C)	2013/09/16	<0.50		mg/L	
	RPD	Dissolved Organic Carbon (C)	2013/09/16	5.5		%	20
7171652 YK1	Matrix Spike	Dissolved Barium (Ba)	2013/09/17		72 (1)	%	80 - 120
		Dissolved Boron (B)	2013/09/17		94	%	80 - 120
		Dissolved Calcium (Ca)	2013/09/17		NC	%	80 - 120
		Dissolved Iron (Fe)	2013/09/17		96	%	80 - 120
		Dissolved Lithium (Li)	2013/09/17		99	%	80 - 120
		Dissolved Magnesium (Mg)	2013/09/17		NC	%	80 - 120
		Dissolved Manganese (Mn)	2013/09/17		91	%	80 - 120
		Dissolved Phosphorus (P)	2013/09/17		103	%	80 - 120
		Dissolved Potassium (K)	2013/09/17		98	%	80 - 120
		Dissolved Silicon (Si)	2013/09/17		NC	%	80 - 120
		Dissolved Sodium (Na)	2013/09/17		NC	%	80 - 120
		Dissolved Strontium (Sr)	2013/09/17		NC	%	80 - 120
	Spiked Blank	Dissolved Barium (Ba)	2013/09/17		93	%	80 - 120
		Dissolved Boron (B)	2013/09/17		94	%	80 - 120
		Dissolved Calcium (Ca)	2013/09/17		98	%	80 - 120
		Dissolved Iron (Fe)	2013/09/17		99	%	80 - 120
		Dissolved Lithium (Li)	2013/09/17		95	%	80 - 120
		Dissolved Magnesium (Mg)	2013/09/17		93	%	80 - 120
		Dissolved Manganese (Mn)	2013/09/17		94	%	80 - 120
		Dissolved Phosphorus (P)	2013/09/17		95	%	80 - 120
		Dissolved Potassium (K)	2013/09/17		95	%	80 - 120
		Dissolved Silicon (Si)	2013/09/17		95	%	80 - 120
		Dissolved Sodium (Na)	2013/09/17		93	%	80 - 120
		Dissolved Strontium (Sr)	2013/09/17		94	%	80 - 120
	Method Blank	Dissolved Barium (Ba)	2013/09/17	<0.010		mg/L	
		Dissolved Boron (B)	2013/09/17	<0.020		mg/L	
		Dissolved Calcium (Ca)	2013/09/17	<0.30		mg/L	
		Dissolved Iron (Fe)	2013/09/17	<0.060		mg/L	
		Dissolved Lithium (Li)	2013/09/17	<0.020		mg/L	
		Dissolved Magnesium (Mg)	2013/09/17	<0.20		mg/L	
		Dissolved Manganese (Mn)	2013/09/17	<0.0040		mg/L	
		Dissolved Phosphorus (P)	2013/09/17	<0.10		mg/L	
		Dissolved Potassium (K)	2013/09/17	<0.30		mg/L	
		Dissolved Silicon (Si)	2013/09/17	<0.10		mg/L	
		Dissolved Sodium (Na)	2013/09/17	<0.50		mg/L	
		Dissolved Strontium (Sr)	2013/09/17	<0.020		mg/L	
		Dissolved Sulphur (S)	2013/09/17	<0.20		mg/L	
	RPD	Dissolved Calcium (Ca)	2013/09/17	1.6		%	20
		Dissolved Iron (Fe)	2013/09/17	NC		%	20
		Dissolved Magnesium (Mg)	2013/09/17	2.9		%	20
		Dissolved Manganese (Mn)	2013/09/17	NC		%	20
		Dissolved Potassium (K)	2013/09/17	3.3		%	20
		Dissolved Sodium (Na)	2013/09/17	4.0		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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NORWEST CORPORATION
Attention: AMY PERRIN
Client Project #: 284-1/CROWN MOUNTAIN
P.O. #:
Site Location: SPONWOOD, BC

Quality Assurance Report (Continued)

Maxxam Job Number: CB381872

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Validation Signature Page

Maxxam Job #: B381872

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Peng Liang, Analyst II

==

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody A039777

Page: 1 of 1

	Invoice To: (C/O Report Address ☐)	Report To: (Same as Invoice ☑)	Report Distribution (E-Mail):
Company:	Norwest corporation		aperrin@norwestcorp.com
Contact:	Amy Perrin		
Address:	2700 411 15th Street SE		
	Prov: AB PC: T2G 4Y5	Prov: PC:	
Contact #s:	Ph: 4032055792 Cell: 4039698380	Ph: Cell:	

REGULATORY GUIDELINES:
- ☐ AT1
- ☐ CCME
- ☐ Regulated Drinking Water
- ☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:	~~28~~
Project # / Name:	~~S-pa~~ 284-1 / Crown Mountain
Site Location:	Sparwood, BC
Quote #:	
Sampled By:	AP

SERVICE REQUESTED:
- ☐ RUSH (Contact lab to reserve)
- Date Required:
- ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill			WATER: ☐BTEX F1 ☐VOCs	☐BTEX F1-F2 ☐BTEX F1-F4	☑Routine Water ☐ Turb ☐ F	☐ TOC ☑DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐ Total ☐ Dissolved	Other Analysis: COD										HOLD - Do not Analyze	# of Containers Submitted
1	CM 11-11			13/09/08 8:30											✓	✓		✓		✓											
2	CM 12-01			13:30											✓	✓		✓		✓											
3	CM 13-06			15:30											✓	✓		✓		✓											
4	~~CM 13-20~~ QC1			13/09/08 17:00											✓	✓		✓		✓											
5	CM 13-25			17:00											✓	✓		✓		✓											
6																															
7																															
8																															
9																															
10																															
11																															
12																															

11-Sep-13 14:02
Carissa Sumka
B381872
JMH
JLT INS-0102

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

<Original signed by>

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Amy Perrin	13/09/11	14:01
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:		
SHERRY WONG	2013/09/11	14:02	Custody Seal	Temperature	Ice
Lab Comments:			NO	8/9/11	YES

NORWEST
CORPORATION

CERTIFICATE OF ANALYSIS

January, 2014

Maxxam

Success Through Science®

Your Project #: B401413
Your C.O.C. #: na

Attention:Carissa Sumka

Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

Report Date: 2014/01/13

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B403864
Received: 2014/01/10, 09:40

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Total Cyanide	3	2014/01/11	2014/01/13	CAM SOP-00457	Ontario MOE CN-E3015

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Shaun Nowickyj,
Email: SNowickyj@maxxam.ca
Phone# (905) 817-5700
==
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Maxxam Job #: B403864
Report Date: 2014/01/13

Maxxam Analytics
Client Project #: B401413

RESULTS OF ANALYSES OF WATER

Maxxam ID		UM8167	UM8189	UM8209		
Sampling Date		2014/01/07 11:00	2014/01/07 11:00	2014/01/07 09:00		
COC Number		na	na	na		
	Units	**IK1794 \ QC1**	**IK1795 \ CM12-01**	**IK1796 \ CM11-11**	**RDL**	**QC Batch**
Total Cyanide (CN)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	3479560

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	-1.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B403864
Report Date: 2014/01/13

Maxxam Analytics
Client Project #: B401413

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3479560	LHA	Matrix Spike	Total Cyanide (CN)	2014/01/13		101	%	80 - 120
3479560	LHA	Spiked Blank	Total Cyanide (CN)	2014/01/13		100	%	80 - 120
3479560	LHA	Method Blank	Total Cyanide (CN)	2014/01/13	<0.0050		mg/L	
3479560	LHA	RPD	Total Cyanide (CN)	2014/01/13	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Services

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Success Through Science®

Your Project #: B401413

Attention: Carissa Sumka
Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

Report Date: 2014/01/15

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B404094
Received: 2014/01/10, 14:24

Sample Matrix: GROUND WATER
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Redox Potential	3	2014/01/10	2014/01/14	APHA-SM 2580 B Mod. & ASTM D1498-76 Mod.	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

<Original signed by>

Validated by :
Grace Sison, B.Sc., C.Chem
Senior Project Manager - Petroleum Division

Total cover pages: 1

Maxxam Job #: B404094
Report Date: 2014/01/15

Maxxam Analytics
Client Project #: B401413

RESULTS OF ANALYSES OF GROUND WATER

Maxxam ID		UM9355	UM9387	UM9388	
Sampling Date		2014/01/07 11:00	2014/01/07 11:00	2014/01/07 09:00	
	Units	**IK1794-13R \ QC1**	**IK1795-13R \ CM12-01**	**IK1796-13R \ CM11-11**	**QC Batch**
Subcontracted Analysis					
Redox Potential	mV	+151	+142	+160	3478671

QC Batch = Quality Control Batch

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam

Success Through Science®

Maxxam Analytics
Attention: Carissa Sumka
Client Project #: B401413
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: SB404094

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3478671	PSH	QC Standard	Redox Potential	2014/01/14		+246	%	238 - 248
		Method Blank	Redox Potential	2014/01/14	+167		mV	
		RPD [UM9388-01]	Redox Potential	2014/01/14	0.6		%	10

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B404094

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division

==

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Success Through Science®

Your Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A101933

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/01/20
Report #: R1503110
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B401413
Received: 2014/01/08, 15:21

Sample Matrix: GROUND WATER
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2014/01/10	AB SOP-00005	SM 2320-B
BTEX/F1 in Water by HS GC/MS	3	N/A	2014/01/10	AB SOP-00039	CCME, EPA 8260C
Cadmium - low level CCME - Dissolved	1	N/A	2014/01/14	AB SOP-00043	EPA 200.8
Cadmium - low level CCME - Dissolved	1	N/A	2014/01/15	AB SOP-00043	EPA 200.8
Cadmium - low level CCME - Dissolved	1	N/A	2014/01/16	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	3	2014/01/08	2014/01/15	AB SOP-00043	EPA 200.8
Chloride by Automated Colourimetry	3	N/A	2014/01/10	AB SOP-00020	SM 4500 Cl-G
Chemical Oxygen Demand	3	N/A	2014/01/15	AB SOP-00016	SM 5220-D
Chemical Oxygen Demand (Dissolved)	1	N/A	2014/01/15	AB SOP-00016	SM 5220-D
COD (Dissolved) - Lab Filtered	2	N/A	2014/01/15	CAL SOP-00042	SM5220D
True Colour	3	N/A	2014/01/10	CAL SOP-00049	SM 2120 C
Carbon (DOC) - Lab Filtered (1)	2	N/A	2014/01/14	CAL SOP-00077	MMCW 119
Carbon (DOC) (1)	1	N/A	2014/01/10	CAL SOP-00077	MMCW 119
Conductivity @25C	3	N/A	2014/01/10	AB SOP-00005	SM 2510-B
CCME Hydrocarbons in Water (F2; C10-C16)	3	2014/01/09	2014/01/09	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	3	N/A	2014/01/14	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	1	N/A	2014/01/13	AB SOP-00042	EPA 200.7
Elements by ICP (Dissolved) Lab Filtered	2	N/A	2014/01/13	AB SOP-00042	EPA 200.7
Elements by ICP - Total	3	2014/01/13	2014/01/13	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved	1	N/A	2014/01/13	AB SOP-00043	EPA 200.8
Elements by ICPMS - Dissolved - Filtered	2	N/A	2014/01/13	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	3	2014/01/13	2014/01/13	AB SOP-00043	EPA 200.8
Ion Balance	3	N/A	2014/01/09	AB WI-00065	SM 1030E
Sum of cations, anions	1	N/A	2014/01/14	AB WI-00065	SM 1030E
Nitrogen (total), Calc. TKN, NO3, NO2	3	N/A	2014/01/14	AB WI-00065	SM 4500-N A
Ammonia-N (Dissolved) - Lab Filtered	2	N/A	2014/01/15	AB SOP-00007	EPA 350.1
Ammonia-N (Dissolved)	1	N/A	2014/01/10	AB SOP-00007	EPA 350.1
Ammonia-N (Total)	3	N/A	2014/01/10	AB SOP-00007	EPA 350.1
Nitrate and Nitrite	3	N/A	2014/01/10	AB SOP-00023	SM4110B

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Maxxam

Success Through Science®

Your Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A101933

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/01/20
Report #: R1503110
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B401413
Received: 2014/01/08, 15:21

Sample Matrix: GROUND WATER
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Nitrate + Nitrite-N (calculated)	3	N/A	2014/01/10	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	3	N/A	2014/01/10	AB SOP-00023	SM 4110-B
Benzo[a]pyrene Equivalency	3	N/A	2014/01/10	AB SOP-00003	EPA 8270D
PAH in Water by GC/MS (2)	3	2014/01/09	2014/01/09	AB SOP-00003 AB SOP-00037	EPA 3510C/8270D
pH @25°C (Alkalinity titrator)	3	N/A	2014/01/10	AB SOP-00005	SM 4500-H+B
Phenols (4-AAP)	3	N/A	2014/01/09	CAL SOP-00067	EPA 420.2
Orthophosphate by Konelab	3	N/A	2014/01/10	AB SOP-00025	SM 4500-P
Sulphate by Automated Colourimetry	3	N/A	2014/01/10	AB SOP-00018	SM 4500 SO4-E
Total Dissolved Solids (Filt. Residue)	3	2014/01/09	2014/01/09	CAL SOP-00074	SM 2540-C
Total Dissolved Solids (Calculated)	3	N/A	2014/01/14	AB WI-00065	SM 1030E
Total Trihalomethanes Calculation	3	N/A	2014/01/10	CAL SOP-00104	EPA 8260 C
Total Kjeldahl Nitrogen (Diss.) Filtered	2	2014/01/14	2014/01/14	AB SOP-00008	EPA 351.1, 351.2
Total Kjeldahl Nitrogen (Dissolved)	1	2014/01/14	2014/01/14	AB SOP-00008	EPA 351.1, 351.2
Total Kjeldahl Nitrogen	3	2014/01/14	2014/01/14	AB SOP-00008	EPA 351.1, 351.2
Carbon (Total Organic) (3)	1	N/A	2014/01/10	CAL SOP-00077	MMCW 119
Carbon (Total Organic) (3)	2	N/A	2014/01/14	CAL SOP-00077	MMCW 119
Total Phosphorus -P (Dissolved) Filtered	2	2014/01/15	2014/01/15	AB SOP-00024	SM 4500-P
Phosphorus -P (Total, Dissolved)	1	2014/01/15	2014/01/15	AB SOP-00024	SM 4500-P
Total Phosphorus	3	2014/01/15	2014/01/15	AB SOP-00024	SM 4500-P
Total Suspended Solids (NFR)	3	2014/01/10	2014/01/10	AB SOP-00061	SM 2540-D
Turbidity	3	N/A	2014/01/09	CAL SOP-00081	SM 2130B
VOCs in Water by HS GC/MS (Std List)	3	N/A	2014/01/10	CAL SOP-00227	EPA 8260 C

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) DOC present in the sample should be considered as non-purgeable DOC.
(2) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(3) TOC present in the sample should be considered as non-purgeable TOC.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A101933

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/01/20
Report #: R1503110
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B401413
Received: 2014/01/08, 15:21

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Carissa Sumka, Project Manager
Email: CSumka@maxxam.ca
Phone# (403) 291-3077
==
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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

AT1 BTEX AND F1-F2 (GROUND WATER)

Maxxam ID		IK1794	IK1795	IK1796		
Sampling Date		2014/01/07 11:00	2014/01/07 11:00	2014/01/07 09:00		
COC Number		A101933	A101933	A101933		
	Units	**QC1**	**CM12-01**	**CM11-11**	**RDL**	**QC Batch**
Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.10	7345340
Volatiles						
Benzene	ug/L	<0.40	<0.40	<0.40	0.40	7345098
Toluene	ug/L	1.1	0.93	<0.40	0.40	7345098
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	0.40	7345098
m & p-Xylene	ug/L	1.3	1.1	<0.80	0.80	7345098
o-Xylene	ug/L	0.60	0.45	<0.40	0.40	7345098
Xylenes (Total)	ug/L	1.9	1.5	<0.80	0.80	7345098
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	100	7345098
(C6-C10)	ug/L	<100	<100	<100	100	7345098
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	111	109	108	N/A	7345098
4-BROMOFLUOROBENZENE (sur.)	%	96	97	99	N/A	7345098
D4-1,2-DICHLOROETHANE (sur.)	%	105	105	102	N/A	7345098
O-TERPHENYL (sur.)	%	109	104	103	N/A	7345340

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		IK1796	IK1796		
Sampling Date		2014/01/07 09:00	2014/01/07 09:00		
COC Number		A101933	A101933		
	Units	CM11-11	CM11-11 Lab-Dup	RDL	QC Batch
Calculated Parameters					
Anion Sum	meq/L	3.4	N/A	N/A	7344337
Cation Sum	meq/L	3.8	N/A	N/A	7344337
Hardness (CaCO3)	mg/L	140	N/A	0.50	7344335
Ion Balance	N/A	1.1	N/A	0.010	7344336
Dissolved Nitrate (NO3)	mg/L	0.26	N/A	0.013	7344338
Nitrate plus Nitrite (N)	mg/L	0.077	N/A	0.0030	7344339
Dissolved Nitrite (NO2)	mg/L	0.057	N/A	0.0099	7344338
Total Dissolved Solids	mg/L	180	N/A	10	7344340
Misc. Inorganics					
Conductivity	uS/cm	350	N/A	1.0	7346189
pH	pH	7.69	N/A	N/A	7346188
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.074	N/A	0.0050	7345057
Anions					
Alkalinity (PP as CaCO3)	mg/L	<0.50	N/A	0.50	7346186
Alkalinity (Total as CaCO3)	mg/L	140	N/A	0.50	7346186
Bicarbonate (HCO3)	mg/L	170	N/A	0.50	7346186
Carbonate (CO3)	mg/L	<0.50	N/A	0.50	7346186
Hydroxide (OH)	mg/L	<0.50	N/A	0.50	7346186
Dissolved Sulphate (SO4)	mg/L	27	N/A	1.0	7346438
Dissolved Chloride (Cl)	mg/L	1.3	N/A	1.0	7346434
Nutrients					
Dissolved Nitrite (N)	mg/L	0.018	N/A	0.0030	7346449
Dissolved Nitrate (N)	mg/L	0.060	N/A	0.0030	7346449
Elements					
Dissolved Aluminum (Al)	mg/L	0.0036	N/A	0.0030	7348077
Dissolved Antimony (Sb)	mg/L	0.031	N/A	0.00060	7348077
Dissolved Arsenic (As)	mg/L	0.00083	N/A	0.00020	7348077
Dissolved Barium (Ba)	mg/L	0.21	0.26	0.010	7348351
Dissolved Beryllium (Be)	mg/L	<0.0010	N/A	0.0010	7348077
Dissolved Boron (B)	mg/L	0.020	<0.020	0.020	7348351

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		IK1796	IK1796		
Sampling Date		2014/01/07 09:00	2014/01/07 09:00		
COC Number		A101933	A101933		
	Units	**CM11-11**	**CM11-11 Lab-Dup**	**RDL**	**QC Batch**
Dissolved Calcium (Ca)	mg/L	36 (1)	35	0.30	7348351
Dissolved Chromium (Cr)	mg/L	<0.0010	N/A	0.0010	7348077
Dissolved Cobalt (Co)	mg/L	0.0015	N/A	0.00030	7348077
Dissolved Copper (Cu)	mg/L	<0.00020	N/A	0.00020	7348077
Dissolved Iron (Fe)	mg/L	<0.060	<0.060	0.060	7348351
Dissolved Lead (Pb)	mg/L	<0.00020	N/A	0.00020	7348077
Dissolved Lithium (Li)	mg/L	<0.020	<0.020	0.020	7348351
Dissolved Magnesium (Mg)	mg/L	13	13	0.20	7348351
Dissolved Manganese (Mn)	mg/L	0.12	0.12	0.0040	7348351
Dissolved Molybdenum (Mo)	mg/L	0.011 (1)	N/A	0.00020	7348077
Dissolved Nickel (Ni)	mg/L	0.0077	N/A	0.00050	7348077
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	0.10	7348351
Dissolved Potassium (K)	mg/L	1.6	1.6	0.30	7348351
Dissolved Selenium (Se)	mg/L	0.027	N/A	0.00020	7348077
Dissolved Silicon (Si)	mg/L	2.6	2.6	0.10	7348351
Dissolved Silver (Ag)	mg/L	<0.00010	N/A	0.00010	7348077
Dissolved Sodium (Na)	mg/L	21 (1)	21	0.50	7348351
Dissolved Strontium (Sr)	mg/L	0.087 (2)	0.087	0.020	7348351
Dissolved Sulphur (S)	mg/L	9.3 (1)	9.2	0.20	7348351
Dissolved Thallium (Tl)	mg/L	0.00027	N/A	0.00020	7348077
Dissolved Tin (Sn)	mg/L	0.0016	N/A	0.0010	7348077
Dissolved Titanium (Ti)	mg/L	<0.0010	N/A	0.0010	7348077
Dissolved Uranium (U)	mg/L	0.011	N/A	0.00010	7348077
Dissolved Vanadium (V)	mg/L	<0.0010	N/A	0.0010	7348077
Dissolved Zinc (Zn)	mg/L	0.021 (1)	N/A	0.0030	7348077

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Dissolved greater than total. Results within acceptable limits of precision.
(2) Dissolved greater than total. Results are within limits of uncertainty(MU).

Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		IK1794		IK1795		
Sampling Date		2014/01/07 11:00		2014/01/07 11:00		
COC Number		A101933		A101933		
	Units	**QC1**	**QC Batch**	**CM12-01**	**RDL**	**QC Batch**
Calculated Parameters						
Hardness (CaCO3)	mg/L	18	7344335	17	0.50	7344335
Ion Balance	N/A	1.0	7344336	1.0	0.010	7344336
Dissolved Nitrate (NO3)	mg/L	3.6	7344338	3.4	0.013	7344338
Nitrate plus Nitrite (N)	mg/L	0.82	7344339	0.80	0.0030	7344339
Dissolved Nitrite (NO2)	mg/L	0.058	7344338	0.059	0.0099	7344338
Total Dissolved Solids	mg/L	290	7344340	280	10	7344340
Misc. Inorganics						
Conductivity	uS/cm	480	7346189	490	1.0	7346189
pH	pH	7.78	7346188	7.82	N/A	7346188
Low Level Elements						
Dissolved Cadmium (Cd)	ug/L	0.11	7345057	0.0062	0.0050	7345057
Anions						
Alkalinity (PP as CaCO3)	mg/L	<0.50	7346186	<0.50	0.50	7346186
Alkalinity (Total as CaCO3)	mg/L	110	7346186	100	0.50	7346186
Bicarbonate (HCO3)	mg/L	140	7346186	140	0.50	7346186
Carbonate (CO3)	mg/L	<0.50	7346186	<0.50	0.50	7346186
Hydroxide (OH)	mg/L	<0.50	7346186	<0.50	0.50	7346186
Dissolved Sulphate (SO4)	mg/L	110	7346438	110	1.0	7346438
Dissolved Chloride (Cl)	mg/L	3.7	7346434	3.6	1.0	7346434
Nutrients						
Dissolved Nitrite (N)	mg/L	0.018	7346449	0.018	0.0030	7346449
Dissolved Nitrate (N)	mg/L	0.80	7346449	0.78	0.0030	7346449
Elements						
Dissolved Aluminum (Al)	mg/L	0.81	7348083	1.3	0.0030	7348273
Dissolved Antimony (Sb)	mg/L	0.0058	7348083	0.0012	0.00060	7348273
Dissolved Arsenic (As)	mg/L	0.0020	7348083	<0.00020	0.00020	7348273
Dissolved Barium (Ba)	mg/L	<0.10	7348344	<0.10	0.10	7348344
Dissolved Beryllium (Be)	mg/L	<0.0010	7348083	<0.0010	0.0010	7348273
Dissolved Boron (B)	mg/L	<0.20	7348344	<0.20	0.20	7348344
Dissolved Calcium (Ca)	mg/L	4.3	7350747	4.1	0.30	7350747
Dissolved Chromium (Cr)	mg/L	0.0029	7348083	<0.0010	0.0010	7348273
Dissolved Cobalt (Co)	mg/L	0.00060	7348083	<0.00030	0.00030	7348273
Dissolved Copper (Cu)	mg/L	0.0010	7348083	<0.00020	0.00020	7348273

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		IK1794		IK1795		
Sampling Date		2014/01/07 11:00		2014/01/07 11:00		
COC Number		A101933		A101933		
	Units	QC1	QC Batch	CM12-01	RDL	QC Batch
Dissolved Iron (Fe)	mg/L	1.9	7350747	1.7	0.060	7350747
Dissolved Lead (Pb)	mg/L	0.0089	7348083	0.00072	0.00020	7348273
Dissolved Lithium (Li)	mg/L	<0.20	7348344	<0.20	0.20	7348344
Dissolved Magnesium (Mg)	mg/L	1.8	7350747	1.7	0.20	7350747
Dissolved Manganese (Mn)	mg/L	0.067	7350747	0.057	0.0040	7350747
Dissolved Molybdenum (Mo)	mg/L	0.0049	7348083	0.00091	0.00020	7348273
Dissolved Nickel (Ni)	mg/L	0.0022	7348083	0.00051	0.00050	7348273
Dissolved Phosphorus (P)	mg/L	<1.0	7348344	<1.0	1.0	7348344
Dissolved Potassium (K)	mg/L	1.6	7350747	1.6	0.30	7350747
Dissolved Selenium (Se)	mg/L	0.0013	7348083	<0.00020	0.00020	7348273
Dissolved Silicon (Si)	mg/L	4.4	7348344	110 (1)	1.0	7348344
Dissolved Silver (Ag)	mg/L	<0.00010	7348083	<0.00010	0.00010	7348273
Dissolved Sodium (Na)	mg/L	97	7350747	96	0.50	7350747
Dissolved Strontium (Sr)	mg/L	<0.20	7348344	<0.20	0.20	7348344
Dissolved Sulphur (S)	mg/L	30	7348344	34 (2)	2.0	7348344
Dissolved Thallium (Tl)	mg/L	<0.00020	7348083	<0.00020	0.00020	7348273
Dissolved Tin (Sn)	mg/L	<0.0010	7348083	<0.0010	0.0010	7348273
Dissolved Titanium (Ti)	mg/L	0.0046	7348083	0.013	0.0010	7348273
Dissolved Uranium (U)	mg/L	0.0056	7348083	0.00038	0.00010	7348273
Dissolved Vanadium (V)	mg/L	0.0013	7348083	<0.0010	0.0010	7348273
Dissolved Zinc (Zn)	mg/L	0.031	7348083	0.0049	0.0030	7348273

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.
(2) Dissolved greater than total. Results within acceptable limits of precision.

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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		IK1794	IK1795		IK1796		
Sampling Date		2014/01/07 11:00	2014/01/07 11:00		2014/01/07 09:00		
COC Number		A101933	A101933		A101933		
	Units	QC1	CM12-01	RDL	CM11-11	RDL	QC Batch
Low Level Elements							
Total Cadmium (Cd)	ug/L	1.1	1.1	0.0050	0.16	0.0050	7344626
Elements							
Total Aluminum (Al)	mg/L	18	18	0.0030	0.20	0.0030	7347961
Total Antimony (Sb)	mg/L	0.0057	0.0069	0.00060	0.044	0.00060	7347961
Total Arsenic (As)	mg/L	0.0099	0.010	0.00020	0.0017	0.00020	7347961
Total Barium (Ba)	mg/L	0.26	0.25	0.10	0.23	0.010	7347967
Total Beryllium (Be)	mg/L	0.0054	0.0054	0.0010	<0.0010	0.0010	7347961
Total Boron (B)	mg/L	<0.20	<0.20	0.20	<0.020	0.020	7347967
Total Calcium (Ca)	mg/L	33	33	3.0	35	0.30	7347967
Total Chromium (Cr)	mg/L	0.021	0.020	0.0010	0.0021	0.0010	7347961
Total Cobalt (Co)	mg/L	0.0049	0.0049	0.00030	0.0021	0.00030	7347961
Total Copper (Cu)	mg/L	0.032	0.031	0.00020	0.0032	0.00020	7347961
Total Iron (Fe)	mg/L	16	16	0.60	0.49	0.060	7347967
Total Lead (Pb)	mg/L	0.085	0.084	0.00020	0.0032	0.00020	7347961
Total Lithium (Li)	mg/L	<0.20	<0.20	0.20	<0.020	0.020	7347967
Total Magnesium (Mg)	mg/L	11	11	2.0	13	0.20	7347967
Total Manganese (Mn)	mg/L	0.70	0.71	0.040	0.13	0.0040	7347967
Total Molybdenum (Mo)	mg/L	0.0063	0.0062	0.00020	0.0095	0.00020	7347961
Total Nickel (Ni)	mg/L	0.018	0.017	0.00050	0.010	0.00050	7347961
Total Phosphorus (P)	mg/L	<1.0	<1.0	1.0	<0.10	0.10	7347967
Total Potassium (K)	mg/L	<3.0	<3.0	3.0	1.7	0.30	7347967
Total Selenium (Se)	mg/L	0.0020	0.0021	0.00020	0.030	0.00020	7347961
Total Silicon (Si)	mg/L	52	49	1.0	2.7	0.10	7347967
Total Silver (Ag)	mg/L	0.00024	0.00024	0.00010	<0.00010	0.00010	7347961
Total Sodium (Na)	mg/L	100	100	5.0	18	0.50	7347967
Total Strontium (Sr)	mg/L	0.43	0.44	0.20	0.086	0.020	7347967
Total Sulphur (S)	mg/L	33	33	2.0	7.6	0.20	7347967
Total Thallium (Tl)	mg/L	<0.00020	0.00020	0.00020	0.00043	0.00020	7347961
Total Tin (Sn)	mg/L	0.014	0.013	0.0010	0.0041	0.0010	7347961
Total Titanium (Ti)	mg/L	0.10	0.12	0.0010	0.019	0.0010	7347961
Total Uranium (U)	mg/L	0.027	0.027	0.00010	0.012	0.00010	7347961
Total Vanadium (V)	mg/L	0.015	0.015	0.0010	0.0040	0.0010	7347961
Total Zinc (Zn)	mg/L	0.35	0.28	0.0030	0.020	0.0030	7347961
RDL = Reportable Detection Limit							

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Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		IK1794	IK1794		IK1795			IK1796		
Sampling Date		2014/01/07 11:00	2014/01/07 11:00		2014/01/07 11:00			2014/01/07 09:00		
COC Number		A101933	A101933		A101933			A101933		
	Units	**QC1**	**QC1 Lab-Dup**	**RDL**	**CM12-01**	**RDL**	**QC Batch**	**CM11-11**	**RDL**	**QC Batch**
CONVENTIONALS										
Dissolved Ammonia (N)	mg/L	<0.050	N/A	0.050	<0.50 (1)	0.50	7350185	0.30	0.050	7346817
Misc. Inorganics										
Dissolved Total Kjeldahl Nitrogen	mg/L	<0.050	N/A	0.050	<0.050	0.050	7349693	0.37	0.050	7349691
Demand Parameters										
Dissolved Chemical Oxygen Demand	mg/L	8.0	N/A	5.0	9.0	5.0	7350294	9.0 (2)	5.0	7350297
Total Chemical Oxygen Demand	mg/L	13	18	5.0	13	5.0	7350293	8.0	5.0	7350293
Misc. Inorganics										
Dissolved Organic Carbon (C)	mg/L	3.2 (3)	N/A	0.50	<5.0 (4)	5.0	7349276	1.4 (2)	0.50	7346576
Total Organic Carbon (C)	mg/L	2.2	N/A	0.50	1.9	0.50	7349277	1.2	0.50	7346577
Total Dissolved Solids	mg/L	1600 (5)	N/A	33	1800 (5)	33	7345141	200	10	7345141
Total Suspended Solids	mg/L	360 (5)	N/A	7.5	370 (5)	7.5	7346182	51	1.0	7346182
Nutrients										
Total Ammonia (N)	mg/L	<0.050	N/A	0.050	0.054	0.050	7346815	0.31	0.050	7346813
Total Kjeldahl Nitrogen	mg/L	1.3 (5)	N/A	0.50	1.1 (5)	0.50	7349687	0.39	0.050	7349687
Total Nitrogen (N)	mg/L	2.1	N/A	0.050	1.9	0.050	7346784	0.47	0.050	7346784
Orthophosphate (P)	mg/L	0.011	N/A	0.0030	<0.030 (6)	0.030	7346704	<0.0030	0.0030	7346704
Dissolved Phosphate (P)	mg/L	0.0035	N/A	0.0030	0.029	0.0030	7350217	<0.0030	0.0030	7350221
Total Phosphate (P)	mg/L	0.45 (5)	N/A	0.030	0.44 (5)	0.030	7350210	<0.0030	0.0030	7350210
Misc. Organics										
Phenols	mg/L	0.0030	N/A	0.0020	0.0029	0.0020	7345346	<0.0020	0.0020	7345346
Physical Properties										
True Colour	PtCo units	9.6	N/A	2.0	13	2.0	7346893	<2.0	2.0	7346893
Physical Properties										
Turbidity	NTU	640	N/A	0.10	650	0.10	7345783	44	0.10	7345783

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Dissolved greater than total. Results are within limits of uncertainty(MU).
(2) Dissolved greater than total. Results are within limits of uncertainty(MU).
(3) Dissolved greater than total. Reanalysis yields similar results.
(4) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.
(5) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
(6) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.

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NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		IK1796		
Sampling Date		2014/01/07 09:00		
COC Number		A101933		
	Units	**CM11-11 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS				
Dissolved Ammonia (N)	mg/L	0.30	0.050	7346817
Demand Parameters				
Dissolved Chemical Oxygen Demand	mg/L	11	5.0	7350297

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

SEMIVOLATILE ORGANICS BY GC-MS (GROUND WATER)

Maxxam ID		IK1794	IK1795	IK1796		
Sampling Date		2014/01/07 11:00	2014/01/07 11:00	2014/01/07 09:00		
COC Number		A101933	A101933	A101933		
	Units	**QC1**	**CM12-01**	**CM11-11**	**RDL**	**QC Batch**
Polycyclic Aromatics						
Benzo[a]pyrene equivalency	ug/L	0.010	0.010	<0.010	0.010	7344392
Acenaphthene	ug/L	<0.10	<0.10	<0.10	0.10	7344969
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	0.10	7344969
Acridine	ug/L	0.80	0.99	0.29	0.20	7344969
Anthracene	ug/L	<0.010	<0.010	<0.010	0.010	7344969
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7344969
Benzo(b&j)fluoranthene	ug/L	0.011	0.012	<0.0085	0.0085	7344969
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7344969
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7344969
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	0.050	7344969
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	<0.0075	0.0075	7344969
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	0.050	7344969
Chrysene	ug/L	0.020	0.021	<0.0085	0.0085	7344969
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	<0.0075	0.0075	7344969
Fluoranthene	ug/L	0.014	0.015	<0.010	0.010	7344969
Fluorene	ug/L	0.053	0.056	<0.050	0.050	7344969
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7344969
2-Methylnaphthalene	ug/L	0.47	0.51	<0.10	0.10	7344969
Naphthalene	ug/L	0.38	0.40	<0.10	0.10	7344969
Phenanthrene	ug/L	0.23	0.25	<0.050	0.050	7344969
Perylene	ug/L	<0.050	<0.050	<0.050	0.050	7344969
Pyrene	ug/L	0.021	0.023	<0.020	0.020	7344969
Quinoline	ug/L	<0.20	<0.20	<0.20	0.20	7344969
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	81	90	103	N/A	7344969
D12-BENZO(A)PYRENE (sur.)	%	94	106	117	N/A	7344969
D8-ACENAPHTHYLENE (sur.)	%	82	92	107	N/A	7344969
TERPHENYL-D14 (sur.)	%	88	97	110	N/A	7344969

RDL = Reportable Detection Limit
N/A = Not Applicable

VOLATILE ORGANICS BY GC-MS (GROUND WATER)

Maxxam ID		IK1794	IK1795	IK1796		
Sampling Date		2014/01/07 11:00	2014/01/07 11:00	2014/01/07 09:00		
COC Number		A101933	A101933	A101933		
	Units	QC1	CM12-01	CM11-11	RDL	QC Batch
Volatiles						
Total Trihalomethanes	ug/L	<2.0	<2.0	<2.0	2.0	7344559
Bromodichloromethane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Bromoform	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Bromomethane	ug/L	<2.0	<2.0	<2.0	2.0	7346405
Carbon tetrachloride	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Chlorobenzene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Chlorodibromomethane	ug/L	<1.0	<1.0	<1.0	1.0	7346405
Chloroethane	ug/L	<1.0	<1.0	<1.0	1.0	7346405
Chloroform	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Chloromethane	ug/L	<2.0	<2.0	<2.0	2.0	7346405
1,2-dibromoethane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,2-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,3-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,4-dichlorobenzene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,1-dichloroethane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,2-dichloroethane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,1-dichloroethene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
cis-1,2-dichloroethene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
trans-1,2-dichloroethene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Dichloromethane	ug/L	<2.0	<2.0	<2.0	2.0	7346405
1,2-dichloropropane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
cis-1,3-dichloropropene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
trans-1,3-dichloropropene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Methyl methacrylate	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Methyl-tert-butylether (MTBE)	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Styrene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,1,1,2-tetrachloroethane	ug/L	<2.0	<2.0	<2.0	2.0	7346405
1,1,2,2-tetrachloroethane	ug/L	<2.0	<2.0	<2.0	2.0	7346405
Tetrachloroethene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,2,3-trichlorobenzene	ug/L	<1.0	<1.0	<1.0	1.0	7346405
1,2,4-trichlorobenzene	ug/L	<1.0	<1.0	<1.0	1.0	7346405
1,3,5-trichlorobenzene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,1,1-trichloroethane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,1,2-trichloroethane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
RDL = Reportable Detection Limit						

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VOLATILE ORGANICS BY GC-MS (GROUND WATER)

Maxxam ID		IK1794	IK1795	IK1796		
Sampling Date		2014/01/07 11:00	2014/01/07 11:00	2014/01/07 09:00		
COC Number		A101933	A101933	A101933		
	Units	**QC1**	**CM12-01**	**CM11-11**	**RDL**	**QC Batch**
Trichloroethene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Trichlorofluoromethane	ug/L	<0.50	<0.50	<0.50	0.50	7346405
1,2,4-trimethylbenzene	ug/L	0.51	0.59	<0.50	0.50	7346405
1,3,5-trimethylbenzene	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Vinyl chloride	ug/L	<0.50	<0.50	<0.50	0.50	7346405
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	101	100	103	N/A	7346405
4-BROMOFLUOROBENZENE (sur.)	%	103	104	99	N/A	7346405
D4-1,2-DICHLOROETHANE (sur.)	%	98	97	71	N/A	7346405

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.0°C

Total Cyanide results are attached to this report file. The reference number from Maxxam Campo for these results is B403864.

Redox Potential results are attached to this report file. The reference number from Maxxam Sladeview for these results is B404094.

Sample IK1794-01 : TDS/ EC ratio and TDSC / TDS ratio exceeds normal acceptance limits, reanalysis yields similar results, possible matrix interference.

Sample IK1795-01 : TDS/ EC ratio and TDSC / TDS ratio exceeds normal acceptance limits, reanalysis yields similar results, possible matrix interference.

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER) Comments

Sample IK1794-02 Elements by ICP (Dissolved) Lab Filtered: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample IK1795-02 Elements by ICP (Dissolved) Lab Filtered: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

REGULATED METALS (CCME/AT1) - TOTAL Comments

Sample IK1794-05 Elements by ICP - Total: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
Sample IK1795-05 Elements by ICP - Total: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Sample IK1794, Elements by ICP (Dissolved) Lab Filtered: Test repeated.
Sample IK1795, Elements by ICP (Dissolved) Lab Filtered: Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7344969	LZ3	Matrix Spike	D10-ANTHRACENE (sur.)	2014/01/09		113	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/01/09		130	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/01/09		116	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/01/09		121	%	50 - 130
			Acenaphthene	2014/01/09		108	%	50 - 130
			Acenaphthylene	2014/01/09		116	%	50 - 130
			Acridine	2014/01/09		91	%	50 - 130
			Anthracene	2014/01/09		102	%	50 - 130
			Benzo(a)anthracene	2014/01/09		111	%	50 - 130
			Benzo(b&j)fluoranthene	2014/01/09		101	%	50 - 130
			Benzo(k)fluoranthene	2014/01/09		82	%	50 - 130
			Benzo(g,h,i)perylene	2014/01/09		81	%	50 - 130
			Benzo(c)phenanthrene	2014/01/09		112	%	50 - 130
			Benzo(a)pyrene	2014/01/09		91	%	50 - 130
			Benzo[e]pyrene	2014/01/09		89	%	50 - 130
			Chrysene	2014/01/09		105	%	50 - 130
			Dibenz(a,h)anthracene	2014/01/09		93	%	50 - 130
			Fluoranthene	2014/01/09		112	%	50 - 130
			Fluorene	2014/01/09		111	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/01/09		88	%	50 - 130
			2-Methylnaphthalene	2014/01/09		91	%	50 - 130
			Naphthalene	2014/01/09		107	%	50 - 130
			Phenanthrene	2014/01/09		111	%	50 - 130
			Perylene	2014/01/09		86	%	50 - 130
			Pyrene	2014/01/09		115	%	50 - 130
			Quinoline	2014/01/09		97	%	50 - 130
7344969	LZ3	Spiked Blank	D10-ANTHRACENE (sur.)	2014/01/09		108	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/01/09		125	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/01/09		112	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/01/09		115	%	50 - 130
			Acenaphthene	2014/01/09		100	%	50 - 130
			Acenaphthylene	2014/01/09		106	%	50 - 130
			Acridine	2014/01/09		87	%	50 - 130
			Anthracene	2014/01/09		97	%	50 - 130
			Benzo(a)anthracene	2014/01/09		110	%	50 - 130
			Benzo(b&j)fluoranthene	2014/01/09		118	%	50 - 130
			Benzo(k)fluoranthene	2014/01/09		112	%	50 - 130
			Benzo(g,h,i)perylene	2014/01/09		104	%	50 - 130
			Benzo(c)phenanthrene	2014/01/09		103	%	50 - 130
			Benzo(a)pyrene	2014/01/09		107	%	50 - 130
			Benzo[e]pyrene	2014/01/09		105	%	50 - 130
			Chrysene	2014/01/09		112	%	50 - 130
			Dibenz(a,h)anthracene	2014/01/09		120	%	50 - 130
			Fluoranthene	2014/01/09		103	%	50 - 130
			Fluorene	2014/01/09		103	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/01/09		113	%	50 - 130
			2-Methylnaphthalene	2014/01/09		83	%	50 - 130
			Naphthalene	2014/01/09		97	%	50 - 130
			Phenanthrene	2014/01/09		102	%	50 - 130
			Perylene	2014/01/09		106	%	50 - 130
			Pyrene	2014/01/09		107	%	50 - 130
			Quinoline	2014/01/09		93	%	50 - 130
7344969	LZ3	Method Blank	D10-ANTHRACENE (sur.)	2014/01/09		104	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/01/09		120	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/01/09		105	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/01/09		112	%	50 - 130
			Acenaphthene	2014/01/09	<0.10		ug/L	
			Acenaphthylene	2014/01/09	<0.10		ug/L	
			Acridine	2014/01/09	<0.20		ug/L	
			Anthracene	2014/01/09	<0.010		ug/L	
			Benzo(a)anthracene	2014/01/09	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2014/01/09	<0.0085		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Benzo(k)fluoranthene	2014/01/09	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2014/01/09	<0.0085		ug/L	
			Benzo(c)phenanthrene	2014/01/09	<0.050		ug/L	
			Benzo(a)pyrene	2014/01/09	<0.0075		ug/L	
			Benzo[e]pyrene	2014/01/09	<0.050		ug/L	
			Chrysene	2014/01/09	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2014/01/09	<0.0075		ug/L	
			Fluoranthene	2014/01/09	<0.010		ug/L	
			Fluorene	2014/01/09	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2014/01/09	<0.0085		ug/L	
			2-Methylnaphthalene	2014/01/09	<0.10		ug/L	
			Naphthalene	2014/01/09	<0.10		ug/L	
			Phenanthrene	2014/01/09	<0.050		ug/L	
			Perylene	2014/01/09	<0.050		ug/L	
			Pyrene	2014/01/09	<0.020		ug/L	
			Quinoline	2014/01/09	<0.20		ug/L	
7344969	LZ3	RPD	Acenaphthene	2014/01/09	NC		%	40
			Acenaphthylene	2014/01/09	NC		%	40
			Acridine	2014/01/09	NC		%	40
			Anthracene	2014/01/09	NC		%	40
			Benzo(a)anthracene	2014/01/09	NC		%	40
			Benzo(b&j)fluoranthene	2014/01/09	NC		%	40
			Benzo(k)fluoranthene	2014/01/09	NC		%	40
			Benzo(g,h,i)perylene	2014/01/09	NC		%	40
			Benzo(c)phenanthrene	2014/01/09	NC		%	40
			Benzo(a)pyrene	2014/01/09	NC		%	40
			Benzo[e]pyrene	2014/01/09	NC		%	40
			Chrysene	2014/01/09	NC		%	40
			Dibenz(a,h)anthracene	2014/01/09	NC		%	40
			Fluoranthene	2014/01/09	NC		%	40
			Fluorene	2014/01/09	NC		%	40
			Indeno(1,2,3-cd)pyrene	2014/01/09	NC		%	40
			2-Methylnaphthalene	2014/01/09	NC		%	40
			Naphthalene	2014/01/09	NC		%	40
			Phenanthrene	2014/01/09	NC		%	40
			Perylene	2014/01/09	NC		%	40
			Pyrene	2014/01/09	NC		%	40
			Quinoline	2014/01/09	NC		%	40
7345098	RSU	Matrix Spike	1,4-Difluorobenzene (sur.)	2014/01/10		105	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		101	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		106	%	70 - 130
			Benzene	2014/01/10		95	%	70 - 130
			Toluene	2014/01/10		94	%	70 - 130
			Ethylbenzene	2014/01/10		96	%	70 - 130
			m & p-Xylene	2014/01/10		94	%	70 - 130
			o-Xylene	2014/01/10		95	%	70 - 130
			(C6-C10)	2014/01/10		85	%	70 - 130
7345098	RSU	Spiked Blank	1,4-Difluorobenzene (sur.)	2014/01/10		107	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		100	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		101	%	70 - 130
			Benzene	2014/01/10		92	%	70 - 130
			Toluene	2014/01/10		92	%	70 - 130
			Ethylbenzene	2014/01/10		96	%	70 - 130
			m & p-Xylene	2014/01/10		93	%	70 - 130
			o-Xylene	2014/01/10		92	%	70 - 130
			(C6-C10)	2014/01/10		96	%	70 - 130
7345098	RSU	Method Blank	1,4-Difluorobenzene (sur.)	2014/01/10		108	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		100	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		101	%	70 - 130
			Benzene	2014/01/10	<0.40		ug/L	
			Toluene	2014/01/10	<0.40		ug/L	
			Ethylbenzene	2014/01/10	<0.40		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			m & p-Xylene	2014/01/10	<0.80		ug/L	
			o-Xylene	2014/01/10	<0.40		ug/L	
			Xylenes (Total)	2014/01/10	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2014/01/10	<100		ug/L	
			(C6-C10)	2014/01/10	<100		ug/L	
7345098	RSU	RPD	Benzene	2014/01/10	NC		%	40
			Toluene	2014/01/10	NC		%	40
			Ethylbenzene	2014/01/10	NC		%	40
			m & p-Xylene	2014/01/10	NC		%	40
			o-Xylene	2014/01/10	NC		%	40
			Xylenes (Total)	2014/01/10	NC		%	40
			F1 (C6-C10) - BTEX	2014/01/10	NC		%	40
			(C6-C10)	2014/01/10	NC		%	40
7345141	HE1	Spiked Blank	Total Dissolved Solids	2014/01/09		94	%	80 - 120
7345141	HE1	Method Blank	Total Dissolved Solids	2014/01/09	<10		mg/L	
7345141	HE1	RPD	Total Dissolved Solids	2014/01/09	NC		%	20
7345340	VP4	Matrix Spike [IK1794-11]	O-TERPHENYL (sur.)	2014/01/09		129	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/01/09		121	%	50 - 130
7345340	VP4	Spiked Blank	O-TERPHENYL (sur.)	2014/01/09		103	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/01/09		97	%	70 - 130
7345340	VP4	Method Blank	O-TERPHENYL (sur.)	2014/01/09		108	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/01/09	<0.10		mg/L	
7345340	VP4	RPD	F2 (C10-C16 Hydrocarbons)	2014/01/09	NC		%	40
7345346	LY	Matrix Spike	Phenols	2014/01/09		101	%	80 - 120
7345346	LY	Spiked Blank	Phenols	2014/01/09		105	%	80 - 120
7345346	LY	Method Blank	Phenols	2014/01/09	<0.0020		mg/L	
7345346	LY	RPD	Phenols	2014/01/09	NC		%	20
7345783	HE1	Spiked Blank	Turbidity	2014/01/09		96	%	80 - 120
7345783	HE1	Method Blank	Turbidity	2014/01/09	<0.10		NTU	
7345783	HE1	RPD	Turbidity	2014/01/09	1.2		%	20
7346182	HE1	Matrix Spike	Total Suspended Solids	2014/01/10		110	%	80 - 120
7346182	HE1	Spiked Blank	Total Suspended Solids	2014/01/10		94	%	80 - 120
7346182	HE1	Method Blank	Total Suspended Solids	2014/01/10	<1.0		mg/L	
7346182	HE1	RPD	Total Suspended Solids	2014/01/10	8.0		%	20
7346186	CT6	Spiked Blank	Alkalinity (Total as CaCO3)	2014/01/10		85	%	80 - 120
7346186	CT6	Method Blank	Alkalinity (PP as CaCO3)	2014/01/10	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2014/01/10	<0.50		mg/L	
			Bicarbonate (HCO3)	2014/01/10	<0.50		mg/L	
			Carbonate (CO3)	2014/01/10	<0.50		mg/L	
			Hydroxide (OH)	2014/01/10	<0.50		mg/L	
7346186	CT6	RPD	Alkalinity (PP as CaCO3)	2014/01/10	NC		%	20
			Alkalinity (Total as CaCO3)	2014/01/10	0.3		%	20
			Bicarbonate (HCO3)	2014/01/10	0.3		%	20
			Carbonate (CO3)	2014/01/10	NC		%	20
			Hydroxide (OH)	2014/01/10	NC		%	20
7346188	CT6	Spiked Blank	pH	2014/01/10		100	%	97 - 102
7346189	CT6	Spiked Blank	Conductivity	2014/01/10		102	%	90 - 110
7346189	CT6	Method Blank	Conductivity	2014/01/10	<1.0		uS/cm	
7346189	CT6	RPD	Conductivity	2014/01/10	0.2		%	20
7346405	GP4	Matrix Spike [IK1796-12]	1,4-Difluorobenzene (sur.)	2014/01/10		101	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		104	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		102	%	70 - 130
			Bromodichloromethane	2014/01/10		118	%	70 - 130
			Bromoform	2014/01/10		111	%	70 - 130
			Bromomethane	2014/01/10		110	%	70 - 130
			Carbon tetrachloride	2014/01/10		102	%	70 - 130
			Chlorobenzene	2014/01/10		106	%	70 - 130
			Chlorodibromomethane	2014/01/10		116	%	70 - 130
			Chloroethane	2014/01/10		103	%	70 - 130
			Chloroform	2014/01/10		114	%	70 - 130
			Chloromethane	2014/01/10		89	%	70 - 130
			1,2-dibromoethane	2014/01/10		115	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			1,2-dichlorobenzene	2014/01/10		109	%	70 - 130
			1,3-dichlorobenzene	2014/01/10		107	%	70 - 130
			1,4-dichlorobenzene	2014/01/10		106	%	70 - 130
			1,1-dichloroethane	2014/01/10		105	%	70 - 130
			1,2-dichloroethane	2014/01/10		110	%	70 - 130
			1,1-dichloroethene	2014/01/10		107	%	70 - 130
			cis-1,2-dichloroethene	2014/01/10		105	%	70 - 130
			trans-1,2-dichloroethene	2014/01/10		105	%	70 - 130
			Dichloromethane	2014/01/10		106	%	70 - 130
			1,2-dichloropropane	2014/01/10		108	%	70 - 130
			cis-1,3-dichloropropene	2014/01/10		128	%	70 - 130
			trans-1,3-dichloropropene	2014/01/10		139 (1)	%	70 - 130
			Methyl methacrylate	2014/01/10		113	%	70 - 130
			Methyl-tert-butylether (MTBE)	2014/01/10		102	%	70 - 130
			Styrene	2014/01/10		111	%	70 - 130
			1,1,1,2-tetrachloroethane	2014/01/10		117	%	70 - 130
			1,1,2,2-tetrachloroethane	2014/01/10		107	%	70 - 130
			Tetrachloroethene	2014/01/10		102	%	70 - 130
			1,2,3-trichlorobenzene	2014/01/10		104	%	70 - 130
			1,2,4-trichlorobenzene	2014/01/10		102	%	70 - 130
			1,3,5-trichlorobenzene	2014/01/10		105	%	70 - 130
			1,1,1-trichloroethane	2014/01/10		107	%	70 - 130
			1,1,2-trichloroethane	2014/01/10		112	%	70 - 130
			Trichloroethene	2014/01/10		102	%	70 - 130
			Trichlorofluoromethane	2014/01/10		98	%	70 - 130
			1,2,4-trimethylbenzene	2014/01/10		105	%	70 - 130
			1,3,5-trimethylbenzene	2014/01/10		110	%	70 - 130
			Vinyl chloride	2014/01/10		103	%	70 - 130
7346405	GP4	Spiked Blank	1,4-Difluorobenzene (sur.)	2014/01/10		101	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		105	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		102	%	70 - 130
			Bromodichloromethane	2014/01/10		111	%	70 - 130
			Bromoform	2014/01/10		102	%	70 - 130
			Bromomethane	2014/01/10		94	%	70 - 130
			Carbon tetrachloride	2014/01/10		98	%	70 - 130
			Chlorobenzene	2014/01/10		100	%	70 - 130
			Chlorodibromomethane	2014/01/10		109	%	70 - 130
			Chloroethane	2014/01/10		99	%	70 - 130
			Chloroform	2014/01/10		109	%	70 - 130
			Chloromethane	2014/01/10		102	%	70 - 130
			1,2-dibromoethane	2014/01/10		104	%	70 - 130
			1,2-dichlorobenzene	2014/01/10		103	%	70 - 130
			1,3-dichlorobenzene	2014/01/10		101	%	70 - 130
			1,4-dichlorobenzene	2014/01/10		101	%	70 - 130
			1,1-dichloroethane	2014/01/10		100	%	70 - 130
			1,2-dichloroethane	2014/01/10		103	%	70 - 130
			1,1-dichloroethene	2014/01/10		103	%	70 - 130
			cis-1,2-dichloroethene	2014/01/10		100	%	70 - 130
			trans-1,2-dichloroethene	2014/01/10		102	%	70 - 130
			Dichloromethane	2014/01/10		101	%	70 - 130
			1,2-dichloropropane	2014/01/10		104	%	70 - 130
			cis-1,3-dichloropropene	2014/01/10		108	%	70 - 130
			trans-1,3-dichloropropene	2014/01/10		104	%	70 - 130
			Methyl methacrylate	2014/01/10		106	%	70 - 130
			Methyl-tert-butylether (MTBE)	2014/01/10		101	%	70 - 130
			Styrene	2014/01/10		105	%	70 - 130
			1,1,1,2-tetrachloroethane	2014/01/10		110	%	70 - 130
			1,1,2,2-tetrachloroethane	2014/01/10		99	%	70 - 130
			Tetrachloroethene	2014/01/10		97	%	70 - 130
			1,2,3-trichlorobenzene	2014/01/10		98	%	70 - 130
			1,2,4-trichlorobenzene	2014/01/10		96	%	70 - 130
			1,3,5-trichlorobenzene	2014/01/10		100	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			1,1,1-trichloroethane	2014/01/10		103	%	70 - 130
			1,1,2-trichloroethane	2014/01/10		106	%	70 - 130
			Trichloroethene	2014/01/10		98	%	70 - 130
			Trichlorofluoromethane	2014/01/10		95	%	70 - 130
			1,2,4-trimethylbenzene	2014/01/10		100	%	70 - 130
			1,3,5-trimethylbenzene	2014/01/10		106	%	70 - 130
			Vinyl chloride	2014/01/10		100	%	70 - 130
7346405	GP4	Method Blank	1,4-Difluorobenzene (sur.)	2014/01/10		100	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		99	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		99	%	70 - 130
			Bromodichloromethane	2014/01/10	<0.50		ug/L	
			Bromoform	2014/01/10	<0.50		ug/L	
			Bromomethane	2014/01/10	<2.0		ug/L	
			Carbon tetrachloride	2014/01/10	<0.50		ug/L	
			Chlorobenzene	2014/01/10	<0.50		ug/L	
			Chlorodibromomethane	2014/01/10	<1.0		ug/L	
			Chloroethane	2014/01/10	<1.0		ug/L	
			Chloroform	2014/01/10	<0.50		ug/L	
			Chloromethane	2014/01/10	<2.0		ug/L	
			1,2-dibromoethane	2014/01/10	<0.50		ug/L	
			1,2-dichlorobenzene	2014/01/10	<0.50		ug/L	
			1,3-dichlorobenzene	2014/01/10	<0.50		ug/L	
			1,4-dichlorobenzene	2014/01/10	<0.50		ug/L	
			1,1-dichloroethane	2014/01/10	<0.50		ug/L	
			1,2-dichloroethane	2014/01/10	<0.50		ug/L	
			1,1-dichloroethene	2014/01/10	<0.50		ug/L	
			cis-1,2-dichloroethene	2014/01/10	<0.50		ug/L	
			trans-1,2-dichloroethene	2014/01/10	<0.50		ug/L	
			Dichloromethane	2014/01/10	<2.0		ug/L	
			1,2-dichloropropane	2014/01/10	<0.50		ug/L	
			cis-1,3-dichloropropene	2014/01/10	<0.50		ug/L	
			trans-1,3-dichloropropene	2014/01/10	<0.50		ug/L	
			Methyl methacrylate	2014/01/10	<0.50		ug/L	
			Methyl-tert-butylether (MTBE)	2014/01/10	<0.50		ug/L	
			Styrene	2014/01/10	<0.50		ug/L	
			1,1,1,2-tetrachloroethane	2014/01/10	<2.0		ug/L	
			1,1,2,2-tetrachloroethane	2014/01/10	<2.0		ug/L	
			Tetrachloroethene	2014/01/10	<0.50		ug/L	
			1,2,3-trichlorobenzene	2014/01/10	<1.0		ug/L	
			1,2,4-trichlorobenzene	2014/01/10	<1.0		ug/L	
			1,3,5-trichlorobenzene	2014/01/10	<0.50		ug/L	
			1,1,1-trichloroethane	2014/01/10	<0.50		ug/L	
			1,1,2-trichloroethane	2014/01/10	<0.50		ug/L	
			Trichloroethene	2014/01/10	<0.50		ug/L	
			Trichlorofluoromethane	2014/01/10	<0.50		ug/L	
			1,2,4-trimethylbenzene	2014/01/10	<0.50		ug/L	
			1,3,5-trimethylbenzene	2014/01/10	<0.50		ug/L	
			Vinyl chloride	2014/01/10	<0.50		ug/L	
7346405	GP4	RPD	Bromodichloromethane	2014/01/10	NC		%	40
			Bromoform	2014/01/10	NC		%	40
			Bromomethane	2014/01/10	NC		%	40
			Carbon tetrachloride	2014/01/10	NC		%	40
			Chlorobenzene	2014/01/10	NC		%	40
			Chlorodibromomethane	2014/01/10	NC		%	40
			Chloroethane	2014/01/10	NC		%	40
			Chloroform	2014/01/10	NC		%	40
			Chloromethane	2014/01/10	NC		%	40
			1,2-dibromoethane	2014/01/10	NC		%	40
			1,2-dichlorobenzene	2014/01/10	NC		%	40
			1,3-dichlorobenzene	2014/01/10	NC		%	40
			1,4-dichlorobenzene	2014/01/10	NC		%	40
			1,1-dichloroethane	2014/01/10	NC		%	40

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			1,2-dichloroethane	2014/01/10	NC		%	40
			1,1-dichloroethene	2014/01/10	NC		%	40
			cis-1,2-dichloroethene	2014/01/10	NC		%	40
			trans-1,2-dichloroethene	2014/01/10	NC		%	40
			Dichloromethane	2014/01/10	NC		%	40
			1,2-dichloropropane	2014/01/10	NC		%	40
			cis-1,3-dichloropropene	2014/01/10	NC		%	40
			trans-1,3-dichloropropene	2014/01/10	NC		%	40
			Methyl methacrylate	2014/01/10	NC		%	40
			Methyl-tert-butylether (MTBE)	2014/01/10	NC		%	40
			Styrene	2014/01/10	NC		%	40
			1,1,1,2-tetrachloroethane	2014/01/10	NC		%	40
			1,1,2,2-tetrachloroethane	2014/01/10	NC		%	40
			Tetrachloroethene	2014/01/10	NC		%	40
			1,2,3-trichlorobenzene	2014/01/10	NC		%	40
			1,2,4-trichlorobenzene	2014/01/10	NC		%	40
			1,3,5-trichlorobenzene	2014/01/10	NC		%	40
			1,1,1-trichloroethane	2014/01/10	NC		%	40
			1,1,2-trichloroethane	2014/01/10	NC		%	40
			Trichloroethene	2014/01/10	NC		%	40
			Trichlorofluoromethane	2014/01/10	NC		%	40
			1,2,4-trimethylbenzene	2014/01/10	NC		%	40
			1,3,5-trimethylbenzene	2014/01/10	NC		%	40
			Vinyl chloride	2014/01/10	NC		%	40
7346434	ZI	Matrix Spike	Dissolved Chloride (Cl)	2014/01/10		100	%	80 - 120
7346434	ZI	Spiked Blank	Dissolved Chloride (Cl)	2014/01/10		102	%	80 - 120
7346434	ZI	Method Blank	Dissolved Chloride (Cl)	2014/01/10	<1.0		mg/L	
7346434	ZI	RPD	Dissolved Chloride (Cl)	2014/01/10	NC		%	20
7346438	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2014/01/10		114	%	80 - 120
7346438	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2014/01/10		104	%	80 - 120
7346438	ZI	Method Blank	Dissolved Sulphate (SO4)	2014/01/10	<1.0		mg/L	
7346438	ZI	RPD	Dissolved Sulphate (SO4)	2014/01/10	NC		%	20
7346449	CT6	Matrix Spike	Dissolved Nitrite (N)	2014/01/10		103	%	80 - 120
			Dissolved Nitrate (N)	2014/01/10		104	%	80 - 120
7346449	CT6	Spiked Blank	Dissolved Nitrite (N)	2014/01/10		99	%	90 - 110
			Dissolved Nitrate (N)	2014/01/10		101	%	90 - 110
7346449	CT6	Method Blank	Dissolved Nitrite (N)	2014/01/10	<0.0030		mg/L	
			Dissolved Nitrate (N)	2014/01/10	<0.0030		mg/L	
7346449	CT6	RPD	Dissolved Nitrite (N)	2014/01/10	NC		%	20
			Dissolved Nitrate (N)	2014/01/10	NC		%	20
7346576	AP1	Matrix Spike	Dissolved Organic Carbon (C)	2014/01/10		113	%	80 - 120
7346576	AP1	Spiked Blank	Dissolved Organic Carbon (C)	2014/01/10		111	%	80 - 120
7346576	AP1	Method Blank	Dissolved Organic Carbon (C)	2014/01/10	<0.50		mg/L	
7346576	AP1	RPD	Dissolved Organic Carbon (C)	2014/01/10	1.1		%	20
7346577	AP1	Matrix Spike	Total Organic Carbon (C)	2014/01/10		100	%	80 - 120
7346577	AP1	Spiked Blank	Total Organic Carbon (C)	2014/01/10		98	%	80 - 120
7346577	AP1	Method Blank	Total Organic Carbon (C)	2014/01/10	<0.50		mg/L	
7346577	AP1	RPD	Total Organic Carbon (C)	2014/01/10	0.7		%	20
7346704	RM9	Matrix Spike	Orthophosphate (P)	2014/01/10		99	%	80 - 120
7346704	RM9	Spiked Blank	Orthophosphate (P)	2014/01/10		101	%	80 - 120
7346704	RM9	Method Blank	Orthophosphate (P)	2014/01/10	<0.0030		mg/L	
7346704	RM9	RPD	Orthophosphate (P)	2014/01/10	NC		%	20
7346813	RM9	Matrix Spike	Total Ammonia (N)	2014/01/10		93	%	80 - 120
7346813	RM9	Spiked Blank	Total Ammonia (N)	2014/01/10		108	%	80 - 120
7346813	RM9	Method Blank	Total Ammonia (N)	2014/01/10	<0.050		mg/L	
7346813	RM9	RPD	Total Ammonia (N)	2014/01/10	NC		%	20
7346815	RM9	Matrix Spike	Total Ammonia (N)	2014/01/10		92	%	80 - 120
7346815	RM9	Spiked Blank	Total Ammonia (N)	2014/01/10		97	%	80 - 120
7346815	RM9	Method Blank	Total Ammonia (N)	2014/01/10	<0.050		mg/L	
7346815	RM9	RPD	Total Ammonia (N)	2014/01/10	NC		%	20
7346817	RM9	Matrix Spike [IK1796-08]	Dissolved Ammonia (N)	2014/01/10		97	%	80 - 120
7346817	RM9	Spiked Blank	Dissolved Ammonia (N)	2014/01/10		100	%	80 - 120

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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7346817	RM9	Method Blank	Dissolved Ammonia (N)	2014/01/10	<0.050		mg/L	
7346817	RM9	RPD [IK1796-08]	Dissolved Ammonia (N)	2014/01/10	0.3		%	20
7346893	ZI	Spiked Blank	True Colour	2014/01/10		98	%	80 - 120
7346893	ZI	Method Blank	True Colour	2014/01/10	<2.0		PtCo units	
7346893	ZI	RPD	True Colour	2014/01/10	NC		%	20
7347961	KA3	Matrix Spike	Total Aluminum (Al)	2014/01/13		103	%	80 - 120
			Total Antimony (Sb)	2014/01/13		112	%	80 - 120
			Total Arsenic (As)	2014/01/13		104	%	80 - 120
			Total Beryllium (Be)	2014/01/13		107	%	80 - 120
			Total Chromium (Cr)	2014/01/13		99	%	80 - 120
			Total Cobalt (Co)	2014/01/13		100	%	80 - 120
			Total Copper (Cu)	2014/01/13		97	%	80 - 120
			Total Lead (Pb)	2014/01/13		98	%	80 - 120
			Total Molybdenum (Mo)	2014/01/13		115	%	80 - 120
			Total Nickel (Ni)	2014/01/13		97	%	80 - 120
			Total Selenium (Se)	2014/01/13		100	%	80 - 120
			Total Silver (Ag)	2014/01/13		101	%	80 - 120
			Total Thallium (Tl)	2014/01/13		97	%	80 - 120
			Total Tin (Sn)	2014/01/13		108	%	80 - 120
			Total Titanium (Ti)	2014/01/13		100	%	80 - 120
			Total Uranium (U)	2014/01/13		102	%	80 - 120
			Total Vanadium (V)	2014/01/13		114	%	80 - 120
			Total Zinc (Zn)	2014/01/13		90	%	80 - 120
7347961	KA3	Spiked Blank	Total Aluminum (Al)	2014/01/13		116	%	80 - 120
			Total Antimony (Sb)	2014/01/13		114	%	80 - 120
			Total Arsenic (As)	2014/01/13		109	%	80 - 120
			Total Beryllium (Be)	2014/01/13		106	%	80 - 120
			Total Chromium (Cr)	2014/01/13		108	%	80 - 120
			Total Cobalt (Co)	2014/01/13		110	%	80 - 120
			Total Copper (Cu)	2014/01/13		115	%	80 - 120
			Total Lead (Pb)	2014/01/13		107	%	80 - 120
			Total Molybdenum (Mo)	2014/01/13		109	%	80 - 120
			Total Nickel (Ni)	2014/01/13		107	%	80 - 120
			Total Selenium (Se)	2014/01/13		109	%	80 - 120
			Total Silver (Ag)	2014/01/13		107	%	80 - 120
			Total Thallium (Tl)	2014/01/13		107	%	80 - 120
			Total Tin (Sn)	2014/01/13		106	%	80 - 120
			Total Titanium (Ti)	2014/01/13		104	%	80 - 120
			Total Uranium (U)	2014/01/13		108	%	80 - 120
			Total Vanadium (V)	2014/01/13		112	%	80 - 120
			Total Zinc (Zn)	2014/01/13		111	%	80 - 120
7347961	KA3	Method Blank	Total Aluminum (Al)	2014/01/13	0.0040, RDL=0.0030		mg/L	
			Total Antimony (Sb)	2014/01/13	<0.00060		mg/L	
			Total Arsenic (As)	2014/01/13	0.00020, RDL=0.00020		mg/L	
			Total Beryllium (Be)	2014/01/13	<0.0010		mg/L	
			Total Chromium (Cr)	2014/01/13	<0.0010		mg/L	
			Total Cobalt (Co)	2014/01/13	<0.00030		mg/L	
			Total Copper (Cu)	2014/01/13	<0.00020		mg/L	
			Total Lead (Pb)	2014/01/13	<0.00020		mg/L	
			Total Molybdenum (Mo)	2014/01/13	<0.00020		mg/L	
			Total Nickel (Ni)	2014/01/13	<0.00050		mg/L	
			Total Selenium (Se)	2014/01/13	<0.00020		mg/L	
			Total Silver (Ag)	2014/01/13	<0.00010		mg/L	
			Total Thallium (Tl)	2014/01/13	<0.00020		mg/L	
			Total Tin (Sn)	2014/01/13	<0.0010		mg/L	
			Total Titanium (Ti)	2014/01/13	<0.0010		mg/L	
			Total Uranium (U)	2014/01/13	<0.00010		mg/L	
			Total Vanadium (V)	2014/01/13	<0.0010		mg/L	
			Total Zinc (Zn)	2014/01/13	<0.0030		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7347961	KA3	RPD	Total Aluminum (Al)	2014/01/13	5.9		%	20
			Total Antimony (Sb)	2014/01/13	NC		%	20
			Total Arsenic (As)	2014/01/13	NC		%	20
			Total Beryllium (Be)	2014/01/13	NC		%	20
			Total Chromium (Cr)	2014/01/13	NC		%	20
			Total Cobalt (Co)	2014/01/13	NC		%	20
			Total Copper (Cu)	2014/01/13	NC		%	20
			Total Lead (Pb)	2014/01/13	0.9		%	20
			Total Molybdenum (Mo)	2014/01/13	1.7		%	20
			Total Nickel (Ni)	2014/01/13	NC		%	20
			Total Selenium (Se)	2014/01/13	NC		%	20
			Total Silver (Ag)	2014/01/13	NC		%	20
			Total Thallium (Tl)	2014/01/13	NC		%	20
			Total Tin (Sn)	2014/01/13	NC		%	20
			Total Titanium (Ti)	2014/01/13	6.9		%	20
			Total Uranium (U)	2014/01/13	NC		%	20
			Total Vanadium (V)	2014/01/13	NC		%	20
			Total Zinc (Zn)	2014/01/13	NC		%	20
7347967	SRT	Matrix Spike	Total Barium (Ba)	2014/01/13		90	%	80 - 120
			Total Boron (B)	2014/01/13		NC	%	80 - 120
			Total Calcium (Ca)	2014/01/13		100	%	80 - 120
			Total Iron (Fe)	2014/01/13		97	%	80 - 120
			Total Lithium (Li)	2014/01/13		87	%	80 - 120
			Total Magnesium (Mg)	2014/01/13		97	%	80 - 120
			Total Manganese (Mn)	2014/01/13		99	%	80 - 120
			Total Phosphorus (P)	2014/01/13		92	%	80 - 120
			Total Potassium (K)	2014/01/13		95	%	80 - 120
			Total Silicon (Si)	2014/01/13		NC	%	80 - 120
			Total Sodium (Na)	2014/01/13		NC	%	80 - 120
			Total Strontium (Sr)	2014/01/13		92	%	80 - 120
7347967	SRT	Spiked Blank	Total Barium (Ba)	2014/01/13		94	%	80 - 120
			Total Boron (B)	2014/01/13		97	%	80 - 120
			Total Calcium (Ca)	2014/01/13		97	%	80 - 120
			Total Iron (Fe)	2014/01/13		99	%	80 - 120
			Total Lithium (Li)	2014/01/13		93	%	80 - 120
			Total Magnesium (Mg)	2014/01/13		100	%	80 - 120
			Total Manganese (Mn)	2014/01/13		101	%	80 - 120
			Total Phosphorus (P)	2014/01/13		93	%	80 - 120
			Total Potassium (K)	2014/01/13		99	%	80 - 120
			Total Silicon (Si)	2014/01/13		95	%	80 - 120
			Total Sodium (Na)	2014/01/13		90	%	80 - 120
			Total Strontium (Sr)	2014/01/13		96	%	80 - 120
7347967	SRT	Method Blank	Total Barium (Ba)	2014/01/13	<0.010		mg/L	
			Total Boron (B)	2014/01/13	<0.020		mg/L	
			Total Calcium (Ca)	2014/01/13	<0.30		mg/L	
			Total Iron (Fe)	2014/01/13	<0.060		mg/L	
			Total Lithium (Li)	2014/01/13	<0.020		mg/L	
			Total Magnesium (Mg)	2014/01/13	<0.20		mg/L	
			Total Manganese (Mn)	2014/01/13	<0.0040		mg/L	
			Total Phosphorus (P)	2014/01/13	<0.10		mg/L	
			Total Potassium (K)	2014/01/13	<0.30		mg/L	
			Total Silicon (Si)	2014/01/13	<0.10		mg/L	
			Total Sodium (Na)	2014/01/13	<0.50		mg/L	
			Total Strontium (Sr)	2014/01/13	<0.020		mg/L	
			Total Sulphur (S)	2014/01/13	<0.20		mg/L	
7347967	SRT	RPD	Total Barium (Ba)	2014/01/13	0.3		%	20
			Total Boron (B)	2014/01/13	0.5		%	20
			Total Calcium (Ca)	2014/01/13	6.1		%	20
			Total Iron (Fe)	2014/01/13	NC		%	20
			Total Lithium (Li)	2014/01/13	0.2		%	20
			Total Magnesium (Mg)	2014/01/13	1.4		%	20
			Total Manganese (Mn)	2014/01/13	NC		%	20

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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Phosphorus (P)	2014/01/13	NC		%	20
			Total Potassium (K)	2014/01/13	1.0		%	20
			Total Silicon (Si)	2014/01/13	0.2		%	20
			Total Sodium (Na)	2014/01/13	4.7		%	20
			Total Strontium (Sr)	2014/01/13	0.1		%	20
			Total Sulphur (S)	2014/01/13	NC		%	20
7348077	TDB	Matrix Spike	Dissolved Aluminum (Al)	2014/01/13		95	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		86	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		100	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		102	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		93	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		93	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		94	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		91	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		107	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		92	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		99	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		93	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		93	%	80 - 120
			Dissolved Tin (Sn)	2014/01/13		100	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		98	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		NC	%	80 - 120
			Dissolved Vanadium (V)	2014/01/13		100	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		92	%	80 - 120
7348077	TDB	Spiked Blank	Dissolved Aluminum (Al)	2014/01/13		99	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		88	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		97	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		98	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		97	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		98	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		98	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		98	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		97	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		99	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		94	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		96	%	80 - 120
			Dissolved Tin (Sn)	2014/01/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		96	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		98	%	80 - 120
			Dissolved Vanadium (V)	2014/01/13		100	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		100	%	80 - 120
7348077	TDB	Method Blank	Dissolved Aluminum (Al)	2014/01/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/01/13	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/01/13	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/01/13	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/01/13	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/01/13	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/01/13	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/01/13	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/01/13	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/01/13	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/01/13	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/01/13	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/01/13	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/01/13	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/01/13	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/01/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/01/13	0.0014, RDL=0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/01/13	<0.0030		mg/L	
7348077	TDB	RPD	Dissolved Aluminum (Al)	2014/01/13	NC		%	20

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NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Antimony (Sb)	2014/01/13	NC		%	20
			Dissolved Arsenic (As)	2014/01/13	NC		%	20
			Dissolved Beryllium (Be)	2014/01/13	NC		%	20
			Dissolved Chromium (Cr)	2014/01/13	NC		%	20
			Dissolved Cobalt (Co)	2014/01/13	NC		%	20
			Dissolved Copper (Cu)	2014/01/13	2.6		%	20
			Dissolved Lead (Pb)	2014/01/13	NC		%	20
			Dissolved Molybdenum (Mo)	2014/01/13	4.0		%	20
			Dissolved Nickel (Ni)	2014/01/13	NC		%	20
			Dissolved Selenium (Se)	2014/01/13	4.9		%	20
			Dissolved Silver (Ag)	2014/01/13	NC		%	20
			Dissolved Thallium (Tl)	2014/01/13	NC		%	20
			Dissolved Tin (Sn)	2014/01/13	NC		%	20
			Dissolved Titanium (Ti)	2014/01/13	NC		%	20
			Dissolved Uranium (U)	2014/01/13	0.6		%	20
			Dissolved Vanadium (V)	2014/01/13	NC		%	20
			Dissolved Zinc (Zn)	2014/01/13	NC		%	20
7348083	HC7	Matrix Spike	Dissolved Aluminum (Al)	2014/01/13		NC	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		87	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		100	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		104	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		94	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		94	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		94	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		95	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		104	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		92	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		100	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		91	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		94	%	80 - 120
			Dissolved Tin (Sn)	2014/01/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		96	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		98	%	80 - 120
			Dissolved Vanadium (V)	2014/01/13		98	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		95	%	80 - 120
7348083	HC7	Spiked Blank	Dissolved Aluminum (Al)	2014/01/13		99	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		90	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		96	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		98	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		94	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		94	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		94	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		98	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		94	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		101	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		94	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		96	%	80 - 120
			Dissolved Tin (Sn)	2014/01/13		97	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		96	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		98	%	80 - 120
			Dissolved Vanadium (V)	2014/01/13		100	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		98	%	80 - 120
7348083	HC7	Method Blank	Dissolved Aluminum (Al)	2014/01/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/01/13	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/01/13	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/01/13	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/01/13	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/01/13	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/01/13	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/01/13	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/01/13	<0.00020		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Nickel (Ni)	2014/01/13	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/01/13	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/01/13	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/01/13	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/01/13	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/01/13	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/01/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/01/13	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/01/13	0.0032, RDL=0.0030		mg/L	
7348083	HC7	RPD	Dissolved Aluminum (Al)	2014/01/13	9.7		%	20
			Dissolved Antimony (Sb)	2014/01/13	NC		%	20
			Dissolved Arsenic (As)	2014/01/13	4.0		%	20
			Dissolved Beryllium (Be)	2014/01/13	NC		%	20
			Dissolved Chromium (Cr)	2014/01/13	NC		%	20
			Dissolved Cobalt (Co)	2014/01/13	NC		%	20
			Dissolved Copper (Cu)	2014/01/13	NC		%	20
			Dissolved Lead (Pb)	2014/01/13	NC		%	20
			Dissolved Molybdenum (Mo)	2014/01/13	3.4		%	20
			Dissolved Nickel (Ni)	2014/01/13	NC		%	20
			Dissolved Selenium (Se)	2014/01/13	NC		%	20
			Dissolved Silver (Ag)	2014/01/13	NC		%	20
			Dissolved Thallium (Tl)	2014/01/13	NC		%	20
			Dissolved Tin (Sn)	2014/01/13	NC		%	20
			Dissolved Titanium (Ti)	2014/01/13	NC		%	20
			Dissolved Uranium (U)	2014/01/13	0.7		%	20
			Dissolved Vanadium (V)	2014/01/13	3.9		%	20
			Dissolved Zinc (Zn)	2014/01/13	NC		%	20
7348273	TDB	Matrix Spike	Dissolved Aluminum (Al)	2014/01/13		96	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		111	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		101	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		104	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		94	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		92	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		88	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		92	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		105	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		90	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		98	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		71 (1)	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		91	%	80 - 120
			Dissolved Tin (Sn)	2014/01/13		101	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		98	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		97	%	80 - 120
			Dissolved Vanadium (V)	2014/01/13		100	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		96	%	80 - 120
7348273	TDB	Spiked Blank	Dissolved Aluminum (Al)	2014/01/13		99	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		96	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		101	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		102	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		98	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		99	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		97	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		103	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		99	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		105	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		99	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		100	%	80 - 120
			Dissolved Tin (Sn)	2014/01/13		103	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		101	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		102	%	80 - 120

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NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
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Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Vanadium (V)	2014/01/13		102	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		102	%	80 - 120
7348273	TDB	Method Blank	Dissolved Aluminum (Al)	2014/01/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/01/13	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/01/13	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/01/13	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/01/13	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/01/13	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/01/13	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/01/13	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/01/13	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/01/13	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/01/13	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/01/13	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/01/13	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/01/13	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/01/13	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/01/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/01/13	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/01/13	0.0037, RDL=0.0030		mg/L	
7348273	TDB	RPD	Dissolved Aluminum (Al)	2014/01/13	NC		%	20
			Dissolved Antimony (Sb)	2014/01/13	NC		%	20
			Dissolved Arsenic (As)	2014/01/13	NC		%	20
			Dissolved Beryllium (Be)	2014/01/13	NC		%	20
			Dissolved Chromium (Cr)	2014/01/13	NC		%	20
			Dissolved Cobalt (Co)	2014/01/13	NC		%	20
			Dissolved Copper (Cu)	2014/01/13	NC		%	20
			Dissolved Lead (Pb)	2014/01/13	NC		%	20
			Dissolved Molybdenum (Mo)	2014/01/13	2.0		%	20
			Dissolved Nickel (Ni)	2014/01/13	NC		%	20
			Dissolved Selenium (Se)	2014/01/13	NC		%	20
			Dissolved Silver (Ag)	2014/01/13	NC		%	20
			Dissolved Thallium (Tl)	2014/01/13	NC		%	20
			Dissolved Tin (Sn)	2014/01/13	NC		%	20
			Dissolved Titanium (Ti)	2014/01/13	NC		%	20
			Dissolved Uranium (U)	2014/01/13	NC		%	20
			Dissolved Vanadium (V)	2014/01/13	NC		%	20
			Dissolved Zinc (Zn)	2014/01/13	NC		%	20
7348344	KSF	Matrix Spike	Dissolved Barium (Ba)	2014/01/13		89	%	80 - 120
			Dissolved Boron (B)	2014/01/13		95	%	80 - 120
			Dissolved Lithium (Li)	2014/01/13		88	%	80 - 120
			Dissolved Phosphorus (P)	2014/01/13		97	%	80 - 120
			Dissolved Silicon (Si)	2014/01/13		93	%	80 - 120
			Dissolved Strontium (Sr)	2014/01/13		89	%	80 - 120
7348344	KSF	Spiked Blank	Dissolved Barium (Ba)	2014/01/13		93	%	80 - 120
			Dissolved Boron (B)	2014/01/13		98	%	80 - 120
			Dissolved Lithium (Li)	2014/01/13		91	%	80 - 120
			Dissolved Phosphorus (P)	2014/01/13		94	%	80 - 120
			Dissolved Silicon (Si)	2014/01/13		98	%	80 - 120
			Dissolved Strontium (Sr)	2014/01/13		95	%	80 - 120
7348344	KSF	Method Blank	Dissolved Barium (Ba)	2014/01/13	<0.010		mg/L	
			Dissolved Boron (B)	2014/01/13	<0.020		mg/L	
			Dissolved Lithium (Li)	2014/01/13	<0.020		mg/L	
			Dissolved Phosphorus (P)	2014/01/13	<0.10		mg/L	
			Dissolved Silicon (Si)	2014/01/13	<0.10		mg/L	
			Dissolved Strontium (Sr)	2014/01/13	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/01/13	<0.20		mg/L	
7348344	KSF	RPD	Dissolved Calcium (Ca)	2014/01/13	0.9		%	20
			Dissolved Iron (Fe)	2014/01/13	NC		%	20
			Dissolved Magnesium (Mg)	2014/01/13	0.4		%	20
			Dissolved Manganese (Mn)	2014/01/13	0.7		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Potassium (K)	2014/01/13	0.7		%	20
			Dissolved Sodium (Na)	2014/01/13	0.2		%	20
7348351	SRT	Matrix Spike [IK1796-06]	Dissolved Barium (Ba)	2014/01/13		93	%	80 - 120
			Dissolved Boron (B)	2014/01/13		99	%	80 - 120
			Dissolved Calcium (Ca)	2014/01/13		104	%	80 - 120
			Dissolved Iron (Fe)	2014/01/13		99	%	80 - 120
			Dissolved Lithium (Li)	2014/01/13		90	%	80 - 120
			Dissolved Magnesium (Mg)	2014/01/13		100	%	80 - 120
			Dissolved Manganese (Mn)	2014/01/13		103	%	80 - 120
			Dissolved Phosphorus (P)	2014/01/13		97	%	80 - 120
			Dissolved Potassium (K)	2014/01/13		97	%	80 - 120
			Dissolved Silicon (Si)	2014/01/13		98	%	80 - 120
			Dissolved Sodium (Na)	2014/01/13		87	%	80 - 120
			Dissolved Strontium (Sr)	2014/01/13		97	%	80 - 120
7348351	SRT	Spiked Blank	Dissolved Barium (Ba)	2014/01/13		93	%	80 - 120
			Dissolved Boron (B)	2014/01/13		99	%	80 - 120
			Dissolved Calcium (Ca)	2014/01/13		105	%	80 - 120
			Dissolved Iron (Fe)	2014/01/13		99	%	80 - 120
			Dissolved Lithium (Li)	2014/01/13		89	%	80 - 120
			Dissolved Magnesium (Mg)	2014/01/13		103	%	80 - 120
			Dissolved Manganese (Mn)	2014/01/13		104	%	80 - 120
			Dissolved Phosphorus (P)	2014/01/13		95	%	80 - 120
			Dissolved Potassium (K)	2014/01/13		97	%	80 - 120
			Dissolved Silicon (Si)	2014/01/13		99	%	80 - 120
			Dissolved Sodium (Na)	2014/01/13		89	%	80 - 120
			Dissolved Strontium (Sr)	2014/01/13		96	%	80 - 120
7348351	SRT	Method Blank	Dissolved Barium (Ba)	2014/01/13	<0.010		mg/L	
			Dissolved Boron (B)	2014/01/13	<0.020		mg/L	
			Dissolved Calcium (Ca)	2014/01/13	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/01/13	<0.060		mg/L	
			Dissolved Lithium (Li)	2014/01/13	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2014/01/13	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/01/13	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2014/01/13	<0.10		mg/L	
			Dissolved Potassium (K)	2014/01/13	<0.30		mg/L	
			Dissolved Silicon (Si)	2014/01/13	<0.10		mg/L	
			Dissolved Sodium (Na)	2014/01/13	<0.50		mg/L	
			Dissolved Strontium (Sr)	2014/01/13	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/01/13	<0.20		mg/L	
7348351	SRT	RPD [IK1796-06]	Dissolved Barium (Ba)	2014/01/13	17.8		%	20
			Dissolved Boron (B)	2014/01/13	NC		%	20
			Dissolved Calcium (Ca)	2014/01/13	0.07		%	20
			Dissolved Iron (Fe)	2014/01/13	NC		%	20
			Dissolved Lithium (Li)	2014/01/13	NC		%	20
			Dissolved Magnesium (Mg)	2014/01/13	0.2		%	20
			Dissolved Manganese (Mn)	2014/01/13	0.5		%	20
			Dissolved Phosphorus (P)	2014/01/13	NC		%	20
			Dissolved Potassium (K)	2014/01/13	2.6		%	20
			Dissolved Silicon (Si)	2014/01/13	0.4		%	20
			Dissolved Sodium (Na)	2014/01/13	0.6		%	20
			Dissolved Strontium (Sr)	2014/01/13	NC		%	20
			Dissolved Sulphur (S)	2014/01/13	0.2		%	20
7349276	AP1	Matrix Spike	Dissolved Organic Carbon (C)	2014/01/14		111	%	80 - 120
7349276	AP1	Spiked Blank	Dissolved Organic Carbon (C)	2014/01/14		109	%	80 - 120
7349276	AP1	Method Blank	Dissolved Organic Carbon (C)	2014/01/14	<0.50		mg/L	
7349276	AP1	RPD	Dissolved Organic Carbon (C)	2014/01/14	NC		%	20
7349277	AP1	Matrix Spike	Total Organic Carbon (C)	2014/01/14		112	%	80 - 120
7349277	AP1	Spiked Blank	Total Organic Carbon (C)	2014/01/14		117	%	80 - 120
7349277	AP1	Method Blank	Total Organic Carbon (C)	2014/01/14	<0.50		mg/L	
7349277	AP1	RPD	Total Organic Carbon (C)	2014/01/14	7.8		%	20
7349687	RM9	Matrix Spike	Total Kjeldahl Nitrogen	2014/01/14		NC	%	80 - 120
7349687	RM9	QC Standard	Total Kjeldahl Nitrogen	2014/01/14		111	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7349687	RM9	Spiked Blank	Total Kjeldahl Nitrogen	2014/01/14		94	%	80 - 120
7349687	RM9	Method Blank	Total Kjeldahl Nitrogen	2014/01/14	<0.050		mg/L	
7349687	RM9	RPD	Total Kjeldahl Nitrogen	2014/01/14	0.9		%	20
7349691	RM9	Matrix Spike [IK1796-08]	Dissolved Total Kjeldahl Nitrogen	2014/01/14		96	%	80 - 120
7349691	RM9	QC Standard	Dissolved Total Kjeldahl Nitrogen	2014/01/14		111	%	75 - 125
7349691	RM9	Spiked Blank	Dissolved Total Kjeldahl Nitrogen	2014/01/14		93	%	80 - 120
7349691	RM9	Method Blank	Dissolved Total Kjeldahl Nitrogen	2014/01/14	<0.050		mg/L	
7349693	RM9	Matrix Spike [IK1794-02]	Dissolved Total Kjeldahl Nitrogen	2014/01/14		106	%	80 - 120
7349693	RM9	QC Standard	Dissolved Total Kjeldahl Nitrogen	2014/01/14		119	%	75 - 125
7349693	RM9	Spiked Blank	Dissolved Total Kjeldahl Nitrogen	2014/01/14		91	%	80 - 120
7349693	RM9	Method Blank	Dissolved Total Kjeldahl Nitrogen	2014/01/14	<0.050		mg/L	
7350185	IA0	Matrix Spike	Dissolved Ammonia (N)	2014/01/15		97	%	80 - 120
7350185	IA0	Spiked Blank	Dissolved Ammonia (N)	2014/01/15		103	%	80 - 120
7350185	IA0	Method Blank	Dissolved Ammonia (N)	2014/01/15	<0.050		mg/L	
7350185	IA0	RPD	Dissolved Ammonia (N)	2014/01/15	NC		%	20
7350210	IA0	Matrix Spike	Total Phosphate (P)	2014/01/15		95	%	80 - 120
7350210	IA0	QC Standard	Total Phosphate (P)	2014/01/15		108	%	80 - 120
7350210	IA0	Spiked Blank	Total Phosphate (P)	2014/01/15		96	%	83 - 111
7350210	IA0	Method Blank	Total Phosphate (P)	2014/01/15	<0.0030		mg/L	
7350210	IA0	RPD	Total Phosphate (P)	2014/01/15	NC		%	20
7350217	IA0	Matrix Spike	Dissolved Phosphorus (P)	2014/01/15		NC	%	80 - 120
7350217	IA0	QC Standard	Dissolved Phosphorus (P)	2014/01/15		108	%	80 - 120
7350217	IA0	Spiked Blank	Dissolved Phosphorus (P)	2014/01/15		95	%	83 - 111
7350217	IA0	Method Blank	Dissolved Phosphorus (P)	2014/01/15	<0.0030		mg/L	
7350217	IA0	RPD	Dissolved Phosphorus (P)	2014/01/15	NC		%	20
7350221	IA0	Matrix Spike	Dissolved Phosphate (P)	2014/01/15		93	%	80 - 120
7350221	IA0	QC Standard	Dissolved Phosphate (P)	2014/01/15		108	%	80 - 120
7350221	IA0	Spiked Blank	Dissolved Phosphate (P)	2014/01/15		96	%	83 - 111
7350221	IA0	Method Blank	Dissolved Phosphate (P)	2014/01/15	<0.0030		mg/L	
7350221	IA0	RPD	Dissolved Phosphate (P)	2014/01/15	NC		%	20
7350293	LY	Matrix Spike [IK1794-07]	Total Chemical Oxygen Demand	2014/01/15		98	%	80 - 120
7350293	LY	Spiked Blank	Total Chemical Oxygen Demand	2014/01/15		100	%	80 - 120
7350293	LY	Method Blank	Total Chemical Oxygen Demand	2014/01/15	<5.0		mg/L	
7350293	LY	RPD [IK1794-07]	Total Chemical Oxygen Demand	2014/01/15	NC		%	20
7350294	LY	Matrix Spike	Dissolved Chemical Oxygen Demand	2014/01/15		98	%	80 - 120
7350294	LY	Spiked Blank	Dissolved Chemical Oxygen Demand	2014/01/15		100	%	80 - 120
7350294	LY	Method Blank	Dissolved Chemical Oxygen Demand	2014/01/15	<5.0		mg/L	
7350294	LY	RPD	Dissolved Chemical Oxygen Demand	2014/01/15	NC		%	20
7350297	LY	Matrix Spike [IK1796-08]	Dissolved Chemical Oxygen Demand	2014/01/15		99	%	80 - 120
7350297	LY	Spiked Blank	Dissolved Chemical Oxygen Demand	2014/01/15		100	%	80 - 120
7350297	LY	Method Blank	Dissolved Chemical Oxygen Demand	2014/01/15	7.0, RDL=5.0		mg/L	
7350297	LY	RPD [IK1796-08]	Dissolved Chemical Oxygen Demand	2014/01/15	NC		%	20
7350747	STI	Matrix Spike	Dissolved Calcium (Ca)	2014/01/15		NC	%	80 - 120
			Dissolved Iron (Fe)	2014/01/15		99	%	80 - 120
			Dissolved Magnesium (Mg)	2014/01/15		NC	%	80 - 120
			Dissolved Manganese (Mn)	2014/01/15		98	%	80 - 120
			Dissolved Potassium (K)	2014/01/15		96	%	80 - 120
			Dissolved Sodium (Na)	2014/01/15		NC	%	80 - 120
7350747	STI	Spiked Blank	Dissolved Calcium (Ca)	2014/01/15		105	%	80 - 120
			Dissolved Iron (Fe)	2014/01/15		103	%	80 - 120
			Dissolved Magnesium (Mg)	2014/01/15		100	%	80 - 120
			Dissolved Manganese (Mn)	2014/01/15		103	%	80 - 120
			Dissolved Potassium (K)	2014/01/15		98	%	80 - 120
			Dissolved Sodium (Na)	2014/01/15		94	%	80 - 120
7350747	STI	Method Blank	Dissolved Calcium (Ca)	2014/01/15	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/01/15	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2014/01/15	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/01/15	<0.0040		mg/L	
			Dissolved Potassium (K)	2014/01/15	<0.30		mg/L	
			Dissolved Sodium (Na)	2014/01/15	<0.50		mg/L	
7350747	STI	RPD	Dissolved Calcium (Ca)	2014/01/15	0.4		%	20

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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Iron (Fe)	2014/01/15	NC		%	20
			Dissolved Magnesium (Mg)	2014/01/15	0.4		%	20
			Dissolved Manganese (Mn)	2014/01/15	0.5		%	20
			Dissolved Potassium (K)	2014/01/15	2.9		%	20
			Dissolved Sodium (Na)	2014/01/15	0.3		%	20
7352413	HE1	RPD	Total Dissolved Solids	2014/01/17	4.4		%	20
7354560	JLD	RPD	Conductivity	2014/01/20	0.4		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B401413
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Janet Gao, Senior Analyst, Organics Department

<Original signed by>

Parastoo Khorsand, Scientific Specialist

<Original signed by>

Peng Liang, Analyst II

<Original signed by>

Veronica Falk, Scientific Specialist

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Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody A101933

Page: ____ of ____

Invoice To:	C/O Report Address	Report To: Same as Invoice ☑	Report Distribution (E-Mail):	REGULATORY GUIDELINES:
Company: Norwest corporation			APERRIN@NORWESTCORP.COM	☐ AT1
Contact: Amy Perrin				☐ CCME
Address: 2730 411 151 St SE Calgary				☐ Regulated Drinking Water
Prov: AB PC: T2G 4Y5		Prov: PC:		☐ Other:
Contact #s: Ph: 403 2055792 Cell: 403 9698380		Cell:		

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: 284-1 / Crown Mountain
Site Location: Sparwood
Quote #:
Sampled By: TD / AP

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill			☑VOCs / BTEX F1	BTEX F1-F4 / BTEX F1-F2	Turb / F / Routine Water	DOC / TOC	Regulated Metals (CCME / AT1) Total	Dissolved	Total / Dissolved Mercury	G1 (all)	G2 (all)	G2 F (all)	Phenol	cyanide	nitrate, nitrite, NO2	pH	redox potential	Ammonia Nitrogen	total carbon	R (orthophosphorus (total + dissolved), acidity, color)	HOLD - Do not Analyze	# of Containers Submitted
* 1	QC1		GW	14/01/07 11:40									X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X		
* 2	CM12-01		GW	14/01/07 11:45									X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X		
3	CM11-11		GW	14/01/07 9:00									X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X		
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

8-Jan-14 15:21
Carissa Sumka
B401413
JB0 INS-0024

Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished By (Signature/Print): <Original signed by> Amy Perrin Date (YY/MM/DD): 14/01/08 Time (24:00): 15:21
Relinquished By (Signature/Print): Date (YY/MM/DD): Time (24:00):

Special Instructions: *Not enough sample to fill filtered G2 + metals bottled.
# of Jars Used & Not Submitted

LAB USE ONLY
Received By: Jason Bic Date: 2014/01/08 Time: 1521 Maxxam Job #:
Lab Comments: 01-089
Custody Seal: No Temperature: 1, 2, 3 Ice: Yes

AB FCD-00331 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam

Success Through Science®

Your Project #: B401432
Your C.O.C. #: na

Attention:Carissa Sumka

Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

Report Date: 2014/01/14

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B403895
Received: 2014/01/10, 09:40

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Total Cyanide	1	2014/01/13	2014/01/14	CAM SOP-00457	Ontario MOE CN-E3015

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Shaun Nowickyj,
Email: SNowickyj@maxxam.ca
Phone# (905) 817-5700
===
This report has been generated and distributed using a secure automated process.
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Maxxam Job #: B403895
Report Date: 2014/01/14

Maxxam Analytics
Client Project #: B401432

RESULTS OF ANALYSES OF WATER

Maxxam ID		UM8372		
Sampling Date		2014/01/06 15:00		
COC Number		na		
	Units	IK2096 \ CM13-06	RDL	QC Batch
Total Cyanide (CN)	mg/L	<0.0050	0.0050	3480007

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	-1.0°C

Results relate only to the items tested.

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Maxxam Job #: B403895
Report Date: 2014/01/14

Maxxam Analytics
Client Project #: B401432

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3480007	LHA	Matrix Spike	Total Cyanide (CN)	2014/01/14		100	%	80 - 120
3480007	LHA	Spiked Blank	Total Cyanide (CN)	2014/01/14		104	%	80 - 120
3480007	LHA	Method Blank	Total Cyanide (CN)	2014/01/14	<0.0050		mg/L	
3480007	LHA	RPD	Total Cyanide (CN)	2014/01/14	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Brad Newman, Scientific Specialist

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Your Project #: B401432

Attention: Carissa Sumka
Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

Report Date: 2014/01/15

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B404074
Received: 2014/01/10, 14:14

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Redox Potential	1	2014/01/10	2014/01/14	APHA-SM 2580 B Mod. & ASTM D1498-76 Mod.	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

<Original signed by>

Validated by :
Grace Sison, B.Sc., C.Chem
Senior Project Manager - Petroleum Division

Total cover pages: 1

Maxxam Job #: B404074
Report Date: 2014/01/15

Maxxam Analytics
Client Project #: B401432

RESULTS OF ANALYSES OF WATER

Maxxam ID		UM9517	
Sampling Date		2014/01/06 15:00	
	Units	**IK2096-13R \ CM13-06**	**QC Batch**

Subcontracted Analysis			
Redox Potential	mV	+271	3478700

QC Batch = Quality Control Batch

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Analytics
Attention: Carissa Sumka
Client Project #: B401432
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: SB404074

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3478700	PSH	QC Standard	Redox Potential	2014/01/14		+246	%	238 - 248
		Method Blank	Redox Potential	2014/01/14	+167		mV	
		RPD [UM9517-01]	Redox Potential	2014/01/14	0.4		%	10

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Sladeview Industrial: 4141 Sladeview Cresent, Unit 10, Mississauga L5L 5T1 (905) 569-7599 Fax (905) 569-6250

Validation Signature Page

Maxxam Job #: B404074

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

.

Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division

==

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Your Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A101932

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/01/20
Report #: R1503200
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B401432
Received: 2014/01/08, 15:21

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2014/01/11	AB SOP-00005	SM 2320-B
BTEX/F1 in Water by HS GC/MS	1	N/A	2014/01/11	AB SOP-00039	CCME, EPA 8260C
Cadmium - low level CCME - Dissolved	1	N/A	2014/01/16	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	1	2014/01/08	2014/01/15	AB SOP-00043	EPA 200.8
Chloride by Automated Colourimetry	1	N/A	2014/01/13	AB SOP-00020	SM 4500 Cl-G
Chemical Oxygen Demand	1	N/A	2014/01/15	AB SOP-00016	SM 5220-D
COD (Dissolved) - Lab Filtered	1	N/A	2014/01/15	CAL SOP-00042	SM5220D
True Colour	1	N/A	2014/01/10	CAL SOP-00049	SM 2120 C
Carbon (DOC) - Lab Filtered (1)	1	N/A	2014/01/14	CAL SOP-00077	MMCW 119
Conductivity @25C	1	N/A	2014/01/16	AB SOP-00005	SM 2510-B
CCME Hydrocarbons in Water (F2; C10-C16)	1	2014/01/09	2014/01/09	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	1	N/A	2014/01/14	AB WI-00065	SM 2340B
Elements by ICP (Dissolved) Lab Filtered	1	N/A	2014/01/13	AB SOP-00042	EPA 200.7
Elements by ICP - Total	1	2014/01/13	2014/01/13	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved - Filtered	1	N/A	2014/01/13	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	1	2014/01/13	2014/01/13	AB SOP-00043	EPA 200.8
Ion Balance	1	N/A	2014/01/09	AB WI-00065	SM 1030E
Nitrogen (total), Calc. TKN, NO3, NO2	1	N/A	2014/01/14	AB WI-00065	SM 4500-N A
Ammonia-N (Dissolved) - Lab Filtered	1	N/A	2014/01/15	AB SOP-00007	EPA 350.1
Ammonia-N (Total)	1	N/A	2014/01/10	AB SOP-00007	EPA 350.1
Nitrate and Nitrite	1	N/A	2014/01/10	AB SOP-00023	SM4110B
Nitrate + Nitrite-N (calculated)	1	N/A	2014/01/10	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	1	N/A	2014/01/10	AB SOP-00023	SM 4110-B
Benzo[a]pyrene Equivalency	1	N/A	2014/01/10	AB SOP-00003	EPA 8270D
PAH in Water by GC/MS (2)	1	2014/01/09	2014/01/09	AB SOP-00003 AB SOP-00037	EPA 3510C/8270D
pH @25°C (Alkalinity titrator)	1	N/A	2014/01/11	AB SOP-00005	SM 4500-H+B
Phenols (4-AAP)	1	N/A	2014/01/09	CAL SOP-00067	EPA 420.2
Orthophosphate by Konelab	1	N/A	2014/01/10	AB SOP-00025	SM 4500-P
Sulphate by Automated Colourimetry	1	N/A	2014/01/13	AB SOP-00018	SM 4500 SO4-E

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Your Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A101932

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/01/20
Report #: R1503200
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B401432
Received: 2014/01/08, 15:21

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Dissolved Solids (Filt. Residue)	1	2014/01/17	2014/01/17	CAL SOP-00074	SM 2540-C
Total Dissolved Solids (Calculated)	1	N/A	2014/01/14	AB WI-00065	SM 1030E
Total Trihalomethanes Calculation	1	N/A	2014/01/10	CAL SOP-00104	EPA 8260 C
Total Kjeldahl Nitrogen (Diss.) Filtered	1	2014/01/14	2014/01/14	AB SOP-00008	EPA 351.1, 351.2
Total Kjeldahl Nitrogen	1	2014/01/14	2014/01/14	AB SOP-00008	EPA 351.1, 351.2
Carbon (Total Organic) (3)	1	N/A	2014/01/14	CAL SOP-00077	MMCW 119
Total Phosphorus -P (Dissolved) Filtered	1	2014/01/15	2014/01/15	AB SOP-00024	SM 4500-P
Total Phosphorus	1	2014/01/15	2014/01/15	AB SOP-00024	SM 4500-P
Total Suspended Solids (NFR)	1	2014/01/10	2014/01/10	AB SOP-00061	SM 2540-D
Turbidity	1	N/A	2014/01/09	CAL SOP-00081	SM 2130B
VOCs in Water by HS GC/MS (Std List)	1	N/A	2014/01/10	CAL SOP-00227	EPA 8260 C

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) DOC present in the sample should be considered as non-purgeable DOC.
(2) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(3) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Carissa Sumka, Project Manager
Email: CSumka@maxxam.ca
Phone# (403) 291-3077
==
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Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		IK2096		
Sampling Date		2014/01/06 15:00		
COC Number		A101932		
	Units	CM13-06	RDL	QC Batch
Hydrocarbons				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	7345340
Volatiles				
Benzene	ug/L	<0.40	0.40	7346113
Toluene	ug/L	<0.40	0.40	7346113
Ethylbenzene	ug/L	<0.40	0.40	7346113
m & p-Xylene	ug/L	<0.80	0.80	7346113
o-Xylene	ug/L	<0.40	0.40	7346113
Xylenes (Total)	ug/L	<0.80	0.80	7346113
F1 (C6-C10) - BTEX	ug/L	<100	100	7346113
(C6-C10)	ug/L	<100	100	7346113
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	127	N/A	7346113
4-BROMOFLUOROBENZENE (sur.)	%	93	N/A	7346113
D4-1,2-DICHLOROETHANE (sur.)	%	129	N/A	7346113
O-TERPHENYL (sur.)	%	116	N/A	7345340

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		IK2096	IK2096		
Sampling Date		2014/01/06 15:00	2014/01/06 15:00		
COC Number		A101932	A101932		
	Units	**CM13-06**	**CM13-06 REPEAT**	**RDL**	**QC Batch**
Calculated Parameters					
Hardness (CaCO3)	mg/L	28	N/A	0.50	7344335
Ion Balance	N/A	1.1	N/A	0.010	7344336
Dissolved Nitrate (NO3)	mg/L	0.24	N/A	0.013	7344338
Nitrate plus Nitrite (N)	mg/L	0.055	N/A	0.0030	7344339
Dissolved Nitrite (NO2)	mg/L	<0.0099	N/A	0.0099	7344338
Total Dissolved Solids	mg/L	41	N/A	10	7344340
Misc. Inorganics					
Conductivity	uS/cm	N/A	54	1.0	7352133
pH	pH	6.80	N/A	N/A	7347168
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.065	N/A	0.0050	7345057
Anions					
Alkalinity (PP as CaCO3)	mg/L	<0.50	N/A	0.50	7347166
Alkalinity (Total as CaCO3)	mg/L	16	N/A	0.50	7347166
Bicarbonate (HCO3)	mg/L	20	N/A	0.50	7347166
Carbonate (CO3)	mg/L	<0.50	N/A	0.50	7347166
Hydroxide (OH)	mg/L	<0.50	N/A	0.50	7347166
Dissolved Sulphate (SO4)	mg/L	14	N/A	1.0	7348084
Dissolved Chloride (Cl)	mg/L	1.7	N/A	1.0	7348079
Nutrients					
Dissolved Nitrite (N)	mg/L	<0.0030	N/A	0.0030	7346449
Dissolved Nitrate (N)	mg/L	0.055	N/A	0.0030	7346449
Elements					
Dissolved Aluminum (Al)	mg/L	0.97	N/A	0.0030	7348273
Dissolved Antimony (Sb)	mg/L	0.0011	N/A	0.00060	7348273
Dissolved Arsenic (As)	mg/L	0.0019	N/A	0.00020	7348273
Dissolved Barium (Ba)	mg/L	<0.10	N/A	0.10	7348344
Dissolved Beryllium (Be)	mg/L	<0.0010	N/A	0.0010	7348273
Dissolved Boron (B)	mg/L	<0.20	N/A	0.20	7348344
Dissolved Calcium (Ca)	mg/L	N/A	7.4	0.30	7350747
Dissolved Chromium (Cr)	mg/L	0.0059	N/A	0.0010	7348273
Dissolved Cobalt (Co)	mg/L	0.0014	N/A	0.00030	7348273
Dissolved Copper (Cu)	mg/L	0.0013	N/A	0.00020	7348273

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		IK2096	IK2096		
Sampling Date		2014/01/06 15:00	2014/01/06 15:00		
COC Number		A101932	A101932		
	Units	**CM13-06**	**CM13-06 REPEAT**	**RDL**	**QC Batch**
Dissolved Iron (Fe)	mg/L	N/A	1.2	0.060	7350747
Dissolved Lead (Pb)	mg/L	0.0019	N/A	0.00020	7348273
Dissolved Lithium (Li)	mg/L	<0.20	N/A	0.20	7348344
Dissolved Magnesium (Mg)	mg/L	N/A	2.4	0.20	7350747
Dissolved Manganese (Mn)	mg/L	N/A	0.0095	0.0040	7350747
Dissolved Molybdenum (Mo)	mg/L	0.00033	N/A	0.00020	7348273
Dissolved Nickel (Ni)	mg/L	0.0077	N/A	0.00050	7348273
Dissolved Phosphorus (P)	mg/L	<1.0	N/A	1.0	7348344
Dissolved Potassium (K)	mg/L	N/A	0.88	0.30	7350747
Dissolved Selenium (Se)	mg/L	0.00036	N/A	0.00020	7348273
Dissolved Silicon (Si)	mg/L	8.4	N/A	1.0	7348344
Dissolved Silver (Ag)	mg/L	0.00010	N/A	0.00010	7348273
Dissolved Sodium (Na)	mg/L	N/A	2.9	0.50	7350747
Dissolved Strontium (Sr)	mg/L	<0.20	N/A	0.20	7348344
Dissolved Sulphur (S)	mg/L	3.2	N/A	2.0	7348344
Dissolved Thallium (Tl)	mg/L	<0.00020	N/A	0.00020	7348273
Dissolved Tin (Sn)	mg/L	<0.0010	N/A	0.0010	7348273
Dissolved Titanium (Ti)	mg/L	0.0033 (1)	N/A	0.0010	7348273
Dissolved Uranium (U)	mg/L	0.00028	N/A	0.00010	7348273
Dissolved Vanadium (V)	mg/L	0.013	N/A	0.0010	7348273
Dissolved Zinc (Zn)	mg/L	0.031	N/A	0.0030	7348273

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).

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Maxxam Job #: B401432
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NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		IK2096		
Sampling Date		2014/01/06 15:00		
COC Number		A101932		
	Units	**CM13-06**	**RDL**	**QC Batch**
Low Level Elements				
Total Cadmium (Cd)	ug/L	14	0.0050	7344626
Elements				
Total Aluminum (Al)	mg/L	110 (1)	0.015	7347961
Total Antimony (Sb)	mg/L	0.0012	0.00060	7347961
Total Arsenic (As)	mg/L	0.20	0.00020	7347961
Total Barium (Ba)	mg/L	7.8	0.10	7347967
Total Beryllium (Be)	mg/L	0.038	0.0010	7347961
Total Boron (B)	mg/L	<0.20	0.20	7347967
Total Calcium (Ca)	mg/L	120	3.0	7347967
Total Chromium (Cr)	mg/L	0.18	0.0010	7347961
Total Cobalt (Co)	mg/L	0.36	0.00030	7347961
Total Copper (Cu)	mg/L	0.67	0.00020	7347961
Total Iron (Fe)	mg/L	550	0.60	7347967
Total Lead (Pb)	mg/L	0.54	0.00020	7347961
Total Lithium (Li)	mg/L	<0.20	0.20	7347967
Total Magnesium (Mg)	mg/L	31	2.0	7347967
Total Manganese (Mn)	mg/L	2.8	0.040	7347967
Total Molybdenum (Mo)	mg/L	0.0098	0.00020	7347961
Total Nickel (Ni)	mg/L	1.1	0.00050	7347961
Total Phosphorus (P)	mg/L	19	1.0	7347967
Total Potassium (K)	mg/L	29	3.0	7347967
Total Selenium (Se)	mg/L	0.0066	0.00020	7347961
Total Silicon (Si)	mg/L	140	1.0	7347967
Total Silver (Ag)	mg/L	0.020	0.00010	7347961
Total Sodium (Na)	mg/L	<5.0	5.0	7347967
Total Strontium (Sr)	mg/L	0.68	0.20	7347967
Total Sulphur (S)	mg/L	12	2.0	7347967
Total Thallium (Tl)	mg/L	0.0046	0.00020	7347961
Total Tin (Sn)	mg/L	0.0019	0.0010	7347961
Total Titanium (Ti)	mg/L	0.10	0.0010	7347961
Total Uranium (U)	mg/L	0.043	0.00010	7347961
Total Vanadium (V)	mg/L	0.46	0.0010	7347961
Total Zinc (Zn)	mg/L	5.2 (1)	0.015	7347961

RDL = Reportable Detection Limit

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

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Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		IK2096	IK2096	IK2096		
Sampling Date		2014/01/06 15:00	2014/01/06 15:00	2014/01/06 15:00		
COC Number		A101932	A101932	A101932		
	Units	**CM13-06**	**CM13-06 REPEAT**	**CM13-06 Lab-Dup**	**RDL**	**QC Batch**
CONVENTIONALS						
Dissolved Ammonia (N)	mg/L	<0.050	N/A	<0.050	0.050	7350185
Misc. Inorganics						
Dissolved Total Kjeldahl Nitrogen	mg/L	<0.050	N/A	N/A	0.050	7349693
Demand Parameters						
Dissolved Chemical Oxygen Demand	mg/L	5.0	N/A	10	5.0	7350294
Total Chemical Oxygen Demand	mg/L	11	N/A	N/A	5.0	7350293
Misc. Inorganics						
Dissolved Organic Carbon (C)	mg/L	<5.0 (1)	N/A	<5.0	5.0	7349276
Total Organic Carbon (C)	mg/L	2.4	N/A	N/A	0.50	7349277
Total Dissolved Solids	mg/L	N/A	1900 (2)	N/A	100	7352413
Total Suspended Solids	mg/L	9900 (3)	N/A	N/A	75	7346182
Nutrients						
Total Ammonia (N)	mg/L	0.073 (4)	N/A	N/A	0.050	7346815
Total Kjeldahl Nitrogen	mg/L	14 (3)	N/A	N/A	0.50	7349687
Total Nitrogen (N)	mg/L	14	N/A	N/A	0.050	7348114
Orthophosphate (P)	mg/L	0.073 (5)	N/A	N/A	0.0030	7346704
Total Phosphate (P)	mg/L	19 (3)	N/A	N/A	0.30	7350210
Dissolved Phosphorus (P)	mg/L	0.17 (3)	N/A	0.19	0.060	7350217
Misc. Organics						
Phenols	mg/L	<0.0020	N/A	N/A	0.0020	7345346
Physical Properties						
True Colour	PtCo units	99	N/A	N/A	2.0	7346893
Physical Properties						
Turbidity	NTU	>1000 (6)	N/A	N/A	0.10	7345783

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

N/A = Not Applicable

(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly. Dissolved greater than total. Results are within limits of uncertainty(MU).

(2) Sample was originally processed within hold time, but required a smaller volume for analysis. Re-analysis was completed past recommended hold time.

(3) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

(4) Ammonia greater than TKN. Results are within limits of uncertainty(MU).

(5) Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.

(6) Sample contains sediment

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Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		IK2096		
Sampling Date		2014/01/06 15:00		
COC Number		A101932		
	Units	CM13-06	RDL	QC Batch
Polycyclic Aromatics				
Benzo[a]pyrene equivalency	ug/L	0.010	0.010	7344392
Acenaphthene	ug/L	<0.10	0.10	7344969
Acenaphthylene	ug/L	<0.10	0.10	7344969
Acridine	ug/L	<0.20	0.20	7344969
Anthracene	ug/L	<0.010	0.010	7344969
Benzo(a)anthracene	ug/L	<0.0085	0.0085	7344969
Benzo(b&j)fluoranthene	ug/L	0.012	0.0085	7344969
Benzo(k)fluoranthene	ug/L	<0.0085	0.0085	7344969
Benzo(g,h,i)perylene	ug/L	<0.0085	0.0085	7344969
Benzo(c)phenanthrene	ug/L	<0.050	0.050	7344969
Benzo(a)pyrene	ug/L	<0.0075	0.0075	7344969
Benzo[e]pyrene	ug/L	<0.050	0.050	7344969
Chrysene	ug/L	0.026	0.0085	7344969
Dibenz(a,h)anthracene	ug/L	<0.0075	0.0075	7344969
Fluoranthene	ug/L	<0.010	0.010	7344969
Fluorene	ug/L	<0.050	0.050	7344969
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	0.0085	7344969
2-Methylnaphthalene	ug/L	0.63	0.10	7344969
Naphthalene	ug/L	0.64	0.10	7344969
Phenanthrene	ug/L	<0.050	0.050	7344969
Perylene	ug/L	<0.050	0.050	7344969
Pyrene	ug/L	<0.020	0.020	7344969
Quinoline	ug/L	<0.20	0.20	7344969
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	95	N/A	7344969
D12-BENZO(A)PYRENE (sur.)	%	105	N/A	7344969
D8-ACENAPHTHYLENE (sur.)	%	98	N/A	7344969
TERPHENYL-D14 (sur.)	%	112	N/A	7344969

RDL = Reportable Detection Limit
N/A = Not Applicable

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VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		IK2096		
Sampling Date		2014/01/06 15:00		
COC Number		A101932		
	Units	**CM13-06**	**RDL**	**QC Batch**
Volatiles				
Total Trihalomethanes	ug/L	<2.0	2.0	7344559
Bromodichloromethane	ug/L	<0.50	0.50	7346405
Bromoform	ug/L	<0.50	0.50	7346405
Bromomethane	ug/L	<2.0	2.0	7346405
Carbon tetrachloride	ug/L	<0.50	0.50	7346405
Chlorobenzene	ug/L	<0.50	0.50	7346405
Chlorodibromomethane	ug/L	<1.0	1.0	7346405
Chloroethane	ug/L	<1.0	1.0	7346405
Chloroform	ug/L	<0.50	0.50	7346405
Chloromethane	ug/L	<2.0	2.0	7346405
1,2-dibromoethane	ug/L	<0.50	0.50	7346405
1,2-dichlorobenzene	ug/L	<0.50	0.50	7346405
1,3-dichlorobenzene	ug/L	<0.50	0.50	7346405
1,4-dichlorobenzene	ug/L	<0.50	0.50	7346405
1,1-dichloroethane	ug/L	<0.50	0.50	7346405
1,2-dichloroethane	ug/L	<0.50	0.50	7346405
1,1-dichloroethene	ug/L	<0.50	0.50	7346405
cis-1,2-dichloroethene	ug/L	<0.50	0.50	7346405
trans-1,2-dichloroethene	ug/L	<0.50	0.50	7346405
Dichloromethane	ug/L	<2.0	2.0	7346405
1,2-dichloropropane	ug/L	<0.50	0.50	7346405
cis-1,3-dichloropropene	ug/L	<0.50	0.50	7346405
trans-1,3-dichloropropene	ug/L	<0.50	0.50	7346405
Methyl methacrylate	ug/L	<0.50	0.50	7346405
Methyl-tert-butylether (MTBE)	ug/L	<0.50	0.50	7346405
Styrene	ug/L	<0.50	0.50	7346405
1,1,1,2-tetrachloroethane	ug/L	<2.0	2.0	7346405
1,1,2,2-tetrachloroethane	ug/L	<2.0	2.0	7346405
Tetrachloroethene	ug/L	<0.50	0.50	7346405
1,2,3-trichlorobenzene	ug/L	<1.0	1.0	7346405
1,2,4-trichlorobenzene	ug/L	<1.0	1.0	7346405
1,3,5-trichlorobenzene	ug/L	<0.50	0.50	7346405
1,1,1-trichloroethane	ug/L	<0.50	0.50	7346405
1,1,2-trichloroethane	ug/L	<0.50	0.50	7346405
RDL = Reportable Detection Limit				

Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		IK2096		
Sampling Date		2014/01/06 15:00		
COC Number		A101932		
	Units	**CM13-06**	**RDL**	**QC Batch**
Trichloroethene	ug/L	<0.50	0.50	7346405
Trichlorofluoromethane	ug/L	<0.50	0.50	7346405
1,2,4-trimethylbenzene	ug/L	<0.50	0.50	7346405
1,3,5-trimethylbenzene	ug/L	<0.50	0.50	7346405
Vinyl chloride	ug/L	<0.50	0.50	7346405
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	100	N/A	7346405
4-BROMOFLUOROBENZENE (sur.)	%	105	N/A	7346405
D4-1,2-DICHLOROETHANE (sur.)	%	96	N/A	7346405
RDL = Reportable Detection Limit N/A = Not Applicable				

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C

Total Cyanide results are attached to this report file. The reference number from Maxxam Campo for these results is B403895.

Redox Potential results are attached to this report file. The reference number from Maxxam Sladeview for these results is B404074.

Sample IK2096-01 : TDS/ EC ratio and TDSC / TDS ratio exceeds normal acceptance limits, reanalysis yields similar results, possible matrix interference.

ROUTINE WATER & DISS. REGULATED METALS (WATER) Comments

Sample IK2096-02 Elements by ICP (Dissolved) Lab Filtered: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

REGULATED METALS (CCME/AT1) - TOTAL Comments

Sample IK2096-07 Elements by ICP - Total: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Sample IK2096, Elements by ICP (Dissolved) Lab Filtered: Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7344969	LZ3	Matrix Spike	D10-ANTHRACENE (sur.)	2014/01/09		113	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/01/09		130	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/01/09		116	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/01/09		121	%	50 - 130
			Acenaphthene	2014/01/09		108	%	50 - 130
			Acenaphthylene	2014/01/09		116	%	50 - 130
			Acridine	2014/01/09		91	%	50 - 130
			Anthracene	2014/01/09		102	%	50 - 130
			Benzo(a)anthracene	2014/01/09		111	%	50 - 130
			Benzo(b&j)fluoranthene	2014/01/09		101	%	50 - 130
			Benzo(k)fluoranthene	2014/01/09		82	%	50 - 130
			Benzo(g,h,i)perylene	2014/01/09		81	%	50 - 130
			Benzo(c)phenanthrene	2014/01/09		112	%	50 - 130
			Benzo(a)pyrene	2014/01/09		91	%	50 - 130
			Benzo[e]pyrene	2014/01/09		89	%	50 - 130
			Chrysene	2014/01/09		105	%	50 - 130
			Dibenz(a,h)anthracene	2014/01/09		93	%	50 - 130
			Fluoranthene	2014/01/09		112	%	50 - 130
			Fluorene	2014/01/09		111	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/01/09		88	%	50 - 130
			2-Methylnaphthalene	2014/01/09		91	%	50 - 130
			Naphthalene	2014/01/09		107	%	50 - 130
			Phenanthrene	2014/01/09		111	%	50 - 130
			Perylene	2014/01/09		86	%	50 - 130
			Pyrene	2014/01/09		115	%	50 - 130
			Quinoline	2014/01/09		97	%	50 - 130
7344969	LZ3	Spiked Blank	D10-ANTHRACENE (sur.)	2014/01/09		108	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/01/09		125	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/01/09		112	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/01/09		115	%	50 - 130
			Acenaphthene	2014/01/09		100	%	50 - 130
			Acenaphthylene	2014/01/09		106	%	50 - 130
			Acridine	2014/01/09		87	%	50 - 130
			Anthracene	2014/01/09		97	%	50 - 130
			Benzo(a)anthracene	2014/01/09		110	%	50 - 130
			Benzo(b&j)fluoranthene	2014/01/09		118	%	50 - 130
			Benzo(k)fluoranthene	2014/01/09		112	%	50 - 130
			Benzo(g,h,i)perylene	2014/01/09		104	%	50 - 130
			Benzo(c)phenanthrene	2014/01/09		103	%	50 - 130
			Benzo(a)pyrene	2014/01/09		107	%	50 - 130
			Benzo[e]pyrene	2014/01/09		105	%	50 - 130
			Chrysene	2014/01/09		112	%	50 - 130
			Dibenz(a,h)anthracene	2014/01/09		120	%	50 - 130
			Fluoranthene	2014/01/09		103	%	50 - 130
			Fluorene	2014/01/09		103	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/01/09		113	%	50 - 130
			2-Methylnaphthalene	2014/01/09		83	%	50 - 130
			Naphthalene	2014/01/09		97	%	50 - 130
			Phenanthrene	2014/01/09		102	%	50 - 130
			Perylene	2014/01/09		106	%	50 - 130
			Pyrene	2014/01/09		107	%	50 - 130
			Quinoline	2014/01/09		93	%	50 - 130
7344969	LZ3	Method Blank	D10-ANTHRACENE (sur.)	2014/01/09		104	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/01/09		120	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/01/09		105	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/01/09		112	%	50 - 130
			Acenaphthene	2014/01/09	<0.10		ug/L	
			Acenaphthylene	2014/01/09	<0.10		ug/L	
			Acridine	2014/01/09	<0.20		ug/L	
			Anthracene	2014/01/09	<0.010		ug/L	
			Benzo(a)anthracene	2014/01/09	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2014/01/09	<0.0085		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Benzo(k)fluoranthene	2014/01/09	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2014/01/09	<0.0085		ug/L	
			Benzo(c)phenanthrene	2014/01/09	<0.050		ug/L	
			Benzo(a)pyrene	2014/01/09	<0.0075		ug/L	
			Benzo[e]pyrene	2014/01/09	<0.050		ug/L	
			Chrysene	2014/01/09	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2014/01/09	<0.0075		ug/L	
			Fluoranthene	2014/01/09	<0.010		ug/L	
			Fluorene	2014/01/09	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2014/01/09	<0.0085		ug/L	
			2-Methylnaphthalene	2014/01/09	<0.10		ug/L	
			Naphthalene	2014/01/09	<0.10		ug/L	
			Phenanthrene	2014/01/09	<0.050		ug/L	
			Perylene	2014/01/09	<0.050		ug/L	
			Pyrene	2014/01/09	<0.020		ug/L	
			Quinoline	2014/01/09	<0.20		ug/L	
7344969	LZ3	RPD	Acenaphthene	2014/01/09	NC		%	40
			Acenaphthylene	2014/01/09	NC		%	40
			Acridine	2014/01/09	NC		%	40
			Anthracene	2014/01/09	NC		%	40
			Benzo(a)anthracene	2014/01/09	NC		%	40
			Benzo(b&j)fluoranthene	2014/01/09	NC		%	40
			Benzo(k)fluoranthene	2014/01/09	NC		%	40
			Benzo(g,h,i)perylene	2014/01/09	NC		%	40
			Benzo(c)phenanthrene	2014/01/09	NC		%	40
			Benzo(a)pyrene	2014/01/09	NC		%	40
			Benzo[e]pyrene	2014/01/09	NC		%	40
			Chrysene	2014/01/09	NC		%	40
			Dibenz(a,h)anthracene	2014/01/09	NC		%	40
			Fluoranthene	2014/01/09	NC		%	40
			Fluorene	2014/01/09	NC		%	40
			Indeno(1,2,3-cd)pyrene	2014/01/09	NC		%	40
			2-Methylnaphthalene	2014/01/09	NC		%	40
			Naphthalene	2014/01/09	NC		%	40
			Phenanthrene	2014/01/09	NC		%	40
			Perylene	2014/01/09	NC		%	40
			Pyrene	2014/01/09	NC		%	40
			Quinoline	2014/01/09	NC		%	40
7345141	HE1	RPD	Total Dissolved Solids	2014/01/09	NC		%	20
7345340	VP4	Matrix Spike	O-TERPHENYL (sur.)	2014/01/09		129	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/01/09		121	%	50 - 130
7345340	VP4	Spiked Blank	O-TERPHENYL (sur.)	2014/01/09		103	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/01/09		97	%	70 - 130
7345340	VP4	Method Blank	O-TERPHENYL (sur.)	2014/01/09		108	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/01/09	<0.10		mg/L	
7345340	VP4	RPD	F2 (C10-C16 Hydrocarbons)	2014/01/09	NC		%	40
7345346	LY	Matrix Spike	Phenols	2014/01/09		101	%	80 - 120
7345346	LY	Spiked Blank	Phenols	2014/01/09		105	%	80 - 120
7345346	LY	Method Blank	Phenols	2014/01/09	<0.0020		mg/L	
7345346	LY	RPD	Phenols	2014/01/09	NC		%	20
7345783	HE1	Spiked Blank	Turbidity	2014/01/09		96	%	80 - 120
7345783	HE1	Method Blank	Turbidity	2014/01/09	<0.10		NTU	
7345783	HE1	RPD	Turbidity	2014/01/09	1.2		%	20
7346113	MZ	Matrix Spike	1,4-Difluorobenzene (sur.)	2014/01/11		124	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/11		97	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/11		127	%	70 - 130
			Benzene	2014/01/11		104	%	70 - 130
			Toluene	2014/01/11		103	%	70 - 130
			Ethylbenzene	2014/01/11		104	%	70 - 130
			m & p-Xylene	2014/01/11		108	%	70 - 130
			o-Xylene	2014/01/11		107	%	70 - 130
			(C6-C10)	2014/01/11		110	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7346113	MZ	Spiked Blank	1,4-Difluorobenzene (sur.)	2014/01/11		124	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/11		95	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/11		126	%	70 - 130
			Benzene	2014/01/11		96	%	70 - 130
			Toluene	2014/01/11		96	%	70 - 130
			Ethylbenzene	2014/01/11		98	%	70 - 130
			m & p-Xylene	2014/01/11		100	%	70 - 130
			o-Xylene	2014/01/11		99	%	70 - 130
			(C6-C10)	2014/01/11		98	%	70 - 130
7346113	MZ	Method Blank	1,4-Difluorobenzene (sur.)	2014/01/11		129	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/11		94	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/11		129	%	70 - 130
			Benzene	2014/01/11	<0.40		ug/L	
			Toluene	2014/01/11	<0.40		ug/L	
			Ethylbenzene	2014/01/11	<0.40		ug/L	
			m & p-Xylene	2014/01/11	<0.80		ug/L	
			o-Xylene	2014/01/11	<0.40		ug/L	
			Xylenes (Total)	2014/01/11	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2014/01/11	<100		ug/L	
			(C6-C10)	2014/01/11	<100		ug/L	
7346113	MZ	RPD	Benzene	2014/01/11	NC		%	40
			Toluene	2014/01/11	NC		%	40
			Ethylbenzene	2014/01/11	NC		%	40
			m & p-Xylene	2014/01/11	NC		%	40
			o-Xylene	2014/01/11	NC		%	40
			Xylenes (Total)	2014/01/11	NC		%	40
			F1 (C6-C10) - BTEX	2014/01/11	NC		%	40
			(C6-C10)	2014/01/11	NC		%	40
7346182	HE1	Matrix Spike	Total Suspended Solids	2014/01/10		110	%	80 - 120
7346182	HE1	Spiked Blank	Total Suspended Solids	2014/01/10		94	%	80 - 120
7346182	HE1	Method Blank	Total Suspended Solids	2014/01/10	<1.0		mg/L	
7346182	HE1	RPD	Total Suspended Solids	2014/01/10	8.0		%	20
7346405	GP4	Matrix Spike	1,4-Difluorobenzene (sur.)	2014/01/10		101	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		104	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		102	%	70 - 130
			Bromodichloromethane	2014/01/10		118	%	70 - 130
			Bromoform	2014/01/10		111	%	70 - 130
			Bromomethane	2014/01/10		110	%	70 - 130
			Carbon tetrachloride	2014/01/10		102	%	70 - 130
			Chlorobenzene	2014/01/10		106	%	70 - 130
			Chlorodibromomethane	2014/01/10		116	%	70 - 130
			Chloroethane	2014/01/10		103	%	70 - 130
			Chloroform	2014/01/10		114	%	70 - 130
			Chloromethane	2014/01/10		89	%	70 - 130
			1,2-dibromoethane	2014/01/10		115	%	70 - 130
			1,2-dichlorobenzene	2014/01/10		109	%	70 - 130
			1,3-dichlorobenzene	2014/01/10		107	%	70 - 130
			1,4-dichlorobenzene	2014/01/10		106	%	70 - 130
			1,1-dichloroethane	2014/01/10		105	%	70 - 130
			1,2-dichloroethane	2014/01/10		110	%	70 - 130
			1,1-dichloroethene	2014/01/10		107	%	70 - 130
			cis-1,2-dichloroethene	2014/01/10		105	%	70 - 130
			trans-1,2-dichloroethene	2014/01/10		105	%	70 - 130
			Dichloromethane	2014/01/10		106	%	70 - 130
			1,2-dichloropropane	2014/01/10		108	%	70 - 130
			cis-1,3-dichloropropene	2014/01/10		128	%	70 - 130
			trans-1,3-dichloropropene	2014/01/10		139 (1)	%	70 - 130
			Methyl methacrylate	2014/01/10		113	%	70 - 130
			Methyl-tert-butylether (MTBE)	2014/01/10		102	%	70 - 130
			Styrene	2014/01/10		111	%	70 - 130
			1,1,1,2-tetrachloroethane	2014/01/10		117	%	70 - 130
			1,1,2,2-tetrachloroethane	2014/01/10		107	%	70 - 130

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Tetrachloroethene	2014/01/10		102	%	70 - 130
			1,2,3-trichlorobenzene	2014/01/10		104	%	70 - 130
			1,2,4-trichlorobenzene	2014/01/10		102	%	70 - 130
			1,3,5-trichlorobenzene	2014/01/10		105	%	70 - 130
			1,1,1-trichloroethane	2014/01/10		107	%	70 - 130
			1,1,2-trichloroethane	2014/01/10		112	%	70 - 130
			Trichloroethene	2014/01/10		102	%	70 - 130
			Trichlorofluoromethane	2014/01/10		98	%	70 - 130
			1,2,4-trimethylbenzene	2014/01/10		105	%	70 - 130
			1,3,5-trimethylbenzene	2014/01/10		110	%	70 - 130
			Vinyl chloride	2014/01/10		103	%	70 - 130
7346405	GP4	Spiked Blank	1,4-Difluorobenzene (sur.)	2014/01/10		101	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		105	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		102	%	70 - 130
			Bromodichloromethane	2014/01/10		111	%	70 - 130
			Bromoform	2014/01/10		102	%	70 - 130
			Bromomethane	2014/01/10		94	%	70 - 130
			Carbon tetrachloride	2014/01/10		98	%	70 - 130
			Chlorobenzene	2014/01/10		100	%	70 - 130
			Chlorodibromomethane	2014/01/10		109	%	70 - 130
			Chloroethane	2014/01/10		99	%	70 - 130
			Chloroform	2014/01/10		109	%	70 - 130
			Chloromethane	2014/01/10		102	%	70 - 130
			1,2-dibromoethane	2014/01/10		104	%	70 - 130
			1,2-dichlorobenzene	2014/01/10		103	%	70 - 130
			1,3-dichlorobenzene	2014/01/10		101	%	70 - 130
			1,4-dichlorobenzene	2014/01/10		101	%	70 - 130
			1,1-dichloroethane	2014/01/10		100	%	70 - 130
			1,2-dichloroethane	2014/01/10		103	%	70 - 130
			1,1-dichloroethene	2014/01/10		103	%	70 - 130
			cis-1,2-dichloroethene	2014/01/10		100	%	70 - 130
			trans-1,2-dichloroethene	2014/01/10		102	%	70 - 130
			Dichloromethane	2014/01/10		101	%	70 - 130
			1,2-dichloropropane	2014/01/10		104	%	70 - 130
			cis-1,3-dichloropropene	2014/01/10		108	%	70 - 130
			trans-1,3-dichloropropene	2014/01/10		104	%	70 - 130
			Methyl methacrylate	2014/01/10		106	%	70 - 130
			Methyl-tert-butylether (MTBE)	2014/01/10		101	%	70 - 130
			Styrene	2014/01/10		105	%	70 - 130
			1,1,1,2-tetrachloroethane	2014/01/10		110	%	70 - 130
			1,1,2,2-tetrachloroethane	2014/01/10		99	%	70 - 130
			Tetrachloroethene	2014/01/10		97	%	70 - 130
			1,2,3-trichlorobenzene	2014/01/10		98	%	70 - 130
			1,2,4-trichlorobenzene	2014/01/10		96	%	70 - 130
			1,3,5-trichlorobenzene	2014/01/10		100	%	70 - 130
			1,1,1-trichloroethane	2014/01/10		103	%	70 - 130
			1,1,2-trichloroethane	2014/01/10		106	%	70 - 130
			Trichloroethene	2014/01/10		98	%	70 - 130
			Trichlorofluoromethane	2014/01/10		95	%	70 - 130
			1,2,4-trimethylbenzene	2014/01/10		100	%	70 - 130
			1,3,5-trimethylbenzene	2014/01/10		106	%	70 - 130
			Vinyl chloride	2014/01/10		100	%	70 - 130
7346405	GP4	Method Blank	1,4-Difluorobenzene (sur.)	2014/01/10		100	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2014/01/10		99	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2014/01/10		99	%	70 - 130
			Bromodichloromethane	2014/01/10	<0.50		ug/L	
			Bromoform	2014/01/10	<0.50		ug/L	
			Bromomethane	2014/01/10	<2.0		ug/L	
			Carbon tetrachloride	2014/01/10	<0.50		ug/L	
			Chlorobenzene	2014/01/10	<0.50		ug/L	
			Chlorodibromomethane	2014/01/10	<1.0		ug/L	
			Chloroethane	2014/01/10	<1.0		ug/L	

Maxxam Job #: B401432
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Chloroform	2014/01/10	<0.50		ug/L	
			Chloromethane	2014/01/10	<2.0		ug/L	
			1,2-dibromoethane	2014/01/10	<0.50		ug/L	
			1,2-dichlorobenzene	2014/01/10	<0.50		ug/L	
			1,3-dichlorobenzene	2014/01/10	<0.50		ug/L	
			1,4-dichlorobenzene	2014/01/10	<0.50		ug/L	
			1,1-dichloroethane	2014/01/10	<0.50		ug/L	
			1,2-dichloroethane	2014/01/10	<0.50		ug/L	
			1,1-dichloroethene	2014/01/10	<0.50		ug/L	
			cis-1,2-dichloroethene	2014/01/10	<0.50		ug/L	
			trans-1,2-dichloroethene	2014/01/10	<0.50		ug/L	
			Dichloromethane	2014/01/10	<2.0		ug/L	
			1,2-dichloropropane	2014/01/10	<0.50		ug/L	
			cis-1,3-dichloropropene	2014/01/10	<0.50		ug/L	
			trans-1,3-dichloropropene	2014/01/10	<0.50		ug/L	
			Methyl methacrylate	2014/01/10	<0.50		ug/L	
			Methyl-tert-butylether (MTBE)	2014/01/10	<0.50		ug/L	
			Styrene	2014/01/10	<0.50		ug/L	
			1,1,1,2-tetrachloroethane	2014/01/10	<2.0		ug/L	
			1,1,2,2-tetrachloroethane	2014/01/10	<2.0		ug/L	
			Tetrachloroethene	2014/01/10	<0.50		ug/L	
			1,2,3-trichlorobenzene	2014/01/10	<1.0		ug/L	
			1,2,4-trichlorobenzene	2014/01/10	<1.0		ug/L	
			1,3,5-trichlorobenzene	2014/01/10	<0.50		ug/L	
			1,1,1-trichloroethane	2014/01/10	<0.50		ug/L	
			1,1,2-trichloroethane	2014/01/10	<0.50		ug/L	
			Trichloroethene	2014/01/10	<0.50		ug/L	
			Trichlorofluoromethane	2014/01/10	<0.50		ug/L	
			1,2,4-trimethylbenzene	2014/01/10	<0.50		ug/L	
			1,3,5-trimethylbenzene	2014/01/10	<0.50		ug/L	
			Vinyl chloride	2014/01/10	<0.50		ug/L	
7346405	GP4	RPD	Bromodichloromethane	2014/01/10	NC		%	40
			Bromoform	2014/01/10	NC		%	40
			Bromomethane	2014/01/10	NC		%	40
			Carbon tetrachloride	2014/01/10	NC		%	40
			Chlorobenzene	2014/01/10	NC		%	40
			Chlorodibromomethane	2014/01/10	NC		%	40
			Chloroethane	2014/01/10	NC		%	40
			Chloroform	2014/01/10	NC		%	40
			Chloromethane	2014/01/10	NC		%	40
			1,2-dibromoethane	2014/01/10	NC		%	40
			1,2-dichlorobenzene	2014/01/10	NC		%	40
			1,3-dichlorobenzene	2014/01/10	NC		%	40
			1,4-dichlorobenzene	2014/01/10	NC		%	40
			1,1-dichloroethane	2014/01/10	NC		%	40
			1,2-dichloroethane	2014/01/10	NC		%	40
			1,1-dichloroethene	2014/01/10	NC		%	40
			cis-1,2-dichloroethene	2014/01/10	NC		%	40
			trans-1,2-dichloroethene	2014/01/10	NC		%	40
			Dichloromethane	2014/01/10	NC		%	40
			1,2-dichloropropane	2014/01/10	NC		%	40
			cis-1,3-dichloropropene	2014/01/10	NC		%	40
			trans-1,3-dichloropropene	2014/01/10	NC		%	40
			Methyl methacrylate	2014/01/10	NC		%	40
			Methyl-tert-butylether (MTBE)	2014/01/10	NC		%	40
			Styrene	2014/01/10	NC		%	40
			1,1,1,2-tetrachloroethane	2014/01/10	NC		%	40
			1,1,2,2-tetrachloroethane	2014/01/10	NC		%	40
			Tetrachloroethene	2014/01/10	NC		%	40
			1,2,3-trichlorobenzene	2014/01/10	NC		%	40
			1,2,4-trichlorobenzene	2014/01/10	NC		%	40
			1,3,5-trichlorobenzene	2014/01/10	NC		%	40

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			1,1,1-trichloroethane	2014/01/10	NC		%	40
			1,1,2-trichloroethane	2014/01/10	NC		%	40
			Trichloroethene	2014/01/10	NC		%	40
			Trichlorofluoromethane	2014/01/10	NC		%	40
			1,2,4-trimethylbenzene	2014/01/10	NC		%	40
			1,3,5-trimethylbenzene	2014/01/10	NC		%	40
			Vinyl chloride	2014/01/10	NC		%	40
7346449	CT6	Matrix Spike	Dissolved Nitrite (N)	2014/01/10		103	%	80 - 120
			Dissolved Nitrate (N)	2014/01/10		104	%	80 - 120
7346449	CT6	Spiked Blank	Dissolved Nitrite (N)	2014/01/10		99	%	90 - 110
			Dissolved Nitrate (N)	2014/01/10		101	%	90 - 110
7346449	CT6	Method Blank	Dissolved Nitrite (N)	2014/01/10	<0.0030		mg/L	
			Dissolved Nitrate (N)	2014/01/10	<0.0030		mg/L	
7346449	CT6	RPD	Dissolved Nitrite (N)	2014/01/10	NC		%	20
			Dissolved Nitrate (N)	2014/01/10	NC		%	20
7346704	RM9	Matrix Spike	Orthophosphate (P)	2014/01/10		99	%	80 - 120
7346704	RM9	Spiked Blank	Orthophosphate (P)	2014/01/10		101	%	80 - 120
7346704	RM9	Method Blank	Orthophosphate (P)	2014/01/10	<0.0030		mg/L	
7346704	RM9	RPD	Orthophosphate (P)	2014/01/10	NC		%	20
7346815	RM9	Matrix Spike	Total Ammonia (N)	2014/01/10		92	%	80 - 120
7346815	RM9	Spiked Blank	Total Ammonia (N)	2014/01/10		97	%	80 - 120
7346815	RM9	Method Blank	Total Ammonia (N)	2014/01/10	<0.050		mg/L	
7346815	RM9	RPD	Total Ammonia (N)	2014/01/10	NC		%	20
7346893	ZI	Spiked Blank	True Colour	2014/01/10		98	%	80 - 120
7346893	ZI	Method Blank	True Colour	2014/01/10	<2.0		PtCo units	
7346893	ZI	RPD	True Colour	2014/01/10	NC		%	20
7347166	CT6	Spiked Blank	Alkalinity (Total as CaCO3)	2014/01/11		91	%	80 - 120
7347166	CT6	Method Blank	Alkalinity (PP as CaCO3)	2014/01/11	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2014/01/11	<0.50		mg/L	
			Bicarbonate (HCO3)	2014/01/11	<0.50		mg/L	
			Carbonate (CO3)	2014/01/11	<0.50		mg/L	
			Hydroxide (OH)	2014/01/11	<0.50		mg/L	
7347166	CT6	RPD	Alkalinity (PP as CaCO3)	2014/01/11	NC		%	20
			Alkalinity (Total as CaCO3)	2014/01/11	0.4		%	20
			Bicarbonate (HCO3)	2014/01/11	0.4		%	20
			Carbonate (CO3)	2014/01/11	NC		%	20
			Hydroxide (OH)	2014/01/11	NC		%	20
7347167	CT6	RPD	Conductivity	2014/01/11	0.5		%	20
7347168	CT6	Spiked Blank	pH	2014/01/11		101	%	97 - 102
7347168	CT6	RPD	pH	2014/01/11	0.6		%	5
7347961	KA3	Matrix Spike	Total Aluminum (Al)	2014/01/13		103	%	80 - 120
			Total Antimony (Sb)	2014/01/13		112	%	80 - 120
			Total Arsenic (As)	2014/01/13		104	%	80 - 120
			Total Beryllium (Be)	2014/01/13		107	%	80 - 120
			Total Chromium (Cr)	2014/01/13		99	%	80 - 120
			Total Cobalt (Co)	2014/01/13		100	%	80 - 120
			Total Copper (Cu)	2014/01/13		97	%	80 - 120
			Total Lead (Pb)	2014/01/13		98	%	80 - 120
			Total Molybdenum (Mo)	2014/01/13		115	%	80 - 120
			Total Nickel (Ni)	2014/01/13		97	%	80 - 120
			Total Selenium (Se)	2014/01/13		100	%	80 - 120
			Total Silver (Ag)	2014/01/13		101	%	80 - 120
			Total Thallium (Tl)	2014/01/13		97	%	80 - 120
			Total Tin (Sn)	2014/01/13		108	%	80 - 120
			Total Titanium (Ti)	2014/01/13		100	%	80 - 120
			Total Uranium (U)	2014/01/13		102	%	80 - 120
			Total Vanadium (V)	2014/01/13		114	%	80 - 120
			Total Zinc (Zn)	2014/01/13		90	%	80 - 120
7347961	KA3	Spiked Blank	Total Aluminum (Al)	2014/01/13		116	%	80 - 120
			Total Antimony (Sb)	2014/01/13		114	%	80 - 120
			Total Arsenic (As)	2014/01/13		109	%	80 - 120
			Total Beryllium (Be)	2014/01/13		106	%	80 - 120

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Success Through Science®

Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Chromium (Cr)	2014/01/13		108	%	80 - 120
			Total Cobalt (Co)	2014/01/13		110	%	80 - 120
			Total Copper (Cu)	2014/01/13		115	%	80 - 120
			Total Lead (Pb)	2014/01/13		107	%	80 - 120
			Total Molybdenum (Mo)	2014/01/13		109	%	80 - 120
			Total Nickel (Ni)	2014/01/13		107	%	80 - 120
			Total Selenium (Se)	2014/01/13		109	%	80 - 120
			Total Silver (Ag)	2014/01/13		107	%	80 - 120
			Total Thallium (Tl)	2014/01/13		107	%	80 - 120
			Total Tin (Sn)	2014/01/13		106	%	80 - 120
			Total Titanium (Ti)	2014/01/13		104	%	80 - 120
			Total Uranium (U)	2014/01/13		108	%	80 - 120
			Total Vanadium (V)	2014/01/13		112	%	80 - 120
			Total Zinc (Zn)	2014/01/13		111	%	80 - 120
7347961	KA3	Method Blank	Total Aluminum (Al)	2014/01/13	0.0040, RDL=0.0030		mg/L	
			Total Antimony (Sb)	2014/01/13	<0.00060		mg/L	
			Total Arsenic (As)	2014/01/13	0.00020, RDL=0.00020		mg/L	
			Total Beryllium (Be)	2014/01/13	<0.0010		mg/L	
			Total Chromium (Cr)	2014/01/13	<0.0010		mg/L	
			Total Cobalt (Co)	2014/01/13	<0.00030		mg/L	
			Total Copper (Cu)	2014/01/13	<0.00020		mg/L	
			Total Lead (Pb)	2014/01/13	<0.00020		mg/L	
			Total Molybdenum (Mo)	2014/01/13	<0.00020		mg/L	
			Total Nickel (Ni)	2014/01/13	<0.00050		mg/L	
			Total Selenium (Se)	2014/01/13	<0.00020		mg/L	
			Total Silver (Ag)	2014/01/13	<0.00010		mg/L	
			Total Thallium (Tl)	2014/01/13	<0.00020		mg/L	
			Total Tin (Sn)	2014/01/13	<0.0010		mg/L	
			Total Titanium (Ti)	2014/01/13	<0.0010		mg/L	
			Total Uranium (U)	2014/01/13	<0.00010		mg/L	
			Total Vanadium (V)	2014/01/13	<0.0010		mg/L	
			Total Zinc (Zn)	2014/01/13	<0.0030		mg/L	
7347961	KA3	RPD	Total Aluminum (Al)	2014/01/13	5.9		%	20
			Total Antimony (Sb)	2014/01/13	NC		%	20
			Total Arsenic (As)	2014/01/13	NC		%	20
			Total Beryllium (Be)	2014/01/13	NC		%	20
			Total Chromium (Cr)	2014/01/13	NC		%	20
			Total Cobalt (Co)	2014/01/13	NC		%	20
			Total Copper (Cu)	2014/01/13	NC		%	20
			Total Lead (Pb)	2014/01/13	0.9		%	20
			Total Molybdenum (Mo)	2014/01/13	1.7		%	20
			Total Nickel (Ni)	2014/01/13	NC		%	20
			Total Selenium (Se)	2014/01/13	NC		%	20
			Total Silver (Ag)	2014/01/13	NC		%	20
			Total Thallium (Tl)	2014/01/13	NC		%	20
			Total Tin (Sn)	2014/01/13	NC		%	20
			Total Titanium (Ti)	2014/01/13	6.9		%	20
			Total Uranium (U)	2014/01/13	NC		%	20
			Total Vanadium (V)	2014/01/13	NC		%	20
			Total Zinc (Zn)	2014/01/13	NC		%	20
7347967	SRT	Matrix Spike	Total Barium (Ba)	2014/01/13		90	%	80 - 120
			Total Boron (B)	2014/01/13		NC	%	80 - 120
			Total Calcium (Ca)	2014/01/13		100	%	80 - 120
			Total Iron (Fe)	2014/01/13		97	%	80 - 120
			Total Lithium (Li)	2014/01/13		87	%	80 - 120
			Total Magnesium (Mg)	2014/01/13		97	%	80 - 120
			Total Manganese (Mn)	2014/01/13		99	%	80 - 120
			Total Phosphorus (P)	2014/01/13		92	%	80 - 120
			Total Potassium (K)	2014/01/13		95	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Silicon (Si)	2014/01/13		NC	%	80 - 120
			Total Sodium (Na)	2014/01/13		NC	%	80 - 120
			Total Strontium (Sr)	2014/01/13		92	%	80 - 120
7347967	SRT	Spiked Blank	Total Barium (Ba)	2014/01/13		94	%	80 - 120
			Total Boron (B)	2014/01/13		97	%	80 - 120
			Total Calcium (Ca)	2014/01/13		97	%	80 - 120
			Total Iron (Fe)	2014/01/13		99	%	80 - 120
			Total Lithium (Li)	2014/01/13		93	%	80 - 120
			Total Magnesium (Mg)	2014/01/13		100	%	80 - 120
			Total Manganese (Mn)	2014/01/13		101	%	80 - 120
			Total Phosphorus (P)	2014/01/13		93	%	80 - 120
			Total Potassium (K)	2014/01/13		99	%	80 - 120
			Total Silicon (Si)	2014/01/13		95	%	80 - 120
			Total Sodium (Na)	2014/01/13		90	%	80 - 120
			Total Strontium (Sr)	2014/01/13		96	%	80 - 120
7347967	SRT	Method Blank	Total Barium (Ba)	2014/01/13	<0.010		mg/L	
			Total Boron (B)	2014/01/13	<0.020		mg/L	
			Total Calcium (Ca)	2014/01/13	<0.30		mg/L	
			Total Iron (Fe)	2014/01/13	<0.060		mg/L	
			Total Lithium (Li)	2014/01/13	<0.020		mg/L	
			Total Magnesium (Mg)	2014/01/13	<0.20		mg/L	
			Total Manganese (Mn)	2014/01/13	<0.0040		mg/L	
			Total Phosphorus (P)	2014/01/13	<0.10		mg/L	
			Total Potassium (K)	2014/01/13	<0.30		mg/L	
			Total Silicon (Si)	2014/01/13	<0.10		mg/L	
			Total Sodium (Na)	2014/01/13	<0.50		mg/L	
			Total Strontium (Sr)	2014/01/13	<0.020		mg/L	
			Total Sulphur (S)	2014/01/13	<0.20		mg/L	
7347967	SRT	RPD	Total Barium (Ba)	2014/01/13	0.3		%	20
			Total Boron (B)	2014/01/13	0.5		%	20
			Total Calcium (Ca)	2014/01/13	6.1		%	20
			Total Iron (Fe)	2014/01/13	NC		%	20
			Total Lithium (Li)	2014/01/13	0.2		%	20
			Total Magnesium (Mg)	2014/01/13	1.4		%	20
			Total Manganese (Mn)	2014/01/13	NC		%	20
			Total Phosphorus (P)	2014/01/13	NC		%	20
			Total Potassium (K)	2014/01/13	1.0		%	20
			Total Silicon (Si)	2014/01/13	0.2		%	20
			Total Sodium (Na)	2014/01/13	4.7		%	20
			Total Strontium (Sr)	2014/01/13	0.1		%	20
			Total Sulphur (S)	2014/01/13	NC		%	20
7348079	ZI	Matrix Spike	Dissolved Chloride (Cl)	2014/01/13		103	%	80 - 120
7348079	ZI	Spiked Blank	Dissolved Chloride (Cl)	2014/01/13		106	%	80 - 120
7348079	ZI	Method Blank	Dissolved Chloride (Cl)	2014/01/13	<1.0		mg/L	
7348079	ZI	RPD	Dissolved Chloride (Cl)	2014/01/13	3.9		%	20
7348084	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2014/01/13		NC	%	80 - 120
7348084	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2014/01/13		104	%	80 - 120
7348084	ZI	Method Blank	Dissolved Sulphate (SO4)	2014/01/13	<1.0		mg/L	
7348084	ZI	RPD	Dissolved Sulphate (SO4)	2014/01/13	1.3		%	20
7348273	TDB	Matrix Spike	Dissolved Aluminum (Al)	2014/01/13		96	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		111	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		101	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		104	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		94	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		92	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		88	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		92	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		105	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		90	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		98	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		71 (1)	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		91	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Tin (Sn)	2014/01/13		101	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		98	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		97	%	80 - 120
			Dissolved Vanadium (V)	2014/01/13		100	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		96	%	80 - 120
7348273	TDB	Spiked Blank	Dissolved Aluminum (Al)	2014/01/13		99	%	80 - 120
			Dissolved Antimony (Sb)	2014/01/13		96	%	80 - 120
			Dissolved Arsenic (As)	2014/01/13		101	%	80 - 120
			Dissolved Beryllium (Be)	2014/01/13		102	%	80 - 120
			Dissolved Chromium (Cr)	2014/01/13		98	%	80 - 120
			Dissolved Cobalt (Co)	2014/01/13		99	%	80 - 120
			Dissolved Copper (Cu)	2014/01/13		97	%	80 - 120
			Dissolved Lead (Pb)	2014/01/13		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/01/13		103	%	80 - 120
			Dissolved Nickel (Ni)	2014/01/13		99	%	80 - 120
			Dissolved Selenium (Se)	2014/01/13		105	%	80 - 120
			Dissolved Silver (Ag)	2014/01/13		99	%	80 - 120
			Dissolved Thallium (Tl)	2014/01/13		100	%	80 - 120
			Dissolved Tin (Sn)	2014/01/13		103	%	80 - 120
			Dissolved Titanium (Ti)	2014/01/13		101	%	80 - 120
			Dissolved Uranium (U)	2014/01/13		102	%	80 - 120
			Dissolved Vanadium (V)	2014/01/13		102	%	80 - 120
			Dissolved Zinc (Zn)	2014/01/13		102	%	80 - 120
7348273	TDB	Method Blank	Dissolved Aluminum (Al)	2014/01/13	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/01/13	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/01/13	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/01/13	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/01/13	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/01/13	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/01/13	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/01/13	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/01/13	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/01/13	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/01/13	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/01/13	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/01/13	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/01/13	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/01/13	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/01/13	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/01/13	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/01/13	0.0037, RDL=0.0030		mg/L	
7348273	TDB	RPD	Dissolved Aluminum (Al)	2014/01/13	NC		%	20
			Dissolved Antimony (Sb)	2014/01/13	NC		%	20
			Dissolved Arsenic (As)	2014/01/13	NC		%	20
			Dissolved Beryllium (Be)	2014/01/13	NC		%	20
			Dissolved Chromium (Cr)	2014/01/13	NC		%	20
			Dissolved Cobalt (Co)	2014/01/13	NC		%	20
			Dissolved Copper (Cu)	2014/01/13	NC		%	20
			Dissolved Lead (Pb)	2014/01/13	NC		%	20
			Dissolved Molybdenum (Mo)	2014/01/13	2.0		%	20
			Dissolved Nickel (Ni)	2014/01/13	NC		%	20
			Dissolved Selenium (Se)	2014/01/13	NC		%	20
			Dissolved Silver (Ag)	2014/01/13	NC		%	20
			Dissolved Thallium (Tl)	2014/01/13	NC		%	20
			Dissolved Tin (Sn)	2014/01/13	NC		%	20
			Dissolved Titanium (Ti)	2014/01/13	NC		%	20
			Dissolved Uranium (U)	2014/01/13	NC		%	20
			Dissolved Vanadium (V)	2014/01/13	NC		%	20
			Dissolved Zinc (Zn)	2014/01/13	NC		%	20
7348344	KSF	Matrix Spike	Dissolved Barium (Ba)	2014/01/13		89	%	80 - 120
			Dissolved Boron (B)	2014/01/13		95	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Lithium (Li)	2014/01/13		88	%	80 - 120
			Dissolved Phosphorus (P)	2014/01/13		97	%	80 - 120
			Dissolved Silicon (Si)	2014/01/13		93	%	80 - 120
			Dissolved Strontium (Sr)	2014/01/13		89	%	80 - 120
7348344	KSF	Spiked Blank	Dissolved Barium (Ba)	2014/01/13		93	%	80 - 120
			Dissolved Boron (B)	2014/01/13		98	%	80 - 120
			Dissolved Lithium (Li)	2014/01/13		91	%	80 - 120
			Dissolved Phosphorus (P)	2014/01/13		94	%	80 - 120
			Dissolved Silicon (Si)	2014/01/13		98	%	80 - 120
			Dissolved Strontium (Sr)	2014/01/13		95	%	80 - 120
7348344	KSF	Method Blank	Dissolved Barium (Ba)	2014/01/13	<0.010		mg/L	
			Dissolved Boron (B)	2014/01/13	<0.020		mg/L	
			Dissolved Lithium (Li)	2014/01/13	<0.020		mg/L	
			Dissolved Phosphorus (P)	2014/01/13	<0.10		mg/L	
			Dissolved Silicon (Si)	2014/01/13	<0.10		mg/L	
			Dissolved Strontium (Sr)	2014/01/13	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/01/13	<0.20		mg/L	
7348344	KSF	RPD	Dissolved Calcium (Ca)	2014/01/13	0.9		%	20
			Dissolved Iron (Fe)	2014/01/13	NC		%	20
			Dissolved Magnesium (Mg)	2014/01/13	0.4		%	20
			Dissolved Manganese (Mn)	2014/01/13	0.7		%	20
			Dissolved Potassium (K)	2014/01/13	0.7		%	20
			Dissolved Sodium (Na)	2014/01/13	0.2		%	20
7349276	AP1	Matrix Spike [IK2096-02]	Dissolved Organic Carbon (C)	2014/01/14		111	%	80 - 120
7349276	AP1	Spiked Blank	Dissolved Organic Carbon (C)	2014/01/14		109	%	80 - 120
7349276	AP1	Method Blank	Dissolved Organic Carbon (C)	2014/01/14	<0.50		mg/L	
7349276	AP1	RPD [IK2096-02]	Dissolved Organic Carbon (C)	2014/01/14	NC		%	20
7349277	AP1	Matrix Spike	Total Organic Carbon (C)	2014/01/14		112	%	80 - 120
7349277	AP1	Spiked Blank	Total Organic Carbon (C)	2014/01/14		117	%	80 - 120
7349277	AP1	Method Blank	Total Organic Carbon (C)	2014/01/14	<0.50		mg/L	
7349277	AP1	RPD	Total Organic Carbon (C)	2014/01/14	7.8		%	20
7349687	RM9	Matrix Spike	Total Kjeldahl Nitrogen	2014/01/14		NC	%	80 - 120
7349687	RM9	QC Standard	Total Kjeldahl Nitrogen	2014/01/14		111	%	75 - 125
7349687	RM9	Spiked Blank	Total Kjeldahl Nitrogen	2014/01/14		94	%	80 - 120
7349687	RM9	Method Blank	Total Kjeldahl Nitrogen	2014/01/14	<0.050		mg/L	
7349687	RM9	RPD	Total Kjeldahl Nitrogen	2014/01/14	0.9		%	20
7349693	RM9	Matrix Spike	Dissolved Total Kjeldahl Nitrogen	2014/01/14		106	%	80 - 120
7349693	RM9	QC Standard	Dissolved Total Kjeldahl Nitrogen	2014/01/14		119	%	75 - 125
7349693	RM9	Spiked Blank	Dissolved Total Kjeldahl Nitrogen	2014/01/14		91	%	80 - 120
7349693	RM9	Method Blank	Dissolved Total Kjeldahl Nitrogen	2014/01/14	<0.050		mg/L	
7350185	IA0	Matrix Spike [IK2096-02]	Dissolved Ammonia (N)	2014/01/15		97	%	80 - 120
7350185	IA0	Spiked Blank	Dissolved Ammonia (N)	2014/01/15		103	%	80 - 120
7350185	IA0	Method Blank	Dissolved Ammonia (N)	2014/01/15	<0.050		mg/L	
7350185	IA0	RPD [IK2096-02]	Dissolved Ammonia (N)	2014/01/15	NC		%	20
7350210	IA0	Matrix Spike	Total Phosphate (P)	2014/01/15		95	%	80 - 120
7350210	IA0	QC Standard	Total Phosphate (P)	2014/01/15		108	%	80 - 120
7350210	IA0	Spiked Blank	Total Phosphate (P)	2014/01/15		96	%	83 - 111
7350210	IA0	Method Blank	Total Phosphate (P)	2014/01/15	<0.0030		mg/L	
7350210	IA0	RPD	Total Phosphate (P)	2014/01/15	NC		%	20
7350217	IA0	Matrix Spike [IK2096-02]	Dissolved Phosphorus (P)	2014/01/15		NC	%	80 - 120
7350217	IA0	QC Standard	Dissolved Phosphorus (P)	2014/01/15		108	%	80 - 120
7350217	IA0	Spiked Blank	Dissolved Phosphorus (P)	2014/01/15		95	%	83 - 111
7350217	IA0	Method Blank	Dissolved Phosphorus (P)	2014/01/15	<0.0030		mg/L	
7350217	IA0	RPD [IK2096-02]	Dissolved Phosphorus (P)	2014/01/15	NC		%	20
7350293	LY	Matrix Spike	Total Chemical Oxygen Demand	2014/01/15		98	%	80 - 120
7350293	LY	Spiked Blank	Total Chemical Oxygen Demand	2014/01/15		100	%	80 - 120
7350293	LY	Method Blank	Total Chemical Oxygen Demand	2014/01/15	<5.0		mg/L	
7350293	LY	RPD	Total Chemical Oxygen Demand	2014/01/15	NC		%	20
7350294	LY	Matrix Spike [IK2096-02]	Dissolved Chemical Oxygen Demand	2014/01/15		98	%	80 - 120
7350294	LY	Spiked Blank	Dissolved Chemical Oxygen Demand	2014/01/15		100	%	80 - 120
7350294	LY	Method Blank	Dissolved Chemical Oxygen Demand	2014/01/15	<5.0		mg/L	
7350294	LY	RPD [IK2096-02]	Dissolved Chemical Oxygen Demand	2014/01/15	NC		%	20

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Success Through Science®

Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7350747	STI	Matrix Spike	Dissolved Calcium (Ca)	2014/01/15		NC	%	80 - 120
			Dissolved Iron (Fe)	2014/01/15		99	%	80 - 120
			Dissolved Magnesium (Mg)	2014/01/15		NC	%	80 - 120
			Dissolved Manganese (Mn)	2014/01/15		98	%	80 - 120
			Dissolved Potassium (K)	2014/01/15		96	%	80 - 120
			Dissolved Sodium (Na)	2014/01/15		NC	%	80 - 120
7350747	STI	Spiked Blank	Dissolved Calcium (Ca)	2014/01/15		105	%	80 - 120
			Dissolved Iron (Fe)	2014/01/15		103	%	80 - 120
			Dissolved Magnesium (Mg)	2014/01/15		100	%	80 - 120
			Dissolved Manganese (Mn)	2014/01/15		103	%	80 - 120
			Dissolved Potassium (K)	2014/01/15		98	%	80 - 120
			Dissolved Sodium (Na)	2014/01/15		94	%	80 - 120
7350747	STI	Method Blank	Dissolved Calcium (Ca)	2014/01/15	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/01/15	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2014/01/15	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/01/15	<0.0040		mg/L	
			Dissolved Potassium (K)	2014/01/15	<0.30		mg/L	
			Dissolved Sodium (Na)	2014/01/15	<0.50		mg/L	
7350747	STI	RPD	Dissolved Calcium (Ca)	2014/01/15	0.4		%	20
			Dissolved Iron (Fe)	2014/01/15	NC		%	20
			Dissolved Magnesium (Mg)	2014/01/15	0.4		%	20
			Dissolved Manganese (Mn)	2014/01/15	0.5		%	20
			Dissolved Potassium (K)	2014/01/15	2.9		%	20
			Dissolved Sodium (Na)	2014/01/15	0.3		%	20
7352133	CT6	Spiked Blank	Conductivity	2014/01/16		101	%	90 - 110
7352133	CT6	Method Blank	Conductivity	2014/01/16	<1.0		uS/cm	
7352413	HE1	Spiked Blank	Total Dissolved Solids	2014/01/17		86	%	80 - 120
7352413	HE1	Method Blank	Total Dissolved Solids	2014/01/17	<10		mg/L	
7352413	HE1	RPD	Total Dissolved Solids	2014/01/17	4.4		%	20
7354560	JLD	RPD	Conductivity	2014/01/20	0.4		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam Job #: B401432
Report Date: 2014/01/20

NORWEST CORPORATION
Client Project #: 284-1 / CROIM MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Janet Gao, Senior Analyst, Organics Department

<Original signed by>

Parastoo Khorsand, Scientific Specialist

<Original signed by>

Peng Liang, Analyst II

<Original signed by>

Veronica Falk, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody

A101932

Page: ____ of ____

Invoice To: C/O Report Address ☐
Company: Norwest corporation
Contact: Amy Perrin
Address: 2700 411 1st St SE
Prov: AB PC: T2G4Y5
Contact #s: Ph: 4032055792 Cell: 4039698380

Report To: Same as invoice ☑
Prov: PC:
Cell:

Report Distribution (E-Mail): APERRIN@NORWESTCORP.COM

REGULATORY GUIDELINES:
☐ CCME
☐ Regulated Drinking Water
☐ Other: D, T+D, acidity, color

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: 284-1 / Crown Mountain
Site Location: Sparwood
Quote #:
Sampled By: TD / AP

SERVICE REQUESTED:
☐ RUSH (Contact lab to reserve)
Date Required:
☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill			WATER: ☐BTEX F1 / ☑VOCs	☑BTEX F1-F2 / ☐BTEX F1-F4	☑Routine Water ☐ Turb. ☐ F	☐ TOC / ☐ DOC	Regulated Metals (CCME / AT1): Total	Regulated Metals: Dissolved	Mercury ☐ Total ☐ Dissolved	Other Analysis: G1 (all)	G2 (all)	G2F (all)	Phenol	cyanide	nitrite, nitrate, NH3	PAH	redox potential	ammonia Nitrogen	total carbon	Phosphorus (T+D)	HOLD - Do not Analyze	# of Containers Submitted
1	CM13-06		GW	14/01/08 15:00									X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X		
2																																
3																																
4																																
5																																
6																																
7																																
8																																
9																																
10																																
11																																
12																																

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

8-Jan-14 15:21
Carissa Sumka
B401432
NC4 AT INS-0062

Relinquished By (Signature/Print): <Original signed by> Date (YY/MM/DD): 14/01/08 Time (24:00): 15:21
Relinquished By (Signature/Print): Date (YY/MM/DD): Time (24:00):

Special Instructions: NOT enough sample to fill Filtered G2 + metals bottles

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:		
Jason Bn	2014/01/08	1521	Custody Seal	Temperature	Ice
Lab Comments:		1-090	No	-1, 6, 6	Yes

AB FCD-00331 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

NORWEST
CORPORATION

CERTIFICATE OF ANALYSIS
April, 2014

Success Through Science®

Your Project #: B431089

Attention: Jenelle Feller
Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

Report Date: 2014/04/23
Report #: R3009311
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B464857
Received: 2014/04/23, 12:33

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Redox Potential	2	2014/04/23	2014/04/23	In house	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division
Email: GSison@maxxam.ca
Phone# (905) 569-7599

==
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Total cover pages: 1

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Maxxam Job #: B464857
Report Date: 2014/04/23

Maxxam Analytics
Client Project #: B431089

Sampler Initials: TD

RESULTS OF ANALYSES OF WATER

Maxxam ID		VQ0717	VQ0727	
Sampling Date		2014/04/19 17:00	2014/04/19 17:00	
	Units	**JK4088-09R \ CREEK**	**JK4089-09R \ QC1**	**QC Batch**

Subcontracted Analysis				
Redox Potential	mV	+295	+265	3581404

QC Batch = Quality Control Batch

Maxxam Job #: B464857
Report Date: 2014/04/23

Maxxam Analytics
Client Project #: B431089

Sampler Initials: TD

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam

Success Through Science®

Maxxam Analytics
Attention: Jenelle Feller
Client Project #: B431089
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: SB464857

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3581404 GSI	QC Standard	Redox Potential	2014/04/23		+239	%	238 - 248
	Method Blank	Redox Potential	2014/04/23	+369		mV	
	RPD [VQ0717-01]	Redox Potential	2014/04/23	4.2		%	10

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics Sladeview Industrial: 4141 Sladeview Cresent, Unit 10, Mississauga L5L 5T1 (905) 569-7599 Fax (905) 569-6250

Maxxam

Success Through Science®

Your Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A145886

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/04/27
Report #: R1558411
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B431089
Received: 2014/04/21, 10:54

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	2	N/A	2014/04/23	AB SOP-00005	SM 2320-B
BTEX/F1 in Water by HS GC/MS	3	N/A	2014/04/22	AB SOP-00039	CCME, EPA 8260C
Cadmium - low level CCME - Dissolved	2	N/A	2014/04/25	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	2	2014/04/21	2014/04/25	AB SOP-00043	EPA 200.8
Chloride by Automated Colourimetry	2	N/A	2014/04/25	AB SOP-00020	SM 4500 Cl-G
Chemical Oxygen Demand	2	N/A	2014/04/25	AB SOP-00016	SM 5220-D
Carbon (DOC) (1)	2	N/A	2014/04/22	CAL SOP-00077	MMCW 119
Conductivity @25C	2	N/A	2014/04/23	AB SOP-00005	SM 2510-B
CCME Hydrocarbons in Water (F2; C10-C16)	3	2014/04/22	2014/04/24	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	2	N/A	2014/04/24	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	2	N/A	2014/04/23	AB SOP-00042	EPA 200.7
Elements by ICP - Total	2	2014/04/23	2014/04/23	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved	2	N/A	2014/04/23	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	2	2014/04/23	2014/04/23	AB SOP-00043	EPA 200.8
Ion Balance	2	N/A	2014/04/22	AB WI-00065	SM 1030E
Sum of cations, anions	2	N/A	2014/04/24	AB WI-00065	SM 1030E
Nitrogen (total), Calc. TKN, NO3, NO2	2	N/A	2014/04/24	AB WI-00065	SM 4500-N A
Ammonia-N (Total)	2	N/A	2014/04/22	AB SOP-00007	EPA 350.1
Nitrate and Nitrite	2	N/A	2014/04/24	AB SOP-00023	SM4110B
Nitrate + Nitrite-N (calculated)	2	N/A	2014/04/24	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	2	N/A	2014/04/23	AB SOP-00023	SM 4110-B
Benzo[a]pyrene Equivalency	2	N/A	2014/04/23	AB SOP-00003	EPA 8270D
PAH in Water by GC/MS (2)	2	2014/04/22	2014/04/22	AB SOP-00003 AB SOP-00037	EPA 3510C/8270D
pH @25°C (Alkalinity titrator)	2	N/A	2014/04/23	AB SOP-00005	SM 4500-H+B
Phenols (4-AAP)	2	N/A	2014/04/22	CAL SOP-00067	EPA 420.2
Sulphate by Automated Colourimetry	2	N/A	2014/04/25	AB SOP-00018	SM 4500 SO4-E
Cyanide (Total) Low level	2	2014/04/22	2014/04/22	CAL SOP-00073	EPA 335.2
Total Dissolved Solids (Filt. Residue)	2	2014/04/23	2014/04/23	CAL SOP-00074	SM 2540-C
Total Dissolved Solids (Calculated)	2	N/A	2014/04/25	AB WI-00065	SM 1030E

Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A145886

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/04/27
Report #: R1558411
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B431089
Received: 2014/04/21, 10:54

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Kjeldahl Nitrogen	2	2014/04/23	2014/04/24	AB SOP-00008	EPA 351.1, 351.2
Carbon (Total Organic) (3)	2	N/A	2014/04/22	CAL SOP-00077	MMCW 119
Phosphorus -P (Total, Dissolved)	2	2014/04/24	2014/04/24	AB SOP-00024	SM 4500-P
Total Phosphorus	2	2014/04/24	2014/04/24	AB SOP-00024	SM 4500-P
Total Suspended Solids (NFR)	2	2014/04/24	2014/04/24	AB SOP-00061	SM 2540-D
Turbidity	2	N/A	2014/04/23	CAL SOP-00081	SM 2130B

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) DOC present in the sample should be considered as non-purgeable DOC.
(2) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(3) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Jenelle Feller, Project Manager
Email: JFeller@maxxam.ca
Phone# (403) 291-3077
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		JK4088	JK4089	JK4090		
Sampling Date		2014/04/19 17:00	2014/04/19 17:00	2014/04/19 17:00		
COC Number		A145886	A145886	A145886		
	Units	**CREEK**	**QC1**	**EB1**	**RDL**	**QC Batch**
Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.10	7459147
Volatiles						
Benzene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
Toluene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	0.80	7459564
o-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	0.80	7459564
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	100	7459564
(C6-C10)	ug/L	<100	<100	<100	100	7459564
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	104	101	104	N/A	7459564
4-Bromofluorobenzene (sur.)	%	108	109	109	N/A	7459564
D4-1,2-Dichloroethane (sur.)	%	96	103	98	N/A	7459564
O-TERPHENYL (sur.)	%	114	99	100	N/A	7459147

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam

Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		JK4088	JK4089		
Sampling Date		2014/04/19 17:00	2014/04/19 17:00		
COC Number		A145886	A145886		
	Units	**CREEK**	**QC1**	**RDL**	**QC Batch**
Calculated Parameters					
Anion Sum	meq/L	3.7	3.8	N/A	7458968
Cation Sum	meq/L	3.9	3.9	N/A	7458968
Hardness (CaCO3)	mg/L	190	190	0.50	7458965
Ion Balance	N/A	1.1	1.0	0.010	7458967
Dissolved Nitrate (NO3)	mg/L	0.35	0.35	0.044	7458969
Nitrate plus Nitrite (N)	mg/L	0.078	0.080	0.010	7458970
Dissolved Nitrite (NO2)	mg/L	<0.033	<0.033	0.033	7458969
Total Dissolved Solids	mg/L	190	190	10	7458971
Misc. Inorganics					
Conductivity	uS/cm	360	360	1.0	7461457
pH	pH	8.24	8.28	N/A	7461464
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.0085	0.0054	0.0050	7458373
Anions					
Alkalinity (PP as CaCO3)	mg/L	<0.50	<0.50	0.50	7461434
Alkalinity (Total as CaCO3)	mg/L	150	150	0.50	7461434
Bicarbonate (HCO3)	mg/L	180	190	0.50	7461434
Carbonate (CO3)	mg/L	<0.50	<0.50	0.50	7461434
Hydroxide (OH)	mg/L	<0.50	<0.50	0.50	7461434
Dissolved Sulphate (SO4)	mg/L	33	33	1.0	7463973
Dissolved Chloride (Cl)	mg/L	1.2	1.2	1.0	7463966
Nutrients					
Dissolved Nitrite (N)	mg/L	<0.010	<0.010	0.010	7461725
Dissolved Nitrate (N)	mg/L	0.078	0.080	0.010	7461725
Elements					
Dissolved Aluminum (Al)	mg/L	<0.0030	<0.0030	0.0030	7461467
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	7461467
Dissolved Arsenic (As)	mg/L	<0.00020	<0.00020	0.00020	7461467
Dissolved Barium (Ba)	mg/L	0.079	0.079	0.010	7461224
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	7461467
Dissolved Boron (B)	mg/L	<0.020	<0.020	0.020	7461224
Dissolved Calcium (Ca)	mg/L	47	47	0.30	7461224
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	7461467

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		JK4088	JK4089		
Sampling Date		2014/04/19 17:00	2014/04/19 17:00		
COC Number		A145886	A145886		
	Units	**CREEK**	**QC1**	**RDL**	**QC Batch**
Dissolved Cobalt (Co)	mg/L	<0.00030	<0.00030	0.00030	7461467
Dissolved Copper (Cu)	mg/L	<0.00020	<0.00020	0.00020	7461467
Dissolved Iron (Fe)	mg/L	<0.060	<0.060	0.060	7461224
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	7461467
Dissolved Lithium (Li)	mg/L	<0.020	<0.020	0.020	7461224
Dissolved Magnesium (Mg)	mg/L	17	17	0.20	7461224
Dissolved Manganese (Mn)	mg/L	<0.0040	<0.0040	0.0040	7461224
Dissolved Molybdenum (Mo)	mg/L	0.0012	0.0013	0.00020	7461467
Dissolved Nickel (Ni)	mg/L	<0.00050	<0.00050	0.00050	7461467
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	0.10	7461224
Dissolved Potassium (K)	mg/L	0.43	0.46 (1)	0.30	7461224
Dissolved Selenium (Se)	mg/L	0.0012	0.0011	0.00020	7461467
Dissolved Silicon (Si)	mg/L	2.4	2.4	0.10	7461224
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	7461467
Dissolved Sodium (Na)	mg/L	3.9	3.9	0.50	7461224
Dissolved Strontium (Sr)	mg/L	0.14	0.14	0.020	7461224
Dissolved Sulphur (S)	mg/L	9.8	9.8 (2)	0.20	7461224
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	7461467
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	7461467
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	0.0010	7461467
Dissolved Uranium (U)	mg/L	0.00068	0.00064	0.00010	7461467
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	0.0010	7461467
Dissolved Zinc (Zn)	mg/L	<0.0030	<0.0030	0.0030	7461467

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).
(2) Dissolved greater than total. Results within acceptable limits of precision.

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Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		JK4088	JK4089	JK4089		
Sampling Date		2014/04/19 17:00	2014/04/19 17:00	2014/04/19 17:00		
COC Number		A145886	A145886	A145886		
	Units	**CREEK**	**QC1**	**QC1 Lab-Dup**	**RDL**	**QC Batch**
Low Level Elements						
Total Cadmium (Cd)	ug/L	0.0080	0.0072	N/A	0.0050	7458374
Elements						
Total Aluminum (Al)	mg/L	0.0051	0.0054	0.0077	0.0030	7461112
Total Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	0.00060	7461112
Total Arsenic (As)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	7461112
Total Barium (Ba)	mg/L	0.080	0.080	0.080	0.010	7461114
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	7461112
Total Boron (B)	mg/L	<0.020	<0.020	<0.020	0.020	7461114
Total Calcium (Ca)	mg/L	48	48	48	0.30	7461114
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	7461112
Total Cobalt (Co)	mg/L	<0.00030	<0.00030	<0.00030	0.00030	7461112
Total Copper (Cu)	mg/L	0.00034	0.00035	0.00036	0.00020	7461112
Total Iron (Fe)	mg/L	<0.060	<0.060	<0.060	0.060	7461114
Total Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	7461112
Total Lithium (Li)	mg/L	<0.020	<0.020	<0.020	0.020	7461114
Total Magnesium (Mg)	mg/L	17	17	17	0.20	7461114
Total Manganese (Mn)	mg/L	<0.0040	<0.0040	<0.0040	0.0040	7461114
Total Molybdenum (Mo)	mg/L	0.0015	0.0015	0.0015	0.00020	7461112
Total Nickel (Ni)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	7461112
Total Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	0.10	7461114
Total Potassium (K)	mg/L	0.43	0.41	0.48	0.30	7461114
Total Selenium (Se)	mg/L	0.0012	0.0013	0.0013	0.00020	7461112
Total Silicon (Si)	mg/L	2.5	2.4	2.5	0.10	7461114
Total Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	0.00010	7461112
Total Sodium (Na)	mg/L	3.9	3.9	3.9	0.50	7461114
Total Strontium (Sr)	mg/L	0.15	0.14	0.14	0.020	7461114
Total Sulphur (S)	mg/L	9.8	9.7	9.8	0.20	7461114
Total Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	7461112
Total Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	7461112
Total Titanium (Ti)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	7461112
Total Uranium (U)	mg/L	0.00071	0.00071	0.00075	0.00010	7461112
Total Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	7461112

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		JK4088	JK4089	JK4089		
Sampling Date		2014/04/19 17:00	2014/04/19 17:00	2014/04/19 17:00		
COC Number		A145886	A145886	A145886		
	Units	**CREEK**	**QC1**	**QC1 Lab-Dup**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/L	<0.0030	<0.0030	<0.0030	0.0030	7461112

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		JK4088	JK4088		JK4089		
Sampling Date		2014/04/19 17:00	2014/04/19 17:00		2014/04/19 17:00		
COC Number		A145886	A145886		A145886		
	Units	**CREEK**	**CREEK Lab-Dup**	**QC Batch**	**QC1**	**RDL**	**QC Batch**
Demand Parameters							
Total Chemical Oxygen Demand	mg/L	<5.0	N/A	7464080	<5.0	5.0	7464080
Misc. Inorganics							
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.0020	N/A	7459994	<0.0020	0.0020	7459994
Dissolved Organic Carbon (C)	mg/L	0.75 (1)	N/A	7460025	0.96 (1)	0.50	7460025
Total Organic Carbon (C)	mg/L	0.65	N/A	7459676	0.77	0.50	7459676
Total Dissolved Solids	mg/L	230	N/A	7461122	190	10	7461122
Total Suspended Solids	mg/L	<1.0	N/A	7462265	<1.0	1.0	7462265
Nutrients							
Total Ammonia (N)	mg/L	<0.050	N/A	7460184	<0.050	0.050	7459999
Total Kjeldahl Nitrogen	mg/L	<0.050	N/A	7462421	<0.050	0.050	7462421
Total Nitrogen (N)	mg/L	0.078	N/A	7459195	0.080	0.050	7459195
Dissolved Phosphate (P)	mg/L	0.0050	0.0040	7463568	0.0040	0.0030	7463568
Total Phosphate (P)	mg/L	0.0050	N/A	7463565	0.0060	0.0030	7463565
Misc. Organics							
Phenols	mg/L	<0.0020	<0.0020	7460314	<0.0020	0.0020	7460314
Physical Properties							
Turbidity	NTU	0.24	N/A	7460959	0.22	0.10	7460959

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).

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NORWEST CORPORATION
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SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		JK4088	JK4089		
Sampling Date		2014/04/19 17:00	2014/04/19 17:00		
COC Number		A145886	A145886		
	Units	**CREEK**	**QC1**	**RDL**	**QC Batch**
Polycyclic Aromatics					
Benzo[a]pyrene equivalency	ug/L	<0.010	<0.010	0.010	7458889
Acenaphthene	ug/L	<0.10	<0.10	0.10	7458803
Acenaphthylene	ug/L	<0.10	<0.10	0.10	7458803
Acridine	ug/L	<0.20	<0.20	0.20	7458803
Anthracene	ug/L	<0.010	<0.010	0.010	7458803
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	0.0085	7458803
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	0.0085	7458803
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	0.0085	7458803
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	0.0085	7458803
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	0.050	7458803
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	0.0075	7458803
Benzo[e]pyrene	ug/L	<0.050	<0.050	0.050	7458803
Chrysene	ug/L	<0.0085	<0.0085	0.0085	7458803
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	0.0075	7458803
Fluoranthene	ug/L	<0.010	<0.010	0.010	7458803
Fluorene	ug/L	<0.050	<0.050	0.050	7458803
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	0.0085	7458803
2-Methylnaphthalene	ug/L	<0.10	<0.10	0.10	7458803
Naphthalene	ug/L	<0.10	<0.10	0.10	7458803
Phenanthrene	ug/L	<0.050	<0.050	0.050	7458803
Perylene	ug/L	<0.050	<0.050	0.050	7458803
Pyrene	ug/L	<0.020	<0.020	0.020	7458803
Quinoline	ug/L	<0.20	<0.20	0.20	7458803
Surrogate Recovery (%)					
D10-ANTHRACENE (sur.)	%	101	101	N/A	7458803
D12-BENZO(A)PYRENE (sur.)	%	100	101	N/A	7458803
D8-ACENAPHTHYLENE (sur.)	%	95	97	N/A	7458803
TERPHENYL-D14 (sur.)	%	101	102	N/A	7458803

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	-2.3°C

Redox Potential results are attached to this report file. The reference number from Sladeview Maxxam for these results is B464857.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7458803	JC7	Matrix Spike	D10-ANTHRACENE (sur.)	2014/04/22		99	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/04/22		103	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/04/22		94	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/04/22		99	%	50 - 130
			Acenaphthene	2014/04/22		97	%	50 - 130
			Acenaphthylene	2014/04/22		95	%	50 - 130
			Acridine	2014/04/22		66	%	50 - 130
			Anthracene	2014/04/22		96	%	50 - 130
			Benzo(a)anthracene	2014/04/22		101	%	50 - 130
			Benzo(b&j)fluoranthene	2014/04/22		109	%	50 - 130
			Benzo(k)fluoranthene	2014/04/22		100	%	50 - 130
			Benzo(g,h,i)perylene	2014/04/22		101	%	50 - 130
			Benzo(c)phenanthrene	2014/04/22		94	%	50 - 130
			Benzo(a)pyrene	2014/04/22		104	%	50 - 130
			Benzo[e]pyrene	2014/04/22		104	%	50 - 130
			Chrysene	2014/04/22		104	%	50 - 130
			Dibenz(a,h)anthracene	2014/04/22		101	%	50 - 130
			Fluoranthene	2014/04/22		97	%	50 - 130
			Fluorene	2014/04/22		100	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/04/22		102	%	50 - 130
			2-Methylnaphthalene	2014/04/22		66	%	50 - 130
			Naphthalene	2014/04/22		82	%	50 - 130
			Phenanthrene	2014/04/22		101	%	50 - 130
			Perylene	2014/04/22		106	%	50 - 130
			Pyrene	2014/04/22		100	%	50 - 130
			Quinoline	2014/04/22		95	%	50 - 130
7458803	JC7	Spiked Blank	D10-ANTHRACENE (sur.)	2014/04/22		101	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/04/22		105	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/04/22		93	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/04/22		102	%	50 - 130
			Acenaphthene	2014/04/22		97	%	50 - 130
			Acenaphthylene	2014/04/22		97	%	50 - 130
			Acridine	2014/04/22		84	%	50 - 130
			Anthracene	2014/04/22		96	%	50 - 130
			Benzo(a)anthracene	2014/04/22		101	%	50 - 130
			Benzo(b&j)fluoranthene	2014/04/22		109	%	50 - 130
			Benzo(k)fluoranthene	2014/04/22		100	%	50 - 130
			Benzo(g,h,i)perylene	2014/04/22		103	%	50 - 130
			Benzo(c)phenanthrene	2014/04/22		95	%	50 - 130
			Benzo(a)pyrene	2014/04/22		104	%	50 - 130
			Benzo[e]pyrene	2014/04/22		105	%	50 - 130
			Chrysene	2014/04/22		104	%	50 - 130
			Dibenz(a,h)anthracene	2014/04/22		100	%	50 - 130
			Fluoranthene	2014/04/22		97	%	50 - 130
			Fluorene	2014/04/22		98	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/04/22		103	%	50 - 130
			2-Methylnaphthalene	2014/04/22		72	%	50 - 130
			Naphthalene	2014/04/22		90	%	50 - 130
			Phenanthrene	2014/04/22		101	%	50 - 130
			Perylene	2014/04/22		105	%	50 - 130
			Pyrene	2014/04/22		101	%	50 - 130
			Quinoline	2014/04/22		96	%	50 - 130

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Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7458803	JC7	Method Blank	D10-ANTHRACENE (sur.)	2014/04/22		102	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/04/22		105	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/04/22		93	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/04/22		102	%	50 - 130
			Acenaphthene	2014/04/22	<0.10		ug/L	
			Acenaphthylene	2014/04/22	<0.10		ug/L	
			Acridine	2014/04/22	<0.20		ug/L	
			Anthracene	2014/04/22	<0.010		ug/L	
			Benzo(a)anthracene	2014/04/22	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2014/04/22	<0.0085		ug/L	
			Benzo(k)fluoranthene	2014/04/22	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2014/04/22	<0.0085		ug/L	
			Benzo(c)phenanthrene	2014/04/22	<0.050		ug/L	
			Benzo(a)pyrene	2014/04/22	<0.0075		ug/L	
			Benzo[e]pyrene	2014/04/22	<0.050		ug/L	
			Chrysene	2014/04/22	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2014/04/22	<0.0075		ug/L	
			Fluoranthene	2014/04/22	<0.010		ug/L	
			Fluorene	2014/04/22	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2014/04/22	<0.0085		ug/L	
			2-Methylnaphthalene	2014/04/22	<0.10		ug/L	
			Naphthalene	2014/04/22	<0.10		ug/L	
			Phenanthrene	2014/04/22	<0.050		ug/L	
			Perylene	2014/04/22	<0.050		ug/L	
			Pyrene	2014/04/22	<0.020		ug/L	
			Quinoline	2014/04/22	<0.20		ug/L	
7459147	VP4	Matrix Spike	O-TERPHENYL (sur.)	2014/04/24		92	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/04/24		78	%	50 - 130
7459147	VP4	Spiked Blank	O-TERPHENYL (sur.)	2014/04/23		107	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/04/23		110	%	70 - 130
7459147	VP4	Method Blank	O-TERPHENYL (sur.)	2014/04/24		103	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/04/24	<0.10		mg/L	
7459147	VP4	RPD	F2 (C10-C16 Hydrocarbons)	2014/04/24	NC		%	40
7459564	RSA	Matrix Spike	1,4-Difluorobenzene (sur.)	2014/04/22		102	%	70 - 130
			4-Bromofluorobenzene (sur.)	2014/04/22		107	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/04/22		96	%	70 - 130
			Benzene	2014/04/22		NC	%	70 - 130
			Toluene	2014/04/22		84	%	70 - 130
			Ethylbenzene	2014/04/22		83	%	70 - 130
			m & p-Xylene	2014/04/22		NC	%	70 - 130
			o-Xylene	2014/04/22		NC	%	70 - 130
			(C6-C10)	2014/04/22		90	%	70 - 130
7459564	RSA	Spiked Blank	1,4-Difluorobenzene (sur.)	2014/04/22		104	%	70 - 130
			4-Bromofluorobenzene (sur.)	2014/04/22		106	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/04/22		94	%	70 - 130
			Benzene	2014/04/22		75	%	70 - 130
			Toluene	2014/04/22		77	%	70 - 130
			Ethylbenzene	2014/04/22		76	%	70 - 130
			m & p-Xylene	2014/04/22		77	%	70 - 130
			o-Xylene	2014/04/22		75	%	70 - 130
			(C6-C10)	2014/04/22		82	%	70 - 130
7459564	RSA	Method Blank	1,4-Difluorobenzene (sur.)	2014/04/22		104	%	70 - 130

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			4-Bromofluorobenzene (sur.)	2014/04/22		108	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/04/22		97	%	70 - 130
			Benzene	2014/04/22	<0.40		ug/L	
			Toluene	2014/04/22	<0.40		ug/L	
			Ethylbenzene	2014/04/22	<0.40		ug/L	
			m & p-Xylene	2014/04/22	<0.80		ug/L	
			o-Xylene	2014/04/22	<0.40		ug/L	
			Xylenes (Total)	2014/04/22	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2014/04/22	<100		ug/L	
			(C6-C10)	2014/04/22	<100		ug/L	
7459564	RSA	RPD	Benzene	2014/04/22	NC		%	40
			Toluene	2014/04/22	NC		%	40
			Ethylbenzene	2014/04/22	NC		%	40
			m & p-Xylene	2014/04/22	NC		%	40
			o-Xylene	2014/04/22	NC		%	40
			Xylenes (Total)	2014/04/22	9.8		%	40
			F1 (C6-C10) - BTEX	2014/04/22	NC		%	40
			(C6-C10)	2014/04/22	NC		%	40
7459676	LY	Matrix Spike	Total Organic Carbon (C)	2014/04/22		NC	%	80 - 120
7459676	LY	Spiked Blank	Total Organic Carbon (C)	2014/04/22		104	%	80 - 120
7459676	LY	Method Blank	Total Organic Carbon (C)	2014/04/22	<0.50		mg/L	
7459676	LY	RPD	Total Organic Carbon (C)	2014/04/22	4.4		%	20
7459994	AP1	Matrix Spike	Strong Acid Dissoc. Cyanide (CN)	2014/04/22		109	%	80 - 120
7459994	AP1	QC Standard	Strong Acid Dissoc. Cyanide (CN)	2014/04/22		91	%	80 - 120
7459994	AP1	Spiked Blank	Strong Acid Dissoc. Cyanide (CN)	2014/04/22		92	%	80 - 120
7459994	AP1	Method Blank	Strong Acid Dissoc. Cyanide (CN)	2014/04/22	<0.0020		mg/L	
7459994	AP1	RPD	Strong Acid Dissoc. Cyanide (CN)	2014/04/22	NC		%	20
7459999	BL5	Matrix Spike	Total Ammonia (N)	2014/04/22		90	%	80 - 120
7459999	BL5	Spiked Blank	Total Ammonia (N)	2014/04/22		98	%	80 - 120
7459999	BL5	Method Blank	Total Ammonia (N)	2014/04/22	<0.050		mg/L	
7459999	BL5	RPD	Total Ammonia (N)	2014/04/22	3.9		%	20
7460025	LY	Matrix Spike	Dissolved Organic Carbon (C)	2014/04/22		109	%	80 - 120
7460025	LY	Spiked Blank	Dissolved Organic Carbon (C)	2014/04/22		109	%	80 - 120
7460025	LY	Method Blank	Dissolved Organic Carbon (C)	2014/04/22	<0.50		mg/L	
7460025	LY	RPD	Dissolved Organic Carbon (C)	2014/04/22	3.7		%	20
7460184	BL5	Matrix Spike	Total Ammonia (N)	2014/04/22		91	%	80 - 120
7460184	BL5	Spiked Blank	Total Ammonia (N)	2014/04/22		96	%	80 - 120
7460184	BL5	Method Blank	Total Ammonia (N)	2014/04/22	<0.050		mg/L	
7460184	BL5	RPD	Total Ammonia (N)	2014/04/22	NC		%	20
7460314	AP1	Matrix Spike [JK4088-10]	Phenols	2014/04/22		104	%	80 - 120
7460314	AP1	Spiked Blank	Phenols	2014/04/22		97	%	80 - 120
7460314	AP1	Method Blank	Phenols	2014/04/22	<0.0020		mg/L	
7460314	AP1	RPD [JK4088-10]	Phenols	2014/04/22	NC		%	20
7460959	HE1	Spiked Blank	Turbidity	2014/04/23		97	%	80 - 120
7460959	HE1	Method Blank	Turbidity	2014/04/23	<0.10		NTU	
7460959	HE1	RPD	Turbidity	2014/04/23	2.1		%	20
7461112	TDB	Matrix Spike [JK4089-06]	Total Aluminum (Al)	2014/04/23		86	%	80 - 120
			Total Antimony (Sb)	2014/04/23		102	%	80 - 120
			Total Arsenic (As)	2014/04/23		97	%	80 - 120
			Total Beryllium (Be)	2014/04/23		102	%	80 - 120
			Total Chromium (Cr)	2014/04/23		96	%	80 - 120
			Total Cobalt (Co)	2014/04/23		94	%	80 - 120

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			Total Copper (Cu)	2014/04/23		93	%	80 - 120
			Total Lead (Pb)	2014/04/23		97	%	80 - 120
			Total Molybdenum (Mo)	2014/04/23		103	%	80 - 120
			Total Nickel (Ni)	2014/04/23		93	%	80 - 120
			Total Selenium (Se)	2014/04/23		96	%	80 - 120
			Total Silver (Ag)	2014/04/23		98	%	80 - 120
			Total Thallium (Tl)	2014/04/23		100	%	80 - 120
			Total Tin (Sn)	2014/04/23		97	%	80 - 120
			Total Titanium (Ti)	2014/04/23		90	%	80 - 120
			Total Uranium (U)	2014/04/23		100	%	80 - 120
			Total Vanadium (V)	2014/04/23		101	%	80 - 120
			Total Zinc (Zn)	2014/04/23		98	%	80 - 120
7461112	TDB	Spiked Blank	Total Aluminum (Al)	2014/04/23		90	%	80 - 120
			Total Antimony (Sb)	2014/04/23		101	%	80 - 120
			Total Arsenic (As)	2014/04/23		99	%	80 - 120
			Total Beryllium (Be)	2014/04/23		98	%	80 - 120
			Total Chromium (Cr)	2014/04/23		98	%	80 - 120
			Total Cobalt (Co)	2014/04/23		99	%	80 - 120
			Total Copper (Cu)	2014/04/23		99	%	80 - 120
			Total Lead (Pb)	2014/04/23		100	%	80 - 120
			Total Molybdenum (Mo)	2014/04/23		99	%	80 - 120
			Total Nickel (Ni)	2014/04/23		95	%	80 - 120
			Total Selenium (Se)	2014/04/23		96	%	80 - 120
			Total Silver (Ag)	2014/04/23		96	%	80 - 120
			Total Thallium (Tl)	2014/04/23		100	%	80 - 120
			Total Tin (Sn)	2014/04/23		94	%	80 - 120
			Total Titanium (Ti)	2014/04/23		91	%	80 - 120
			Total Uranium (U)	2014/04/23		99	%	80 - 120
			Total Vanadium (V)	2014/04/23		101	%	80 - 120
			Total Zinc (Zn)	2014/04/23		92	%	80 - 120
7461112	TDB	Method Blank	Total Aluminum (Al)	2014/04/23	<0.0030		mg/L	
			Total Antimony (Sb)	2014/04/23	<0.00060		mg/L	
			Total Arsenic (As)	2014/04/23	<0.00020		mg/L	
			Total Beryllium (Be)	2014/04/23	<0.0010		mg/L	
			Total Chromium (Cr)	2014/04/23	<0.0010		mg/L	
			Total Cobalt (Co)	2014/04/23	<0.00030		mg/L	
			Total Copper (Cu)	2014/04/23	<0.00020		mg/L	
			Total Lead (Pb)	2014/04/23	<0.00020		mg/L	
			Total Molybdenum (Mo)	2014/04/23	<0.00020		mg/L	
			Total Nickel (Ni)	2014/04/23	<0.00050		mg/L	
			Total Selenium (Se)	2014/04/23	<0.00020		mg/L	
			Total Silver (Ag)	2014/04/23	<0.00010		mg/L	
			Total Thallium (Tl)	2014/04/23	<0.00020		mg/L	
			Total Tin (Sn)	2014/04/23	<0.0010		mg/L	
			Total Titanium (Ti)	2014/04/23	<0.0010		mg/L	
			Total Uranium (U)	2014/04/23	<0.00010		mg/L	
			Total Vanadium (V)	2014/04/23	<0.0010		mg/L	
			Total Zinc (Zn)	2014/04/23	<0.0030		mg/L	
7461112	TDB	RPD [JK4089-06]	Total Aluminum (Al)	2014/04/23	NC		%	20
			Total Antimony (Sb)	2014/04/23	NC		%	20
			Total Arsenic (As)	2014/04/23	NC		%	20
			Total Beryllium (Be)	2014/04/23	NC		%	20

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Chromium (Cr)	2014/04/23	NC		%	20
			Total Cobalt (Co)	2014/04/23	NC		%	20
			Total Copper (Cu)	2014/04/23	NC		%	20
			Total Lead (Pb)	2014/04/23	NC		%	20
			Total Molybdenum (Mo)	2014/04/23	3.0		%	20
			Total Nickel (Ni)	2014/04/23	NC		%	20
			Total Selenium (Se)	2014/04/23	1.6		%	20
			Total Silver (Ag)	2014/04/23	NC		%	20
			Total Thallium (Tl)	2014/04/23	NC		%	20
			Total Tin (Sn)	2014/04/23	NC		%	20
			Total Titanium (Ti)	2014/04/23	NC		%	20
			Total Uranium (U)	2014/04/23	4.9		%	20
			Total Vanadium (V)	2014/04/23	NC		%	20
			Total Zinc (Zn)	2014/04/23	NC		%	20
7461114	STI	Matrix Spike [JK4089-06]	Total Barium (Ba)	2014/04/23		96	%	80 - 120
			Total Boron (B)	2014/04/23		100	%	80 - 120
			Total Calcium (Ca)	2014/04/23		NC	%	80 - 120
			Total Iron (Fe)	2014/04/23		102	%	80 - 120
			Total Lithium (Li)	2014/04/23		98	%	80 - 120
			Total Magnesium (Mg)	2014/04/23		102	%	80 - 120
			Total Manganese (Mn)	2014/04/23		101	%	80 - 120
			Total Phosphorus (P)	2014/04/23		97	%	80 - 120
			Total Potassium (K)	2014/04/23		100	%	80 - 120
			Total Silicon (Si)	2014/04/23		98	%	80 - 120
			Total Sodium (Na)	2014/04/23		98	%	80 - 120
			Total Strontium (Sr)	2014/04/23		99	%	80 - 120
7461114	STI	Spiked Blank	Total Barium (Ba)	2014/04/23		96	%	80 - 120
			Total Boron (B)	2014/04/23		98	%	80 - 120
			Total Calcium (Ca)	2014/04/23		98	%	80 - 120
			Total Iron (Fe)	2014/04/23		102	%	80 - 120
			Total Lithium (Li)	2014/04/23		97	%	80 - 120
			Total Magnesium (Mg)	2014/04/23		100	%	80 - 120
			Total Manganese (Mn)	2014/04/23		101	%	80 - 120
			Total Phosphorus (P)	2014/04/23		96	%	80 - 120
			Total Potassium (K)	2014/04/23		98	%	80 - 120
			Total Silicon (Si)	2014/04/23		95	%	80 - 120
			Total Sodium (Na)	2014/04/23		97	%	80 - 120
			Total Strontium (Sr)	2014/04/23		98	%	80 - 120
7461114	STI	Method Blank	Total Barium (Ba)	2014/04/23	<0.010		mg/L	
			Total Boron (B)	2014/04/23	<0.020		mg/L	
			Total Calcium (Ca)	2014/04/23	<0.30		mg/L	
			Total Iron (Fe)	2014/04/23	<0.060		mg/L	
			Total Lithium (Li)	2014/04/23	<0.020		mg/L	
			Total Magnesium (Mg)	2014/04/23	<0.20		mg/L	
			Total Manganese (Mn)	2014/04/23	<0.0040		mg/L	
			Total Phosphorus (P)	2014/04/23	<0.10		mg/L	
			Total Potassium (K)	2014/04/23	<0.30		mg/L	
			Total Silicon (Si)	2014/04/23	<0.10		mg/L	
			Total Sodium (Na)	2014/04/23	<0.50		mg/L	
			Total Strontium (Sr)	2014/04/23	<0.020		mg/L	
			Total Sulphur (S)	2014/04/23	<0.20		mg/L	
7461114	STI	RPD [JK4089-06]	Total Barium (Ba)	2014/04/23	0.3		%	20

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			Total Boron (B)	2014/04/23	NC		%	20
			Total Calcium (Ca)	2014/04/23	0.01		%	20
			Total Iron (Fe)	2014/04/23	NC		%	20
			Total Lithium (Li)	2014/04/23	NC		%	20
			Total Magnesium (Mg)	2014/04/23	0.1		%	20
			Total Manganese (Mn)	2014/04/23	NC		%	20
			Total Phosphorus (P)	2014/04/23	NC		%	20
			Total Potassium (K)	2014/04/23	NC		%	20
			Total Silicon (Si)	2014/04/23	0.2		%	20
			Total Sodium (Na)	2014/04/23	0.8		%	20
			Total Strontium (Sr)	2014/04/23	0.05		%	20
			Total Sulphur (S)	2014/04/23	1.3		%	20
7461122	KKV	Spiked Blank	Total Dissolved Solids	2014/04/23		94	%	80 - 120
7461122	KKV	Method Blank	Total Dissolved Solids	2014/04/23	<10		mg/L	
7461122	KKV	RPD	Total Dissolved Solids	2014/04/23	1.9		%	20
7461224	STI	Matrix Spike	Dissolved Barium (Ba)	2014/04/23		82	%	80 - 120
			Dissolved Boron (B)	2014/04/23		88	%	80 - 120
			Dissolved Calcium (Ca)	2014/04/23		NC	%	80 - 120
			Dissolved Iron (Fe)	2014/04/23		NC	%	80 - 120
			Dissolved Lithium (Li)	2014/04/23		84	%	80 - 120
			Dissolved Magnesium (Mg)	2014/04/23		NC	%	80 - 120
			Dissolved Manganese (Mn)	2014/04/23		NC	%	80 - 120
			Dissolved Phosphorus (P)	2014/04/23		101	%	80 - 120
			Dissolved Potassium (K)	2014/04/23		87	%	80 - 120
			Dissolved Silicon (Si)	2014/04/23		NC	%	80 - 120
			Dissolved Sodium (Na)	2014/04/23		NC	%	80 - 120
			Dissolved Strontium (Sr)	2014/04/23		NC	%	80 - 120
7461224	STI	Spiked Blank	Dissolved Barium (Ba)	2014/04/23		95	%	80 - 120
			Dissolved Boron (B)	2014/04/23		101	%	80 - 120
			Dissolved Calcium (Ca)	2014/04/23		102	%	80 - 120
			Dissolved Iron (Fe)	2014/04/23		103	%	80 - 120
			Dissolved Lithium (Li)	2014/04/23		97	%	80 - 120
			Dissolved Magnesium (Mg)	2014/04/23		103	%	80 - 120
			Dissolved Manganese (Mn)	2014/04/23		101	%	80 - 120
			Dissolved Phosphorus (P)	2014/04/23		99	%	80 - 120
			Dissolved Potassium (K)	2014/04/23		103	%	80 - 120
			Dissolved Silicon (Si)	2014/04/23		98	%	80 - 120
			Dissolved Sodium (Na)	2014/04/23		100	%	80 - 120
			Dissolved Strontium (Sr)	2014/04/23		97	%	80 - 120
7461224	STI	Method Blank	Dissolved Barium (Ba)	2014/04/23	<0.010		mg/L	
			Dissolved Boron (B)	2014/04/23	<0.020		mg/L	
			Dissolved Calcium (Ca)	2014/04/23	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/04/23	<0.060		mg/L	
			Dissolved Lithium (Li)	2014/04/23	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2014/04/23	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/04/23	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2014/04/23	<0.10		mg/L	
			Dissolved Potassium (K)	2014/04/23	<0.30		mg/L	
			Dissolved Silicon (Si)	2014/04/23	<0.10		mg/L	
			Dissolved Sodium (Na)	2014/04/23	<0.50		mg/L	
			Dissolved Strontium (Sr)	2014/04/23	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/04/23	<0.20		mg/L	

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Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7461224	STI	RPD	Dissolved Calcium (Ca)	2014/04/23	1		%	20
			Dissolved Magnesium (Mg)	2014/04/23	1		%	20
7461434	SCC	Spiked Blank	Alkalinity (Total as CaCO3)	2014/04/23		94	%	80 - 120
7461434	SCC	Method Blank	Alkalinity (PP as CaCO3)	2014/04/23	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2014/04/23	<0.50		mg/L	
			Bicarbonate (HCO3)	2014/04/23	<0.50		mg/L	
			Carbonate (CO3)	2014/04/23	<0.50		mg/L	
			Hydroxide (OH)	2014/04/23	<0.50		mg/L	
7461434	SCC	RPD	Alkalinity (PP as CaCO3)	2014/04/23	NC		%	20
			Alkalinity (Total as CaCO3)	2014/04/23	3.2		%	20
			Bicarbonate (HCO3)	2014/04/23	3.2		%	20
			Carbonate (CO3)	2014/04/23	NC		%	20
			Hydroxide (OH)	2014/04/23	NC		%	20
7461457	SCC	Spiked Blank	Conductivity	2014/04/23		102	%	90 - 110
7461457	SCC	Method Blank	Conductivity	2014/04/23	<1.0		uS/cm	
7461457	SCC	RPD	Conductivity	2014/04/23	0.7		%	20
7461464	SCC	Spiked Blank	pH	2014/04/23		100	%	97 - 102
7461464	SCC	RPD	pH	2014/04/23	0.6		%	5
7461467	TDB	Matrix Spike	Dissolved Aluminum (Al)	2014/04/23		103	%	80 - 120
			Dissolved Antimony (Sb)	2014/04/23		77 (1)	%	80 - 120
			Dissolved Arsenic (As)	2014/04/23		93	%	80 - 120
			Dissolved Beryllium (Be)	2014/04/23		99	%	80 - 120
			Dissolved Chromium (Cr)	2014/04/23		88	%	80 - 120
			Dissolved Cobalt (Co)	2014/04/23		89	%	80 - 120
			Dissolved Copper (Cu)	2014/04/23		88	%	80 - 120
			Dissolved Lead (Pb)	2014/04/23		80	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/04/23		98	%	80 - 120
			Dissolved Nickel (Ni)	2014/04/23		87	%	80 - 120
			Dissolved Selenium (Se)	2014/04/23		94	%	80 - 120
			Dissolved Silver (Ag)	2014/04/23		83	%	80 - 120
			Dissolved Thallium (Tl)	2014/04/23		85	%	80 - 120
			Dissolved Tin (Sn)	2014/04/23		95	%	80 - 120
			Dissolved Titanium (Ti)	2014/04/23		93	%	80 - 120
			Dissolved Uranium (U)	2014/04/23		91	%	80 - 120
			Dissolved Vanadium (V)	2014/04/23		97	%	80 - 120
			Dissolved Zinc (Zn)	2014/04/23		92	%	80 - 120
7461467	TDB	Spiked Blank	Dissolved Aluminum (Al)	2014/04/23		103	%	80 - 120
			Dissolved Antimony (Sb)	2014/04/23		82	%	80 - 120
			Dissolved Arsenic (As)	2014/04/23		91	%	80 - 120
			Dissolved Beryllium (Be)	2014/04/23		94	%	80 - 120
			Dissolved Chromium (Cr)	2014/04/23		92	%	80 - 120
			Dissolved Cobalt (Co)	2014/04/23		93	%	80 - 120
			Dissolved Copper (Cu)	2014/04/23		92	%	80 - 120
			Dissolved Lead (Pb)	2014/04/23		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/04/23		96	%	80 - 120
			Dissolved Nickel (Ni)	2014/04/23		93	%	80 - 120
			Dissolved Selenium (Se)	2014/04/23		95	%	80 - 120
			Dissolved Silver (Ag)	2014/04/23		96	%	80 - 120
			Dissolved Thallium (Tl)	2014/04/23		92	%	80 - 120
			Dissolved Tin (Sn)	2014/04/23		96	%	80 - 120
			Dissolved Titanium (Ti)	2014/04/23		95	%	80 - 120
			Dissolved Uranium (U)	2014/04/23		95	%	80 - 120

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Success Through Science®

Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Vanadium (V)	2014/04/23		96	%	80 - 120
			Dissolved Zinc (Zn)	2014/04/23		90	%	80 - 120
7461467	TDB	Method Blank	Dissolved Aluminum (Al)	2014/04/23	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/04/23	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/04/23	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/04/23	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/04/23	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/04/23	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/04/23	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/04/23	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/04/23	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/04/23	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/04/23	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/04/23	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/04/23	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/04/23	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/04/23	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/04/23	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/04/23	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/04/23	<0.0030		mg/L	
7461467	TDB	RPD	Dissolved Aluminum (Al)	2014/04/23	NC		%	20
			Dissolved Antimony (Sb)	2014/04/23	NC		%	20
			Dissolved Arsenic (As)	2014/04/23	3.9		%	20
			Dissolved Beryllium (Be)	2014/04/23	NC		%	20
			Dissolved Chromium (Cr)	2014/04/23	NC		%	20
			Dissolved Cobalt (Co)	2014/04/23	NC		%	20
			Dissolved Copper (Cu)	2014/04/23	NC		%	20
			Dissolved Lead (Pb)	2014/04/23	NC		%	20
			Dissolved Molybdenum (Mo)	2014/04/23	4.2		%	20
			Dissolved Nickel (Ni)	2014/04/23	NC		%	20
			Dissolved Selenium (Se)	2014/04/23	NC		%	20
			Dissolved Silver (Ag)	2014/04/23	NC		%	20
			Dissolved Thallium (Tl)	2014/04/23	NC		%	20
			Dissolved Tin (Sn)	2014/04/23	NC		%	20
			Dissolved Titanium (Ti)	2014/04/23	NC		%	20
			Dissolved Uranium (U)	2014/04/23	1.3		%	20
			Dissolved Vanadium (V)	2014/04/23	NC		%	20
			Dissolved Zinc (Zn)	2014/04/23	NC		%	20
7461725	CT6	Matrix Spike	Dissolved Nitrite (N)	2014/04/24		104	%	80 - 120
			Dissolved Nitrate (N)	2014/04/24		106	%	80 - 120
7461725	CT6	Spiked Blank	Dissolved Nitrite (N)	2014/04/23		102	%	90 - 110
			Dissolved Nitrate (N)	2014/04/23		103	%	90 - 110
7461725	CT6	Method Blank	Dissolved Nitrite (N)	2014/04/23	<0.010		mg/L	
			Dissolved Nitrate (N)	2014/04/23	<0.010		mg/L	
7461725	CT6	RPD	Dissolved Nitrite (N)	2014/04/24	NC		%	20
			Dissolved Nitrate (N)	2014/04/24	NC		%	20
7462265	HE1	Matrix Spike	Total Suspended Solids	2014/04/24		102	%	80 - 120
7462265	HE1	Spiked Blank	Total Suspended Solids	2014/04/24		92	%	80 - 120
7462265	HE1	Method Blank	Total Suspended Solids	2014/04/24	<1.0		mg/L	
7462265	HE1	RPD	Total Suspended Solids	2014/04/24	8.7		%	20
7462421	BL5	Matrix Spike	Total Kjeldahl Nitrogen	2014/04/24		NC	%	80 - 120
7462421	BL5	QC Standard	Total Kjeldahl Nitrogen	2014/04/24		92	%	75 - 125

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Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7462421	BL5	Spiked Blank	Total Kjeldahl Nitrogen	2014/04/24		86	%	80 - 120
7462421	BL5	Method Blank	Total Kjeldahl Nitrogen	2014/04/24	<0.050		mg/L	
7462421	BL5	RPD	Total Kjeldahl Nitrogen	2014/04/24	2.4		%	20
7463565	BL5	Matrix Spike	Total Phosphate (P)	2014/04/24		98	%	80 - 120
7463565	BL5	QC Standard	Total Phosphate (P)	2014/04/24		95	%	80 - 120
7463565	BL5	Spiked Blank	Total Phosphate (P)	2014/04/24		100	%	83 - 111
7463565	BL5	Method Blank	Total Phosphate (P)	2014/04/24	<0.0030		mg/L	
7463565	BL5	RPD	Total Phosphate (P)	2014/04/24	NC		%	20
7463568	BL5	Matrix Spike [JK4088-05]	Dissolved Phosphate (P)	2014/04/24		99	%	80 - 120
7463568	BL5	QC Standard	Dissolved Phosphate (P)	2014/04/24		95	%	80 - 120
7463568	BL5	Spiked Blank	Dissolved Phosphate (P)	2014/04/24		99	%	83 - 111
7463568	BL5	Method Blank	Dissolved Phosphate (P)	2014/04/24	<0.0030		mg/L	
7463568	BL5	RPD [JK4088-05]	Dissolved Phosphate (P)	2014/04/24	NC		%	20
7463966	ZI	Matrix Spike	Dissolved Chloride (Cl)	2014/04/25		109	%	80 - 120
7463966	ZI	Spiked Blank	Dissolved Chloride (Cl)	2014/04/25		105	%	80 - 120
7463966	ZI	Method Blank	Dissolved Chloride (Cl)	2014/04/25	<1.0		mg/L	
7463966	ZI	RPD	Dissolved Chloride (Cl)	2014/04/25	NC		%	20
7463973	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2014/04/25		NC	%	80 - 120
7463973	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2014/04/25		104	%	80 - 120
7463973	ZI	Method Blank	Dissolved Sulphate (SO4)	2014/04/25	<1.0		mg/L	
7463973	ZI	RPD	Dissolved Sulphate (SO4)	2014/04/25	1		%	20
7464080	DK9	Matrix Spike	Total Chemical Oxygen Demand	2014/04/25		99	%	80 - 120
7464080	DK9	Spiked Blank	Total Chemical Oxygen Demand	2014/04/25		102	%	80 - 120
7464080	DK9	Method Blank	Total Chemical Oxygen Demand	2014/04/25	<5.0		mg/L	
7464080	DK9	RPD	Total Chemical Oxygen Demand	2014/04/25	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B431089
Report Date: 2014/04/27

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Michael Sheppard, Organics Supervisor

<Original signed by>

Peng Liang, Analyst II

<Original signed by>

Veronica Falk, Scientific Specialist

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Edmonton: 9331 - 48 Street, T6B 2R4, Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody A145886

Page: ____ of ____

	Invoice To:	Report To:
Company:	NORWEST CORPORATION	
Contact:	AMY PERRIN	
Address:	2700 411 1ST ST SE CALGARY	
Prov:	AB PC: T2G 4Y5	Prov: PC:
Contact #s:	Ph: 4032056792 Cell: 4039698580	Cell:

C/O Report Address ☐ Same as Invoice ☑

Report Distribution (E-Mail): APERRIN@NORWESTCORP.COM

REGULATORY GUIDELINES:
☐ AT1
☐ CCME
☐ Regulated Drinking Water
☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: 284-1 / CROWN MOUNTAIN
Site Location: SPARWOOD
Quote #:
Sampled By: TD / AP

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

SOIL: BTEX F1-F4; Sieve (75 micron); Regulated Metals (CCME / AT1); Salinity 4; Assessment ICP Metals; Basic Class II Landfill

WATER: BTEX F1; BTEX F1-F2; Routine Water; TOC; Total; Dissolved; Mercury; EVOCs; BTEX F1-F4; Turb; F; DOC; Regulated Metals (CCME/AT1); Total; Dissolved

Other Analysis: CYANIDE; Cl; Nitrate+Nitrite; PHENOL; Redox Potential; PAH; F2-TEH; COD; Total Phosphorus; Nitrogen Total; Ammonia Nitrogen; HOLD - Do not Analyze; # of Containers Submitted; Dissolved Phosphorus

#	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	Analyses
1	CREEK		W	14/04/19 17:20	✓
2	QC1		W	14/04/19 17:00	✓
3	EB1		W	14/04/19 17:20	✓
4					
5					
6					
7					
8					
9					
10					
11					
12					

21-Apr-14 10:54
Jenelle Feller
B431089 JKG
NB6 INS-0078

Please indicate Filtered, Preserved or Both (F, P, F/P) F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
<Original signed by>	14/04/21	10:53

Received By:	Date:	Time:
<Original signed by>	2014/04/21	1054

Special Instructions:

# of Jars Used & Not Submitted

Lab Comments: 4-515

LAB USE ONLY

Maxxam Job #:		
Custody Seal	Temperature	Ice
No	-2, -3, -2	Yes

AB FCD-00331 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

Your Project #: B431090

Attention: Jenelle Feller
Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

Report Date: 2014/04/30
Report #: R3015432
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B465312
Received: 2014/04/23, 10:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Redox Potential	2	2014/04/23	2014/04/30	In house	

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division
Email: GSison@maxxam.ca
Phone# (905) 569-7599

==
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Total cover pages: 1

Maxxam Job #: B465312
Report Date: 2014/04/30

Maxxam Analytics
Client Project #: B431090

Sampler Initials: TD

RESULTS OF ANALYSES OF WATER

Maxxam ID		VQ2580	VQ2581	
Sampling Date		2014/04/19 11:30	2014/04/20 11:00	
	Units	**JK4091-03R \ CM13-06**	**JK4092-03R \CM12-01**	**QC Batch**
Subcontracted Analysis				
Redox Potential	mV	+357	+299	3582103

QC Batch = Quality Control Batch

Maxxam Job #: B465312
Report Date: 2014/04/30

Maxxam Analytics
Client Project #: B431090

Sampler Initials: TD

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Analytics
Attention: Jenelle Feller
Client Project #: B431090
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: SB465312

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3582103	RSR	QC Standard	Redox Potential	2014/04/30		+244	%	238 - 248
		Method Blank	Redox Potential	2014/04/30	+308		mV	
		RPD [VQ2581-01]	Redox Potential	2014/04/30	1.0		%	10

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Your Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: a145887

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/05/02
Report #: R1561538
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B431090
Received: 2014/04/21, 10:54

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	2	N/A	2014/04/24	AB SOP-00005	SM 2320-B
BTEX/F1 in Water by HS GC/MS	3	N/A	2014/04/22	AB SOP-00039	CCME, EPA 8260C
Cadmium - low level CCME - Dissolved	2	N/A	2014/04/25	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	2	2014/04/21	2014/04/25	AB SOP-00043	EPA 200.8
Chloride by Automated Colourimetry	2	N/A	2014/04/25	AB SOP-00020	SM 4500 Cl-G
Chemical Oxygen Demand	2	N/A	2014/04/25	AB SOP-00016	SM 5220-D
Carbon (DOC) (1)	2	N/A	2014/04/22	CAL SOP-00077	MMCW 119
Conductivity @25C	2	N/A	2014/04/24	AB SOP-00005	SM 2510-B
CCME Hydrocarbons in Water (F2; C10-C16)	3	2014/04/22	2014/04/24	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	1	N/A	2014/04/24	AB WI-00065	SM 2340B
Hardness	1	N/A	2014/04/25	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	1	N/A	2014/04/23	AB SOP-00042	EPA 200.7
Elements by ICP (Dissolved) Lab Filtered	1	N/A	2014/04/25	AB SOP-00042	EPA 200.7
Elements by ICP - Total	2	2014/04/23	2014/04/23	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved	1	N/A	2014/04/23	AB SOP-00043	EPA 200.8
Elements by ICPMS - Dissolved - Filtered	1	N/A	2014/04/24	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	1	2014/04/23	2014/04/23	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	1	2014/04/23	2014/04/24	AB SOP-00043	EPA 200.8
Ion Balance	2	N/A	2014/04/22	AB WI-00065	SM 1030E
Sum of cations, anions	1	N/A	2014/04/24	AB WI-00065	SM 1030E
Sum of cations, anions	1	N/A	2014/04/25	AB WI-00065	SM 1030E
Nitrogen (total), Calc. TKN, NO3, NO2	2	N/A	2014/04/24	AB WI-00065	SM 4500-N A
Ammonia-N (Total)	2	N/A	2014/04/22	AB SOP-00007	EPA 350.1
Nitrate and Nitrite	2	N/A	2014/04/23	AB SOP-00023	SM4110B
Nitrate + Nitrite-N (calculated)	2	N/A	2014/04/23	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	2	N/A	2014/04/22	AB SOP-00023	SM 4110-B
Benzo[a]pyrene Equivalency	3	N/A	2014/04/23	AB SOP-00003	EPA 8270D
PAH in Water by GC/MS (2)	2	2014/04/22	2014/04/22	AB SOP-00003 AB SOP-00037	EPA 3510C/8270D

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Your Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: a145887

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/05/02
Report #: R1561538
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B431090
Received: 2014/04/21, 10:54

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
PAH in Water by GC/MS (2)	1	2014/04/22	2014/04/23	AB SOP-00003 AB SOP-00037	EPA 3510C/8270D
pH @25°C (Alkalinity titrator)	2	N/A	2014/04/24	AB SOP-00005	SM 4500-H+B
Phenols (4-AAP)	2	N/A	2014/04/22	CAL SOP-00067	EPA 420.2
Sulphate by Automated Colourimetry	2	N/A	2014/04/25	AB SOP-00018	SM 4500 SO4-E
Cyanide (Total) Low level	2	2014/04/22	2014/04/22	CAL SOP-00073	EPA 335.2
Total Dissolved Solids (Filt. Residue)	2	2014/04/23	2014/04/23	CAL SOP-00074	SM 2540-C
Total Dissolved Solids (Calculated)	2	N/A	2014/04/25	AB WI-00065	SM 1030E
Total Kjeldahl Nitrogen	2	2014/04/23	2014/04/24	AB SOP-00008	EPA 351.1, 351.2
Carbon (Total Organic) (3)	2	N/A	2014/04/22	CAL SOP-00077	MMCW 119
Phosphorus -P (Total, Dissolved)	2	2014/04/24	2014/04/24	AB SOP-00024	SM 4500-P
Total Phosphorus	2	2014/04/24	2014/04/24	AB SOP-00024	SM 4500-P
Total Suspended Solids (NFR)	2	2014/04/24	2014/04/24	AB SOP-00061	SM 2540-D
Turbidity	2	N/A	2014/04/23	CAL SOP-00081	SM 2130B

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) DOC present in the sample should be considered as non-purgeable DOC.
(2) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(3) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Jenelle Feller, Project Manager
Email: JFeller@maxxam.ca
Phone# (403) 291-3077
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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam

Maxxam Job #: B431090
Report Date: 2014/05/02

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		JK4091	JK4092	JK4093		
Sampling Date		2014/04/19 11:30	2014/04/20 11:00			
COC Number		a145887	a145887	a145887		
	Units	**CM13-06**	**CM12-01**	**TRIP BLANK**	**RDL**	**QC Batch**
Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.10	7459147
Volatiles						
Benzene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
Toluene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	0.80	7459564
o-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	7459564
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	0.80	7459564
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	100	7459564
(C6-C10)	ug/L	<100	<100	<100	100	7459564
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	103	104	103	N/A	7459564
4-Bromofluorobenzene (sur.)	%	109	108	109	N/A	7459564
D4-1,2-Dichloroethane (sur.)	%	99	98	99	N/A	7459564
O-TERPHENYL (sur.)	%	109	101	113	N/A	7459147

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B431090
Report Date: 2014/05/02

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		JK4091	JK4091		
Sampling Date		2014/04/19 11:30	2014/04/19 11:30		
COC Number		a145887	a145887		
	Units	**CM13-06**	**CM13-06 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters					
Anion Sum	meq/L	0.58	N/A	N/A	7458968
Cation Sum	meq/L	0.55	N/A	N/A	7458968
Hardness (CaCO3)	mg/L	26	N/A	0.50	7458965
Ion Balance	N/A	0.96	N/A	0.010	7458967
Dissolved Nitrate (NO3)	mg/L	0.17	N/A	0.044	7458969
Nitrate plus Nitrite (N)	mg/L	0.038	N/A	0.010	7458970
Dissolved Nitrite (NO2)	mg/L	<0.033	N/A	0.033	7458969
Total Dissolved Solids	mg/L	30	N/A	10	7458971
Misc. Inorganics					
Conductivity	uS/cm	57	55	1.0	7462640
pH	pH	6.78	N/A	N/A	7462641
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.031	N/A	0.0050	7458373
Anions					
Alkalinity (PP as CaCO3)	mg/L	<0.50	N/A	0.50	7462630
Alkalinity (Total as CaCO3)	mg/L	21	N/A	0.50	7462630
Bicarbonate (HCO3)	mg/L	26	N/A	0.50	7462630
Carbonate (CO3)	mg/L	<0.50	N/A	0.50	7462630
Hydroxide (OH)	mg/L	<0.50	N/A	0.50	7462630
Dissolved Sulphate (SO4)	mg/L	5.9	N/A	1.0	7463973
Dissolved Chloride (Cl)	mg/L	1.1	N/A	1.0	7463966
Nutrients					
Dissolved Nitrite (N)	mg/L	<0.010	N/A	0.010	7460408
Dissolved Nitrate (N)	mg/L	0.038	N/A	0.010	7460408
Elements					
Dissolved Aluminum (Al)	mg/L	0.027	N/A	0.0030	7461467
Dissolved Antimony (Sb)	mg/L	0.0018	N/A	0.00060	7461467
Dissolved Arsenic (As)	mg/L	<0.00020	N/A	0.00020	7461467
Dissolved Barium (Ba)	mg/L	0.052	N/A	0.010	7461224
Dissolved Beryllium (Be)	mg/L	<0.0010	N/A	0.0010	7461467
Dissolved Boron (B)	mg/L	<0.020	N/A	0.020	7461224
Dissolved Calcium (Ca)	mg/L	7.0	N/A	0.30	7461224

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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NORWEST CORPORATION
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Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		JK4091	JK4091		
Sampling Date		2014/04/19 11:30	2014/04/19 11:30		
COC Number		a145887	a145887		
	Units	**CM13-06**	**CM13-06 Lab-Dup**	**RDL**	**QC Batch**
Dissolved Chromium (Cr)	mg/L	<0.0010	N/A	0.0010	7461467
Dissolved Cobalt (Co)	mg/L	<0.00030	N/A	0.00030	7461467
Dissolved Copper (Cu)	mg/L	0.00086	N/A	0.00020	7461467
Dissolved Iron (Fe)	mg/L	<0.060	N/A	0.060	7461224
Dissolved Lead (Pb)	mg/L	<0.00020	N/A	0.00020	7461467
Dissolved Lithium (Li)	mg/L	<0.020	N/A	0.020	7461224
Dissolved Magnesium (Mg)	mg/L	2.1	N/A	0.20	7461224
Dissolved Manganese (Mn)	mg/L	<0.0040	N/A	0.0040	7461224
Dissolved Molybdenum (Mo)	mg/L	<0.00020	N/A	0.00020	7461467
Dissolved Nickel (Ni)	mg/L	0.0024	N/A	0.00050	7461467
Dissolved Phosphorus (P)	mg/L	<0.10	N/A	0.10	7461224
Dissolved Potassium (K)	mg/L	<0.30	N/A	0.30	7461224
Dissolved Selenium (Se)	mg/L	<0.00020	N/A	0.00020	7461467
Dissolved Silicon (Si)	mg/L	1.9	N/A	0.10	7461224
Dissolved Silver (Ag)	mg/L	<0.00010	N/A	0.00010	7461467
Dissolved Sodium (Na)	mg/L	0.56 (1)	N/A	0.50	7461224
Dissolved Strontium (Sr)	mg/L	0.023	N/A	0.020	7461224
Dissolved Sulphur (S)	mg/L	1.7 (2)	N/A	0.20	7461224
Dissolved Thallium (Tl)	mg/L	<0.00020	N/A	0.00020	7461467
Dissolved Tin (Sn)	mg/L	<0.0010	N/A	0.0010	7461467
Dissolved Titanium (Ti)	mg/L	<0.0010	N/A	0.0010	7461467
Dissolved Uranium (U)	mg/L	<0.00010	N/A	0.00010	7461467
Dissolved Vanadium (V)	mg/L	<0.0010	N/A	0.0010	7461467
Dissolved Zinc (Zn)	mg/L	0.0057	N/A	0.0030	7461467

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).
(2) Dissolved greater than total. Results within acceptable limits of precision.

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ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		JK4092		
Sampling Date		2014/04/20 11:00		
COC Number		a145887		
	Units	**CM12-01**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	meq/L	7.0	N/A	7458968
Cation Sum	meq/L	6.8	N/A	7458968
Hardness (CaCO3)	mg/L	20	0.50	7458965
Ion Balance	N/A	0.98	0.010	7458967
Dissolved Nitrate (NO3)	mg/L	4.0	0.044	7458969
Nitrate plus Nitrite (N)	mg/L	1.4	0.010	7458970
Dissolved Nitrite (NO2)	mg/L	1.7	0.033	7458969
Total Dissolved Solids	mg/L	440	10	7458971
Misc. Inorganics				
Conductivity	uS/cm	720	1.0	7462640
pH	pH	8.22	N/A	7462641
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	<0.025	0.025	7458373
Anions				
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	7462630
Alkalinity (Total as CaCO3)	mg/L	140	0.50	7462630
Bicarbonate (HCO3)	mg/L	170	0.50	7462630
Carbonate (CO3)	mg/L	<0.50	0.50	7462630
Hydroxide (OH)	mg/L	<0.50	0.50	7462630
Dissolved Sulphate (SO4)	mg/L	190	1.0	7463973
Dissolved Chloride (Cl)	mg/L	6.6	1.0	7463966
Nutrients				
Dissolved Nitrite (N)	mg/L	0.52	0.010	7460408
Dissolved Nitrate (N)	mg/L	0.90	0.010	7460408
Elements				
Dissolved Aluminum (Al)	mg/L	2.9	0.015	7463344
Dissolved Antimony (Sb)	mg/L	0.0051 (1)	0.0030	7463344
Dissolved Arsenic (As)	mg/L	0.0054	0.0010	7463344
Dissolved Barium (Ba)	mg/L	0.010	0.010	7461250
Dissolved Beryllium (Be)	mg/L	<0.0050	0.0050	7463344
Dissolved Boron (B)	mg/L	<0.020	0.020	7461250
Dissolved Calcium (Ca)	mg/L	5.4	0.30	7461250

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).

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NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		JK4092		
Sampling Date		2014/04/20 11:00		
COC Number		a145887		
	Units	CM12-01	RDL	QC Batch
Dissolved Chromium (Cr)	mg/L	<0.0050	0.0050	7463344
Dissolved Cobalt (Co)	mg/L	<0.0015	0.0015	7463344
Dissolved Copper (Cu)	mg/L	<0.0010	0.0010	7463344
Dissolved Iron (Fe)	mg/L	0.19	0.060	7461250
Dissolved Lead (Pb)	mg/L	0.0018	0.0010	7463344
Dissolved Lithium (Li)	mg/L	0.044	0.020	7461250
Dissolved Magnesium (Mg)	mg/L	1.5	0.20	7461250
Dissolved Manganese (Mn)	mg/L	0.046	0.0040	7461250
Dissolved Molybdenum (Mo)	mg/L	0.023 (1)	0.0010	7463344
Dissolved Nickel (Ni)	mg/L	<0.0025	0.0025	7463344
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	7461250
Dissolved Potassium (K)	mg/L	1.6	0.30	7461250
Dissolved Selenium (Se)	mg/L	0.0020	0.0010	7463344
Dissolved Silicon (Si)	mg/L	5.3	0.10	7461250
Dissolved Silver (Ag)	mg/L	<0.00050	0.00050	7463344
Dissolved Sodium (Na)	mg/L	150	0.50	7461250
Dissolved Strontium (Sr)	mg/L	0.075	0.020	7461250
Dissolved Sulphur (S)	mg/L	54	0.20	7461250
Dissolved Thallium (Tl)	mg/L	<0.0010	0.0010	7463344
Dissolved Tin (Sn)	mg/L	<0.0050	0.0050	7463344
Dissolved Titanium (Ti)	mg/L	0.024	0.0050	7463344
Dissolved Uranium (U)	mg/L	0.014	0.00050	7463344
Dissolved Vanadium (V)	mg/L	<0.0050	0.0050	7463344
Dissolved Zinc (Zn)	mg/L	<0.015	0.015	7463344

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Reanalysis yields similar results.

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NORWEST CORPORATION
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Site Location: SPARWOOD
Sampler Initials: TD

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		JK4091		JK4092		
Sampling Date		2014/04/19 11:30		2014/04/20 11:00		
COC Number		a145887		a145887		
	Units	**CM13-06**	**RDL**	**CM12-01**	**RDL**	**QC Batch**
Low Level Elements						
Total Cadmium (Cd)	ug/L	0.077	0.0050	0.42	0.025	7458374
Elements						
Total Aluminum (Al)	mg/L	0.68	0.0030	13	0.015	7461112
Total Antimony (Sb)	mg/L	0.0042	0.00060	0.0036	0.0030	7461112
Total Arsenic (As)	mg/L	0.0010	0.00020	0.011	0.0010	7461112
Total Barium (Ba)	mg/L	0.070	0.010	0.12	0.010	7461114
Total Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0050	0.0050	7461112
Total Boron (B)	mg/L	<0.020	0.020	0.023	0.020	7461114
Total Calcium (Ca)	mg/L	7.2	0.30	25	0.30	7461114
Total Chromium (Cr)	mg/L	0.0018	0.0010	0.0076	0.0050	7461112
Total Cobalt (Co)	mg/L	0.0015	0.00030	0.0029	0.0015	7461112
Total Copper (Cu)	mg/L	0.0069	0.00020	0.0088	0.0010	7461112
Total Iron (Fe)	mg/L	1.1	0.060	10	0.060	7461114
Total Lead (Pb)	mg/L	0.0058	0.00020	0.056	0.0010	7461112
Total Lithium (Li)	mg/L	<0.020	0.020	0.061	0.020	7461114
Total Magnesium (Mg)	mg/L	2.1	0.20	8.9	0.20	7461114
Total Manganese (Mn)	mg/L	0.011	0.0040	0.47	0.0040	7461114
Total Molybdenum (Mo)	mg/L	<0.00020	0.00020	0.014	0.0010	7461112
Total Nickel (Ni)	mg/L	0.0048	0.00050	0.0094	0.0025	7461112
Total Phosphorus (P)	mg/L	<0.10	0.10	0.33	0.10	7461114
Total Potassium (K)	mg/L	0.46	0.30	2.6	0.30	7461114
Total Selenium (Se)	mg/L	0.00025	0.00020	0.0023	0.0010	7461112
Total Silicon (Si)	mg/L	2.2	0.10	38	0.10	7461114
Total Silver (Ag)	mg/L	<0.00010	0.00010	<0.00050	0.00050	7461112
Total Sodium (Na)	mg/L	0.55	0.50	150	0.50	7461114
Total Strontium (Sr)	mg/L	0.025	0.020	0.36	0.020	7461114
Total Sulphur (S)	mg/L	1.6	0.20	54	0.20	7461114
Total Thallium (Tl)	mg/L	<0.00020	0.00020	<0.0010	0.0010	7461112
Total Tin (Sn)	mg/L	<0.0010	0.0010	<0.0050	0.0050	7461112
Total Titanium (Ti)	mg/L	0.084	0.0010	0.097	0.0050	7461112
Total Uranium (U)	mg/L	0.00018	0.00010	0.028	0.00050	7461112
Total Vanadium (V)	mg/L	0.0033	0.0010	0.0062	0.0050	7461112
Total Zinc (Zn)	mg/L	0.020	0.0030	0.099	0.015	7461112
RDL = Reportable Detection Limit						

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NORWEST CORPORATION
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Site Location: SPARWOOD
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RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		JK4091		JK4092		
Sampling Date		2014/04/19 11:30		2014/04/20 11:00		
COC Number		a145887		a145887		
	Units	**CM13-06**	**RDL**	**CM12-01**	**RDL**	**QC Batch**
Demand Parameters						
Total Chemical Oxygen Demand	mg/L	<5.0	5.0	9.0	5.0	7464080
Misc. Inorganics						
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.0020	0.0020	0.0020	0.0020	7459994
Dissolved Organic Carbon (C)	mg/L	2.0 (1)	0.50	2.0	0.50	7460025
Total Organic Carbon (C)	mg/L	1.5	0.50	<5.0 (2)	5.0	7459676
Total Dissolved Solids	mg/L	46	10	1200 (2)	33	7461122
Total Suspended Solids	mg/L	68	1.0	560 (2)	3.3	7462265
Nutrients						
Total Ammonia (N)	mg/L	0.071	0.050	0.066	0.050	7460184
Total Kjeldahl Nitrogen	mg/L	<0.50 (2)	0.50	<0.50 (2)	0.50	7462421
Total Nitrogen (N)	mg/L	<0.050	0.050	1.4	0.050	7459761
Dissolved Phosphate (P)	mg/L	0.040	0.0030	0.048	0.0030	7463568
Total Phosphate (P)	mg/L	0.13	0.0030	0.38	0.0030	7463565
Misc. Organics						
Phenols	mg/L	<0.0020	0.0020	<0.0020	0.0020	7460314
Physical Properties						
Turbidity	NTU	110	0.10	610	0.10	7460959

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).
(2) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

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SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		JK4091	JK4092	JK4093		
Sampling Date		2014/04/19 11:30	2014/04/20 11:00			
COC Number		a145887	a145887	a145887		
	Units	**CM13-06**	**CM12-01**	**TRIP BLANK**	**RDL**	**QC Batch**
Polycyclic Aromatics						
Benzo[a]pyrene equivalency	ug/L	<0.010	<0.010	<0.010	0.010	7458889
Acenaphthene	ug/L	<0.10	<0.10	<0.10	0.10	7458803
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	0.10	7458803
Acridine	ug/L	<0.20	2.0	<0.20	0.20	7458803
Anthracene	ug/L	<0.010	<0.010	<0.010	0.010	7458803
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7458803
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7458803
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7458803
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7458803
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	0.050	7458803
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	<0.0075	0.0075	7458803
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	0.050	7458803
Chrysene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7458803
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	<0.0075	0.0075	7458803
Fluoranthene	ug/L	<0.010	<0.010	<0.010	0.010	7458803
Fluorene	ug/L	<0.050	<0.050	<0.050	0.050	7458803
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	7458803
2-Methylnaphthalene	ug/L	<0.10	<0.10	<0.10	0.10	7458803
Naphthalene	ug/L	<0.10	<0.10	<0.10	0.10	7458803
Phenanthrene	ug/L	<0.050	<0.050	<0.050	0.050	7458803
Perylene	ug/L	<0.050	<0.050	<0.050	0.050	7458803
Pyrene	ug/L	<0.020	<0.020	<0.020	0.020	7458803
Quinoline	ug/L	<0.20	<0.20	<0.20	0.20	7458803
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	99	103	95	N/A	7458803
D12-BENZO(A)PYRENE (sur.)	%	102	103	94	N/A	7458803
D8-ACENAPHTHYLENE (sur.)	%	95	94	94	N/A	7458803
TERPHENYL-D14 (sur.)	%	100	102	95	N/A	7458803

RDL = Reportable Detection Limit
N/A = Not Applicable

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	-0.7°C

Redox results are attached to this report file. The reference number from Maxxam Sladeview for these results is B465312.

Sample JK4091-01 : TDS/ TDSC ratio exceeds normal acceptance limits, due to the low concentrations of ions being measured.

Sample JK4092-01 : TDS/ EC ratio and TDSC / TDS ratio exceeds normal acceptance limits, reanalysis yields similar results due to possible matrix interference.

ROUTINE WATER & DISS. REGULATED METALS (WATER) Comments

Sample JK4092-02 Elements by ICPMS - Dissolved - Filtered: Detection limits raised due to matrix interference.

REGULATED METALS (CCME/AT1) - TOTAL Comments

Sample JK4092-06 Elements by ICPMS - Total: Detection limits raised due to matrix interference.

Results relate only to the items tested.

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Maxxam Job #: B431090
Report Date: 2014/05/02

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7458803	JC7	Matrix Spike	D10-ANTHRACENE (sur.)	2014/04/22		99	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/04/22		103	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/04/22		94	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/04/22		99	%	50 - 130
			Acenaphthene	2014/04/22		97	%	50 - 130
			Acenaphthylene	2014/04/22		95	%	50 - 130
			Acridine	2014/04/22		66	%	50 - 130
			Anthracene	2014/04/22		96	%	50 - 130
			Benzo(a)anthracene	2014/04/22		101	%	50 - 130
			Benzo(b&j)fluoranthene	2014/04/22		109	%	50 - 130
			Benzo(k)fluoranthene	2014/04/22		100	%	50 - 130
			Benzo(g,h,i)perylene	2014/04/22		101	%	50 - 130
			Benzo(c)phenanthrene	2014/04/22		94	%	50 - 130
			Benzo(a)pyrene	2014/04/22		104	%	50 - 130
			Benzo[e]pyrene	2014/04/22		104	%	50 - 130
			Chrysene	2014/04/22		104	%	50 - 130
			Dibenz(a,h)anthracene	2014/04/22		101	%	50 - 130
			Fluoranthene	2014/04/22		97	%	50 - 130
			Fluorene	2014/04/22		100	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/04/22		102	%	50 - 130
			2-Methylnaphthalene	2014/04/22		66	%	50 - 130
			Naphthalene	2014/04/22		82	%	50 - 130
			Phenanthrene	2014/04/22		101	%	50 - 130
			Perylene	2014/04/22		106	%	50 - 130
			Pyrene	2014/04/22		100	%	50 - 130
			Quinoline	2014/04/22		95	%	50 - 130
7458803	JC7	Spiked Blank	D10-ANTHRACENE (sur.)	2014/04/22		101	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/04/22		105	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/04/22		93	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/04/22		102	%	50 - 130
			Acenaphthene	2014/04/22		97	%	50 - 130
			Acenaphthylene	2014/04/22		97	%	50 - 130
			Acridine	2014/04/22		84	%	50 - 130
			Anthracene	2014/04/22		96	%	50 - 130
			Benzo(a)anthracene	2014/04/22		101	%	50 - 130
			Benzo(b&j)fluoranthene	2014/04/22		109	%	50 - 130
			Benzo(k)fluoranthene	2014/04/22		100	%	50 - 130
			Benzo(g,h,i)perylene	2014/04/22		103	%	50 - 130
			Benzo(c)phenanthrene	2014/04/22		95	%	50 - 130
			Benzo(a)pyrene	2014/04/22		104	%	50 - 130
			Benzo[e]pyrene	2014/04/22		105	%	50 - 130
			Chrysene	2014/04/22		104	%	50 - 130
			Dibenz(a,h)anthracene	2014/04/22		100	%	50 - 130
			Fluoranthene	2014/04/22		97	%	50 - 130
			Fluorene	2014/04/22		98	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/04/22		103	%	50 - 130
			2-Methylnaphthalene	2014/04/22		72	%	50 - 130
			Naphthalene	2014/04/22		90	%	50 - 130
			Phenanthrene	2014/04/22		101	%	50 - 130
			Perylene	2014/04/22		105	%	50 - 130
			Pyrene	2014/04/22		101	%	50 - 130
			Quinoline	2014/04/22		96	%	50 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7458803	JC7	Method Blank	D10-ANTHRACENE (sur.)	2014/04/22		102	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/04/22		105	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/04/22		93	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/04/22		102	%	50 - 130
			Acenaphthene	2014/04/22	<0.10		ug/L	
			Acenaphthylene	2014/04/22	<0.10		ug/L	
			Acridine	2014/04/22	<0.20		ug/L	
			Anthracene	2014/04/22	<0.010		ug/L	
			Benzo(a)anthracene	2014/04/22	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2014/04/22	<0.0085		ug/L	
			Benzo(k)fluoranthene	2014/04/22	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2014/04/22	<0.0085		ug/L	
			Benzo(c)phenanthrene	2014/04/22	<0.050		ug/L	
			Benzo(a)pyrene	2014/04/22	<0.0075		ug/L	
			Benzo[e]pyrene	2014/04/22	<0.050		ug/L	
			Chrysene	2014/04/22	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2014/04/22	<0.0075		ug/L	
			Fluoranthene	2014/04/22	<0.010		ug/L	
			Fluorene	2014/04/22	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2014/04/22	<0.0085		ug/L	
			2-Methylnaphthalene	2014/04/22	<0.10		ug/L	
			Naphthalene	2014/04/22	<0.10		ug/L	
			Phenanthrene	2014/04/22	<0.050		ug/L	
			Perylene	2014/04/22	<0.050		ug/L	
			Pyrene	2014/04/22	<0.020		ug/L	
			Quinoline	2014/04/22	<0.20		ug/L	
7459147	VP4	Matrix Spike	O-TERPHENYL (sur.)	2014/04/24		92	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/04/24		78	%	50 - 130
7459147	VP4	Spiked Blank	O-TERPHENYL (sur.)	2014/04/23		107	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/04/23		110	%	70 - 130
7459147	VP4	Method Blank	O-TERPHENYL (sur.)	2014/04/24		103	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/04/24	<0.10		mg/L	
7459147	VP4	RPD	F2 (C10-C16 Hydrocarbons)	2014/04/24	NC		%	40
7459564	RSA	Matrix Spike	1,4-Difluorobenzene (sur.)	2014/04/22		102	%	70 - 130
			4-Bromofluorobenzene (sur.)	2014/04/22		107	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/04/22		96	%	70 - 130
			Benzene	2014/04/22		NC	%	70 - 130
			Toluene	2014/04/22		84	%	70 - 130
			Ethylbenzene	2014/04/22		83	%	70 - 130
			m & p-Xylene	2014/04/22		NC	%	70 - 130
			o-Xylene	2014/04/22		NC	%	70 - 130
			(C6-C10)	2014/04/22		90	%	70 - 130
7459564	RSA	Spiked Blank	1,4-Difluorobenzene (sur.)	2014/04/22		104	%	70 - 130
			4-Bromofluorobenzene (sur.)	2014/04/22		106	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/04/22		94	%	70 - 130
			Benzene	2014/04/22		75	%	70 - 130
			Toluene	2014/04/22		77	%	70 - 130
			Ethylbenzene	2014/04/22		76	%	70 - 130
			m & p-Xylene	2014/04/22		77	%	70 - 130
			o-Xylene	2014/04/22		75	%	70 - 130
			(C6-C10)	2014/04/22		82	%	70 - 130
7459564	RSA	Method Blank	1,4-Difluorobenzene (sur.)	2014/04/22		104	%	70 - 130

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NORWEST CORPORATION
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			4-Bromofluorobenzene (sur.)	2014/04/22		108	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/04/22		97	%	70 - 130
			Benzene	2014/04/22	<0.40		ug/L	
			Toluene	2014/04/22	<0.40		ug/L	
			Ethylbenzene	2014/04/22	<0.40		ug/L	
			m & p-Xylene	2014/04/22	<0.80		ug/L	
			o-Xylene	2014/04/22	<0.40		ug/L	
			Xylenes (Total)	2014/04/22	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2014/04/22	<100		ug/L	
			(C6-C10)	2014/04/22	<100		ug/L	
7459564	RSA	RPD	Benzene	2014/04/22	NC		%	40
			Toluene	2014/04/22	NC		%	40
			Ethylbenzene	2014/04/22	NC		%	40
			m & p-Xylene	2014/04/22	NC		%	40
			o-Xylene	2014/04/22	NC		%	40
			Xylenes (Total)	2014/04/22	9.8		%	40
			F1 (C6-C10) - BTEX	2014/04/22	NC		%	40
			(C6-C10)	2014/04/22	NC		%	40
7459676	LY	Matrix Spike	Total Organic Carbon (C)	2014/04/22		NC	%	80 - 120
7459676	LY	Spiked Blank	Total Organic Carbon (C)	2014/04/22		104	%	80 - 120
7459676	LY	Method Blank	Total Organic Carbon (C)	2014/04/22	<0.50		mg/L	
7459676	LY	RPD	Total Organic Carbon (C)	2014/04/22	4.4		%	20
7459994	AP1	Matrix Spike	Strong Acid Dissoc. Cyanide (CN)	2014/04/22		109	%	80 - 120
7459994	AP1	QC Standard	Strong Acid Dissoc. Cyanide (CN)	2014/04/22		91	%	80 - 120
7459994	AP1	Spiked Blank	Strong Acid Dissoc. Cyanide (CN)	2014/04/22		92	%	80 - 120
7459994	AP1	Method Blank	Strong Acid Dissoc. Cyanide (CN)	2014/04/22	<0.0020		mg/L	
7459994	AP1	RPD	Strong Acid Dissoc. Cyanide (CN)	2014/04/22	NC		%	20
7460025	LY	Matrix Spike	Dissolved Organic Carbon (C)	2014/04/22		109	%	80 - 120
7460025	LY	Spiked Blank	Dissolved Organic Carbon (C)	2014/04/22		109	%	80 - 120
7460025	LY	Method Blank	Dissolved Organic Carbon (C)	2014/04/22	<0.50		mg/L	
7460025	LY	RPD	Dissolved Organic Carbon (C)	2014/04/22	3.7		%	20
7460184	BL5	Matrix Spike	Total Ammonia (N)	2014/04/22		91	%	80 - 120
7460184	BL5	Spiked Blank	Total Ammonia (N)	2014/04/22		96	%	80 - 120
7460184	BL5	Method Blank	Total Ammonia (N)	2014/04/22	<0.050		mg/L	
7460184	BL5	RPD	Total Ammonia (N)	2014/04/22	NC		%	20
7460314	AP1	Matrix Spike	Phenols	2014/04/22		104	%	80 - 120
7460314	AP1	Spiked Blank	Phenols	2014/04/22		97	%	80 - 120
7460314	AP1	Method Blank	Phenols	2014/04/22	<0.0020		mg/L	
7460314	AP1	RPD	Phenols	2014/04/22	NC		%	20
7460408	JLD	Matrix Spike	Dissolved Nitrite (N)	2014/04/22		101	%	80 - 120
			Dissolved Nitrate (N)	2014/04/22		102	%	80 - 120
7460408	JLD	Spiked Blank	Dissolved Nitrite (N)	2014/04/22		101	%	90 - 110
			Dissolved Nitrate (N)	2014/04/22		103	%	90 - 110
7460408	JLD	Method Blank	Dissolved Nitrite (N)	2014/04/22	<0.010		mg/L	
			Dissolved Nitrate (N)	2014/04/22	<0.010		mg/L	
7460408	JLD	RPD	Dissolved Nitrite (N)	2014/04/22	NC		%	20
			Dissolved Nitrate (N)	2014/04/22	NC		%	20
7460959	HE1	Spiked Blank	Turbidity	2014/04/23		97	%	80 - 120
7460959	HE1	Method Blank	Turbidity	2014/04/23	<0.10		NTU	
7460959	HE1	RPD	Turbidity	2014/04/23	2.1		%	20
7461112	TDB	Matrix Spike	Total Aluminum (Al)	2014/04/23		86	%	80 - 120
			Total Antimony (Sb)	2014/04/23		102	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Arsenic (As)	2014/04/23		97	%	80 - 120
			Total Beryllium (Be)	2014/04/23		102	%	80 - 120
			Total Chromium (Cr)	2014/04/23		96	%	80 - 120
			Total Cobalt (Co)	2014/04/23		94	%	80 - 120
			Total Copper (Cu)	2014/04/23		93	%	80 - 120
			Total Lead (Pb)	2014/04/23		97	%	80 - 120
			Total Molybdenum (Mo)	2014/04/23		103	%	80 - 120
			Total Nickel (Ni)	2014/04/23		93	%	80 - 120
			Total Selenium (Se)	2014/04/23		96	%	80 - 120
			Total Silver (Ag)	2014/04/23		98	%	80 - 120
			Total Thallium (Tl)	2014/04/23		100	%	80 - 120
			Total Tin (Sn)	2014/04/23		97	%	80 - 120
			Total Titanium (Ti)	2014/04/23		90	%	80 - 120
			Total Uranium (U)	2014/04/23		100	%	80 - 120
			Total Vanadium (V)	2014/04/23		101	%	80 - 120
			Total Zinc (Zn)	2014/04/23		98	%	80 - 120
7461112	TDB	Spiked Blank	Total Aluminum (Al)	2014/04/23		90	%	80 - 120
			Total Antimony (Sb)	2014/04/23		101	%	80 - 120
			Total Arsenic (As)	2014/04/23		99	%	80 - 120
			Total Beryllium (Be)	2014/04/23		98	%	80 - 120
			Total Chromium (Cr)	2014/04/23		98	%	80 - 120
			Total Cobalt (Co)	2014/04/23		99	%	80 - 120
			Total Copper (Cu)	2014/04/23		99	%	80 - 120
			Total Lead (Pb)	2014/04/23		100	%	80 - 120
			Total Molybdenum (Mo)	2014/04/23		99	%	80 - 120
			Total Nickel (Ni)	2014/04/23		95	%	80 - 120
			Total Selenium (Se)	2014/04/23		96	%	80 - 120
			Total Silver (Ag)	2014/04/23		96	%	80 - 120
			Total Thallium (Tl)	2014/04/23		100	%	80 - 120
			Total Tin (Sn)	2014/04/23		94	%	80 - 120
			Total Titanium (Ti)	2014/04/23		91	%	80 - 120
			Total Uranium (U)	2014/04/23		99	%	80 - 120
			Total Vanadium (V)	2014/04/23		101	%	80 - 120
			Total Zinc (Zn)	2014/04/23		92	%	80 - 120
7461112	TDB	Method Blank	Total Aluminum (Al)	2014/04/23	<0.0030		mg/L	
			Total Antimony (Sb)	2014/04/23	<0.00060		mg/L	
			Total Arsenic (As)	2014/04/23	<0.00020		mg/L	
			Total Beryllium (Be)	2014/04/23	<0.0010		mg/L	
			Total Chromium (Cr)	2014/04/23	<0.0010		mg/L	
			Total Cobalt (Co)	2014/04/23	<0.00030		mg/L	
			Total Copper (Cu)	2014/04/23	<0.00020		mg/L	
			Total Lead (Pb)	2014/04/23	<0.00020		mg/L	
			Total Molybdenum (Mo)	2014/04/23	<0.00020		mg/L	
			Total Nickel (Ni)	2014/04/23	<0.00050		mg/L	
			Total Selenium (Se)	2014/04/23	<0.00020		mg/L	
			Total Silver (Ag)	2014/04/23	<0.00010		mg/L	
			Total Thallium (Tl)	2014/04/23	<0.00020		mg/L	
			Total Tin (Sn)	2014/04/23	<0.0010		mg/L	
			Total Titanium (Ti)	2014/04/23	<0.0010		mg/L	
			Total Uranium (U)	2014/04/23	<0.00010		mg/L	
			Total Vanadium (V)	2014/04/23	<0.0010		mg/L	
			Total Zinc (Zn)	2014/04/23	<0.0030		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7461112	TDB	RPD	Total Aluminum (Al)	2014/04/23	NC		%	20
			Total Antimony (Sb)	2014/04/23	NC		%	20
			Total Arsenic (As)	2014/04/23	NC		%	20
			Total Beryllium (Be)	2014/04/23	NC		%	20
			Total Chromium (Cr)	2014/04/23	NC		%	20
			Total Cobalt (Co)	2014/04/23	NC		%	20
			Total Copper (Cu)	2014/04/23	NC		%	20
			Total Lead (Pb)	2014/04/23	NC		%	20
			Total Molybdenum (Mo)	2014/04/23	3.0		%	20
			Total Nickel (Ni)	2014/04/23	NC		%	20
			Total Selenium (Se)	2014/04/23	1.6		%	20
			Total Silver (Ag)	2014/04/23	NC		%	20
			Total Thallium (Tl)	2014/04/23	NC		%	20
			Total Tin (Sn)	2014/04/23	NC		%	20
			Total Titanium (Ti)	2014/04/23	NC		%	20
			Total Uranium (U)	2014/04/23	4.9		%	20
			Total Vanadium (V)	2014/04/23	NC		%	20
			Total Zinc (Zn)	2014/04/23	NC		%	20
7461114	STI	Matrix Spike	Total Barium (Ba)	2014/04/23		96	%	80 - 120
			Total Boron (B)	2014/04/23		100	%	80 - 120
			Total Calcium (Ca)	2014/04/23		NC	%	80 - 120
			Total Iron (Fe)	2014/04/23		102	%	80 - 120
			Total Lithium (Li)	2014/04/23		98	%	80 - 120
			Total Magnesium (Mg)	2014/04/23		102	%	80 - 120
			Total Manganese (Mn)	2014/04/23		101	%	80 - 120
			Total Phosphorus (P)	2014/04/23		97	%	80 - 120
			Total Potassium (K)	2014/04/23		100	%	80 - 120
			Total Silicon (Si)	2014/04/23		98	%	80 - 120
			Total Sodium (Na)	2014/04/23		98	%	80 - 120
			Total Strontium (Sr)	2014/04/23		99	%	80 - 120
7461114	STI	Spiked Blank	Total Barium (Ba)	2014/04/23		96	%	80 - 120
			Total Boron (B)	2014/04/23		98	%	80 - 120
			Total Calcium (Ca)	2014/04/23		98	%	80 - 120
			Total Iron (Fe)	2014/04/23		102	%	80 - 120
			Total Lithium (Li)	2014/04/23		97	%	80 - 120
			Total Magnesium (Mg)	2014/04/23		100	%	80 - 120
			Total Manganese (Mn)	2014/04/23		101	%	80 - 120
			Total Phosphorus (P)	2014/04/23		96	%	80 - 120
			Total Potassium (K)	2014/04/23		98	%	80 - 120
			Total Silicon (Si)	2014/04/23		95	%	80 - 120
			Total Sodium (Na)	2014/04/23		97	%	80 - 120
			Total Strontium (Sr)	2014/04/23		98	%	80 - 120
7461114	STI	Method Blank	Total Barium (Ba)	2014/04/23	<0.010		mg/L	
			Total Boron (B)	2014/04/23	<0.020		mg/L	
			Total Calcium (Ca)	2014/04/23	<0.30		mg/L	
			Total Iron (Fe)	2014/04/23	<0.060		mg/L	
			Total Lithium (Li)	2014/04/23	<0.020		mg/L	
			Total Magnesium (Mg)	2014/04/23	<0.20		mg/L	
			Total Manganese (Mn)	2014/04/23	<0.0040		mg/L	
			Total Phosphorus (P)	2014/04/23	<0.10		mg/L	
			Total Potassium (K)	2014/04/23	<0.30		mg/L	
			Total Silicon (Si)	2014/04/23	<0.10		mg/L	

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Maxxam Job #: B431090
Report Date: 2014/05/02

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Sodium (Na)	2014/04/23	<0.50		mg/L	
			Total Strontium (Sr)	2014/04/23	<0.020		mg/L	
			Total Sulphur (S)	2014/04/23	<0.20		mg/L	
7461114	STI	RPD	Total Barium (Ba)	2014/04/23	0.3		%	20
			Total Boron (B)	2014/04/23	NC		%	20
			Total Calcium (Ca)	2014/04/23	0.01		%	20
			Total Iron (Fe)	2014/04/23	NC		%	20
			Total Lithium (Li)	2014/04/23	NC		%	20
			Total Magnesium (Mg)	2014/04/23	0.1		%	20
			Total Manganese (Mn)	2014/04/23	NC		%	20
			Total Phosphorus (P)	2014/04/23	NC		%	20
			Total Potassium (K)	2014/04/23	NC		%	20
			Total Silicon (Si)	2014/04/23	0.2		%	20
			Total Sodium (Na)	2014/04/23	0.8		%	20
			Total Strontium (Sr)	2014/04/23	0.05		%	20
			Total Sulphur (S)	2014/04/23	1.3		%	20
7461122	KKV	Spiked Blank	Total Dissolved Solids	2014/04/23		94	%	80 - 120
7461122	KKV	Method Blank	Total Dissolved Solids	2014/04/23	<10		mg/L	
7461122	KKV	RPD	Total Dissolved Solids	2014/04/23	1.9		%	20
7461224	STI	Matrix Spike	Dissolved Barium (Ba)	2014/04/23		82	%	80 - 120
			Dissolved Boron (B)	2014/04/23		88	%	80 - 120
			Dissolved Calcium (Ca)	2014/04/23		NC	%	80 - 120
			Dissolved Iron (Fe)	2014/04/23		NC	%	80 - 120
			Dissolved Lithium (Li)	2014/04/23		84	%	80 - 120
			Dissolved Magnesium (Mg)	2014/04/23		NC	%	80 - 120
			Dissolved Manganese (Mn)	2014/04/23		NC	%	80 - 120
			Dissolved Phosphorus (P)	2014/04/23		101	%	80 - 120
			Dissolved Potassium (K)	2014/04/23		87	%	80 - 120
			Dissolved Silicon (Si)	2014/04/23		NC	%	80 - 120
			Dissolved Sodium (Na)	2014/04/23		NC	%	80 - 120
			Dissolved Strontium (Sr)	2014/04/23		NC	%	80 - 120
7461224	STI	Spiked Blank	Dissolved Barium (Ba)	2014/04/23		95	%	80 - 120
			Dissolved Boron (B)	2014/04/23		101	%	80 - 120
			Dissolved Calcium (Ca)	2014/04/23		102	%	80 - 120
			Dissolved Iron (Fe)	2014/04/23		103	%	80 - 120
			Dissolved Lithium (Li)	2014/04/23		97	%	80 - 120
			Dissolved Magnesium (Mg)	2014/04/23		103	%	80 - 120
			Dissolved Manganese (Mn)	2014/04/23		101	%	80 - 120
			Dissolved Phosphorus (P)	2014/04/23		99	%	80 - 120
			Dissolved Potassium (K)	2014/04/23		103	%	80 - 120
			Dissolved Silicon (Si)	2014/04/23		98	%	80 - 120
			Dissolved Sodium (Na)	2014/04/23		100	%	80 - 120
			Dissolved Strontium (Sr)	2014/04/23		97	%	80 - 120
7461224	STI	Method Blank	Dissolved Barium (Ba)	2014/04/23	<0.010		mg/L	
			Dissolved Boron (B)	2014/04/23	<0.020		mg/L	
			Dissolved Calcium (Ca)	2014/04/23	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/04/23	<0.060		mg/L	
			Dissolved Lithium (Li)	2014/04/23	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2014/04/23	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/04/23	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2014/04/23	<0.10		mg/L	
			Dissolved Potassium (K)	2014/04/23	<0.30		mg/L	

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Client Project #: 284-1/CROWN MOUNTAIN
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Silicon (Si)	2014/04/23	<0.10		mg/L	
			Dissolved Sodium (Na)	2014/04/23	<0.50		mg/L	
			Dissolved Strontium (Sr)	2014/04/23	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/04/23	<0.20		mg/L	
7461224	STI	RPD	Dissolved Calcium (Ca)	2014/04/23	1		%	20
			Dissolved Magnesium (Mg)	2014/04/23	1		%	20
7461250	JBA	Matrix Spike	Dissolved Barium (Ba)	2014/04/25		87	%	80 - 120
			Dissolved Boron (B)	2014/04/25		93	%	80 - 120
			Dissolved Calcium (Ca)	2014/04/25		NC	%	80 - 120
			Dissolved Iron (Fe)	2014/04/25		90	%	80 - 120
			Dissolved Lithium (Li)	2014/04/25		94	%	80 - 120
			Dissolved Magnesium (Mg)	2014/04/25		NC	%	80 - 120
			Dissolved Manganese (Mn)	2014/04/25		NC	%	80 - 120
			Dissolved Phosphorus (P)	2014/04/25		99	%	80 - 120
			Dissolved Potassium (K)	2014/04/25		101	%	80 - 120
			Dissolved Silicon (Si)	2014/04/25		92	%	80 - 120
			Dissolved Sodium (Na)	2014/04/25		NC	%	80 - 120
			Dissolved Strontium (Sr)	2014/04/25		NC	%	80 - 120
7461250	JBA	Spiked Blank	Dissolved Barium (Ba)	2014/04/25		93	%	80 - 120
			Dissolved Boron (B)	2014/04/25		96	%	80 - 120
			Dissolved Calcium (Ca)	2014/04/25		95	%	80 - 120
			Dissolved Iron (Fe)	2014/04/25		96	%	80 - 120
			Dissolved Lithium (Li)	2014/04/25		96	%	80 - 120
			Dissolved Magnesium (Mg)	2014/04/25		100	%	80 - 120
			Dissolved Manganese (Mn)	2014/04/25		95	%	80 - 120
			Dissolved Phosphorus (P)	2014/04/25		96	%	80 - 120
			Dissolved Potassium (K)	2014/04/25		103	%	80 - 120
			Dissolved Silicon (Si)	2014/04/25		94	%	80 - 120
			Dissolved Sodium (Na)	2014/04/25		97	%	80 - 120
			Dissolved Strontium (Sr)	2014/04/25		93	%	80 - 120
7461250	JBA	Method Blank	Dissolved Barium (Ba)	2014/04/25	<0.010		mg/L	
			Dissolved Boron (B)	2014/04/25	<0.020		mg/L	
			Dissolved Calcium (Ca)	2014/04/25	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/04/25	<0.060		mg/L	
			Dissolved Lithium (Li)	2014/04/25	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2014/04/25	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/04/25	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2014/04/25	<0.10		mg/L	
			Dissolved Potassium (K)	2014/04/25	<0.30		mg/L	
			Dissolved Silicon (Si)	2014/04/25	<0.10		mg/L	
			Dissolved Sodium (Na)	2014/04/25	<0.50		mg/L	
			Dissolved Strontium (Sr)	2014/04/25	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/04/25	<0.20		mg/L	
7461250	JBA	RPD	Dissolved Barium (Ba)	2014/04/25	NC		%	20
			Dissolved Boron (B)	2014/04/25	1.9		%	20
			Dissolved Calcium (Ca)	2014/04/25	2.2		%	20
			Dissolved Iron (Fe)	2014/04/25	NC		%	20
			Dissolved Lithium (Li)	2014/04/25	3.0		%	20
			Dissolved Magnesium (Mg)	2014/04/25	2.4		%	20
			Dissolved Manganese (Mn)	2014/04/25	2.4		%	20
			Dissolved Phosphorus (P)	2014/04/25	NC		%	20
			Dissolved Potassium (K)	2014/04/25	3.4		%	20

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NORWEST CORPORATION
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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Silicon (Si)	2014/04/25	1.8		%	20
			Dissolved Sodium (Na)	2014/04/25	2.6		%	20
			Dissolved Strontium (Sr)	2014/04/25	2.4		%	20
			Dissolved Sulphur (S)	2014/04/25	2.3		%	20
7461467	TDB	Matrix Spike	Dissolved Aluminum (Al)	2014/04/23		103	%	80 - 120
			Dissolved Antimony (Sb)	2014/04/23		77 (1)	%	80 - 120
			Dissolved Arsenic (As)	2014/04/23		93	%	80 - 120
			Dissolved Beryllium (Be)	2014/04/23		99	%	80 - 120
			Dissolved Chromium (Cr)	2014/04/23		88	%	80 - 120
			Dissolved Cobalt (Co)	2014/04/23		89	%	80 - 120
			Dissolved Copper (Cu)	2014/04/23		88	%	80 - 120
			Dissolved Lead (Pb)	2014/04/23		80	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/04/23		98	%	80 - 120
			Dissolved Nickel (Ni)	2014/04/23		87	%	80 - 120
			Dissolved Selenium (Se)	2014/04/23		94	%	80 - 120
			Dissolved Silver (Ag)	2014/04/23		83	%	80 - 120
			Dissolved Thallium (Tl)	2014/04/23		85	%	80 - 120
			Dissolved Tin (Sn)	2014/04/23		95	%	80 - 120
			Dissolved Titanium (Ti)	2014/04/23		93	%	80 - 120
			Dissolved Uranium (U)	2014/04/23		91	%	80 - 120
			Dissolved Vanadium (V)	2014/04/23		97	%	80 - 120
			Dissolved Zinc (Zn)	2014/04/23		92	%	80 - 120
7461467	TDB	Spiked Blank	Dissolved Aluminum (Al)	2014/04/23		103	%	80 - 120
			Dissolved Antimony (Sb)	2014/04/23		82	%	80 - 120
			Dissolved Arsenic (As)	2014/04/23		91	%	80 - 120
			Dissolved Beryllium (Be)	2014/04/23		94	%	80 - 120
			Dissolved Chromium (Cr)	2014/04/23		92	%	80 - 120
			Dissolved Cobalt (Co)	2014/04/23		93	%	80 - 120
			Dissolved Copper (Cu)	2014/04/23		92	%	80 - 120
			Dissolved Lead (Pb)	2014/04/23		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/04/23		96	%	80 - 120
			Dissolved Nickel (Ni)	2014/04/23		93	%	80 - 120
			Dissolved Selenium (Se)	2014/04/23		95	%	80 - 120
			Dissolved Silver (Ag)	2014/04/23		96	%	80 - 120
			Dissolved Thallium (Tl)	2014/04/23		92	%	80 - 120
			Dissolved Tin (Sn)	2014/04/23		96	%	80 - 120
			Dissolved Titanium (Ti)	2014/04/23		95	%	80 - 120
			Dissolved Uranium (U)	2014/04/23		95	%	80 - 120
			Dissolved Vanadium (V)	2014/04/23		96	%	80 - 120
			Dissolved Zinc (Zn)	2014/04/23		90	%	80 - 120
7461467	TDB	Method Blank	Dissolved Aluminum (Al)	2014/04/23	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/04/23	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/04/23	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/04/23	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/04/23	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/04/23	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/04/23	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/04/23	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/04/23	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/04/23	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/04/23	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/04/23	<0.00010		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Thallium (Tl)	2014/04/23	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/04/23	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/04/23	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/04/23	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/04/23	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/04/23	<0.0030		mg/L	
7461467	TDB	RPD	Dissolved Aluminum (Al)	2014/04/23	NC		%	20
			Dissolved Antimony (Sb)	2014/04/23	NC		%	20
			Dissolved Arsenic (As)	2014/04/23	3.9		%	20
			Dissolved Beryllium (Be)	2014/04/23	NC		%	20
			Dissolved Chromium (Cr)	2014/04/23	NC		%	20
			Dissolved Cobalt (Co)	2014/04/23	NC		%	20
			Dissolved Copper (Cu)	2014/04/23	NC		%	20
			Dissolved Lead (Pb)	2014/04/23	NC		%	20
			Dissolved Molybdenum (Mo)	2014/04/23	4.2		%	20
			Dissolved Nickel (Ni)	2014/04/23	NC		%	20
			Dissolved Selenium (Se)	2014/04/23	NC		%	20
			Dissolved Silver (Ag)	2014/04/23	NC		%	20
			Dissolved Thallium (Tl)	2014/04/23	NC		%	20
			Dissolved Tin (Sn)	2014/04/23	NC		%	20
			Dissolved Titanium (Ti)	2014/04/23	NC		%	20
			Dissolved Uranium (U)	2014/04/23	1.3		%	20
			Dissolved Vanadium (V)	2014/04/23	NC		%	20
			Dissolved Zinc (Zn)	2014/04/23	NC		%	20
7462265	HE1	Matrix Spike	Total Suspended Solids	2014/04/24		102	%	80 - 120
7462265	HE1	Spiked Blank	Total Suspended Solids	2014/04/24		92	%	80 - 120
7462265	HE1	Method Blank	Total Suspended Solids	2014/04/24	<1.0		mg/L	
7462265	HE1	RPD	Total Suspended Solids	2014/04/24	8.7		%	20
7462421	BL5	Matrix Spike	Total Kjeldahl Nitrogen	2014/04/24		NC	%	80 - 120
7462421	BL5	QC Standard	Total Kjeldahl Nitrogen	2014/04/24		92	%	75 - 125
7462421	BL5	Spiked Blank	Total Kjeldahl Nitrogen	2014/04/24		86	%	80 - 120
7462421	BL5	Method Blank	Total Kjeldahl Nitrogen	2014/04/24	<0.050		mg/L	
7462421	BL5	RPD	Total Kjeldahl Nitrogen	2014/04/24	2.4		%	20
7462630	JLD	Spiked Blank	Alkalinity (Total as CaCO3)	2014/04/24		94	%	80 - 120
7462630	JLD	Method Blank	Alkalinity (PP as CaCO3)	2014/04/24	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2014/04/24	<0.50		mg/L	
			Bicarbonate (HCO3)	2014/04/24	<0.50		mg/L	
			Carbonate (CO3)	2014/04/24	<0.50		mg/L	
			Hydroxide (OH)	2014/04/24	<0.50		mg/L	
7462630	JLD	RPD	Alkalinity (PP as CaCO3)	2014/04/24	NC		%	20
			Alkalinity (Total as CaCO3)	2014/04/24	6.2		%	20
			Bicarbonate (HCO3)	2014/04/24	6.3		%	20
			Carbonate (CO3)	2014/04/24	NC		%	20
			Hydroxide (OH)	2014/04/24	NC		%	20
7462640	JLD	Spiked Blank	Conductivity	2014/04/24		101	%	90 - 110
7462640	JLD	Method Blank	Conductivity	2014/04/24	<1.0		uS/cm	
7462640	JLD	RPD [JK4091-02]	Conductivity	2014/04/24	4.2		%	20
7462641	JLD	Spiked Blank	pH	2014/04/24		100	%	97 - 102
7463344	MB5	Matrix Spike	Dissolved Aluminum (Al)	2014/04/25		NC	%	80 - 120
			Dissolved Antimony (Sb)	2014/04/25		85	%	80 - 120
			Dissolved Arsenic (As)	2014/04/25		107	%	80 - 120
			Dissolved Beryllium (Be)	2014/04/25		113	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Chromium (Cr)	2014/04/25		105	%	80 - 120
			Dissolved Cobalt (Co)	2014/04/25		106	%	80 - 120
			Dissolved Copper (Cu)	2014/04/25		109	%	80 - 120
			Dissolved Lead (Pb)	2014/04/25		103	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/04/25		115	%	80 - 120
			Dissolved Nickel (Ni)	2014/04/25		106	%	80 - 120
			Dissolved Selenium (Se)	2014/04/25		108	%	80 - 120
			Dissolved Silver (Ag)	2014/04/25		111	%	80 - 120
			Dissolved Thallium (Tl)	2014/04/25		106	%	80 - 120
			Dissolved Tin (Sn)	2014/04/25		107	%	80 - 120
			Dissolved Titanium (Ti)	2014/04/25		105	%	80 - 120
			Dissolved Uranium (U)	2014/04/25		107	%	80 - 120
			Dissolved Vanadium (V)	2014/04/25		111	%	80 - 120
			Dissolved Zinc (Zn)	2014/04/25		113	%	80 - 120
7463344	MB5	Spiked Blank	Dissolved Aluminum (Al)	2014/04/25		104	%	80 - 120
			Dissolved Antimony (Sb)	2014/04/25		105	%	80 - 120
			Dissolved Arsenic (As)	2014/04/25		85	%	80 - 120
			Dissolved Beryllium (Be)	2014/04/25		87	%	80 - 120
			Dissolved Chromium (Cr)	2014/04/25		87	%	80 - 120
			Dissolved Cobalt (Co)	2014/04/25		88	%	80 - 120
			Dissolved Copper (Cu)	2014/04/25		91	%	80 - 120
			Dissolved Lead (Pb)	2014/04/25		87	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/04/25		90	%	80 - 120
			Dissolved Nickel (Ni)	2014/04/25		90	%	80 - 120
			Dissolved Selenium (Se)	2014/04/25		88	%	80 - 120
			Dissolved Silver (Ag)	2014/04/25		89	%	80 - 120
			Dissolved Thallium (Tl)	2014/04/25		87	%	80 - 120
			Dissolved Tin (Sn)	2014/04/25		87	%	80 - 120
			Dissolved Titanium (Ti)	2014/04/25		88	%	80 - 120
			Dissolved Uranium (U)	2014/04/25		86	%	80 - 120
			Dissolved Vanadium (V)	2014/04/25		90	%	80 - 120
			Dissolved Zinc (Zn)	2014/04/25		104	%	80 - 120
7463344	MB5	Method Blank	Dissolved Aluminum (Al)	2014/04/25	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/04/25	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/04/25	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/04/25	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/04/25	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/04/25	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/04/25	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/04/25	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/04/25	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/04/25	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/04/25	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/04/25	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/04/25	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/04/25	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/04/25	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/04/25	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/04/25	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/04/25	<0.0030		mg/L	
7463344	MB5	RPD	Dissolved Aluminum (Al)	2014/04/25	2.0		%	20
			Dissolved Antimony (Sb)	2014/04/25	NC		%	20

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Maxxam Job #: B431090
Report Date: 2014/05/02

NORWEST CORPORATION
Client Project #: 284-1/CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Arsenic (As)	2014/04/25	NC		%	20
			Dissolved Beryllium (Be)	2014/04/25	NC		%	20
			Dissolved Chromium (Cr)	2014/04/25	NC		%	20
			Dissolved Cobalt (Co)	2014/04/25	NC		%	20
			Dissolved Copper (Cu)	2014/04/25	1.5		%	20
			Dissolved Lead (Pb)	2014/04/25	NC		%	20
			Dissolved Molybdenum (Mo)	2014/04/25	3.6		%	20
			Dissolved Nickel (Ni)	2014/04/25	NC		%	20
			Dissolved Selenium (Se)	2014/04/25	NC		%	20
			Dissolved Silver (Ag)	2014/04/25	NC		%	20
			Dissolved Thallium (Tl)	2014/04/25	NC		%	20
			Dissolved Tin (Sn)	2014/04/25	NC		%	20
			Dissolved Titanium (Ti)	2014/04/25	NC		%	20
			Dissolved Uranium (U)	2014/04/25	8.7		%	20
			Dissolved Vanadium (V)	2014/04/25	NC		%	20
			Dissolved Zinc (Zn)	2014/04/25	NC		%	20
7463565	BL5	Matrix Spike	Total Phosphate (P)	2014/04/24		98	%	80 - 120
7463565	BL5	QC Standard	Total Phosphate (P)	2014/04/24		95	%	80 - 120
7463565	BL5	Spiked Blank	Total Phosphate (P)	2014/04/24		100	%	83 - 111
7463565	BL5	Method Blank	Total Phosphate (P)	2014/04/24	<0.0030		mg/L	
7463565	BL5	RPD	Total Phosphate (P)	2014/04/24	NC		%	20
7463568	BL5	Matrix Spike	Dissolved Phosphate (P)	2014/04/24		99	%	80 - 120
7463568	BL5	QC Standard	Dissolved Phosphate (P)	2014/04/24		95	%	80 - 120
7463568	BL5	Spiked Blank	Dissolved Phosphate (P)	2014/04/24		99	%	83 - 111
7463568	BL5	Method Blank	Dissolved Phosphate (P)	2014/04/24	<0.0030		mg/L	
7463568	BL5	RPD	Dissolved Phosphate (P)	2014/04/24	NC		%	20
7463966	ZI	Matrix Spike	Dissolved Chloride (Cl)	2014/04/25		109	%	80 - 120
7463966	ZI	Spiked Blank	Dissolved Chloride (Cl)	2014/04/25		105	%	80 - 120
7463966	ZI	Method Blank	Dissolved Chloride (Cl)	2014/04/25	<1.0		mg/L	
7463966	ZI	RPD	Dissolved Chloride (Cl)	2014/04/25	NC		%	20
7463973	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2014/04/25		NC	%	80 - 120
7463973	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2014/04/25		104	%	80 - 120
7463973	ZI	Method Blank	Dissolved Sulphate (SO4)	2014/04/25	<1.0		mg/L	
7463973	ZI	RPD	Dissolved Sulphate (SO4)	2014/04/25	1		%	20
7464080	DK9	Matrix Spike	Total Chemical Oxygen Demand	2014/04/25		99	%	80 - 120
7464080	DK9	Spiked Blank	Total Chemical Oxygen Demand	2014/04/25		102	%	80 - 120
7464080	DK9	Method Blank	Total Chemical Oxygen Demand	2014/04/25	<5.0		mg/L	
7464080	DK9	RPD	Total Chemical Oxygen Demand	2014/04/25	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7465983	HE1	RPD	Total Dissolved Solids	2014/04/28	1.1		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Scientific Specialist

<Original signed by>

Michael Sheppard, Organics Supervisor

<Original signed by>

Peng Liang, Analyst II

<Original signed by>

Veronica Falk, Scientific Specialist

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Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody A145887

Page: ____ of ____

Invoice To:	C/O Report Address ☐	Report To: Same as Invoice ☑	Report Distribution (E-Mail):	REGULATORY GUIDELINES:
Company:	NORWEST CORPORATION		APERRIN@NORWESTCORP.COM	☐ AT1
Contact:	AMY PERRIN			☐ CCME
Address:	2700 411 1ST ST SE CALGARY			☐ Regulated Drinking Water
	Prov: ALBERTA PC: T2G 4Y5	Prov: PC:		☐ Other:
Contact #s:	Ph: 403 205 5762 Cell: 403 9618380	Cell:		

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: 284-1 / CROWN MOUNTAIN
Site Location: SPARWOOD
Quote #:
Sampled By: TD / AP

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

#	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: BTEX F1 / VOCs	BTEX F1-F2 / BTEX F1-F4	Routine Water / Turb / F	TOC / DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury: Total / Dissolved	CYANIDE	Cl	Nitrate + Nitrite	PHENOL	Redox Potential	PAH	F2 / PAH	COD	total Phosphorus	Nitrogen total	Ammonia Nitrogen	HOLD - Do not Analyze	# of Containers Submitted	Dissolved Phosphorus
1	CM13-06											✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓
2	~~CMMM~~																														
3	CM12-01										✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
4																															
5																															
6																															
7																															
8																															
9																															
10																															
11																															
12																															

21-Apr-14 10:54
Jenelle Feller
B431090
DT5 INS-0105
NC

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
<Original signed by> AMY PERRIN	14/04/21	10:53
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: CM12-01 dissolved metals NOT field filtered or preserved.

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:		
<Original signed by>	14/04/21	1054	Custody Seal	Temperature	Ice
Lab Comments: 4 - 516			No	-1, -1, 0	Yes

AB FCD-00331 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

NORWEST CORPORATION

CERTIFICATE OF ANALYSIS

August, 2014

Your Project #: B468695
Your C.O.C. #: N/A

Attention:Jenelle Feller

Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

Report Date: 2014/08/15
Report #: R3122509
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B4E4832
Received: 2014/08/12, 11:35

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Redox Potential	5	2014/08/13	2014/08/15	SLA SOP-00101	In house

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division
Email: GSison@maxxam.ca
Phone# (905) 569-7599
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B4E4832
Report Date: 2014/08/15

Maxxam Analytics
Client Project #: B468695
Sampler Initials: TD

RESULTS OF ANALYSES OF WATER

Maxxam ID		XC1286	XC1304	XC1305	XC1306	
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/09 12:00	2014/08/09 15:00	
	Units	**KH6210-03R \ 11-11**	**KH6211-03R \ CREEK**	**KH6213-03R \ 13-25**	**KH6214-03R \ 12-01**	**QC Batch**
Redox Potential	mV	+49	+40	+69	+72	3709325

QC Batch = Quality Control Batch

Maxxam ID		XC1306	XC1307	
Sampling Date		2014/08/09 15:00	2014/08/09 15:00	
	Units	**KH6214-03R \ 12-01 Lab-Dup**	**KH6215-03R \ QC1**	**QC Batch**
Redox Potential	mV	+68	+95	3709325

QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics 4141 Sladeview Crescent, Unit 10, Mississauga, ON, L5L 5T1 Tel: (905) 569-7599 Fax: (905) 569-6250 www.maxxam.ca

GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B4E4832
Report Date: 2014/08/15

Maxxam Analytics
Client Project #: B468695
Sampler Initials: TD

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
3709325	GSI	QC Standard	Redox Potential	2014/08/15		+244	%	238 - 248
3709325	GSI	Method Blank	Redox Potential	2014/08/15	+276		mV	

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

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Maxxam Job #: B4E4832
Report Date: 2014/08/15

Maxxam Analytics
Client Project #: B468695
Sampler Initials: TD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division

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Success Through Science®

Your Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A094754, A094755

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/08/19
Report #: R1624327
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B468695
Received: 2014/08/10, 11:32

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	5	N/A	2014/08/11	AB SOP-00005	SM 2320-B
BTEX/F1 in Water by HS GC/MS	6	N/A	2014/08/14	AB SOP-00039	CCME, EPA 8260C
Cadmium - low level CCME - Dissolved	5	N/A	2014/08/13	AB SOP-00043	EPA 200.8 R5.4 m
Cadmium - low level CCME (Total)	5	2014/08/11	2014/08/16	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Chloride by Automated Colourimetry	5	N/A	2014/08/13	AB SOP-00020	SM 22 4500-Cl G m
Chemical Oxygen Demand	5	N/A	2014/08/12	AB SOP-00016	SM 22 5220 D m
Carbon (DOC) (2)	5	N/A	2014/08/12	CAL SOP-00077	MMCW 119 1996 m
Conductivity @25C	5	N/A	2014/08/11	AB SOP-00005	SM 2510-B
CCME Hydrocarbons in Water (F2; C10-C16)	1	2014/08/11	2014/08/12	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
CCME Hydrocarbons in Water (F2; C10-C16)	5	2014/08/11	2014/08/13	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	5	N/A	2014/08/13	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	5	N/A	2014/08/12	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	5	2014/08/12	2014/08/12	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved	5	N/A	2014/08/12	AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Total	5	2014/08/12	2014/08/12	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	5	N/A	2014/08/12	AB WI-00065	SM 1030E
Sum of cations, anions	5	N/A	2014/08/13	AB WI-00065	SM 1030E
Nitrogen (total), Calc. TKN, NO3, NO2	5	N/A	2014/08/13	AB WI-00065	SM 4500-N A
Ammonia-N (Total)	5	N/A	2014/08/13	AB SOP-00007	EPA 350.1 R2.0 m
Nitrate and Nitrite	5	N/A	2014/08/12	AB SOP-00023	Auto Calc
Nitrate + Nitrite-N (calculated)	5	N/A	2014/08/12	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	5	N/A	2014/08/12	AB SOP-00023	SM 22 4110 B m
Benzo[a]pyrene Equivalency (3)	5	N/A	2014/08/13	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	5	2014/08/12	2014/08/12	AB SOP-00037 / AB SOP-00003	EPA 8270D m
pH @25°C (Alkalinity titrator)	5	N/A	2014/08/11	AB SOP-00005	SM 22 4500-H B m

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Maxxam

Success Through Science®

Your Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Your C.O.C. #: A094754, A094755

Attention:AMY PERRIN

NORWEST CORPORATION
2700, 411 - 1ST STREET SE
CALGARY, AB
CANADA T2G 4Y5

Report Date: 2014/08/19
Report #: R1624327
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B468695
Received: 2014/08/10, 11:32

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Phenols (4-AAP)	5	N/A	2014/08/12	CAL SOP-00067	EPA 420.2
Orthophosphate by Konelab	5	N/A	2014/08/12	AB SOP-00025	SM 22 4500-P A,B,F m
Sulphate by Automated Colourimetry	5	N/A	2014/08/13	AB SOP-00018	SM 22 4500-SO4 E m
Cyanide (Total) Low level	5	2014/08/14	2014/08/14	CAL SOP-00073	EPA 335.2
Total Dissolved Solids (Calculated)	5	N/A	2014/08/13	AB WI-00065	SM 1030E
Carbon (Total Inorganic) (1)	5	N/A	2014/08/16	BBY6SOP-00018	SM 22 5310 C
Total Kjeldahl Nitrogen	5	2014/08/12	2014/08/13	AB SOP-00008	EPA 351.1 R 1978 m
Carbon (Total Organic) (4)	5	N/A	2014/08/12	CAL SOP-00077	MMCW 119 1996 m
Total Phosphorus	5	2014/08/13	2014/08/13	AB SOP-00024	SM 22 4500-P A,B,F m

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Vancouver
(2) DOC present in the sample should be considered as non-purgeable DOC.
(3) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(4) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Jenelle Feller, Project Manager
Email: JFeller@maxxam.ca
Phone# (403) 291-3077
==
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Maxxam

Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		KH6210	KH6211	KH6212	KH6213	KH6214	KH6215	KH6215		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/05	2014/08/09 12:00	2014/08/09 15:00	2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094754	A094754	A094754	A094755	A094755	A094755	A094755		
	Units	**11-11**	**CREEK**	**TRIP BLANK**	**13-25**	**12-01**	**QC1**	**QC1 Lab-Dup**	**RDL**	**QC Batch**
Hydrocarbons										
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	<0.10	0.10	7596119
Volatiles										
Benzene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	N/A	0.40	7599689
Toluene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	N/A	0.40	7599689
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	N/A	0.40	7599689
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	N/A	0.80	7599689
o-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	N/A	0.40	7599689
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	N/A	0.80	7599689
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	<100	<100	<100	N/A	100	7599689
(C6-C10)	ug/L	<100	<100	<100	<100	<100	<100	N/A	100	7599689
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	107	105	95	107	103	106	N/A	N/A	7599689
4-Bromofluorobenzene (sur.)	%	104	107	108	107	102	109	N/A	N/A	7599689
D4-1,2-Dichloroethane (sur.)	%	102	100	105	102	99	102	N/A	N/A	7599689
O-TERPHENYL (sur.)	%	105	107	104	108	110	105	111	N/A	7596119

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		KH6210	KH6211	KH6213	KH6214	KH6215		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/09 12:00	2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094754	A094754	A094755	A094755	A094755		
	Units	11-11	CREEK	13-25	12-01	QC1	RDL	QC Batch
Calculated Parameters								
Anion Sum	meq/L	3.2	3.6	3.5	3.3	3.3	N/A	7595444
Cation Sum	meq/L	3.4	3.8	3.6	3.3	3.3	N/A	7595444
Hardness (CaCO3)	mg/L	140	180	160	160	150	0.50	7595442
Ion Balance	N/A	1.1	1.1	1.0	1.0	1.0	0.010	7595443
Dissolved Nitrate (NO3)	mg/L	0.097	0.23	0.091	0.053	0.044	0.044	7595445
Nitrate plus Nitrite (N)	mg/L	0.022	0.052	0.021	0.012	0.010	0.010	7595447
Dissolved Nitrite (NO2)	mg/L	<0.033	<0.033	<0.033	<0.033	<0.033	0.033	7595445
Total Dissolved Solids	mg/L	160	180	170	160	160	10	7595449
Misc. Inorganics								
Conductivity	uS/cm	310	340	330	310	310	1.0	7596155
pH	pH	7.67	8.34	7.32	7.89	7.91	N/A	7596154
Low Level Elements								
Dissolved Cadmium (Cd)	ug/L	<0.020	<0.020	0.040	<0.020	<0.020	0.020	7595600
Anions								
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.66	<0.50	<0.50	<0.50	0.50	7596153
Alkalinity (Total as CaCO3)	mg/L	150	150	160	150	150	0.50	7596153
Bicarbonate (HCO3)	mg/L	180	190	200	180	180	0.50	7596153
Carbonate (CO3)	mg/L	<0.50	0.79	<0.50	<0.50	<0.50	0.50	7596153
Hydroxide (OH)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7596153
Dissolved Sulphate (SO4)	mg/L	10	25	13	14	14	1.0	7598844
Dissolved Chloride (Cl)	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7598820
Nutrients								
Dissolved Nitrite (N)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7596237
Dissolved Nitrate (N)	mg/L	0.022	0.052	0.021	0.012	0.010	0.010	7596237
Elements								
Dissolved Aluminum (Al)	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	7596831
Dissolved Antimony (Sb)	mg/L	0.00061	<0.00060	0.0022	<0.00060	<0.00060	0.00060	7596831
Dissolved Arsenic (As)	mg/L	0.0011	<0.00020	0.00050	<0.00020	<0.00020	0.00020	7596831
Dissolved Barium (Ba)	mg/L	0.30	0.079 (1)	0.17	0.27 (1)	0.26	0.010	7596946
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	7596831
Dissolved Boron (B)	mg/L	0.036 (2)	<0.020	<0.020	<0.020	<0.020	0.020	7596946
Dissolved Calcium (Ca)	mg/L	32	47 (1)	33	37 (1)	37	0.30	7596946

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Dissolved greater than total. Results within acceptable limits of precision.
(2) Dissolved greater than total. Results are within limits of uncertainty(MU).

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Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		KH6210	KH6211	KH6213	KH6214	KH6215		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/09 12:00	2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094754	A094754	A094755	A094755	A094755		
	Units	**11-11**	**CREEK**	**13-25**	**12-01**	**QC1**	**RDL**	**QC Batch**
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	7596831
Dissolved Cobalt (Co)	mg/L	<0.00030	<0.00030	0.0025	<0.00030	<0.00030	0.00030	7596831
Dissolved Copper (Cu)	mg/L	<0.00020	0.00022	0.00059	0.00023	0.00028	0.00020	7596831
Dissolved Iron (Fe)	mg/L	0.32	<0.060	<0.060	<0.060	<0.060	0.060	7596946
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	7596831
Dissolved Lithium (Li)	mg/L	0.022	<0.020	<0.020	<0.020	<0.020	0.020	7596946
Dissolved Magnesium (Mg)	mg/L	14	16	19	15 (1)	15	0.20	7596946
Dissolved Manganese (Mn)	mg/L	0.076	<0.0040	0.18	0.038 (1)	0.038	0.0040	7596946
Dissolved Molybdenum (Mo)	mg/L	0.0019	0.0013	0.0022	0.0010	0.0010 (1)	0.00020	7596831
Dissolved Nickel (Ni)	mg/L	0.0012	<0.00050	0.0038	<0.00050	<0.00050	0.00050	7596831
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7596946
Dissolved Potassium (K)	mg/L	1.6	0.68	1.0	1.2	1.2	0.30	7596946
Dissolved Selenium (Se)	mg/L	<0.00020	0.0011	<0.00020	<0.00020	<0.00020	0.00020	7596831
Dissolved Silicon (Si)	mg/L	2.7	2.6	2.7	2.5	2.5	0.10	7596946
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	7596831
Dissolved Sodium (Na)	mg/L	12	2.5 (1)	6.0	4.1 (1)	4.1	0.50	7596946
Dissolved Strontium (Sr)	mg/L	0.092	0.13	0.051	0.044 (2)	0.044	0.020	7596946
Dissolved Sulphur (S)	mg/L	3.1	7.6 (1)	4.1	4.2 (1)	4.2 (1)	0.20	7596946
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	7596831
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	7596831
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	7596831
Dissolved Uranium (U)	mg/L	0.00045	0.00070 (1)	0.00038	0.00022	0.00023	0.00010	7596831
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	7596831
Dissolved Zinc (Zn)	mg/L	<0.0030	<0.0030	0.0077	<0.0030	<0.0030	0.0030	7596831

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Results within acceptable limits of precision.
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NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

NITROGEN-N (TOTAL)

Maxxam ID		KH6210	KH6211		KH6213		KH6214	KH6215		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00		2014/08/09 12:00		2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094754	A094754		A094755		A094755	A094755		
	Units	**11-11**	**CREEK**	**RDL**	**13-25**	**RDL**	**12-01**	**QC1**	**RDL**	**QC Batch**
Nutrients										
Total Kjeldahl Nitrogen	mg/L	0.80	0.14	0.050	1.3 (1)	0.50	0.44	0.48	0.050	7597115
Total Nitrogen (N)	mg/L	0.83	0.19	0.050	1.3	0.050	0.46	0.49	0.050	7595602

RDL = Reportable Detection Limit
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

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REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		KH6210	KH6211	KH6211	KH6213	KH6214	KH6215		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/09 18:00	2014/08/09 12:00	2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094754	A094754	A094754	A094755	A094755	A094755		
	Units	**11-11**	**CREEK**	**CREEK Lab-Dup**	**13-25**	**12-01**	**QC1**	**RDL**	**QC Batch**
Low Level Elements									
Total Cadmium (Cd)	ug/L	0.039	<0.020	N/A	1.2	<0.020	0.022	0.020	7595601
Elements									
Total Aluminum (Al)	mg/L	0.53	0.035	0.041	2.2	0.041	0.058	0.0030	7596624
Total Antimony (Sb)	mg/L	0.0027	<0.00060	<0.00060	0.022	<0.00060	<0.00060	0.00060	7596624
Total Arsenic (As)	mg/L	0.0017	0.00027	0.00025	0.0033	<0.00020	<0.00020	0.00020	7596624
Total Barium (Ba)	mg/L	0.31	0.078	0.078	0.37	0.26	0.26	0.010	7596698
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	7596624
Total Boron (B)	mg/L	0.034	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7596698
Total Calcium (Ca)	mg/L	32	45	45	37	36	37	0.30	7596698
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	<0.0010	0.0043	<0.0010	<0.0010	0.0010	7596624
Total Cobalt (Co)	mg/L	0.00054	<0.00030	<0.00030	0.0063	<0.00030	<0.00030	0.00030	7596624
Total Copper (Cu)	mg/L	0.0014	0.00047	0.00051	0.031	0.00095	0.00093	0.00020	7596624
Total Iron (Fe)	mg/L	0.98	<0.060	<0.060	6.2	0.094	0.11	0.060	7596698
Total Lead (Pb)	mg/L	0.0023	<0.00020	<0.00020	0.012	<0.00020	0.00025	0.00020	7596624
Total Lithium (Li)	mg/L	0.022	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	7596698
Total Magnesium (Mg)	mg/L	14	16	16	21	14	15	0.20	7596698
Total Manganese (Mn)	mg/L	0.085	<0.0040	<0.0040	0.26	0.037	0.038	0.0040	7596698
Total Molybdenum (Mo)	mg/L	0.0019	0.0014	0.0014	0.0030	0.0010	0.0010	0.00020	7596624
Total Nickel (Ni)	mg/L	0.0020	<0.00050	<0.00050	0.017	<0.00050	<0.00050	0.00050	7596624
Total Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	0.50	<0.10	<0.10	0.10	7596698
Total Potassium (K)	mg/L	1.7	0.68	0.66	2.8	1.2	1.3	0.30	7596698
Total Selenium (Se)	mg/L	0.00021	0.0011	0.0011	0.00085	<0.00020	<0.00020	0.00020	7596624
Total Silicon (Si)	mg/L	3.9	2.7	2.7	4.7	2.5	2.6	0.10	7596698
Total Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	0.00029	<0.00010	<0.00010	0.00010	7596624
Total Sodium (Na)	mg/L	12	2.4	2.5	6.3	4.0	4.1	0.50	7596698
Total Strontium (Sr)	mg/L	0.094	0.13	0.13	0.063	0.043	0.044	0.020	7596698
Total Sulphur (S)	mg/L	3.1	7.4	7.5	4.2	4.1	4.1	0.20	7596698
Total Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	<0.00020	0.00020	7596624
Total Tin (Sn)	mg/L	0.0017	<0.0010	<0.0010	0.0065	0.0015	0.0025	0.0010	7596624
Total Titanium (Ti)	mg/L	0.024	<0.0010	0.0015	0.015	<0.0010	0.0019	0.0010	7596624
Total Uranium (U)	mg/L	0.0012	0.00069	0.00073	0.0012	0.00023	0.00024	0.00010	7596624
Total Vanadium (V)	mg/L	0.0035	0.0021	0.0018	0.015	0.0013	0.0015	0.0010	7596624

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		KH6210	KH6211	KH6211	KH6213	KH6214	KH6215		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/09 18:00	2014/08/09 12:00	2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094754	A094754	A094754	A094755	A094755	A094755		
	Units	**11-11**	**CREEK**	**CREEK Lab-Dup**	**13-25**	**12-01**	**QC1**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/L	0.0083	<0.0030	<0.0030	0.15	<0.0030	0.0035	0.0030	7596624

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		KH6210	KH6211	KH6211		KH6213	KH6213		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/09 18:00		2014/08/09 12:00	2014/08/09 12:00		
COC Number		A094754	A094754	A094754		A094755	A094755		
	Units	**11-11**	**CREEK**	**CREEK Lab-Dup**	**RDL**	**13-25**	**13-25 Lab-Dup**	**RDL**	**QC Batch**
Demand Parameters									
Total Chemical Oxygen Demand	mg/L	<5.0	5.0	N/A	5.0	6.0	N/A	5.0	7597360
Misc. Inorganics									
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.0020	<0.0020	N/A	0.0020	<0.0020	<0.0020	0.0020	7599952
Dissolved Organic Carbon (C)	mg/L	2.4 (1)	2.4 (1)	N/A	0.50	0.83	N/A	0.50	7596850
Total Organic Carbon (C)	mg/L	0.57	0.78	N/A	0.50	0.89	N/A	0.50	7596851
Nutrients									
Total Ammonia (N)	mg/L	0.81	0.086	N/A	0.050	0.11	N/A	0.050	7598291
Orthophosphate (P)	mg/L	0.0040	0.0060	N/A	0.0030	<0.0030	N/A	0.0030	7596693
Total Phosphate (P)	mg/L	0.044	0.0060	0.0050	0.0030	0.32 (2)	N/A	0.030	7598815
Total Inorganic Carbon (C)	mg/L	34.6	33.4	N/A	0.50	37.2	N/A	0.50	7603112
Misc. Organics									
Phenols	mg/L	0.0035	0.0021	N/A	0.0020	0.0023	N/A	0.0020	7596938

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).
(2) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		KH6214	KH6215		
Sampling Date		2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094755	A094755		
	Units	**12-01**	**QC1**	**RDL**	**QC Batch**
Demand Parameters					
Total Chemical Oxygen Demand	mg/L	8.0	6.0	5.0	7597360
Misc. Inorganics					
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.0020	<0.0020	0.0020	7599952
Dissolved Organic Carbon (C)	mg/L	<0.50	0.96 (1)	0.50	7596850
Total Organic Carbon (C)	mg/L	<0.50	<0.50	0.50	7596851
Nutrients					
Total Ammonia (N)	mg/L	0.37	0.41	0.050	7598291
Orthophosphate (P)	mg/L	0.0050	<0.0030	0.0030	7596693
Total Phosphate (P)	mg/L	0.0080	0.0090	0.0030	7598815
Total Inorganic Carbon (C)	mg/L	33.9	33.2	0.50	7603112
Misc. Organics					
Phenols	mg/L	0.0044	0.0033	0.0020	7596938

RDL = Reportable Detection Limit
(1) Dissolved greater than total. Results are within limits of uncertainty(MU).

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Maxxam

Maxxam Job #: B468695
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NORWEST CORPORATION
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Site Location: SPARWOOD
Sampler Initials: TD

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		KH6210	KH6211	KH6213	KH6214	KH6215		
Sampling Date		2014/08/09 16:00	2014/08/09 18:00	2014/08/09 12:00	2014/08/09 15:00	2014/08/09 15:00		
COC Number		A094754	A094754	A094755	A094755	A094755		
	Units	**11-11**	**CREEK**	**13-25**	**12-01**	**QC1**	**RDL**	**QC Batch**
Polycyclic Aromatics								
Benzo[a]pyrene equivalency	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7595448
Acenaphthene	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7596120
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	7596120
Acridine	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7596120
Anthracene	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	7596120
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7596120
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7596120
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7596120
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7596120
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7596120
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	7596120
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7596120
Chrysene	ug/L	<0.0085	<0.0085	0.014	<0.0085	<0.0085	0.0085	7596120
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	0.0075	7596120
Fluoranthene	ug/L	<0.010	<0.010	0.017	<0.010	<0.010	0.010	7596120
Fluorene	ug/L	<0.050	<0.050	0.089	<0.050	<0.050	0.050	7596120
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	0.0085	7596120
2-Methylnaphthalene	ug/L	<0.10	<0.10	0.68	0.19	0.18	0.10	7596120
Naphthalene	ug/L	0.27	<0.10	0.45	0.70	0.68	0.10	7596120
Phenanthrene	ug/L	<0.050	<0.050	0.37	<0.050	<0.050	0.050	7596120
Perylene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	7596120
Pyrene	ug/L	<0.020	<0.020	0.024	<0.020	<0.020	0.020	7596120
Quinoline	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7596120
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	109	107	107	106	107	N/A	7596120
D12-BENZO(A)PYRENE (sur.)	%	107	105	107	106	107	N/A	7596120
D8-ACENAPHTHYLENE (sur.)	%	105	103	105	107	104	N/A	7596120
TERPHENYL-D14 (sur.)	%	111	109	111	110	109	N/A	7596120

RDL = Reportable Detection Limit
N/A = Not Applicable

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Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.0°C
Package 2	4.7°C

Redox Potential results are attached to this report file. The reference number from Maxxam Sladeview for these results is B4E4832.

Results relate only to the items tested.

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Success Through Science®

Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7596119	MWB	Matrix Spike [KH6210-10]	O-TERPHENYL (sur.)	2014/08/13		113	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/08/13		103	%	50 - 130
7596119	MWB	Spiked Blank	O-TERPHENYL (sur.)	2014/08/12		107	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/08/12		103	%	70 - 130
7596119	MWB	Method Blank	O-TERPHENYL (sur.)	2014/08/12		111	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2014/08/12	<0.10		mg/L	
7596119	MWB	RPD [KH6215-10]	F2 (C10-C16 Hydrocarbons)	2014/08/13	NC		%	40
7596120	LZ3	Matrix Spike	D10-ANTHRACENE (sur.)	2014/08/12		118	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/08/12		118	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/08/12		116	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/08/12		121	%	50 - 130
			Acenaphthene	2014/08/12		116	%	50 - 130
			Acenaphthylene	2014/08/12		120	%	50 - 130
			Acridine	2014/08/12		108	%	50 - 130
			Anthracene	2014/08/12		110	%	50 - 130
			Benzo(a)anthracene	2014/08/12		96	%	50 - 130
			Benzo(b&j)fluoranthene	2014/08/12		81	%	50 - 130
			Benzo(k)fluoranthene	2014/08/12		80	%	50 - 130
			Benzo(g,h,i)perylene	2014/08/12		80	%	50 - 130
			Benzo(c)phenanthrene	2014/08/12		104	%	50 - 130
			Benzo(a)pyrene	2014/08/12		84	%	50 - 130
			Benzo[e]pyrene	2014/08/12		85	%	50 - 130
			Chrysene	2014/08/12		92	%	50 - 130
			Dibenz(a,h)anthracene	2014/08/12		82	%	50 - 130
			Fluoranthene	2014/08/12		118	%	50 - 130
			Fluorene	2014/08/12		119	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2014/08/12		86	%	50 - 130
			2-Methylnaphthalene	2014/08/12		116	%	50 - 130
			Naphthalene	2014/08/12		119	%	50 - 130
			Phenanthrene	2014/08/12		123	%	50 - 130
			Perylene	2014/08/12		83	%	50 - 130
			Pyrene	2014/08/12		119	%	50 - 130
			Quinoline	2014/08/12		95	%	50 - 130
7596120	LZ3	Spiked Blank	D10-ANTHRACENE (sur.)	2014/08/12		110	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/08/12		112	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/08/12		110	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/08/12		115	%	50 - 130
			Acenaphthene	2014/08/12		101	%	50 - 130
			Acenaphthylene	2014/08/12		108	%	50 - 130
			Acridine	2014/08/12		91	%	50 - 130
			Anthracene	2014/08/12		98	%	50 - 130
			Benzo(a)anthracene	2014/08/12		88	%	50 - 130
			Benzo(b&j)fluoranthene	2014/08/12		73	%	50 - 130
			Benzo(k)fluoranthene	2014/08/12		75	%	50 - 130
			Benzo(g,h,i)perylene	2014/08/12		77	%	50 - 130
			Benzo(c)phenanthrene	2014/08/12		94	%	50 - 130
			Benzo(a)pyrene	2014/08/12		79	%	50 - 130
			Benzo[e]pyrene	2014/08/12		78	%	50 - 130
			Chrysene	2014/08/12		84	%	50 - 130
			Dibenz(a,h)anthracene	2014/08/12		79	%	50 - 130
			Fluoranthene	2014/08/12		105	%	50 - 130
			Fluorene	2014/08/12		106	%	50 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Indeno(1,2,3-cd)pyrene	2014/08/12		85	%	50 - 130
			2-Methylnaphthalene	2014/08/12		104	%	50 - 130
			Naphthalene	2014/08/12		106	%	50 - 130
			Phenanthrene	2014/08/12		109	%	50 - 130
			Perylene	2014/08/12		76	%	50 - 130
			Pyrene	2014/08/12		107	%	50 - 130
			Quinoline	2014/08/12		89	%	50 - 130
7596120	LZ3	Method Blank	D10-ANTHRACENE (sur.)	2014/08/12		113	%	50 - 130
			D12-BENZO(A)PYRENE (sur.)	2014/08/12		113	%	50 - 130
			D8-ACENAPHTHYLENE (sur.)	2014/08/12		111	%	50 - 130
			TERPHENYL-D14 (sur.)	2014/08/12		117	%	50 - 130
			Acenaphthene	2014/08/12	<0.10		ug/L	
			Acenaphthylene	2014/08/12	<0.10		ug/L	
			Acridine	2014/08/12	<0.20		ug/L	
			Anthracene	2014/08/12	<0.010		ug/L	
			Benzo(a)anthracene	2014/08/12	<0.0085		ug/L	
			Benzo(b&j)fluoranthene	2014/08/12	<0.0085		ug/L	
			Benzo(k)fluoranthene	2014/08/12	<0.0085		ug/L	
			Benzo(g,h,i)perylene	2014/08/12	<0.0085		ug/L	
			Benzo(c)phenanthrene	2014/08/12	<0.050		ug/L	
			Benzo(a)pyrene	2014/08/12	<0.0075		ug/L	
			Benzo[e]pyrene	2014/08/12	<0.050		ug/L	
			Chrysene	2014/08/12	<0.0085		ug/L	
			Dibenz(a,h)anthracene	2014/08/12	<0.0075		ug/L	
			Fluoranthene	2014/08/12	<0.010		ug/L	
			Fluorene	2014/08/12	<0.050		ug/L	
			Indeno(1,2,3-cd)pyrene	2014/08/12	<0.0085		ug/L	
			2-Methylnaphthalene	2014/08/12	<0.10		ug/L	
			Naphthalene	2014/08/12	<0.10		ug/L	
			Phenanthrene	2014/08/12	<0.050		ug/L	
			Perylene	2014/08/12	<0.050		ug/L	
			Pyrene	2014/08/12	<0.020		ug/L	
			Quinoline	2014/08/12	<0.20		ug/L	
7596153	SCC	Spiked Blank	Alkalinity (Total as CaCO3)	2014/08/11		94	%	80 - 120
7596153	SCC	Method Blank	Alkalinity (PP as CaCO3)	2014/08/11	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2014/08/11	<0.50		mg/L	
			Bicarbonate (HCO3)	2014/08/11	<0.50		mg/L	
			Carbonate (CO3)	2014/08/11	<0.50		mg/L	
			Hydroxide (OH)	2014/08/11	<0.50		mg/L	
7596154	SCC	Spiked Blank	pH	2014/08/11		100	%	97 - 102
7596155	SCC	Spiked Blank	Conductivity	2014/08/11		101	%	90 - 110
7596155	SCC	Method Blank	Conductivity	2014/08/11	<1.0		uS/cm	
7596237	LQ1	Matrix Spike	Dissolved Nitrite (N)	2014/08/12		97	%	80 - 120
			Dissolved Nitrate (N)	2014/08/12		97	%	80 - 120
7596237	LQ1	Spiked Blank	Dissolved Nitrite (N)	2014/08/12		97	%	80 - 120
			Dissolved Nitrate (N)	2014/08/12		99	%	80 - 120
7596237	LQ1	Method Blank	Dissolved Nitrite (N)	2014/08/12	<0.010		mg/L	
			Dissolved Nitrate (N)	2014/08/12	<0.010		mg/L	
7596624	KA3	Matrix Spike [KH6211-06]	Total Aluminum (Al)	2014/08/12		NC	%	80 - 120
			Total Antimony (Sb)	2014/08/12		102	%	80 - 120
			Total Arsenic (As)	2014/08/12		99	%	80 - 120
			Total Beryllium (Be)	2014/08/12		103	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Chromium (Cr)	2014/08/12		99	%	80 - 120
			Total Cobalt (Co)	2014/08/12		97	%	80 - 120
			Total Copper (Cu)	2014/08/12		96	%	80 - 120
			Total Lead (Pb)	2014/08/12		99	%	80 - 120
			Total Molybdenum (Mo)	2014/08/12		107	%	80 - 120
			Total Nickel (Ni)	2014/08/12		95	%	80 - 120
			Total Selenium (Se)	2014/08/12		101	%	80 - 120
			Total Silver (Ag)	2014/08/12		93	%	80 - 120
			Total Thallium (Tl)	2014/08/12		101	%	80 - 120
			Total Tin (Sn)	2014/08/12		100	%	80 - 120
			Total Titanium (Ti)	2014/08/12		96	%	80 - 120
			Total Uranium (U)	2014/08/12		101	%	80 - 120
			Total Vanadium (V)	2014/08/12		106	%	80 - 120
			Total Zinc (Zn)	2014/08/12		93	%	80 - 120
7596624	KA3	Spiked Blank	Total Aluminum (Al)	2014/08/12		100	%	80 - 120
			Total Antimony (Sb)	2014/08/12		98	%	80 - 120
			Total Arsenic (As)	2014/08/12		96	%	80 - 120
			Total Beryllium (Be)	2014/08/12		97	%	80 - 120
			Total Chromium (Cr)	2014/08/12		96	%	80 - 120
			Total Cobalt (Co)	2014/08/12		97	%	80 - 120
			Total Copper (Cu)	2014/08/12		95	%	80 - 120
			Total Lead (Pb)	2014/08/12		97	%	80 - 120
			Total Molybdenum (Mo)	2014/08/12		97	%	80 - 120
			Total Nickel (Ni)	2014/08/12		94	%	80 - 120
			Total Selenium (Se)	2014/08/12		95	%	80 - 120
			Total Silver (Ag)	2014/08/12		91	%	80 - 120
			Total Thallium (Tl)	2014/08/12		97	%	80 - 120
			Total Tin (Sn)	2014/08/12		97	%	80 - 120
			Total Titanium (Ti)	2014/08/12		91	%	80 - 120
			Total Uranium (U)	2014/08/12		99	%	80 - 120
			Total Vanadium (V)	2014/08/12		105	%	80 - 120
			Total Zinc (Zn)	2014/08/12		92	%	80 - 120
7596624	KA3	Method Blank	Total Aluminum (Al)	2014/08/12	<0.0030		mg/L	
			Total Antimony (Sb)	2014/08/12	<0.00060		mg/L	
			Total Arsenic (As)	2014/08/12	<0.00020		mg/L	
			Total Beryllium (Be)	2014/08/12	<0.0010		mg/L	
			Total Chromium (Cr)	2014/08/12	<0.0010		mg/L	
			Total Cobalt (Co)	2014/08/12	<0.00030		mg/L	
			Total Copper (Cu)	2014/08/12	0.00030 , RDL=0.00020		mg/L	
			Total Lead (Pb)	2014/08/12	<0.00020		mg/L	
			Total Molybdenum (Mo)	2014/08/12	<0.00020		mg/L	
			Total Nickel (Ni)	2014/08/12	<0.00050		mg/L	
			Total Selenium (Se)	2014/08/12	<0.00020		mg/L	
			Total Silver (Ag)	2014/08/12	<0.00010		mg/L	
			Total Thallium (Tl)	2014/08/12	<0.00020		mg/L	
			Total Tin (Sn)	2014/08/12	<0.0010		mg/L	
			Total Titanium (Ti)	2014/08/12	<0.0010		mg/L	
			Total Uranium (U)	2014/08/12	<0.00010		mg/L	
			Total Vanadium (V)	2014/08/12	0.0014 , RDL=0.0010		mg/L	
			Total Zinc (Zn)	2014/08/12	<0.0030		mg/L	

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Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7596624	KA3	RPD [KH6211-06]	Total Aluminum (Al)	2014/08/12	14.8		%	20
			Total Antimony (Sb)	2014/08/12	NC		%	20
			Total Arsenic (As)	2014/08/12	NC		%	20
			Total Beryllium (Be)	2014/08/12	NC		%	20
			Total Chromium (Cr)	2014/08/12	NC		%	20
			Total Cobalt (Co)	2014/08/12	NC		%	20
			Total Copper (Cu)	2014/08/12	NC		%	20
			Total Lead (Pb)	2014/08/12	NC		%	20
			Total Molybdenum (Mo)	2014/08/12	0.7		%	20
			Total Nickel (Ni)	2014/08/12	NC		%	20
			Total Selenium (Se)	2014/08/12	0.9		%	20
			Total Silver (Ag)	2014/08/12	NC		%	20
			Total Thallium (Tl)	2014/08/12	NC		%	20
			Total Tin (Sn)	2014/08/12	NC		%	20
			Total Titanium (Ti)	2014/08/12	NC		%	20
			Total Uranium (U)	2014/08/12	5.9		%	20
			Total Vanadium (V)	2014/08/12	NC		%	20
			Total Zinc (Zn)	2014/08/12	NC		%	20
7596693	HC	Matrix Spike	Orthophosphate (P)	2014/08/12		101	%	80 - 120
7596693	HC	Spiked Blank	Orthophosphate (P)	2014/08/12		105	%	80 - 120
7596693	HC	Method Blank	Orthophosphate (P)	2014/08/12	<0.0030		mg/L	
7596698	SRT	Matrix Spike [KH6211-06]	Total Barium (Ba)	2014/08/12		84	%	80 - 120
			Total Boron (B)	2014/08/12		88	%	80 - 120
			Total Calcium (Ca)	2014/08/12		NC	%	80 - 120
			Total Iron (Fe)	2014/08/12		86	%	80 - 120
			Total Lithium (Li)	2014/08/12		87	%	80 - 120
			Total Magnesium (Mg)	2014/08/12		89	%	80 - 120
			Total Manganese (Mn)	2014/08/12		88	%	80 - 120
			Total Phosphorus (P)	2014/08/12		89	%	80 - 120
			Total Potassium (K)	2014/08/12		90	%	80 - 120
			Total Silicon (Si)	2014/08/12		88	%	80 - 120
			Total Sodium (Na)	2014/08/12		90	%	80 - 120
			Total Strontium (Sr)	2014/08/12		87	%	80 - 120
7596698	SRT	Spiked Blank	Total Barium (Ba)	2014/08/12		85	%	80 - 120
			Total Boron (B)	2014/08/12		88	%	80 - 120
			Total Calcium (Ca)	2014/08/12		91	%	80 - 120
			Total Iron (Fe)	2014/08/12		89	%	80 - 120
			Total Lithium (Li)	2014/08/12		88	%	80 - 120
			Total Magnesium (Mg)	2014/08/12		91	%	80 - 120
			Total Manganese (Mn)	2014/08/12		89	%	80 - 120
			Total Phosphorus (P)	2014/08/12		88	%	80 - 120
			Total Potassium (K)	2014/08/12		91	%	80 - 120
			Total Silicon (Si)	2014/08/12		89	%	80 - 120
			Total Sodium (Na)	2014/08/12		91	%	80 - 120
			Total Strontium (Sr)	2014/08/12		88	%	80 - 120
7596698	SRT	Method Blank	Total Barium (Ba)	2014/08/12	<0.010		mg/L	
			Total Boron (B)	2014/08/12	<0.020		mg/L	
			Total Calcium (Ca)	2014/08/12	<0.30		mg/L	
			Total Iron (Fe)	2014/08/12	<0.060		mg/L	
			Total Lithium (Li)	2014/08/12	<0.020		mg/L	
			Total Magnesium (Mg)	2014/08/12	<0.20		mg/L	
			Total Manganese (Mn)	2014/08/12	<0.0040		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Phosphorus (P)	2014/08/12	<0.10		mg/L	
			Total Potassium (K)	2014/08/12	<0.30		mg/L	
			Total Silicon (Si)	2014/08/12	<0.10		mg/L	
			Total Sodium (Na)	2014/08/12	<0.50		mg/L	
			Total Strontium (Sr)	2014/08/12	<0.020		mg/L	
			Total Sulphur (S)	2014/08/12	<0.20		mg/L	
7596698	SRT	RPD [KH6211-06]	Total Barium (Ba)	2014/08/12	0.9		%	20
			Total Boron (B)	2014/08/12	NC		%	20
			Total Calcium (Ca)	2014/08/12	1.2		%	20
			Total Iron (Fe)	2014/08/12	NC		%	20
			Total Lithium (Li)	2014/08/12	NC		%	20
			Total Magnesium (Mg)	2014/08/12	1		%	20
			Total Manganese (Mn)	2014/08/12	NC		%	20
			Total Phosphorus (P)	2014/08/12	NC		%	20
			Total Potassium (K)	2014/08/12	NC		%	20
			Total Silicon (Si)	2014/08/12	1.2		%	20
			Total Sodium (Na)	2014/08/12	NC		%	20
			Total Strontium (Sr)	2014/08/12	0.9		%	20
			Total Sulphur (S)	2014/08/12	0.9		%	20
7596831	KA3	Matrix Spike	Dissolved Aluminum (Al)	2014/08/12		105	%	80 - 120
			Dissolved Antimony (Sb)	2014/08/12		75 (1)	%	80 - 120
			Dissolved Arsenic (As)	2014/08/12		89	%	80 - 120
			Dissolved Beryllium (Be)	2014/08/12		93	%	80 - 120
			Dissolved Chromium (Cr)	2014/08/12		86	%	80 - 120
			Dissolved Cobalt (Co)	2014/08/12		83	%	80 - 120
			Dissolved Copper (Cu)	2014/08/12		83	%	80 - 120
			Dissolved Lead (Pb)	2014/08/12		84	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/08/12		94	%	80 - 120
			Dissolved Nickel (Ni)	2014/08/12		84	%	80 - 120
			Dissolved Selenium (Se)	2014/08/12		108	%	80 - 120
			Dissolved Silver (Ag)	2014/08/12		81	%	80 - 120
			Dissolved Thallium (Tl)	2014/08/12		101	%	80 - 120
			Dissolved Tin (Sn)	2014/08/12		102	%	80 - 120
			Dissolved Titanium (Ti)	2014/08/12		110	%	80 - 120
			Dissolved Uranium (U)	2014/08/12		104	%	80 - 120
			Dissolved Vanadium (V)	2014/08/12		112	%	80 - 120
			Dissolved Zinc (Zn)	2014/08/12		108	%	80 - 120
7596831	KA3	Spiked Blank	Dissolved Aluminum (Al)	2014/08/12		116	%	80 - 120
			Dissolved Antimony (Sb)	2014/08/12		109	%	80 - 120
			Dissolved Arsenic (As)	2014/08/12		105	%	80 - 120
			Dissolved Beryllium (Be)	2014/08/12		109	%	80 - 120
			Dissolved Chromium (Cr)	2014/08/12		105	%	80 - 120
			Dissolved Cobalt (Co)	2014/08/12		106	%	80 - 120
			Dissolved Copper (Cu)	2014/08/12		106	%	80 - 120
			Dissolved Lead (Pb)	2014/08/12		106	%	80 - 120
			Dissolved Molybdenum (Mo)	2014/08/12		104	%	80 - 120
			Dissolved Nickel (Ni)	2014/08/12		104	%	80 - 120
			Dissolved Selenium (Se)	2014/08/12		105	%	80 - 120
			Dissolved Silver (Ag)	2014/08/12		104	%	80 - 120
			Dissolved Thallium (Tl)	2014/08/12		105	%	80 - 120
			Dissolved Tin (Sn)	2014/08/12		100	%	80 - 120
			Dissolved Titanium (Ti)	2014/08/12		104	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Uranium (U)	2014/08/12		104	%	80 - 120
			Dissolved Vanadium (V)	2014/08/12		107	%	80 - 120
			Dissolved Zinc (Zn)	2014/08/12		120	%	80 - 120
7596831	KA3	Method Blank	Dissolved Aluminum (Al)	2014/08/12	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2014/08/12	<0.00060		mg/L	
			Dissolved Arsenic (As)	2014/08/12	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2014/08/12	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2014/08/12	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2014/08/12	<0.00030		mg/L	
			Dissolved Copper (Cu)	2014/08/12	<0.00020		mg/L	
			Dissolved Lead (Pb)	2014/08/12	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2014/08/12	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2014/08/12	<0.00050		mg/L	
			Dissolved Selenium (Se)	2014/08/12	<0.00020		mg/L	
			Dissolved Silver (Ag)	2014/08/12	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2014/08/12	<0.00020		mg/L	
			Dissolved Tin (Sn)	2014/08/12	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2014/08/12	<0.0010		mg/L	
			Dissolved Uranium (U)	2014/08/12	<0.00010		mg/L	
			Dissolved Vanadium (V)	2014/08/12	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2014/08/12	<0.0030		mg/L	
7596850	AP1	Matrix Spike	Dissolved Organic Carbon (C)	2014/08/12		NC	%	80 - 120
7596850	AP1	Spiked Blank	Dissolved Organic Carbon (C)	2014/08/12		84	%	80 - 120
7596850	AP1	Method Blank	Dissolved Organic Carbon (C)	2014/08/12	<0.50		mg/L	
7596851	AP1	Matrix Spike	Total Organic Carbon (C)	2014/08/12		NC	%	80 - 120
7596851	AP1	Spiked Blank	Total Organic Carbon (C)	2014/08/12		98	%	80 - 120
7596851	AP1	Method Blank	Total Organic Carbon (C)	2014/08/12	<0.50		mg/L	
7596938	LY	Matrix Spike	Phenols	2014/08/12		102	%	80 - 120
7596938	LY	Spiked Blank	Phenols	2014/08/12		98	%	80 - 120
7596938	LY	Method Blank	Phenols	2014/08/12	<0.0020		mg/L	
7596946	SRT	Matrix Spike	Dissolved Barium (Ba)	2014/08/12		90	%	80 - 120
			Dissolved Boron (B)	2014/08/12		94	%	80 - 120
			Dissolved Calcium (Ca)	2014/08/12		NC	%	80 - 120
			Dissolved Iron (Fe)	2014/08/12		94	%	80 - 120
			Dissolved Lithium (Li)	2014/08/12		92	%	80 - 120
			Dissolved Magnesium (Mg)	2014/08/12		NC	%	80 - 120
			Dissolved Manganese (Mn)	2014/08/12		93	%	80 - 120
			Dissolved Phosphorus (P)	2014/08/12		100	%	80 - 120
			Dissolved Potassium (K)	2014/08/12		98	%	80 - 120
			Dissolved Silicon (Si)	2014/08/12		89	%	80 - 120
			Dissolved Sodium (Na)	2014/08/12		NC	%	80 - 120
			Dissolved Strontium (Sr)	2014/08/12		NC	%	80 - 120
7596946	SRT	Spiked Blank	Dissolved Barium (Ba)	2014/08/12		89	%	80 - 120
			Dissolved Boron (B)	2014/08/12		94	%	80 - 120
			Dissolved Calcium (Ca)	2014/08/12		96	%	80 - 120
			Dissolved Iron (Fe)	2014/08/12		92	%	80 - 120
			Dissolved Lithium (Li)	2014/08/12		90	%	80 - 120
			Dissolved Magnesium (Mg)	2014/08/12		98	%	80 - 120
			Dissolved Manganese (Mn)	2014/08/12		94	%	80 - 120
			Dissolved Phosphorus (P)	2014/08/12		97	%	80 - 120
			Dissolved Potassium (K)	2014/08/12		99	%	80 - 120
			Dissolved Silicon (Si)	2014/08/12		95	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Dissolved Sodium (Na)	2014/08/12		94	%	80 - 120
			Dissolved Strontium (Sr)	2014/08/12		91	%	80 - 120
7596946	SRT	Method Blank	Dissolved Barium (Ba)	2014/08/12	<0.010		mg/L	
			Dissolved Boron (B)	2014/08/12	<0.020		mg/L	
			Dissolved Calcium (Ca)	2014/08/12	<0.30		mg/L	
			Dissolved Iron (Fe)	2014/08/12	<0.060		mg/L	
			Dissolved Lithium (Li)	2014/08/12	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2014/08/12	<0.20		mg/L	
			Dissolved Manganese (Mn)	2014/08/12	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2014/08/12	<0.10		mg/L	
			Dissolved Potassium (K)	2014/08/12	<0.30		mg/L	
			Dissolved Silicon (Si)	2014/08/12	<0.10		mg/L	
			Dissolved Sodium (Na)	2014/08/12	<0.50		mg/L	
			Dissolved Strontium (Sr)	2014/08/12	<0.020		mg/L	
			Dissolved Sulphur (S)	2014/08/12	<0.20		mg/L	
7597115	HC	Matrix Spike	Total Kjeldahl Nitrogen	2014/08/13		95	%	80 - 120
7597115	HC	QC Standard	Total Kjeldahl Nitrogen	2014/08/13		106	%	80 - 120
7597115	HC	Spiked Blank	Total Kjeldahl Nitrogen	2014/08/13		113	%	80 - 120
7597115	HC	Method Blank	Total Kjeldahl Nitrogen	2014/08/13	<0.050		mg/L	
7597360	AP1	Matrix Spike	Total Chemical Oxygen Demand	2014/08/12		93	%	80 - 120
7597360	AP1	Spiked Blank	Total Chemical Oxygen Demand	2014/08/12		101	%	80 - 120
7597360	AP1	Method Blank	Total Chemical Oxygen Demand	2014/08/12	<5.0		mg/L	
7598291	HC	Matrix Spike	Total Ammonia (N)	2014/08/13		109	%	80 - 120
7598291	HC	Spiked Blank	Total Ammonia (N)	2014/08/13		98	%	80 - 120
7598291	HC	Method Blank	Total Ammonia (N)	2014/08/13	<0.050		mg/L	
7598815	BL5	Matrix Spike [KH6211-04]	Total Phosphate (P)	2014/08/13		101	%	80 - 120
7598815	BL5	QC Standard	Total Phosphate (P)	2014/08/13		91	%	80 - 120
7598815	BL5	Spiked Blank	Total Phosphate (P)	2014/08/13		97	%	83 - 111
7598815	BL5	Method Blank	Total Phosphate (P)	2014/08/13	<0.0030		mg/L	
7598815	BL5	RPD [KH6211-04]	Total Phosphate (P)	2014/08/13	NC		%	20
7598820	ZI	Matrix Spike	Dissolved Chloride (Cl)	2014/08/13		NC	%	80 - 120
7598820	ZI	Spiked Blank	Dissolved Chloride (Cl)	2014/08/13		103	%	80 - 120
7598820	ZI	Method Blank	Dissolved Chloride (Cl)	2014/08/13	<1.0		mg/L	
7598844	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2014/08/13		117	%	80 - 120
7598844	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2014/08/13		107	%	80 - 120
7598844	ZI	Method Blank	Dissolved Sulphate (SO4)	2014/08/13	<1.0		mg/L	
7599689	ARA	Matrix Spike	1,4-Difluorobenzene (sur.)	2014/08/14		107	%	70 - 130
			4-Bromofluorobenzene (sur.)	2014/08/14		106	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/08/14		108	%	70 - 130
			Benzene	2014/08/14		98	%	70 - 130
			Toluene	2014/08/14		91	%	70 - 130
			Ethylbenzene	2014/08/14		91	%	70 - 130
			m & p-Xylene	2014/08/14		93	%	70 - 130
			o-Xylene	2014/08/14		95	%	70 - 130
			(C6-C10)	2014/08/14		75	%	70 - 130
7599689	ARA	Spiked Blank	1,4-Difluorobenzene (sur.)	2014/08/14		106	%	70 - 130
			4-Bromofluorobenzene (sur.)	2014/08/14		106	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/08/14		102	%	70 - 130
			Benzene	2014/08/14		92	%	70 - 130
			Toluene	2014/08/14		89	%	70 - 130
			Ethylbenzene	2014/08/14		92	%	70 - 130
			m & p-Xylene	2014/08/14		91	%	70 - 130

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Maxxam

Success Through Science®

Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			o-Xylene	2014/08/14		92	%	70 - 130
			(C6-C10)	2014/08/14		102	%	70 - 130
7599689	ARA	Method Blank	1,4-Difluorobenzene (sur.)	2014/08/14		107	%	70 - 130
			4-Bromofluorobenzene (sur.)	2014/08/14		107	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2014/08/14		101	%	70 - 130
			Benzene	2014/08/14	<0.40		ug/L	
			Toluene	2014/08/14	<0.40		ug/L	
			Ethylbenzene	2014/08/14	<0.40		ug/L	
			m & p-Xylene	2014/08/14	<0.80		ug/L	
			o-Xylene	2014/08/14	<0.40		ug/L	
			Xylenes (Total)	2014/08/14	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2014/08/14	<100		ug/L	
			(C6-C10)	2014/08/14	<100		ug/L	
7599952	LY	Matrix Spike [KH6213-08]	Strong Acid Dissoc. Cyanide (CN)	2014/08/14		116	%	80 - 120
7599952	LY	QC Standard	Strong Acid Dissoc. Cyanide (CN)	2014/08/14		116	%	80 - 120
7599952	LY	Spiked Blank	Strong Acid Dissoc. Cyanide (CN)	2014/08/14		105	%	80 - 120
7599952	LY	Method Blank	Strong Acid Dissoc. Cyanide (CN)	2014/08/14	<0.0020		mg/L	
7599952	LY	RPD [KH6213-08]	Strong Acid Dissoc. Cyanide (CN)	2014/08/14	NC		%	20
7603112	VT1	Matrix Spike	Total Inorganic Carbon (C)	2014/08/16		97	%	80 - 120
7603112	VT1	Spiked Blank	Total Inorganic Carbon (C)	2014/08/16		102	%	80 - 120
7603112	VT1	Method Blank	Total Inorganic Carbon (C)	2014/08/16	<0.50		mg/L	

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B468695
Report Date: 2014/08/19

NORWEST CORPORATION
Client Project #: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Sampler Initials: TD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

<Original signed by>

Janet Gao, Senior Analyst, Organics Department

<Original signed by>

Peng Liang, Analyst II

<Original signed by>

Rob Reinert, Data Validation Coordinator

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam

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288 2 coolers

Chain of Custody A094754

Page: 1 of 2

Invoice To:	C/O Report Address ☐	Report To:	Same as Invoice ☑	Report Distribution (E-Mail):	REGULATORY GUIDELINES:
Company:	NORWEST CORPORATION			APERRIN@NORWESTCORP.COM	☑ AT1
Contact:	AMY PERRIN				☐ CCME
Address:	2700 411 1ST ST SE				☐ Regulated Drinking Water
	Prov: AB PC: T2G4Y5	Prov:	PC:		☐ Other:
Contact #s:	Ph: 403 205 5792 Cell: 403 969 8580		Cell:		

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: 284-1 CROWN MOUNTAIN
Site Location: SPARWOOD
Quote #:
Sampled By: TD / AP

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required:
☑ REGULAR (5 to 7 Days)

See reverse for package specifics

Analysis columns — SOIL: BTEX F1-F4; Sieve (75 micron); Regulated Metals (CCME / AT1); Salinity 4; Assessment ICP Metals; Basic Class II Landfill. WATER: ☐BTEX-F1 ☐VOCs; ☑BTEX F1-F2 ☐BTEX F1-F4; ☑Routine Water ☐ Turb. ☐ F; ☑TOC ☑DOC; Total / Regulated Metals (CCME / AT1); Dissolved; Mercury ☐ Total ☐ Dissolved. Other Analysis: PHENOL; PAH; REDOX POTENTIAL; COD; TOTAL CARBON; CYANIDE; NITRATE NITROGEN; NITRITE NITROGEN; NITROGEN TOTAL; AMMONIA NITROGEN; ORTHOPHOSPHORUS (DISSOLVED); PHOSPHOROUS TOTAL; HOLD - Do not Analyze; # of Containers Submitted.

#	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	BTEX-F1 / VOCs	BTEX F1-F2	Routine Water	TOC / DOC	Regulated Metals Total	Regulated Metals Dissolved	Mercury	PHENOL	PAH	REDOX POTENTIAL	COD	TOTAL CARBON	CYANIDE	NITRATE NITROGEN	NITRITE NITROGEN	NITROGEN TOTAL	AMMONIA NITROGEN	ORTHOPHOSPHORUS (DISSOLVED)	PHOSPHOROUS TOTAL	HOLD	# of Containers
1	11-11		GW	14/08/09 16:00		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
2	CREEK			14/08/09 18:00		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
3	TRIP BLANK					✓																			
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

10-Aug-14 11:32
Jenelle Feller
B468695
MHR
NB6 INS-0101

Please indicate Filtered, Preserved or Both (F, P, F/P) F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
<Original signed by>	14/08/10	11:30am
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: | # of Jars Used & Not Submitted

LAB USE ONLY					
Received By:	Date:	Time:	Maxxam Job #:		
Ho. Adeleright H. Loquellano	2014/08/10	11:32	Custody Seal	Temperature	Ice
Lab Comments:			No	6, 5, 4 / 4, 4, 6	Yes

AB FCD-00331 Rev3 2010/05

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Chain of Custody A094755

Page: 2 of 2

	Invoice To:	C/O Report Address ☐	Report To:	Same as Invoice ☑	Report Distribution (E-Mail):	REGULATORY GUIDELINES:
Company:	NORWEST CORPORATION				APERRIN@NORWESTCORP.COM	☐ AT1
Contact:	AMY PERRIN					☐ CCME
Address:	2 700 411 1ST ST SE					☐ Regulated Drinking Water
	Prov: ALBERTA	PC: T2G4Y5	Prov:	PC:		☐ Other:
Contact #s:	Ph: 403 205.5702	Cell: 403 969 8380		Cell:		

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: 284-1 / CROWN MOUNTAIN
Site Location: SPARWOOD
Quote #:
Sampled By: TD / AP

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME/AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill				WATER: ☐BTEX F1 ☐VOCs	☐BTEX F1-F2 ☐BTEX F1-F4	☐Routine Water ☐Turb ☐F	☐TOC ☐DOC	Regulated Metals (CCME/AT1) Total	Dissolved	Mercury ☐Total ☐Dissolved	Other Analysis: PHENOL	PAH	REDOX POTENTIAL	COD	TOTAL CARBON	CYANIDE	NITRATE NITROGEN	NITRITE NITROGEN	NITROGEN TOTAL	AMMONIA NITROGEN	ORTHOPHOSPHORUS (DISSOLVED)	HOLD - Do not Analyze	# of Containers Submitted	PHOSPHORUS TOTAL
1	13-25		GW	14/08/09 12:00											✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
2	12-01		GW	14/08/09 15:00											✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
3	QC1		GW	14/08/09 15:00											✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
4																																		
5																																		
6																																		
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8																																		
9																																		
10																																		
11																																		
12																																		

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Signature/Print:	Date (YY/MM/DD):	Time (24:00):
<Original signed by> Tim Davies.	14/08/10	11:30am
Signature/Print:	Date (YY/MM/DD):	Time (24:00):

Special Instructions:

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:		
Mo. Adee Light H. Loguellano	2014/08/10	11:32	Custody Seal	Temperature	Ice
Lab Comments:			No	6, 5, 4 / 4, 4, 6	Yes

AB FCD-00331 Rev3 2010/05

Maxxam Analytics International Corporation o/a Maxxam Analytics

MAXXAM ANALYTICS
4000 19st N.E
Calgary, Alberta, T2E 6P8
Phone: (403) 291-3077
Fax: (403) 291-9468

NORWEST CORPORATION - CALGARY
Maxxam PM Jenelle Feller

SUBCONTRACTING REQUEST FORM

To: Maxxam Vancouver

Job# B468695

☐ Yes ☐ No International Sample/BioHazard (if yes, add copy of Movement Cert., heat treat is required prior to disposal)
☐ Yes ☐ No Special Protocol (if yes, Protocol ____________)

Sample ID	Matrix	Test(s) Required	Container	Date Sampled	Date Required
KH6210-02R \ 11-11	WATER	Carbon (Total Inorganic)	1(CR1)	2014/08/09 16:00	2014/08/18
KH6211-02R \ CREEK	WATER	Carbon (Total Inorganic)	1(CR1)	2014/08/09 18:00	2014/08/18
KH6213-02R \ 13-25	WATER	Carbon (Total Inorganic)	1(CR1)	2014/08/09 12:00	2014/08/18
KH6214-02R \ 12-01	WATER	Carbon (Total Inorganic)	1(CR1)	2014/08/09 15:00	2014/08/18
KH6215-02R \ QC1	WATER	Carbon (Total Inorganic)	1(CR1)	2014/08/09 15:00	2014/08/18

	Temp. 1	Temp. 2	Temp. 3			
Cooler #1	2	2	3	Custody Seal Present	YES	NO
				Custody Seal Intact	YES	NO
				Ice Present Upon Receipt	YES	NO
Cooler #2				Custody Seal Present	YES	NO
				Custody Seal Intact	YES	NO
				Ice Present Upon Receipt	YES	NO
Cooler #3				Custody Seal Present	YES	NO
				Custody Seal Intact	YES	NO
				Ice Present Upon Receipt	YES	NO

Receiving Maxxam Location: Maxxam Vancouver JOB # ____________

Relinquished by (Sign) <Original signed by> (Print) <Original signed by> Date and Time 2014/08/13 1520

Received by (Sign) <Original signed by> (Print) <Original signed by> Date and Time 2014/08/14 08:45

NOTES:
1) Please call us if due date cannot be met. Please reference Sample ID on your report.
2) Include copy of this completed form, Client COC & signed final report to **calgarycustomerservice@maxxamanalytics.com**

Reporting Requirements:
National:
Regional:

B468695

NORWEST
CORPORATION

CERTIFICATE OF ANALYSIS
November, 2014

NORWEST
CORPORATION

CERTIFICATE OF ANALYSIS

October, 2015

O'KANE CONSULTANTS INC.
ATTN: Tyler Birkham
905 C Industrial Road #2
Cranbrook BC V1C 4C9

Date Received: 20-OCT-15
Report Date: 03-NOV-15 16:27 (MT)
Version: FINAL

Client Phone: 250-420-7010

Certificate of Analysis

Lab Work Order #: L1690289

Project P.O. #: CROWN MOUNTAIN
Job Reference: 3284
C of C Numbers: 14-491007
Legal Site Desc:

<Original signed by>

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1690289-1	L1690289-2	L1690289-3	L1690289-4	L1690289-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15
	Sampled Time					
	Client ID	13-06	11-11	12-01	13-25	11-11-D
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	50.3	279	324	321	314
	Hardness (as CaCO3) (mg/L)	23.0	131	153	168	128
	pH (pH)	6.37	7.66	8.00	7.14	7.71
	Total Dissolved Solids (mg/L)	62	159	192	184	190
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	23.2	145	166	176	151
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Phenolphthalein (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Total (as CaCO3) (mg/L)	23.2	145	166	176	151
	Ammonia, Total (as N) (mg/L)	0.0050	0.809	0.259	0.123	0.834
	Bromide (Br) (mg/L)	<0.050	0.062	0.052	<0.050	0.062
	Chloride (Cl) (mg/L)	<0.50	0.63	<0.50	<0.50	1.06
	Fluoride (F) (mg/L)	0.034	0.145	0.209	0.192	0.126
	Nitrate and Nitrite (as N) (mg/L)	0.0442	<0.0051	0.170	<0.0051	0.0062
	Nitrate (as N) (mg/L)	0.0442	<0.0050	0.148	<0.0050	0.0062
	Nitrite (as N) (mg/L)	<0.0010	0.0013	0.0221	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	1.54 RRV	0.982	0.342	6.82	0.984
	Total Nitrogen (mg/L)	0.75 DLM	0.939	0.444	0.85 DLM	0.941
	Orthophosphate-Dissolved (as P) (mg/L)	0.0375	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	0.96	0.0172	0.0225	1.89	0.0186
	Sulfate (SO4) (mg/L)	3.64	15.2	27.7	17.0	30.3
	Anion Sum (meq/L)	0.54	3.25	3.92	3.88	3.68
	Cation Sum (meq/L)	0.50	3.35	3.58	3.92	3.54
	Cation - Anion Balance (%)	-4.3	1.6	-4.5	0.6	-1.9
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.51	1.18	2.44	1.24	1.25
	Total Inorganic Carbon (mg/L)	4.09	30.4	37.3	45.9	34.9
	Total Organic Carbon (mg/L)	44.4	4.64	1.80 RRV	247	3.68
Total Metals	Aluminum (Al)-Total (mg/L)	23.4	0.149	0.0626	10.1	0.211
	Antimony (Sb)-Total (mg/L)	0.00080	0.0160	0.00229	0.00297	0.0132
	Arsenic (As)-Total (mg/L)	0.0242	0.00042	0.00130	0.0114	0.00044
	Barium (Ba)-Total (mg/L)	0.779	0.423	0.209	1.16	0.377
	Beryllium (Be)-Total (mg/L)	0.00441	0.000028	<0.000020	0.00203	0.000047
	Bismuth (Bi)-Total (mg/L)	0.000627	<0.000050	<0.000050	0.000492	<0.000050
	Boron (B)-Total (mg/L)	0.030	0.039	0.024	0.036	0.038
	Cadmium (Cd)-Total (mg/L)	0.00140	0.0000251	0.0000193	0.00732	0.0000258

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1690289-6				
	Description	Blank				
	Sampled Date	15-OCT-15				
	Sampled Time					
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (mg/L)	<0.50				
	pH (pH)	5.62				
	Total Dissolved Solids (mg/L)	<10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Phenolphthalein (as CaCO3) (mg/L)	<2.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	0.0067				
	Nitrate (as N) (mg/L)	0.0067				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Total Nitrogen (mg/L)	<0.030				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Sulfate (SO4) (mg/L)	<0.30				
	Anion Sum (meq/L)	<0.10				
	Cation Sum (meq/L)	<0.10				
	Cation - Anion Balance (%)	66.6				
Cyanides	Cyanide, Total (mg/L)	<0.0050				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50				
	Total Inorganic Carbon (mg/L)	<0.50				
	Total Organic Carbon (mg/L)	<0.50				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	<0.00010				
	Barium (Ba)-Total (mg/L)	0.000105 RRV				
	Beryllium (Be)-Total (mg/L)	<0.000020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1690289-1	L1690289-2	L1690289-3	L1690289-4	L1690289-5
	Sample ID	L1690289-1	L1690289-2	L1690289-3	L1690289-4	L1690289-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15
	Sampled Time					
	Client ID	13-06	11-11	12-01	13-25	11-11-D
WATER						
Total Metals	Calcium (Ca)-Total (mg/L)	18.0	31.1	36.1	42.9	30.0
	Chromium (Cr)-Total (mg/L)	0.0272	<0.00080 DLB	<0.00030 DLB	0.0183	<0.00070 DLB
	Cobalt (Co)-Total (mg/L)	0.0483	0.00018	0.00014	0.0135	0.00018
	Copper (Cu)-Total (mg/L)	0.0730	0.00242	0.00136	0.107	0.00238
	Iron (Fe)-Total (mg/L)	54.7	1.92	0.368	28.2	1.57
	Lead (Pb)-Total (mg/L)	0.0646	0.000699	0.00136	0.0501	0.000819
	Lithium (Li)-Total (mg/L)	0.0145	0.0168	0.0146	0.0190	0.0195
	Magnesium (Mg)-Total (mg/L)	5.73	12.2	13.6	23.4	12.0
	Manganese (Mn)-Total (mg/L)	0.609	0.0585	0.0712	0.254	0.0581
	Mercury (Hg)-Total (mg/L)	0.00042	<0.0000050	<0.0000050	0.00039	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00133	0.00328	0.00449	0.00297	0.00552
	Nickel (Ni)-Total (mg/L)	0.113	0.00068	<0.00050	0.0530	0.00067
	Phosphorus (P)-Total (mg/L)	2.05 RRV	<0.050	<0.050	2.05	<0.050
	Potassium (K)-Total (mg/L)	5.87	2.23	1.29	4.82	2.29
	Selenium (Se)-Total (mg/L)	0.00179	0.000363	0.000062	0.00291	0.000398
	Silicon (Si)-Total (mg/L)	26.6	2.98	3.23	16.3	3.23
	Silver (Ag)-Total (mg/L)	0.00172	0.000016	<0.000010	0.000817	0.000013
	Sodium (Na)-Total (mg/L)	0.689	11.7	18.2	11.1	21.8
	Strontium (Sr)-Total (mg/L)	0.101	0.0699	0.0556	0.109	0.0682
	Sulfur (S)-Total (mg/L)	2.13	5.11	9.70	6.97	10.4
	Thallium (Tl)-Total (mg/L)	0.00194	0.000124	0.000057	0.000684	0.000102
	Tin (Sn)-Total (mg/L)	0.00102	0.00194	0.00106	0.00076	0.00157
	Titanium (Ti)-Total (mg/L)	0.387	0.00338	0.00180	0.0484	0.00743
	Uranium (U)-Total (mg/L)	0.00789	0.000412	0.00116	0.00432	0.000548
	Vanadium (V)-Total (mg/L)	0.0630	<0.00050	<0.00050	0.0583	<0.00050
	Zinc (Zn)-Total (mg/L)	0.472	0.0092	0.0066	0.412	0.0081
	Zirconium (Zr)-Total (mg/L)	0.0106	<0.00030	<0.00030	0.00127	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0380	0.0013	0.0014	0.0048	0.0044
	Antimony (Sb)-Dissolved (mg/L)	0.00036	0.00252	0.00175	0.00182	0.00262
	Arsenic (As)-Dissolved (mg/L)	0.00023	0.00029	0.00034	0.00143	0.00031
	Barium (Ba)-Dissolved (mg/L)	0.0476	0.420	0.257	0.185	0.396
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.00010 DLM	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	0.033	0.020	0.014	0.035
	Cadmium (Cd)-Dissolved (mg/L)	0.0000228	<0.0000050	<0.0000050	<0.0000050	<0.0000050

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1690289-6				
		Description	Blank				
		Sampled Date	15-OCT-15				
		Sampled Time					
		Client ID	FIELD BLANK				
Grouping	**Analyte**						
WATER							
Total Metals	Calcium (Ca)-Total (mg/L)		<0.050				
	Chromium (Cr)-Total (mg/L)		<0.00010				
	Cobalt (Co)-Total (mg/L)		<0.00010				
	Copper (Cu)-Total (mg/L)		<0.00050				
	Iron (Fe)-Total (mg/L)		<0.010				
	Lead (Pb)-Total (mg/L)		<0.000050				
	Lithium (Li)-Total (mg/L)		<0.0010				
	Magnesium (Mg)-Total (mg/L)		<0.10				
	Manganese (Mn)-Total (mg/L)		<0.00010				
	Mercury (Hg)-Total (mg/L)		<0.0000050				
	Molybdenum (Mo)-Total (mg/L)		<0.000050				
	Nickel (Ni)-Total (mg/L)		<0.00050				
	Phosphorus (P)-Total (mg/L)		<0.050				
	Potassium (K)-Total (mg/L)		<0.10				
	Selenium (Se)-Total (mg/L)		<0.000050				
	Silicon (Si)-Total (mg/L)		<0.050				
	Silver (Ag)-Total (mg/L)		<0.000010				
	Sodium (Na)-Total (mg/L)		<0.050				
	Strontium (Sr)-Total (mg/L)		<0.00020				
	Sulfur (S)-Total (mg/L)		<0.50				
	Thallium (Tl)-Total (mg/L)		<0.000010				
	Tin (Sn)-Total (mg/L)		<0.00010				
	Titanium (Ti)-Total (mg/L)		<0.00030				
	Uranium (U)-Total (mg/L)		<0.000010				
	Vanadium (V)-Total (mg/L)		<0.00050				
	Zinc (Zn)-Total (mg/L)		<0.0030				
	Zirconium (Zr)-Total (mg/L)		<0.00030				
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD				
	Dissolved Metals Filtration Location		FIELD				
	Aluminum (Al)-Dissolved (mg/L)		<0.0010				
	Antimony (Sb)-Dissolved (mg/L)		<0.00010				
	Arsenic (As)-Dissolved (mg/L)		<0.00010				
	Barium (Ba)-Dissolved (mg/L)		RRV 0.000085				
	Beryllium (Be)-Dissolved (mg/L)		<0.000020				
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050				
	Boron (B)-Dissolved (mg/L)		<0.010				
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1690289-1	L1690289-2	L1690289-3	L1690289-4	L1690289-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15
	Sampled Time					
	Client ID	13-06	11-11	12-01	13-25	11-11-D
Grouping	**Analyte**					
WATER						
Dissolved Metals	Calcium (Ca)-Dissolved (mg/L)	6.20	31.7	37.8	34.0	30.7
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	0.00028	0.00013	<0.00010	0.00176	0.00012
	Copper (Cu)-Dissolved (mg/L)	0.00046	<0.00020	0.00054	<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.039	1.74	0.041	1.48	1.47
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	0.0176	0.0124	0.0141	0.0204
	Magnesium (Mg)-Dissolved (mg/L)	1.84	12.5	14.3	20.2	12.5
	Manganese (Mn)-Dissolved (mg/L)	0.00358	0.0574	0.0278	0.0683	0.0554
	Mercury (Hg)-Dissolved (mg/L)	0.0000112	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	0.00223	0.00279	0.00165	0.00407
	Nickel (Ni)-Dissolved (mg/L)	0.00281	0.00063	<0.00050	0.00370	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.54	2.32	1.22	0.91	2.49
	Selenium (Se)-Dissolved (mg/L)	0.000130	0.000083	0.000148	0.000094	0.000112
	Silicon (Si)-Dissolved (mg/L)	1.90	2.69	2.82	2.92	2.76
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.00050 DLM	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.394	12.2	10.9	10.3	17.8
	Strontium (Sr)-Dissolved (mg/L)	0.0230	0.0701	0.0497	0.0545	0.0709
	Sulfur (S)-Dissolved (mg/L)	1.31	6.8 RRV	7.28	6.09	11.0
	Thallium (Tl)-Dissolved (mg/L)	0.000025	<0.000010	0.000078 DTC	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	0.00173	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	<0.000010	0.000308	0.000654	0.000449	0.000358
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0097	0.0039	0.0053	0.0127	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Aggregate Organics	COD (mg/L)	125	23	<20	882	<20
	Phenols (4AAP) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1690289-6				
	Description	Blank				
	Sampled Date	15-OCT-15				
	Sampled Time					
	Client ID	FIELD BLANK				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Calcium (Ca)-Dissolved (mg/L)	<0.050				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	<0.10				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	<0.10				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	<0.050				
	Strontium (Sr)-Dissolved (mg/L)	<0.00020				
	Sulfur (S)-Dissolved (mg/L)	<0.50				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Uranium (U)-Dissolved (mg/L)	<0.000010				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				
Aggregate Organics	COD (mg/L)	<20				
	Phenols (4AAP) (mg/L)	<0.0010				
Volatile Organic Compounds	Benzene (mg/L)					
	Ethylbenzene (mg/L)					
	Methyl t-butyl ether (MTBE) (mg/L)					
	Styrene (mg/L)					
	Toluene (mg/L)					
	ortho-Xylene (mg/L)					
	meta- & para-Xylene (mg/L)					

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1690289-1	L1690289-2	L1690289-3	L1690289-4	L1690289-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Sampled Date	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15	15-OCT-15
	Sampled Time					
	Client ID	13-06	11-11	12-01	13-25	11-11-D
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
	F1 (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)	101.0	103.1	102.9	101.7	98.9
	Surrogate: 1,4-Difluorobenzene (SS) (%)	101.4	101.6	102.8	102.9	101.7
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	F2 (C10-C16) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	103.9	115.0	109.6	107.0	105.7
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	88.9	SURR-ND 68.3	87.3	87.1	78.8
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050	<0.000050	<0.000050	DLCI <0.00020	<0.000050
	Acenaphthylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acridine (mg/L)	<0.000050	0.000611	0.000178	DLCI <0.0010	0.000548
	Anthracene (mg/L)	<0.000050	<0.000050	<0.000050	DLCI <0.000070	<0.000050
	Benz(a)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	DLCI <0.000060	<0.000050
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	0.000040	<0.000010
	Benzo(b)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	0.000133	<0.000050
	Benzo(g,h,i)perylene (mg/L)	<0.000050	<0.000050	<0.000050	0.000050	<0.000050
	Benzo(k)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Chrysene (mg/L)	<0.000050	<0.000050	<0.000050	DLCI <0.00030	<0.000050
	Dibenz(a,h)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	0.000084	<0.000050
	Fluorene (mg/L)	<0.000050	<0.000050	<0.000050	0.000524	<0.000050
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	0.00115	<0.000050
	Phenanthrene (mg/L)	<0.000050	<0.000050	<0.000050	0.00190	<0.000050
	Pyrene (mg/L)	<0.000050	<0.000050	<0.000050	0.000167	<0.000050
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acridine d9 (%)	60.7	76.7	77.6	SURR-ND 36.7	98.7
	Surrogate: Chrysene d12 (%)	73.9	62.8	65.0	78.7	70.4
	Surrogate: Naphthalene d8 (%)	92.9	88.7	88.7	88.4	89.8
	Surrogate: Phenanthrene d10 (%)	90.9	87.7	88.2	90.4	94.5

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1690289-6 Blank 15-OCT-15 FIELD BLANK				
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Xylenes (mg/L)					
	F1 (C6-C10) (mg/L)					
	Surrogate: 4-Bromofluorobenzene (SS) (%)					
	Surrogate: 1,4-Difluorobenzene (SS) (%)					
Hydrocarbons	F1-BTEX (mg/L)					
	F2 (C10-C16) (mg/L)	<0.30				
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	100.2				
	Surrogate: 3,4-Dichlorotoluene (SS) (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050				
	Acenaphthylene (mg/L)	<0.000050				
	Acridine (mg/L)	<0.000050				
	Anthracene (mg/L)	<0.000050				
	Benz(a)anthracene (mg/L)	<0.000050				
	Benzo(a)pyrene (mg/L)	<0.000010				
	Benzo(b)fluoranthene (mg/L)	<0.000050				
	Benzo(g,h,i)perylene (mg/L)	<0.000050				
	Benzo(k)fluoranthene (mg/L)	<0.000050				
	Chrysene (mg/L)	<0.000050				
	Dibenz(a,h)anthracene (mg/L)	<0.000050				
	Fluoranthene (mg/L)	<0.000050				
	Fluorene (mg/L)	<0.000050				
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000050				
	Naphthalene (mg/L)	<0.000050				
	Phenanthrene (mg/L)	<0.000050				
	Pyrene (mg/L)	<0.000050				
	Quinoline (mg/L)	<0.000050				
	Surrogate: Acridine d9 (%)	94.8				
	Surrogate: Chrysene d12 (%)	79.6				
	Surrogate: Naphthalene d8 (%)	86.1				
	Surrogate: Phenanthrene d10 (%)	96.0				

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO3)	B	L1690289-1, -2, -3, -4, -5, -6
Duplicate	Chromium (Cr)-Total	DLB	L1690289-1, -2, -3, -4, -5, -6
Duplicate	Bromide (Br)	DLDS	L1690289-1, -2, -3, -4, -5, -6
Duplicate	Chloride (Cl)	DLDS	L1690289-1, -2, -3, -4, -5, -6
Duplicate	Bromide (Br)	DLDS	L1690289-1, -2, -3, -4, -5, -6
Duplicate	Fluoride (F)	DLDS	L1690289-1, -2, -3, -4, -5, -6
Method Blank	Chromium (Cr)-Total	MB-LOR	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Phosphorus (P)-Total	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Total Nitrogen	MS-B	L1690289-2, -3, -5, -6
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Total Organic Carbon	MS-B	L1690289-1, -2, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1690289-1, -2, -4, -5, -6
Matrix Spike	Total Organic Carbon	MS-B	L1690289-3
Matrix Spike	Dissolved Organic Carbon	MS-B	L1690289-3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Total Inorganic Carbon	MS-B	L1690289-4
Matrix Spike	Total Organic Carbon	MS-B	L1690289-4
Matrix Spike	Total Organic Carbon	MS-B	L1690289-4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Total Inorganic Carbon	MS-B	L1690289-1, -2, -3, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Uranium (U)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1690289-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLB	Detection Limit Raised. Analyte detected at comparable level in Method Blank.
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.

Reference Information

MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-PP-VA	Water	Phenolphthalein alkalinity by titration	APHA 2320 "Alkalinity"

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity".

ALK-PP-VA	Water	Phenolphthalein alkalinity by titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity".

ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

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).

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

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

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

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

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

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

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

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

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B 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-TIC-VA	Water	Total inorganic carbon by CO2 purge	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

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

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

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

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

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux 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.

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

Reference Information

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

F1-BTX-CALC-VA Water F1-Total BTX CCME CWS PHC TIER 1 (2001)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:

F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

F1-HSFID-VA Water CCME F1 By Headspace with GCFID CCME PHC TIER 1

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-ME-FID-VA Water CCME F2-F4 Hydrocarbons in Water CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Water Hardness APHA 2340B

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

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

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

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

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

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

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

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

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

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

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

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

MET-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 EPA 200.2/6020A (mod)

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

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

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).

N-T-COL-VA Water Total Nitrogen in water by Colour APHA Method 4500-P (J) / NEMI 5735

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

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

Reference Information

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

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

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

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

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

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

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

P-T-PRES-COL-VA	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 Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

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

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

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

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

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

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

PHENOLS-4AAP-ED	Water	Phenols (4AAP)	AB ENV.06537-COLORIMETRIC

This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

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

S-DIS-ICP-VA	Water	Dissolved Sulfur 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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

S-TOT-ICP-VA	Water	Total Sulfur 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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

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

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

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

Reference Information

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-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	B.C. MIN. OF ENV. LAB. MAN. (2009)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA8260B, 5021

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA8260B, 5021
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-491007

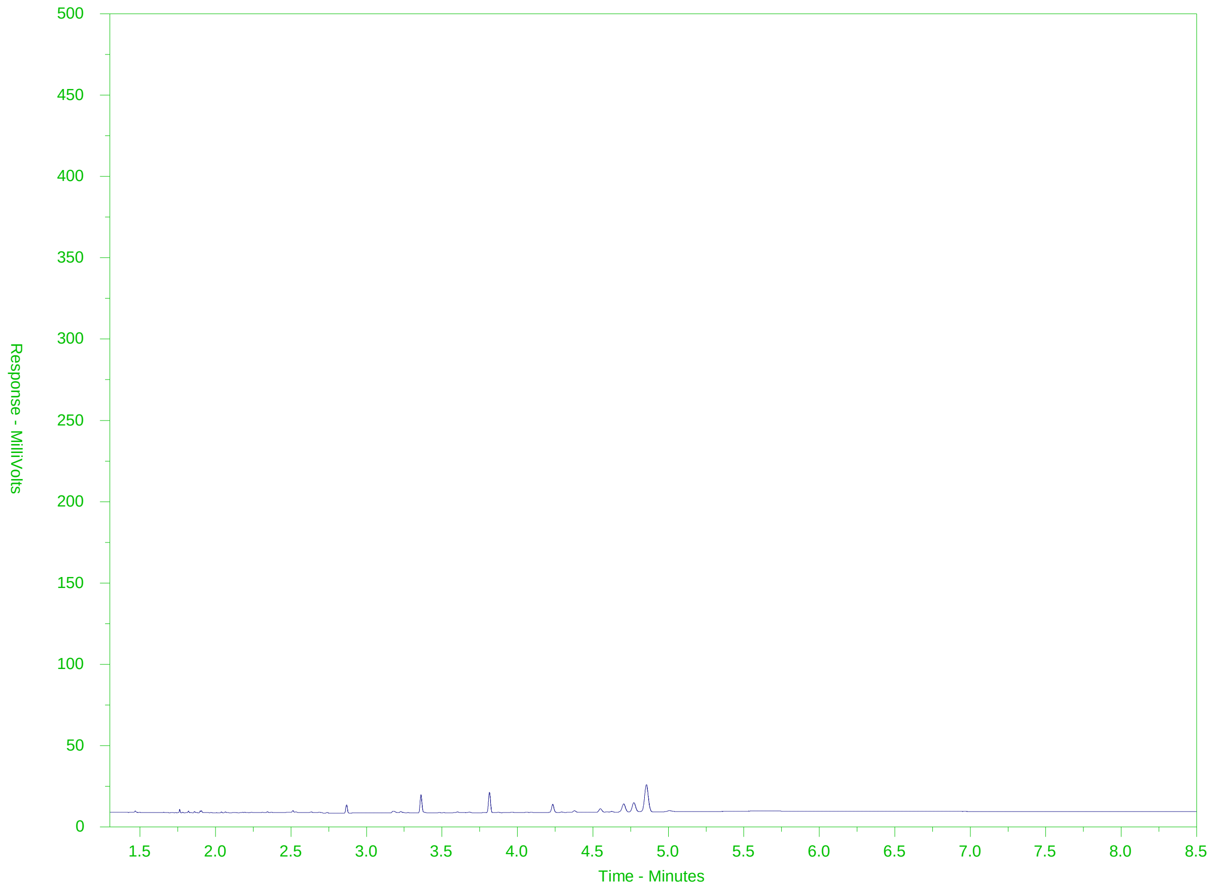
GLOSSARY OF REPORT TERMS

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.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1690289-C-1
Client Sample ID: 13-06



← F2 →	← F3 →		← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

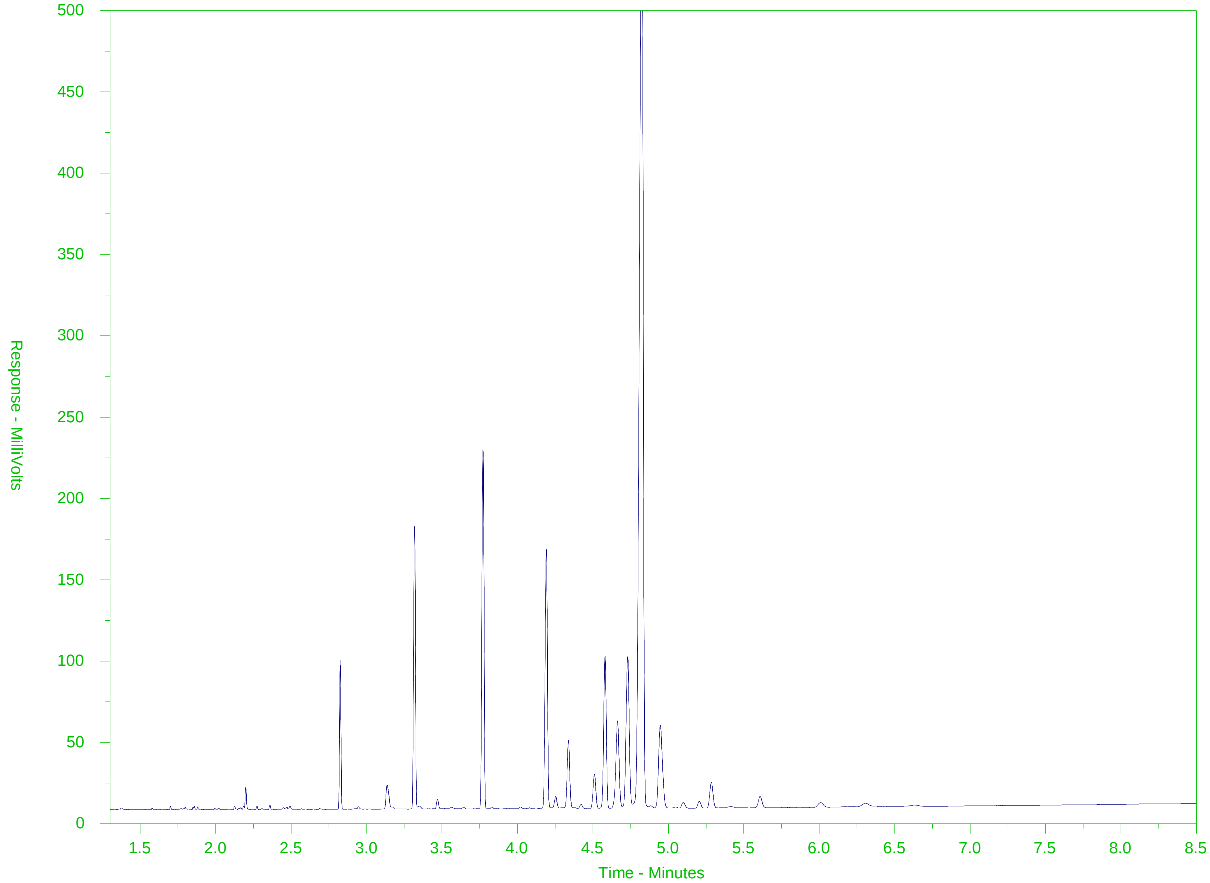
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1690289-C-2
Client Sample ID: 11-11



← F2 →	← F3 →		← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

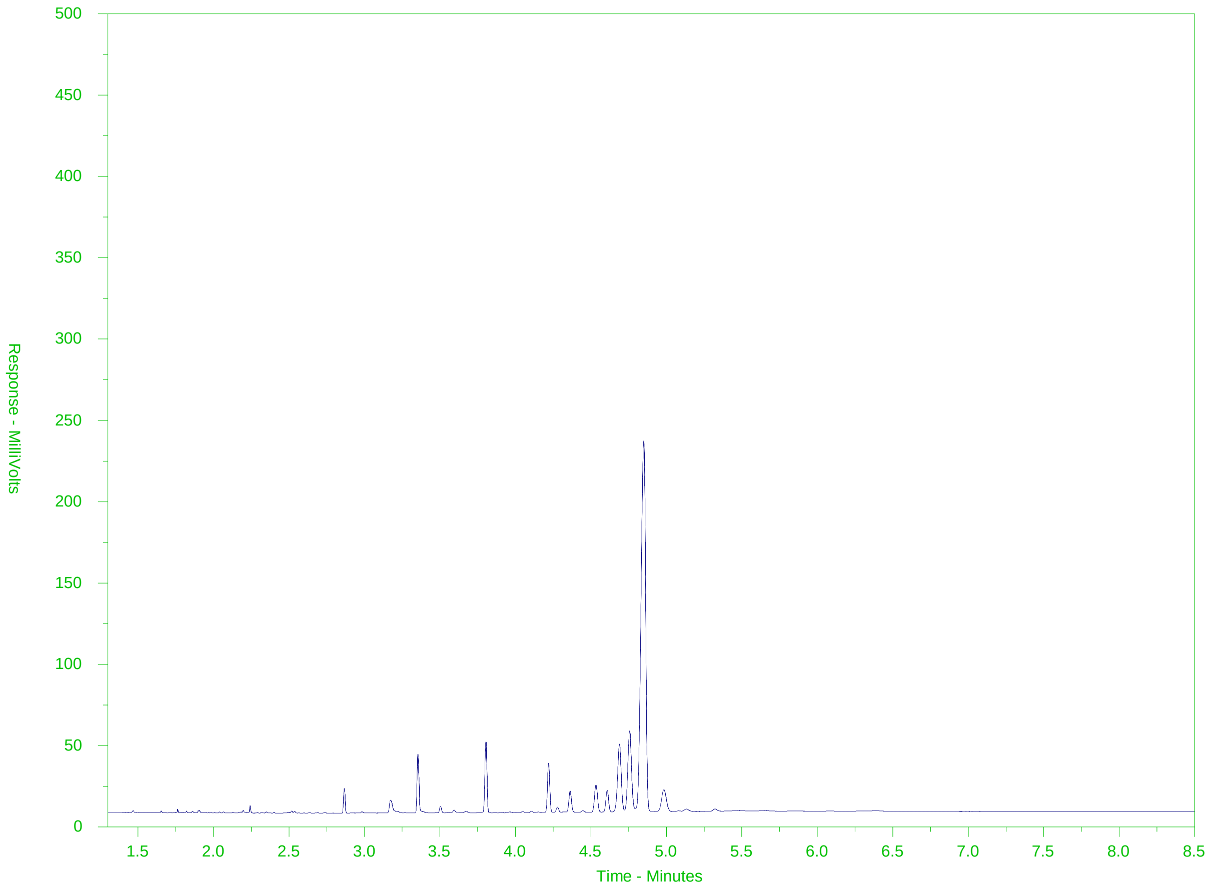
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1690289-C-3
Client Sample ID: 12-01



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

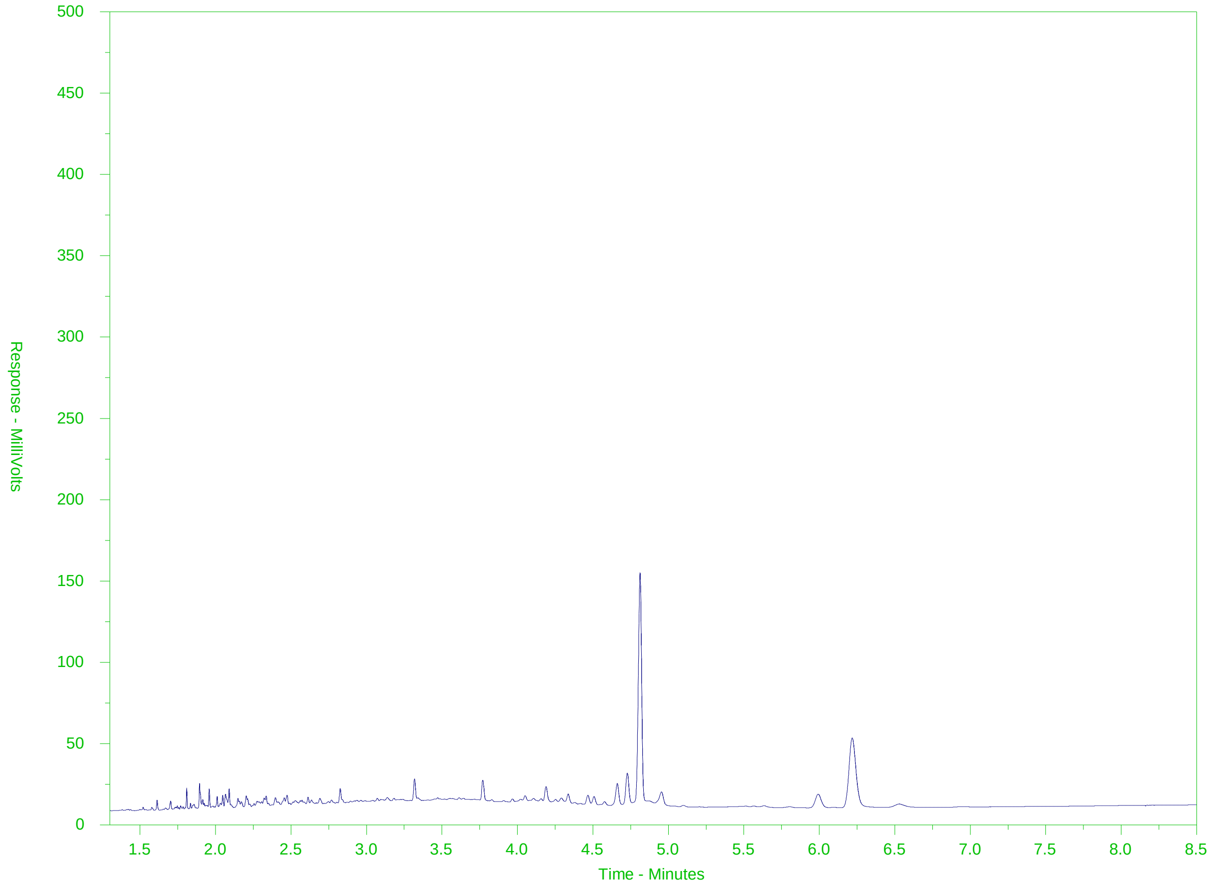
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1690289-C-4
Client Sample ID: 13-25



← F2 →	← F3	→	← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

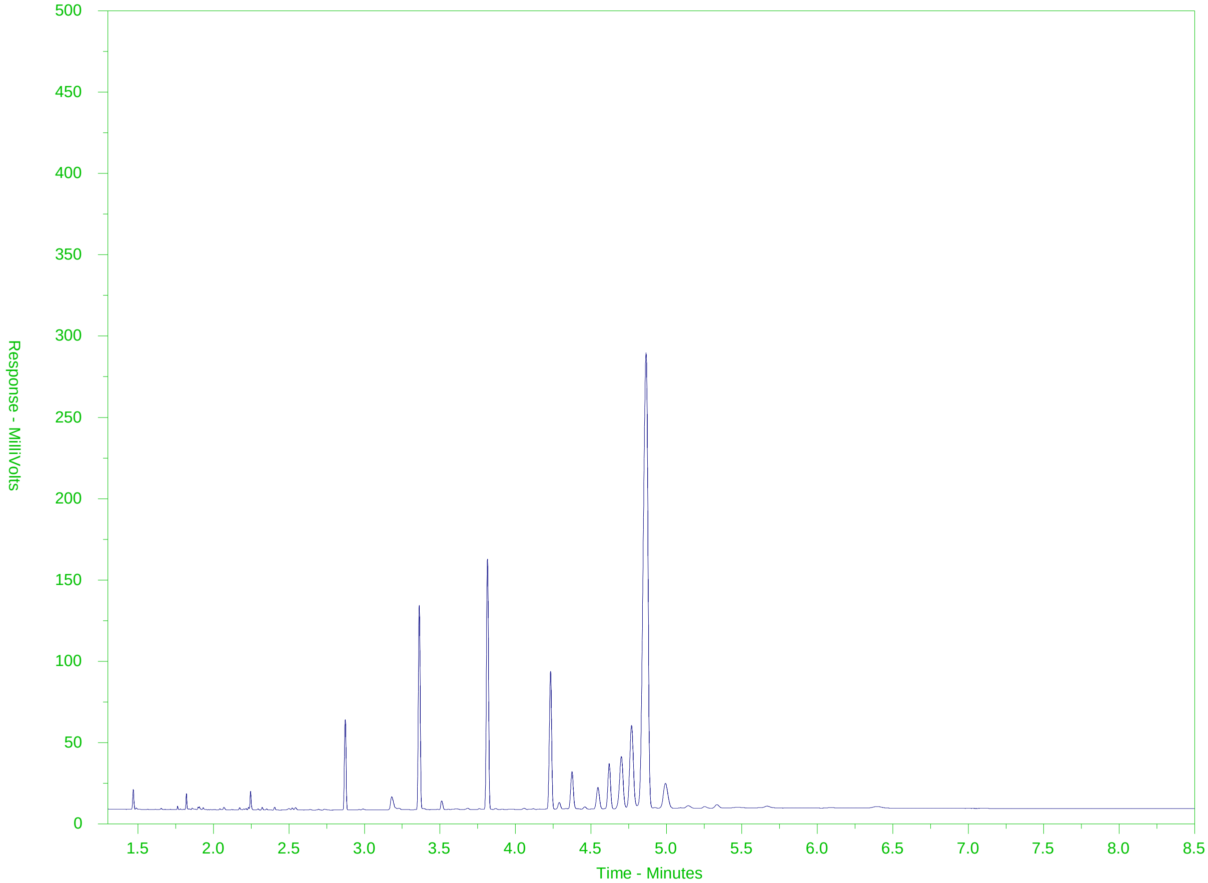
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1690289-C-5
Client Sample ID: 11-11-D



← F2 →	←	F3 →	← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

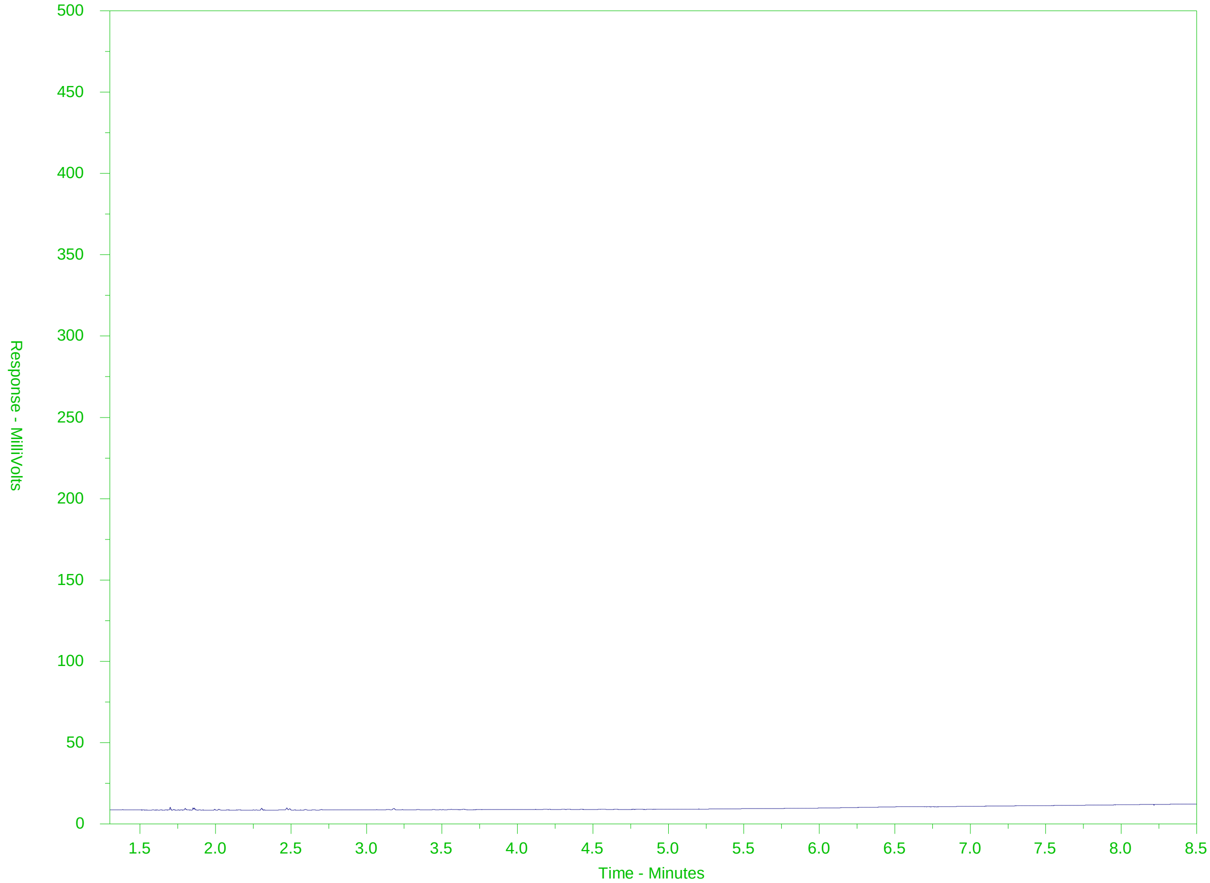
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1690289-C-6
Client Sample ID: FIELD BLANK



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

Short Holding Time ● *Rush Processing*

stody (COC) / Analytical equest Form

oll Free: 1 800 668 9878

L1690289-COFC

COC Number: 14 - 491007

Page 1 of 1

Report To	
Company:	O'Kane Consultants
Contact:	Tyler Birkham
Address:	905C Industrial Rd 2 Cranbrook BC
Phone:	250-919-6737

Report Format / Distribution

Select Report Format: [X] PDF [X] EXCEL [ ] EDD (DIGITAL)

Quality Control (QC) Report with Report [X] Yes [ ] No

[ ] Criteria on Report - provide details below if box checked

Select Distribution: [ ] EMAIL [ ] MAIL [ ] FAX

Email 1 or Fax tbirkham@oke-sk.com

Email 2

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

R [✓] Regular (Standard TAT if received by 3pm)

P [ ] Priority (2-4 business days if received by 3pm)

E [ ] Emergency (1-2 business days if received by 3pm)

E2 [ ] Same day or weekend emergency if received by 10am – contact ALS for surcharge.

Specify Date Required for E2,E or P:

Invoice To Same as Report To [X] Yes [ ] No

Copy of Invoice with Report [ ] Yes [ ] No

Company:

Contact:

Invoice Distribution

Select Invoice Distribution: [✓] EMAIL [ ] MAIL [ ] FAX

Email 1 or Fax

Email 2

Project Information

ALS Quote #: Q52907

Job #: Crown Mountain

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

Approver ID: Cost Center:

GL Account: Routing Code:

Activity Code:

Location:

ALS Lab Work Order # (lab use only) L1690289

ALS Contact: Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General	Total Metals	Diss. Metals	TOC	DOC	Total Hg	Diss Hg.	PAH	BTEX	Phenols	Cyanide			Number of Containers
						P	F/P	P	F/P	P	F/P	P	P	P	P			
	13-06	15-OCT-15		Groundwater	1	1	1	1	1	1	1	2	2	1	1			13
	11-11																	
	12-01																	
	13-25																	
	11-11-D																	
	Field Blank			Blank														

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] Yes [X] No

Are samples for human drinking water use? [ ] Yes [X] No

Special Instructions / Specify Criteria to add on report (client Use)

Metals by BC MDG Criteria

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice packs Yes [X] No [ ] Custody seal intact Yes [ ] No [X]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			3	2	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: <Original signed by>	Date: Oct 19/15	Time: 17:00	Received by:	Date:	Time:	Received by: Jean	Date: OCT 20 2015	Time: 9:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION   WHITE - LABORATORY COPY   YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

CERTIFICATE OF ANALYSIS

June, 2016

O'KANE CONSULTANTS INC.
ATTN: Tyler Birkham
905 C Industrial Road #2
Cranbrook BC V1C 4C9

Date Received: 23-JUN-16
Report Date: 12-JUL-16 15:21 (MT)
Version: FINAL

Client Phone: 250-420-7010

Certificate of Analysis

Lab Work Order #: L1788050

Project P.O. #: OKC project 959-02/NWPCoal-Crown Mountain
Job Reference:
C of C Numbers: 14-472357
Legal Site Desc:

<Original signed by>

Michael Hornby
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-1	L1788050-2	L1788050-3	L1788050-4	L1788050-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16
	Sampled Time					
	Client ID	CM 12-01	CM 11-11	CM 13-06	CM 13-06D	CM 13-25
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	320	382	37.7	37.3	289
	Hardness (as CaCO3) (mg/L)	154	68.3	17.9	18.1	150
	pH (pH)	7.81	7.63	6.46	6.37	7.11
	Total Dissolved Solids (mg/L)	192	253	130	136	169
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	156	180	19.3	19.2	148
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Phenolphthalein (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Total (as CaCO3) (mg/L)	156	180	19.3	19.2	148
	Ammonia, Total (as N) (mg/L)	0.316	0.872	0.0154	0.0071	0.0719
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	0.73	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.201	0.164	0.041	0.041	0.182
	Nitrate and Nitrite (as N) (mg/L)	0.113	<0.0051	0.0226	0.0266	<0.0051
	Nitrate (as N) (mg/L)	0.110	<0.0050	0.0226	0.0266	<0.0050
	Nitrite (as N) (mg/L)	0.0029	0.0010	HTD <0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.349	0.932	RRV 3.08	RRV 3.28	0.371
	Total Nitrogen (mg/L)	0.473	0.929	DLM 1.5	DLM <1.5	0.282
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	0.0418	0.0418	<0.0010
	Phosphorus (P)-Total (mg/L)	0.0156	0.0198	2.06	2.40	0.0581
	Sulfate (SO4) (mg/L)	14.8	29.2	2.12	2.12	7.82
	Anion Sum (meq/L)	3.45	4.23	0.43	0.43	3.14
	Cation Sum (meq/L)	3.54	4.12	0.40	0.39	3.17
	Cation - Anion Balance (%)	1.3	-1.2	-4.4	-5.5	0.5
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	0.92	2.63	2.93	3.01	3.52
	Total Inorganic Carbon (mg/L)	40.2	46.6	4.13	5.24	39.9
	Total Organic Carbon (mg/L)	0.86	2.43	79.2	84.9	6.47
Total Metals	Aluminum (Al)-Total (mg/L)	0.0360	0.198	23.7	22.3	0.631
	Antimony (Sb)-Total (mg/L)	0.00257	0.00646	0.00074	0.00076	0.0314
	Arsenic (As)-Total (mg/L)	0.00051	0.00185	0.0319	0.0315	0.00185
	Barium (Ba)-Total (mg/L)	0.258	0.130	0.773	0.745	0.198
	Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	0.00448	0.00444	<0.00010
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	0.00058	0.00057	<0.000050
	Boron (B)-Total (mg/L)	0.020	0.037	0.024	0.023	0.017
	Cadmium (Cd)-Total (mg/L)	0.0000129	0.0000240	0.00168	0.00161	0.000141

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-6				
	Description	Water				
	Sampled Date	21-JUN-16				
	Sampled Time					
	Client ID	BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (mg/L)	<0.50				
	pH (pH)	5.30				
	Total Dissolved Solids (mg/L)	<10				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Phenolphthalein (as CaCO3) (mg/L)	<2.0				
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	0.0272				
	Nitrate (as N) (mg/L)	0.0272				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Total Nitrogen (mg/L)	<0.030				
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010				
	Phosphorus (P)-Total (mg/L)	<0.0020				
	Sulfate (SO4) (mg/L)	<0.30				
	Anion Sum (meq/L)	<0.10				
	Cation Sum (meq/L)	<0.10				
	Cation - Anion Balance (%)	44.1				
Cyanides	Cyanide, Total (mg/L)	<0.0050				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50				
	Total Inorganic Carbon (mg/L)	<0.50				
	Total Organic Carbon (mg/L)	<0.50				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030				
	Antimony (Sb)-Total (mg/L)	<0.00010				
	Arsenic (As)-Total (mg/L)	<0.00010				
	Barium (Ba)-Total (mg/L)	RRV 0.000079				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-1	L1788050-2	L1788050-3	L1788050-4	L1788050-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16
	Sampled Time					
	Client ID	CM 12-01	CM 11-11	CM 13-06	CM 13-06D	CM 13-25
Grouping	**Analyte**					
WATER						
Total Metals	Calcium (Ca)-Total (mg/L)	37.1	16.0	15.5	15.5	30.1
	Cesium (Cs)-Total (mg/L)	0.000040	0.000110	0.00930	0.00929	0.000242
	Chromium (Cr)-Total (mg/L)	0.00030	0.00085	0.0295	0.0273	0.00118
	Cobalt (Co)-Total (mg/L)	0.00010	0.00041	0.0519	0.0497	0.00159
	Copper (Cu)-Total (mg/L)	0.00165	0.00285	0.0823	0.0834	0.00449
	Iron (Fe)-Total (mg/L)	0.331	1.45	60.0	59.8	1.89
	Lead (Pb)-Total (mg/L)	0.000721	0.000512	0.0686	0.0682	0.00134
	Lithium (Li)-Total (mg/L)	0.0127	0.0364	0.0138	0.0137	0.0121
	Magnesium (Mg)-Total (mg/L)	14.4	6.71	5.22	5.13	17.8
	Manganese (Mn)-Total (mg/L)	0.0606	0.0711	0.526	0.485	0.0533
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	0.00060	0.00065	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00213	0.00713	0.00153	0.00159	0.00143
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00130	0.119	0.118	0.00423
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	2.21	1.95	0.065
	Potassium (K)-Total (mg/L)	1.22	1.99	7.13	6.79	1.67
	Rubidium (Rb)-Total (mg/L)	0.00259	0.00393	0.0577	0.0558	0.00315
	Selenium (Se)-Total (mg/L)	<0.000050	0.000055	0.00186	0.00180	0.000089
	Silicon (Si)-Total (mg/L)	3.03	4.56	34.1	33.3	3.82
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	0.00183	0.00181	0.000034
	Sodium (Na)-Total (mg/L)	9.81	58.6	0.61	0.58	1.82
	Strontium (Sr)-Total (mg/L)	0.0500	0.0717	0.0946	0.0952	0.0535
	Sulfur (S)-Total (mg/L)	5.29	10.0	1.4	1.3	2.94
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	DLM <0.00040	DLM <0.00040	<0.00020
	Thallium (Tl)-Total (mg/L)	0.000066	0.000081	0.00223	0.00221	0.000261
	Thorium (Th)-Total (mg/L)	<0.00010	0.00038	0.0130	0.0126	0.00020
	Tin (Sn)-Total (mg/L)	0.00044	0.00068	0.00053	0.00051	0.00101
	Titanium (Ti)-Total (mg/L)	0.00078	0.00434	0.200	0.171	0.00853
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	DLM <0.00020	DLM <0.00020	<0.00010
	Uranium (U)-Total (mg/L)	0.000583	0.00201	0.00719	0.00702	0.000221
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	0.0731	0.0720	0.00262
	Zinc (Zn)-Total (mg/L)	0.0046	0.0091	0.564	0.555	0.0401
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	0.00344	0.00306	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010	<0.0010	0.136	0.0526	0.0013
	Antimony (Sb)-Dissolved (mg/L)	0.00177	0.00208	DLM <0.00020	DLM <0.00020	0.00705
	Arsenic (As)-Dissolved (mg/L)	0.00047	0.00172	0.00029	0.00026	0.00108

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-6
	Description	Water
	Sampled Date	21-JUN-16
	Sampled Time	
	Client ID	BLANK
Grouping	**Analyte**	
WATER		
Total Metals	Calcium (Ca)-Total (mg/L)	<0.050
	Cesium (Cs)-Total (mg/L)	<0.000010
	Chromium (Cr)-Total (mg/L)	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010
	Magnesium (Mg)-Total (mg/L)	<0.0050
	Manganese (Mn)-Total (mg/L)	<0.00010
	Mercury (Hg)-Total (mg/L)	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050
	Nickel (Ni)-Total (mg/L)	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050
	Potassium (K)-Total (mg/L)	<0.050
	Rubidium (Rb)-Total (mg/L)	<0.00020
	Selenium (Se)-Total (mg/L)	<0.000050
	Silicon (Si)-Total (mg/L)	<0.050
	Silver (Ag)-Total (mg/L)	<0.000010
	Sodium (Na)-Total (mg/L)	<0.050
	Strontium (Sr)-Total (mg/L)	<0.00020
	Sulfur (S)-Total (mg/L)	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010
	Uranium (U)-Total (mg/L)	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD
	Dissolved Metals Filtration Location	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010
	Arsenic (As)-Dissolved (mg/L)	<0.00010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-1	L1788050-2	L1788050-3	L1788050-4	L1788050-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16
	Sampled Time					
	Client ID	CM 12-01	CM 11-11	CM 13-06	CM 13-06D	CM 13-25
Grouping	**Analyte**					
WATER						
Dissolved Metals	Barium (Ba)-Dissolved (mg/L)	0.266	0.116	0.0365	0.0377	0.177
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00020 DLM	<0.00020 DLM	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.00010 DLM	<0.00010 DLM	<0.000050
	Boron (B)-Dissolved (mg/L)	0.020	0.036	<0.020 DLM	<0.020 DLM	0.015
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.000021	0.000013	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	37.1	16.0	4.92	4.86	30.4
	Cesium (Cs)-Dissolved (mg/L)	0.000034	0.000089	<0.000020 DLM	<0.000020 DLM	0.000011
	Chromium (Cr)-Dissolved (mg/L)	<0.00010	<0.00010	0.00020	<0.00020 DLM	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00031	<0.00020 DLM	<0.00020 DLM	0.00128
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00086	0.00045	0.00037
	Iron (Fe)-Dissolved (mg/L)	0.235	0.307	0.088	0.036	0.895
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.00010 DLM	<0.00010 DLM	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0138	0.0385	<0.0020 DLM	<0.0020 DLM	0.0122
	Magnesium (Mg)-Dissolved (mg/L)	14.8	6.87	1.36	1.46	18.0
	Manganese (Mn)-Dissolved (mg/L)	0.0549	0.0652	0.00246	0.00232	0.0491
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000084	0.0000081	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00202	0.00675	<0.00010 DLM	<0.00010 DLM	0.00109
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00062	0.0027	0.0028	0.00282
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.10 DLM	<0.10 DLM	<0.050
	Potassium (K)-Dissolved (mg/L)	1.18	2.01	0.21	0.19	1.44
	Rubidium (Rb)-Dissolved (mg/L)	0.00252	0.00395	<0.00040 DLM	<0.00040 DLM	0.00136
	Selenium (Se)-Dissolved (mg/L)	<0.000050	<0.000050	0.00012	<0.00010 DLM	<0.000050
	Silicon (Si)-Dissolved (mg/L)	2.95	4.22	1.93	1.69	2.85
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000020 DLM	<0.000020 DLM	<0.000010
	Sodium (Na)-Dissolved (mg/L)	9.43	60.4	0.29	0.25	1.85
	Strontium (Sr)-Dissolved (mg/L)	0.0488	0.0710	0.0159	0.0166	0.0516
	Sulfur (S)-Dissolved (mg/L)	5.09	10.3	<1.0 DLM	<1.0 DLM	2.79
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00040 DLM	<0.00040 DLM	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	0.000047	0.000022	<0.000020 DLM	<0.000020 DLM	0.000036
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00020 DLM	<0.00020 DLM	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00020 DLM	<0.00020 DLM	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	0.00755	0.00206	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	0.00016	<0.00020 DLA	<0.00020 DLM	0.00070 DTC
	Uranium (U)-Dissolved (mg/L)	0.000585	0.00184	<0.000020 DLM	<0.000020 DLM	0.000105
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.0010 DLM	<0.0010 DLM	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0029	0.0034	0.0095	0.0058	0.0073
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00060 DLM	<0.00060 DLM	<0.00030

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-6				
	Description	Water				
	Sampled Date	21-JUN-16				
	Sampled Time					
	Client ID	BLANK				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Barium (Ba)-Dissolved (mg/L)	<0.000050				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050				
	Calcium (Ca)-Dissolved (mg/L)	<0.050				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	<0.0050				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	<0.050				
	Rubidium (Rb)-Dissolved (mg/L)	<0.00020				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	<0.050				
	Strontium (Sr)-Dissolved (mg/L)	<0.00020				
	Sulfur (S)-Dissolved (mg/L)	<0.50				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	DTC 0.00034				
	Uranium (U)-Dissolved (mg/L)	<0.000010				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-1	L1788050-2	L1788050-3	L1788050-4	L1788050-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16
	Sampled Time					
	Client ID	CM 12-01	CM 11-11	CM 13-06	CM 13-06D	CM 13-25
Grouping	**Analyte**					
WATER						
Aggregate Organics	COD (mg/L)	<20	<20	242	248	32
	Phenols (4AAP) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
	F1 (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (SS) (%)	98.1	96.6	97.6	97.1	100.7
	Surrogate: 1,4-Difluorobenzene (SS) (%)	97.2	97.1	97.2	96.7	100.8
Hydrocarbons	F1-BTEX (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	F2 (C10-C16) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	93.8	95.9	99.4	95.0	97.1
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	89.7	85.8	SURR-ND 65.6	88.6	90.7
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acenaphthylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acridine (mg/L)	0.000162	0.000362	<0.000050	<0.000050	0.000825
	Anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benz(a)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Benzo(b)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(g,h,i)perylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(k)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Chrysene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Dibenz(a,h)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Fluorene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-6				
	Description	Water				
	Sampled Date	21-JUN-16				
	Sampled Time					
	Client ID	BLANK				
Grouping	**Analyte**					
WATER						
Aggregate Organics	COD (mg/L)	<20				
	Phenols (4AAP) (mg/L)	<0.0010				
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00050				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	F1 (C6-C10) (mg/L)	<0.10				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	100.1				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	100.8				
Hydrocarbons	F1-BTEX (mg/L)	<0.10				
	F2 (C10-C16) (mg/L)	<0.30				
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	94.9				
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	99.1				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050				
	Acenaphthylene (mg/L)	<0.000050				
	Acridine (mg/L)	<0.000050				
	Anthracene (mg/L)	<0.000050				
	Benz(a)anthracene (mg/L)	<0.000050				
	Benzo(a)pyrene (mg/L)	<0.000010				
	Benzo(b)fluoranthene (mg/L)	<0.000050				
	Benzo(g,h,i)perylene (mg/L)	<0.000050				
	Benzo(k)fluoranthene (mg/L)	<0.000050				
	Chrysene (mg/L)	<0.000050				
	Dibenz(a,h)anthracene (mg/L)	<0.000050				
	Fluoranthene (mg/L)	<0.000050				
	Fluorene (mg/L)	<0.000050				
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000050				
	Naphthalene (mg/L)	<0.000050				
	Phenanthrene (mg/L)	<0.000050				
	Pyrene (mg/L)	<0.000050				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-1	L1788050-2	L1788050-3	L1788050-4	L1788050-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16	21-JUN-16
	Sampled Time					
	Client ID	CM 12-01	CM 11-11	CM 13-06	CM 13-06D	CM 13-25
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acridine d9 (%)	97.4	94.4	22.8 SURR-ND	94.4	97.3
	Surrogate: Chrysene d12 (%)	105.2	101.6	78.8	68.4	94.8
	Surrogate: Naphthalene d8 (%)	71.9	64.8	93.5	68.6	70.8
	Surrogate: Phenanthrene d10 (%)	112.6	109.0	92.6	81.9	108.2

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1788050-6				
	Description	Water				
	Sampled Date	21-JUN-16				
	Sampled Time					
	Client ID	BLANK				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Quinoline (mg/L)	<0.000050				
	Surrogate: Acridine d9 (%)	93.6				
	Surrogate: Chrysene d12 (%)	109.6				
	Surrogate: Naphthalene d8 (%)	61.9				
	Surrogate: Phenanthrene d10 (%)	101.2				

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Aluminum (Al)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Antimony (Sb)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Beryllium (Be)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Cesium (Cs)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Cobalt (Co)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Iron (Fe)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Lead (Pb)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Phosphorus (P)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Silver (Ag)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Tellurium (Te)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Thorium (Th)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Tin (Sn)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Titanium (Ti)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Tungsten (W)-Dissolved	DLA	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Phosphorus (P)-Total	MS-B	L1788050-6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Manganese (Mn)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Sulfur (S)-Total	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Dissolved Organic Carbon	MS-B	L1788050-1, -2, -3, -4, -5
Matrix Spike	Total Inorganic Carbon	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1788050-1, -2, -3, -4, -5, -6

Reference Information

	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Total Kjeldahl Nitrogen	MS-B	L1788050-1, -2, -3, -4, -5, -6
Duplicate	Total Kjeldahl Nitrogen	TKND	L1788050-1, -2, -3, -4, -5, -6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.
TKND	TKN duplication was poor due to interference from high nitrate, which causes negative bias on TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

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).

BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

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

CARBONS-DOC-VA	Water	Dissolved organic carbon by combustion	APHA 5310B 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-TIC-VA	Water	Total inorganic carbon by CO2 purge	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

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

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

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

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

COD-COL-VA	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux 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.

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

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

F1-BTX-CALC-VA	Water	F1-Total BTX	CCME CWS PHC TIER 1 (2001)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a purge and trap extraction prior to analysis by GC/FID. The F1-BTEX result is calculated as follows:

Reference Information

F1-BTEX: F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

F1-HSFID-VA	Water	CCME F1 By Headspace with GCFID	EPA 5021A/CCME CWS PHC (Pub# 1310)

This analysis is based on the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method, Canadian Council of Ministers of the Environment, December 2000." For F1 (C6-C10), the sample undergoes a headspace purge prior to analysis by GC/FID.

F1 (C6-C10): Sum of all hydrocarbons that elute between nC6 and nC10.

F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

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

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

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

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

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

IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E

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

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

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

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

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

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

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

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

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

N-T-COL-VA	Water	Total Nitrogen in water by Colour	APHA4500-P(J)/NEMI9171/USGS03-4174

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

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

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

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

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

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

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

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

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

P-T-PRES-COL-VA	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 Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

Reference Information

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

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

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

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

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

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

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

PHENOLS-4AAP-ED	Water	Phenols (4AAP)	AB ENV.06537-COLORIMETRIC

This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

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

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

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

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

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

TKN-F-VA	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

VH-SURR-FID-VA	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

14-472357

Reference Information

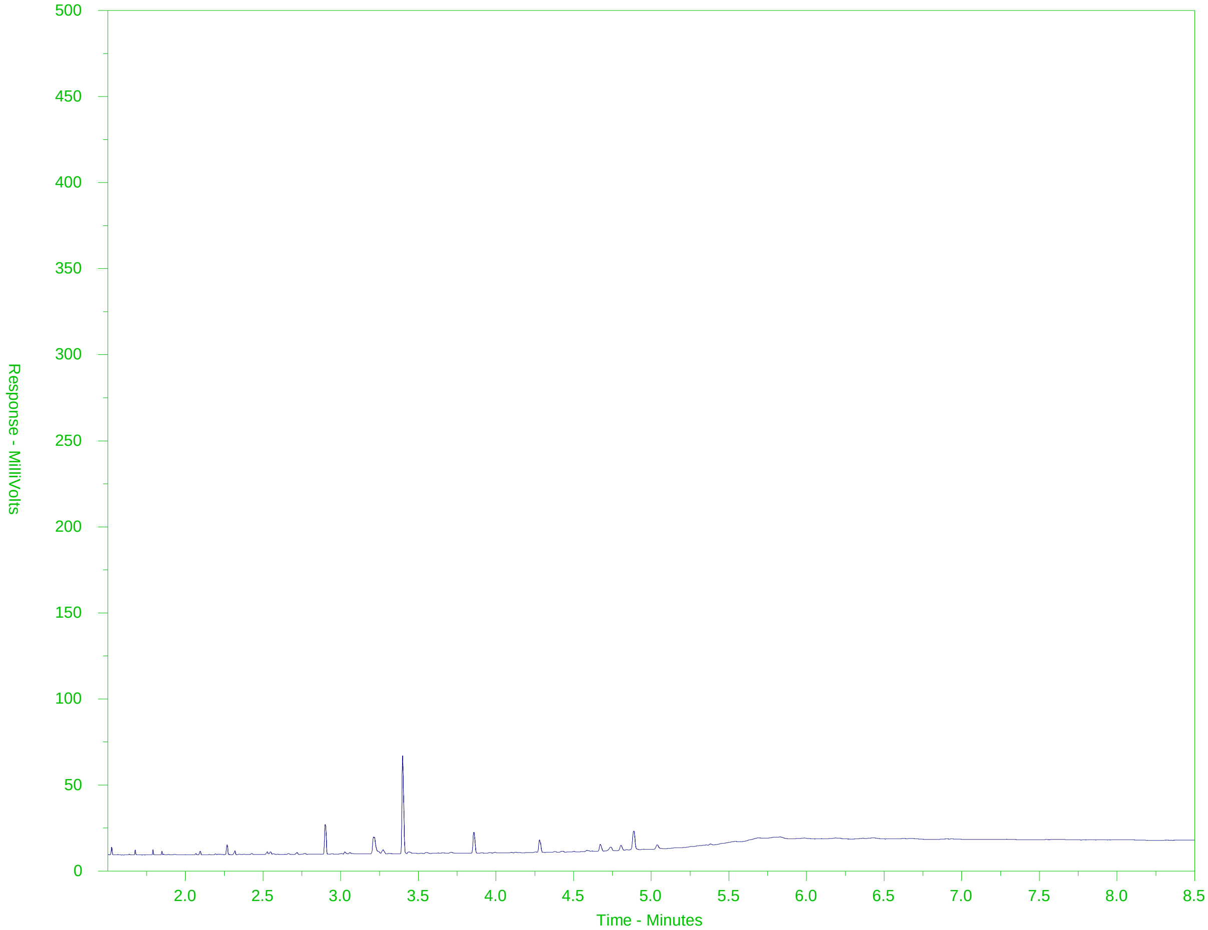
GLOSSARY OF REPORT TERMS

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 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.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1788050-C-1
Client Sample ID: CM 12-01



← F2 →	← F3 →		← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

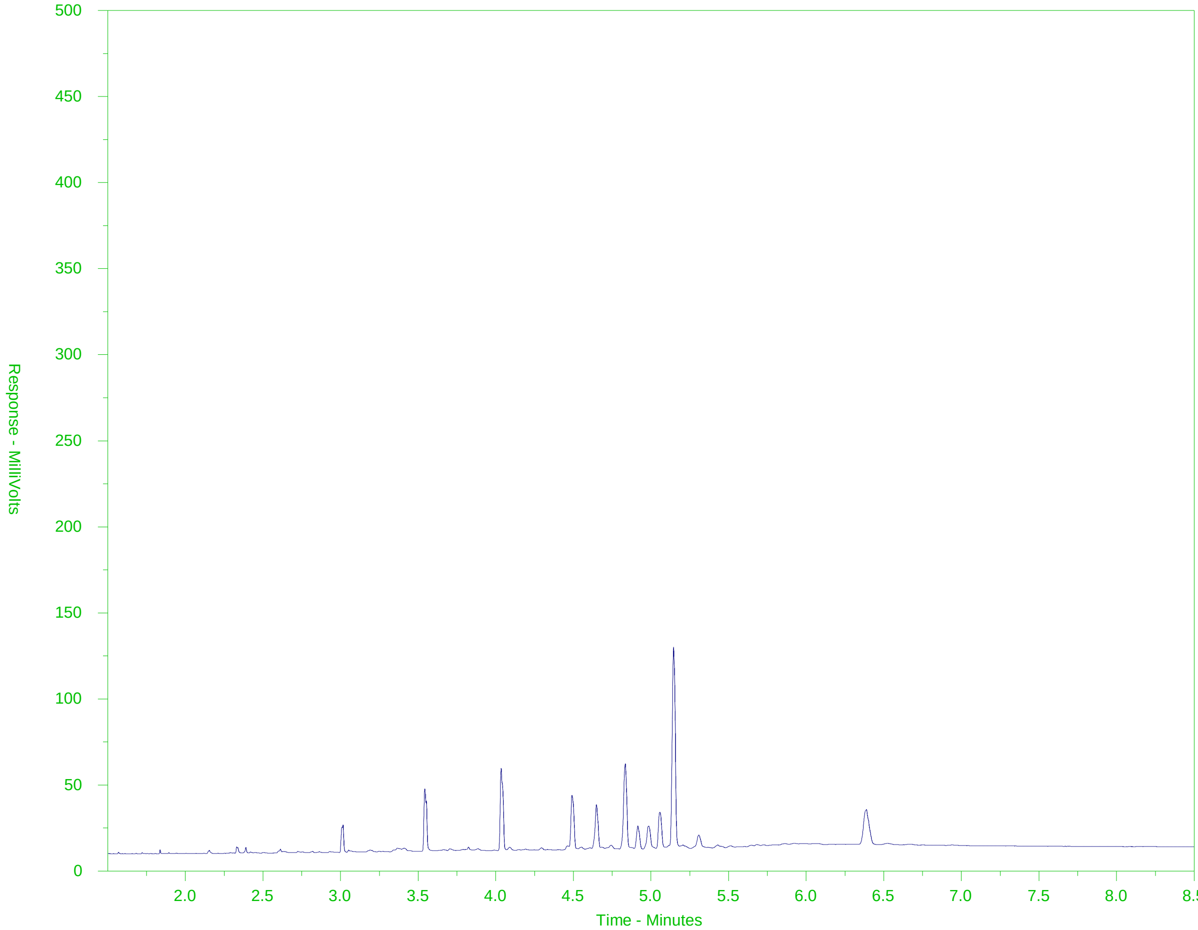
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1788050-C-2
Client Sample ID: CM 11-11



← F2 →	← F3	→	← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

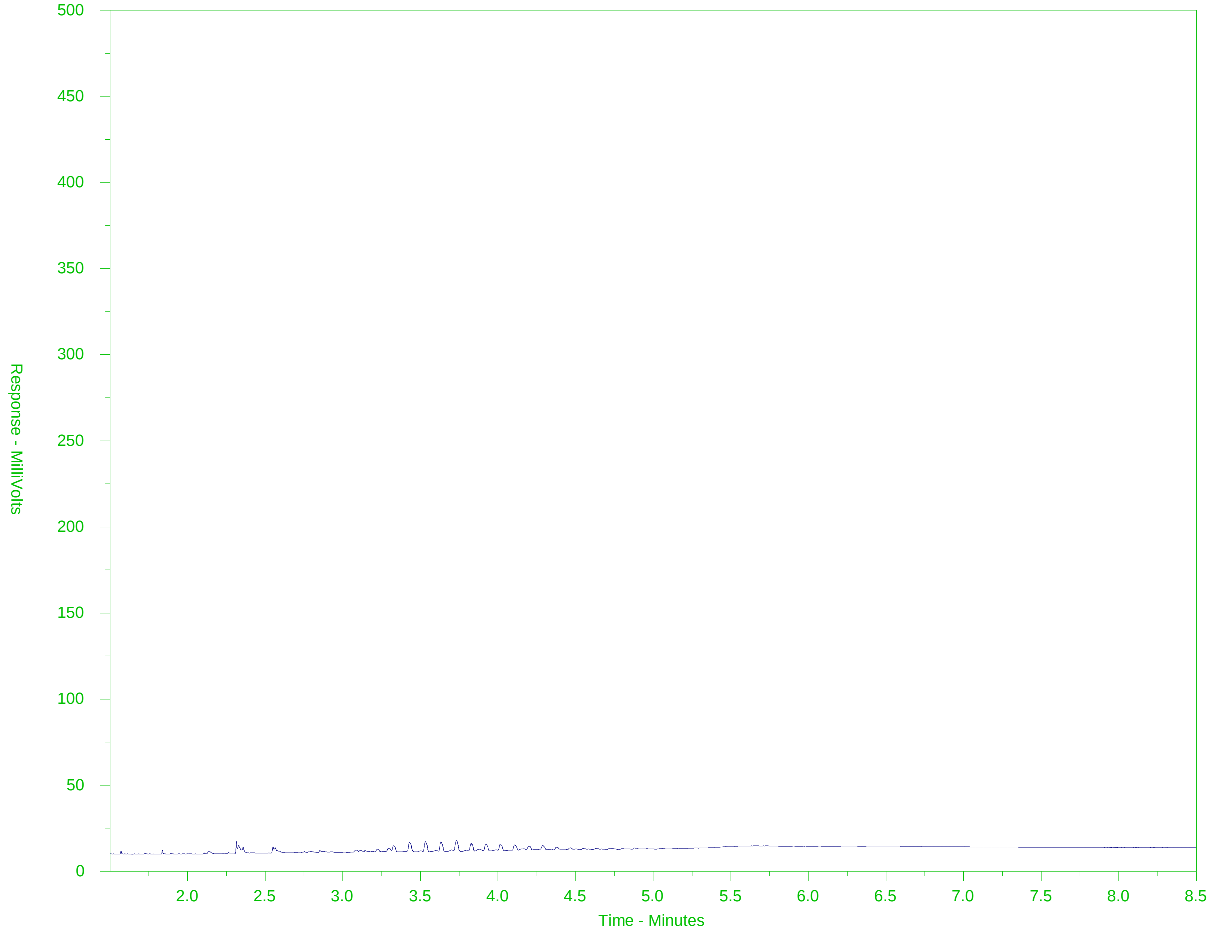
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1788050-C-3
Client Sample ID: CM 13-06



← F2 →	← F3 →		← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

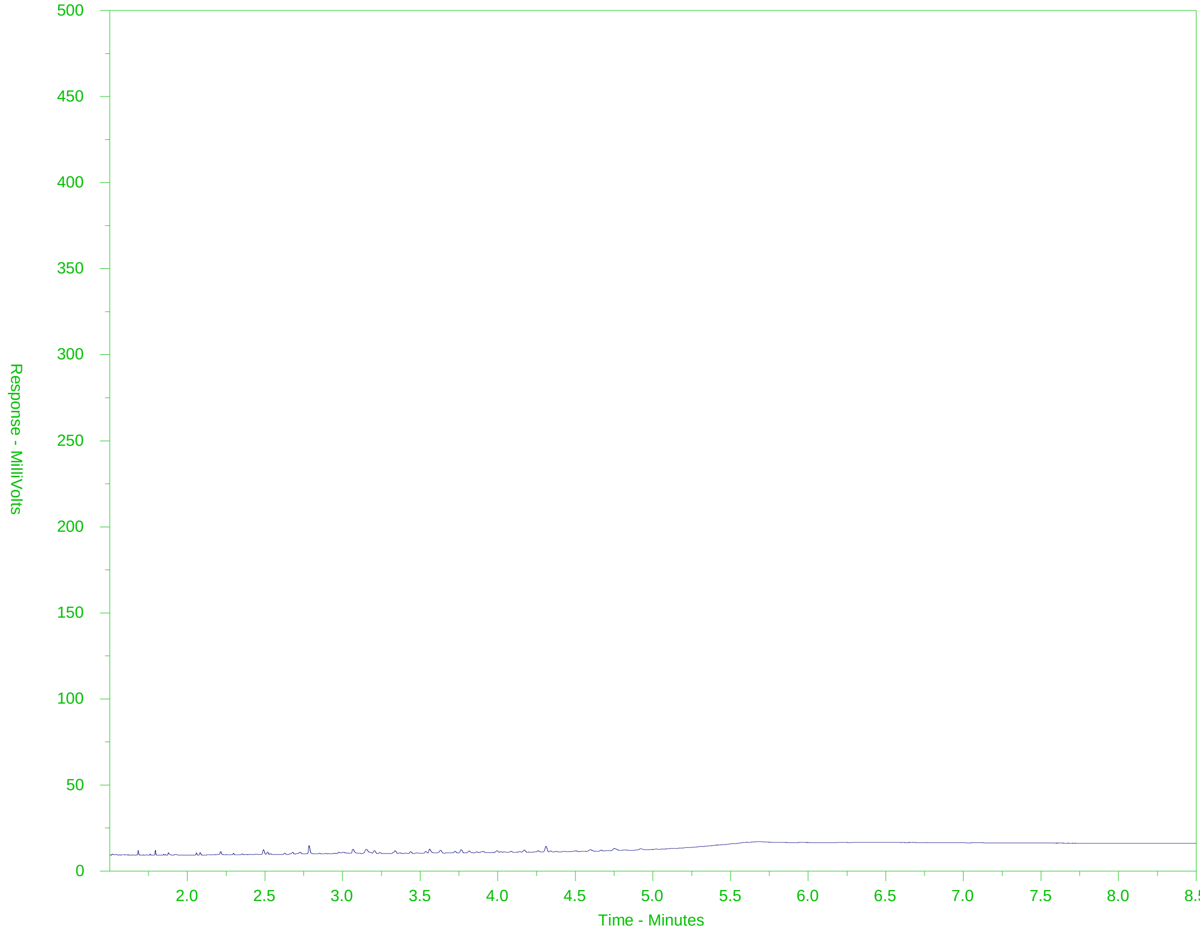
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1788050-C-4
Client Sample ID: CM 13-06D



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

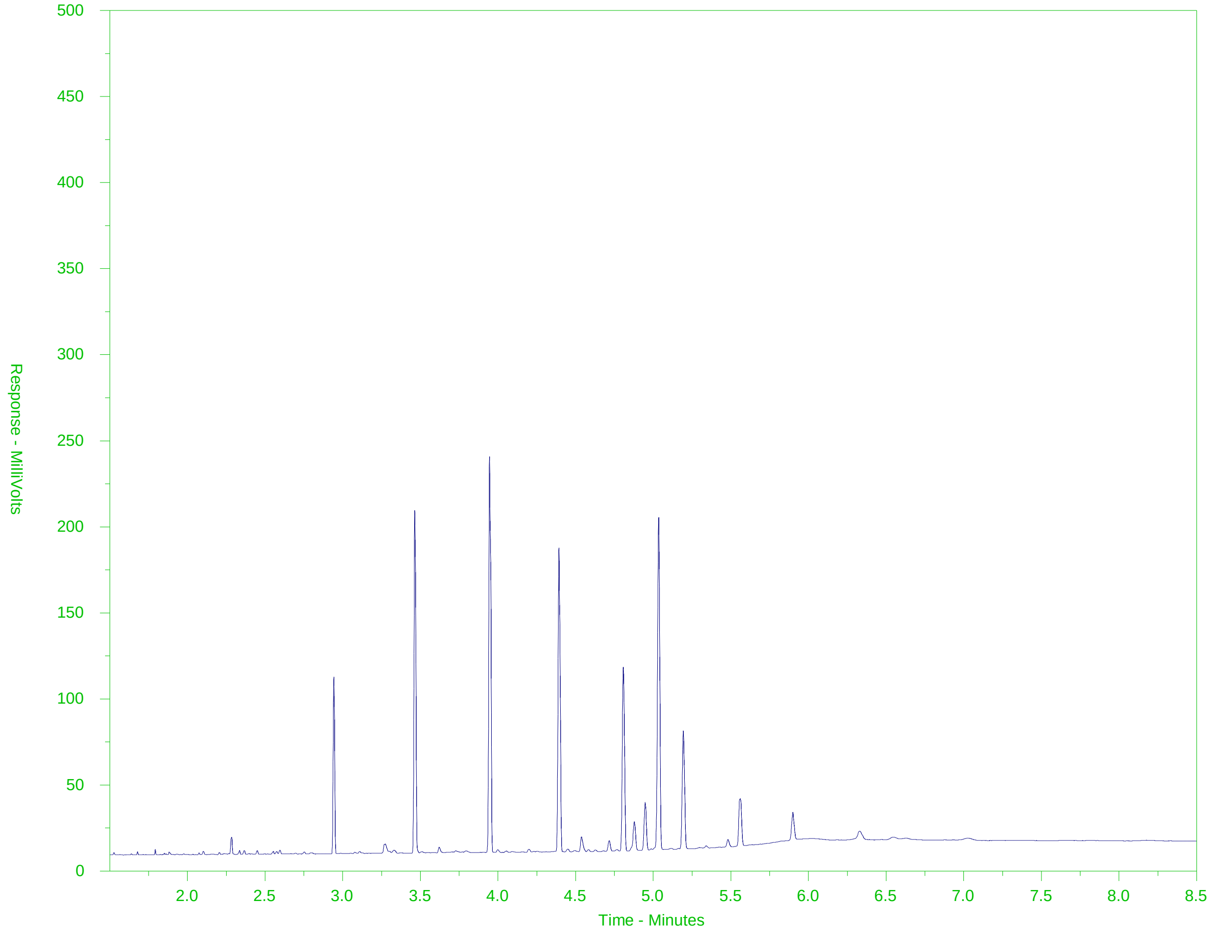
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1788050-C-5
Client Sample ID: CM 13-25



← F2 →	← F3 →		← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

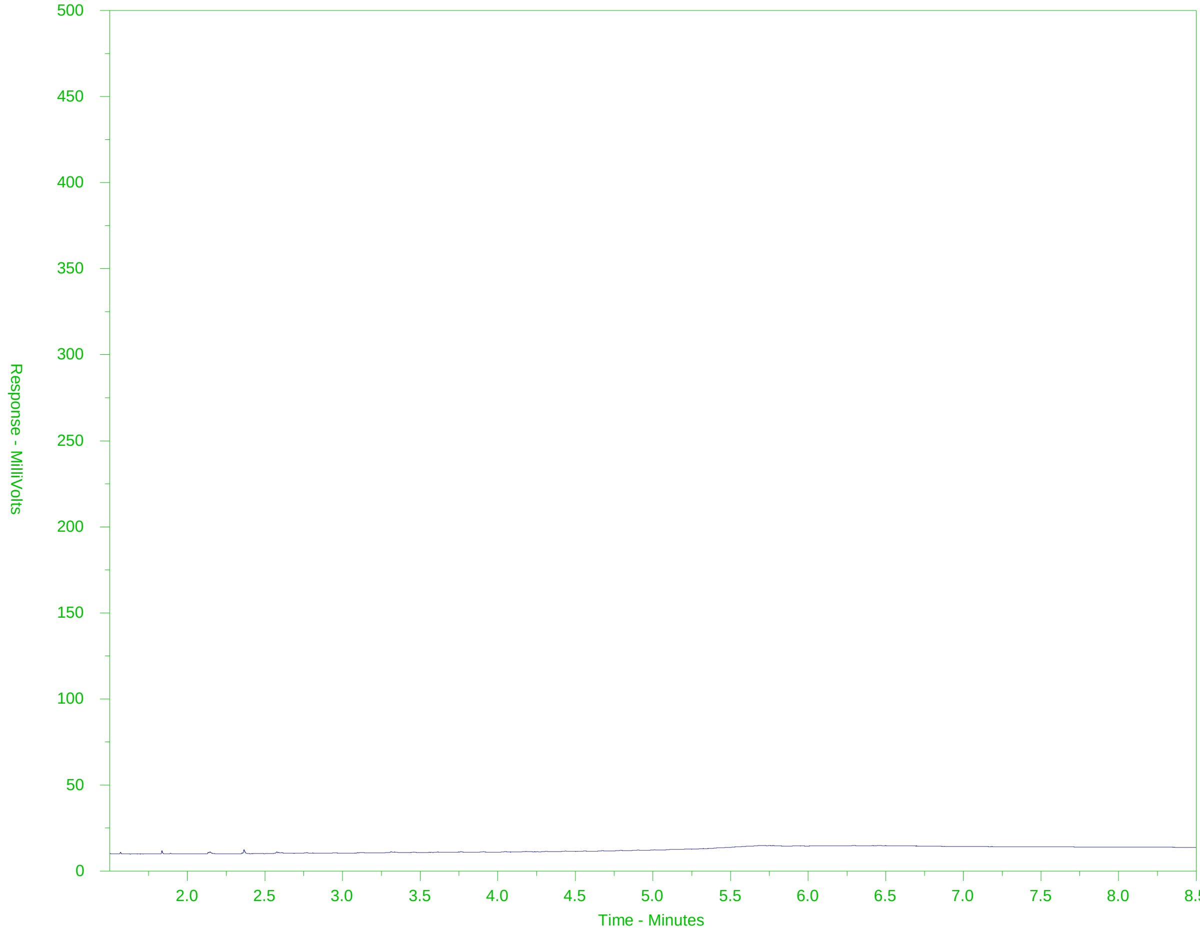
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L1788050-C-6
Client Sample ID: BLANK



← F2 →	← F3 →		← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →		← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1788050-COFC

COC Number: 14 - 472357

Page ____ of ____

Report To	
Company:	O'Kane.
Contact:	Tyler Bickham
Address:	905C Industrial Road 2
Phone:	250-919-6737

Report Format / Distribution	
Select Report Format:	☒ PDF ☒ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☒ Yes ☐ No
☐ Criteria on Report - provide details below if box checked	
Select Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	tbickham@okc-sk.com
Email 2	

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)	
R ☐	Regular (Standard TAT if received by 3pm)
P ☐	Priority (2-4 business days if received by 3pm)
E ☐	Emergency (1-2 business days if received by 3pm)
E2 ☐	Same day or weekend emergency if received by 10am – contact ALS for surcharge.
Specify Date Required for E2,E or P:	

Invoice To	
Same as Report To	☒ Yes ☐ No
Copy of Invoice with Report	☒ Yes ☐ No
Company:	
Contact:	

Invoice Distribution	
Select Invoice Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	tbickham@okc-sk.com
Email 2	

Project Information	
ALS Quote #:	Q52907
Job #:	OKC project 959-02./NWPCoal-CrownMount
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
Approver ID:	Cost Center:
GL Account:	Routing Code:
Activity Code:	
Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: Michael Hornby

Sampler: PB/TB (OKC)

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General	Total metals	Dissolved metals	Total nutrients	Dissolved nutrients	Phenols	PAH	BTEX	Total Hg	Dissolved Hg	Cyanide			Number of Containers
						P	F/P	P	F/P	P	P	P	P	F/P	P			
	CM 12-01	21-June-16		Water	1	1	1	1	1	1	2	2	1	1	1			13
	CM 11-11	"		"	1	1	1	1	1	1	2	2	1	1	1			13
	CM ~~[illegible]~~ 13-06	"		"	1	1	1	1	1	1	2	2	1	1	1			13
	CM ~~[illegible]~~ 13-06 D	"		"	1	1	1	1	1	1	2	2	1	1	1			13
	CM 13-25	"		"	1	1	1	1	1	1	2	2	1	1	1			13
	Blank	"		"	1	1	1	1	1	1	2	2	1	1	1			13

Short Holding Time

● Rush Processing

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☒ No

Are samples for human drinking water use? ☐ Yes ☒ No

Special Instructions / Specify Criteria to add on report (client Use)

-Metals by BC MDG Criteria

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐		SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	3, 4

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: <Original signed by>	Date: June 22/16	Time: 15:30	Received by: Shayan	Date: June 23	Time: 1030	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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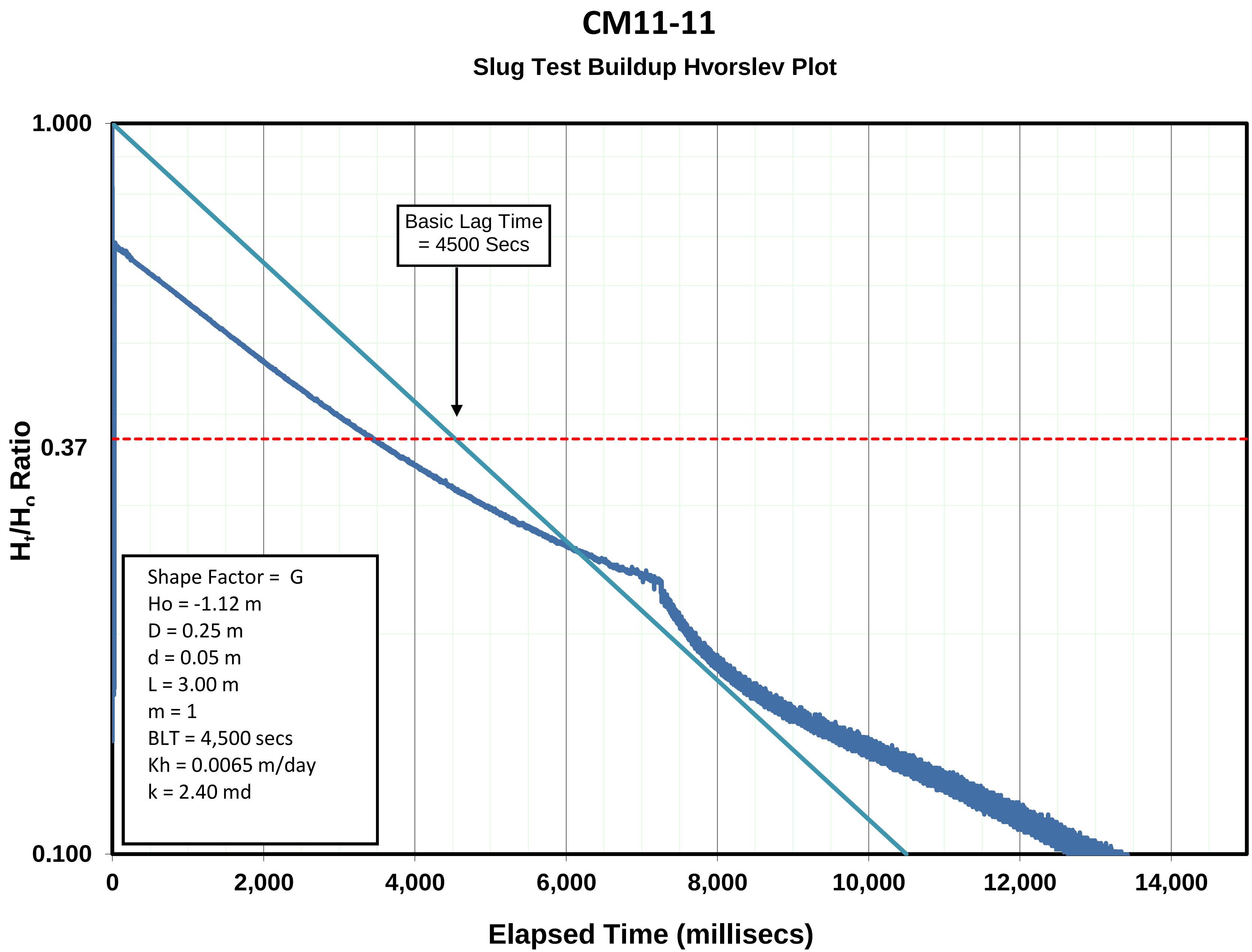
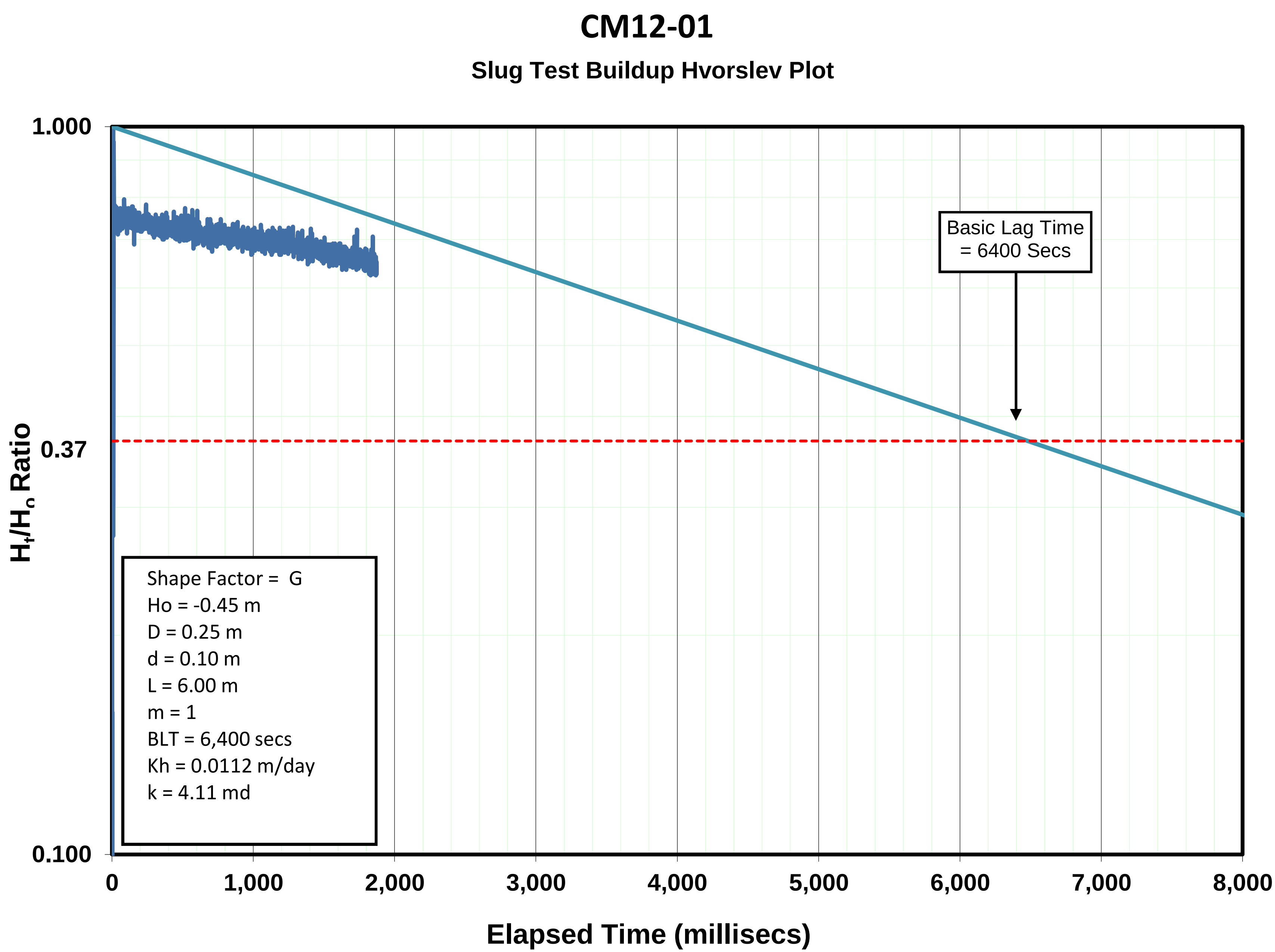
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

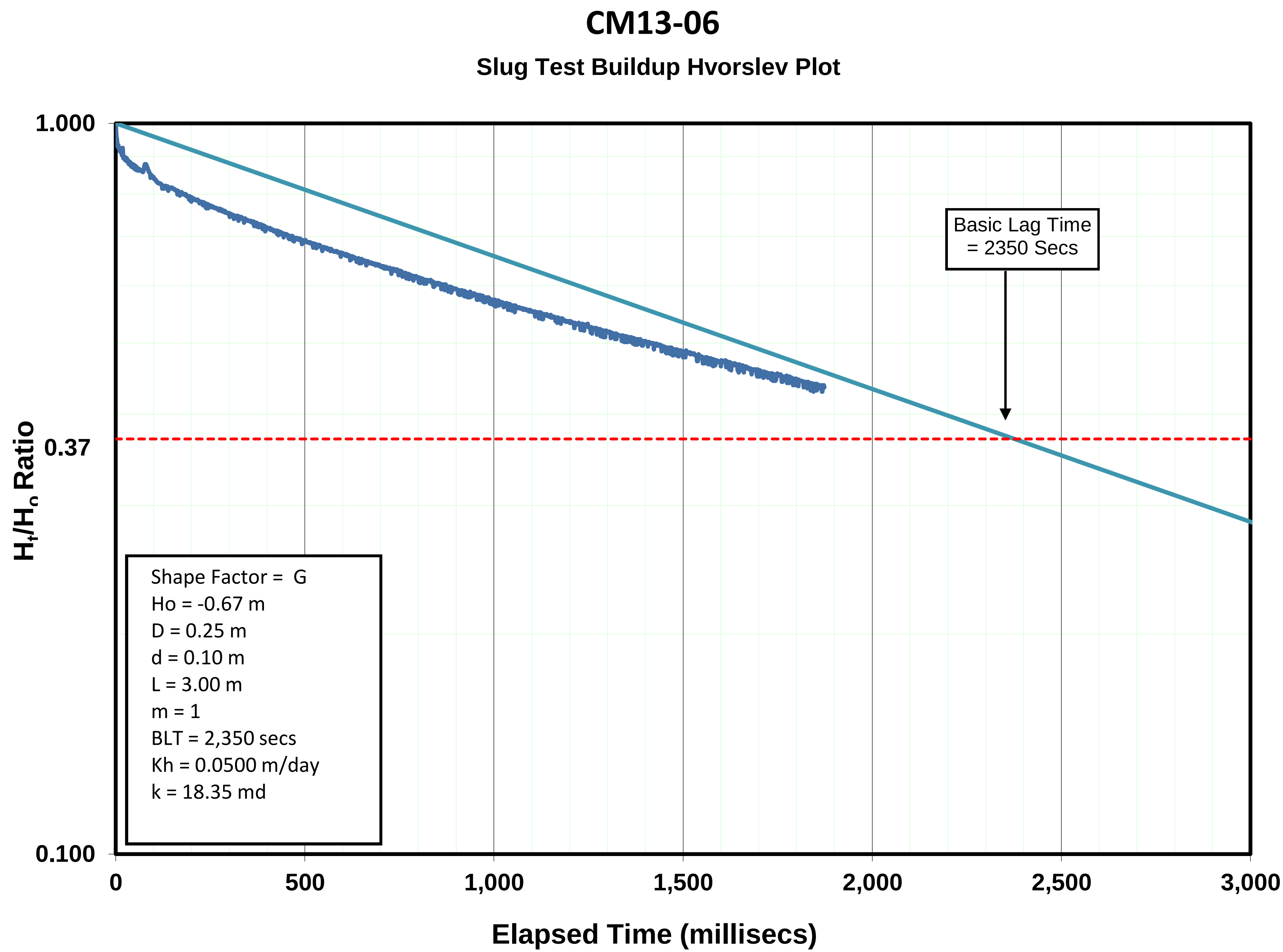
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Appendix C
Aquifer Testing Results


CM11-11
Slug Test Buildup Hvorslev Plot
1.000
0.37
0.100
Ht/Ho Ratio
Basic Lag Time = 4500 Secs
Shape Factor = G
Ho = -1.12 m
D = 0.25 m
d = 0.05 m
L = 3.00 m
m = 1
BLT = 4,500 secs
Kh = 0.0065 m/day
k = 2.40 md
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
Elapsed Time (millisecs)



CM12-01
Slug Test Buildup Hvorslev Plot
1.000
0.37
0.100
Ht/Ho Ratio
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
Elapsed Time (millisecs)
Basic Lag Time
= 6400 Secs
Shape Factor = G
Ho = -0.45 m
D = 0.25 m
d = 0.10 m
L = 6.00 m
m = 1
BLT = 6,400 secs
Kh = 0.0112 m/day
k = 4.11 md


CM13-06
Slug Test Buildup Hvorslev Plot
1.000
0.37
0.100
Ht/Ho Ratio
0
500
1,000
1,500
2,000
2,500
3,000
Elapsed Time (millisecs)
Basic Lag Time
= 2350 Secs
Shape Factor = G
Ho = -0.67 m
D = 0.25 m
d = 0.10 m
L = 3.00 m
m = 1
BLT = 2,350 secs
Kh = 0.0500 m/day
k = 18.35 md