



February 23, 2013

HYDROGEOLOGICAL ASSESSMENT

Destruction Bay Solid Waste Disposal Facility

Submitted to:

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REPORT



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Executive Summary

Golder Associates Ltd. (“Golder”) was retained by the Government of Yukon Community Services Infrastructure Branch on September 28, 2011 to complete a groundwater monitoring well network installation and hydrogeological assessment program at up to 20 solid waste facilities located across the Territory. The Destruction Bay Solid Waste Disposal Facility (the “Facility” or “Site”) is one of the sites included in the program. A multiphase approach was implemented at each facility in order to carry out the hydrogeological assessment. The first phase completed for the program was a review of Site-specific requirements and considerations. The second phase was the preparation of a work plan and schedule. The third phase was the Background Research. Results of the background research are included in this report. The fourth phase consisted of the drill program tender specification and tender process management. The fifth phase consisted of the installation of a monitoring well network and collection of data on water levels, water quality, and aquifer parameters. The sixth and final phase resulted in a draft of this Hydrogeological Assessment Report, documenting the results of the investigation.

In summary, the information obtained during the Site Assessment indicated the following:

- **Site Description:** The Destruction Bay Solid Waste Disposal Facility is located in the southwest portion of the Yukon, within the Ruby Ranges Ecological Region, and in Kluane First Nation traditional territory. The Facility is located in a former gravel pit located on a Federal Reserve parcel to the Government of Yukon (Parcel ID. #115G07-00000-00012 at 61°17' north latitude, 138°51' west longitude). The Site is accessed by a gravel road off the east side of the Alaska Highway at kilometre 1746.7; approximately 175 km east of the community of Beaver Creek, and 125 km west of Haines Junction. The Facility serves the communities of Burwash Landing, Destruction Bay, and the nearby Kluane First Nations residents; receiving primarily demolition and metal waste, and starting in October 2011 the Facility also serves as a transfer station for domestic garbage.
- **Site Topography:** The Facility is at an elevation of approximately 815 m (2,650 feet) above sea level and lies within the Kluane Lake watershed. A cleared area, of approximately 12,000 square meters, that slopes moderately to the northeast, is present at the Facility. Local topography is characteristic of a sloping till plain deposit. Bordering the Site to the northeast are hummocky glaciofluvial deposits that south end in Kluane Lake. The regional hydraulic gradient near the Site is expected to follow the regional topography, which slopes northeast towards Kluane Lake. Although permafrost was not found at the Site it is mapped as being present in till plain deposits throughout the north and west of Kluane Lake.
- **Stratigraphy and Hydrogeology:**
 - Surface expression in the vicinity of the Facility is dominated by quaternary surficial deposits; reworked by sand and gravel extraction activities.
 - Subsurface conditions were investigated with the installation of three monitoring wells, including DBMW12-01, DB-MW12-02, and DB-MW12-03, which were installed on June 22 and 23, 2012 under the direction of Golder Associates for the formation of a monitoring well network at the Facility.



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- The Site stratigraphy to a depth of 25 m below grade consists of mixed sand and gravel deposits with minor silt.
- An unconfined aquifer was encountered during drilling and installation of three monitoring wells between 17 and 23 m below grade.
- A series of hydraulic response tests was performed on three monitoring wells. The results of these tests indicate the hydraulic conductivity of the unconfined aquifer underlying the Site is approximately 5×10^{-4} m/s. This value is considered reasonable for the types of sediments encountered during well drilling.
- Horizontal hydraulic gradient at the Site was determined, using monitoring well water level data, to be 0.08 m/m sloping to the northwest.
- Average linear groundwater seepage velocity in the surficial aquifer is estimated to be approximately 10 m/day.
- The nearest potential downgradient receptor was determined to be a branch of Lewis Creek located approximately 400 m north of the Site.
- Based on the results of these investigations it was confirmed that the requirement of a minimum of one upgradient (DB-MW12-01) and two downgradient (DB-MW12-02 and DB-MW12-03) wells was met.

■ Groundwater Chemistry:

- The results of a desktop study and several Site visits indicated that the Yukon Contaminated Sites Regulation (CSR) criterion for freshwater aquatic life was applicable to the Site.
- A water quality assessment was performed on water samples collected from all monitoring wells, as well as Lewis Creek, downgradient of the Site, during a single monitoring event in August 2012. Samples showed acceptable levels of chemical parameters as defined by the Yukon CSR criteria for freshwater aquatic life.
- Results of groundwater sampling performed on the monitoring well network showed low and non-detect levels of chemical parameters typically associated with leachate contamination. This suggests that leachate influence on shallow groundwater underlying the Site is not evident.

The Following recommendations are made based on the results of the 2012 hydrogeological assessment presented in this report:

- As required by the Facility's Waste Management Permit, future groundwater monitoring should be conducted in the spring and late summer.
- The potential impact that landfill leachate may be having on groundwater quality at the Facility should be reevaluated following an additional round of groundwater monitoring.



Study Limitations

This report was prepared for the Government of Yukon, Community Services Infrastructure Development Branch.

The inferences concerning the Destruction Bay Solid Waste Disposal Facility contained in this report are based on information obtained during the assessment conducted by Golder personnel, and are based solely on the condition of the property at the time of the Site reconnaissance, monitoring wells installation, and groundwater monitoring events, supplemented by historical and interview information obtained by Golder, as described in this report.

This report was prepared, based in part, on information obtained from historic information sources. In evaluating the subject Site, Golder has relied in good faith on information provided. We accept no responsibility for deficiency or inaccuracy contained in this report as a result of our reliance on the aforementioned information.

The findings and conclusions documented in this report have been prepared for the specific application to this project, and have been developed in a manner consistent with that level of care normally exercised by environmental professionals currently practicing under similar conditions in the jurisdiction.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations may change over time, and should be reviewed.

If new information is discovered during future work, Golder should be requested to re-evaluate the conclusions of this report and to provide amendments, as required, prior to any reliance upon the information presented herein.



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1.0 INTRODUCTION

1.1 Background

Golder Associates Ltd. ("Golder") was retained by the Government of Yukon Community Services Infrastructure Branch on September 28, 2011 to complete a groundwater monitoring well network installation and hydrogeological assessment program at up to 20 solid waste facilities located across the Territory. The Destruction Bay Solid Waste Disposal Facility (the "Facility", the "Site") is one of the sites included in the program. This completed Hydrogeological Assessment Report presents the findings of our investigation.

These works have been performed in accordance with the approved scope of work detailed in Golder's proposal (P1-1436-0073) dated August 29, 2011, accepted by Yukon Government Community Services on October 7, 2011 and additional works detailed in our letter dated April 26, 2012 and accepted April 30, 2012.

1.2 Purpose and Objectives

A phased approach is typically implemented in order to develop a Site-specific groundwater monitoring program. The following objectives are included in the development of the program:

- Develop a conceptual hydrogeological model of the Site using existing data that identifies contaminant source(s), pathways and receptors;
- Visit the Site to confirm the hydrogeological model, assess Site conditions and identify monitoring well locations;
- Design a monitoring well network and drilling program;
- Install groundwater monitoring wells in accordance with the plan;
- Sample the groundwater and, if applicable, surface water;
- Analyze the data and identify potential impacts;
- With the new data, re-evaluate the conceptual hydrogeological model and groundwater monitoring program; and
- Provide recommendations, if needed, to further assess potential impacts to groundwater quality

1.3 Scope and Sequence of Work

The following scope of work was proposed to develop the conceptual hydrogeological model for the Site and installation of a monitoring well network. This work was performed in accordance with the Waste Management Permit (Permit No. 80-009 effective February 29, 2012 to December 31, 2014), and relevant Environment Yukon Protocols. No decision document was available for this Facility on the Yukon Environmental and Socioeconomic Board's (YESAB) website as of October 5, 2012.



In summary, the work completed at the Facility included the following six phases:

- Phase 1 assessed the needs for special considerations at the Site;
- Phase 2 outlined a work plan and schedule;
- Phase 3 consisted of background research;
- Phase 4 consisted of the drill program tender specification and tender process management;
- Phase 5 consisted of the installation of a monitoring well network and collection of data on water levels, water quality, and aquifer parameters; and
- Phase 6 resulted in the preparation of a draft of this Hydrogeological Assessment Report documenting the results of this investigation and background research.

1.4 Qualifications of Assessors

Project Manager

The role of Project Manager was filled by Gary Hamilton, P. Geo., of Golder's Burnaby, BC office. Mr. Hamilton is a senior contaminant Hydrogeologist and Principal with Golder Associates. He has over 25 years of experience, has completed landfill monitoring projects locally, and is very familiar with Yukon environmental regulations. Mr. Hamilton conducted the initial Site inspections, coordinated the drilling work and reviewed this assessment report.

Project Director

The role of Project Director was filled by Guy Patrick, P. Eng., of Golder's Victoria, BC office. Mr. Patrick is a senior Hydrogeologist and a Principal with Golder Associates. He is a Professional Engineer registered with the Association of Professional Engineers of the Yukon Territory. Mr. Patrick has over 30 years of experience in the field of environmental and hydrogeological assessments.

Field Hydrogeologist-Engineer

The role of Project Hydrogeologist was filled by Calvin Beebe of Golder's Nelson, BC office. Mr. Beebe has an M.Sc. degree in Hydrogeology from Saint Francis Xavier University (2012) and has completed numerous projects as a Hydrogeologist with Golder Associates including work on contaminated sites.

Mr. Beebe was assisted in carrying out the field work by Ms. Andrea Badger, who joined Golder in May 2012. She obtained a B.Sc. in Civil Engineering with an Environmental Option, from the University of Alberta, Edmonton (2012) and a Diploma of Northern Studies, Outdoor and Environmental Studies at Yukon College, Whitehorse (2007). She has been involved with monitoring well drilling, development, testing and sampling at landfills across the Yukon since beginning work at Golder. She has also been involved with surface water monitoring at a construction site in Northern British Columbia.



1.5 Authorization

Written authorization and a signed contract to proceed with the work outlined in our proposal dated August 29, 2011 was received by Ms. Laura Prentice, Program Manager, on October 7, 2011. Golder received e-mail authorization to proceed with additional work detailed in our letter dated April 26, 2012 on April 30, 2012. The Change Order for the work was attached to the e-mail message.

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Location

The Destruction Bay Solid Waste Disposal Facility is in the southwest portion of the Yukon, within the Ruby Ranges Ecological region, and in Kluane First Nation traditional territory. The Facility is located within a former gravel pit on Federal Reserve to the Government of Yukon (Parcel ID. #115G07-00000-00012 at 61°17' north latitude, 138°51' west longitude). The Site is accessed by a gravel road off the east side of the Alaska Highway at kilometre 1746.7; approximately 175 km east of the community of Beaver Creek, and 125 km west of Haines Junction (Figure 1).

2.2 Site History

The Facility serves the communities of Burwash Landing, Destruction Bay, and the nearby Kluane First Nation residents; it receives primarily demolition and metals waste; including waste oils, batteries, and household appliances. Since October 2011 the Facility has also served as a transfer station for domestic garbage.

3.0 METHODOLOGY

3.1 Preliminary Hydrogeological Assessment

The preliminary hydrogeological assessment involved a desktop review and interpretation of existing information followed by an inspection of the Destruction Bay Solid Waste Disposal Facility. The initial inspection of the Facility was conducted on October 23, 2011 and a follow up inspection was completed on June 22, 2012. The purpose of preliminary hydrogeological assessment was to identify the appropriate drilling methods and equipment, and potential monitoring well locations. This portion of the work included the following three tasks:

- Compilation and review of available information;
- Assessment and interpretation of available hydrogeological data; and
- Development of a conceptual hydrogeological model.



3.1.1 Data sources

Data used to complete the hydrogeological assessment was obtained from the following sources:

- Access Consulting Group and G. J. Bull and Associates Inc., *Solid Waste Management Plan – Destruction Bay*. Prepared for Yukon Community Services, Community Development Branch. 2003.
- Bouwer, H. and R.C. Rice, 1976. *A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells*, Water Resources Research, vol. 12, no. 3, pp. 423-428.
- Environment Canada, Meteorological Service of Canada Last Modified 2011-11-16, Website: [http://www.climate.weatheroffice.ec.gc.ca/climate_normals/Canadian Climate Normals or Averages 1971-2000](http://www.climate.weatheroffice.ec.gc.ca/climate_normals/Canadian_Climat_Normals_or_Averages_1971-2000).
- Fetter, C. W., *Applied Hydrogeology*, Third Edition, PRENTICE HALL, New Jersey. 1994.
- Government of Yukon. Environment Act Contaminated Sites Regulation. O.I.C. 2002/171. *Schedule 3 – Generic Numerical Water Standards for Protection of Freshwater Aquatic Life and Drinking Water*.
- Government of Yukon, Yukon Community Services, Community Services and Infrastructure Branch, *Solid Waste Operation Plan: Destruction Bay*, 2008.
- Government of Yukon, Yukon Environment, *Protocol for the Contaminated Sites Regulation Under the Environment Act*. 2011.
- Government of Yukon, Yukon Geological Survey, YGS MapMaker Online Website: <http://maps.gov.yk.ca/imf.jsp?site=YGS>
- Government of Yukon, Yukon Mining and Lands Viewer Website: <http://maps.gov.yk.ca/imf.jsp?site=miningLands>
- Government of Yukon, Yukon Water, Water Data Catalogue Website: <http://yukonwater.ca/MonitoringYukonWater/WaterDataCatalogue/>
- Government of Yukon, Department of Environment, Compiled from The Yukon Water Well Registry, *Summary of Yukon Water Wells*, May 11, 2006- Website: <http://www.env.gov.yk.ca/monitoringenvironment/hydrology.php>
- Natural Resources Canada, Groundwater Information Network Website: http://ngwd-bdnes.cits.nrcan.gc.ca/service/api_ngwds:gin/en/wmc/aquifermap.html
- Rampton, V.N., 1977. *Surficial Geology and Geomorphology, Burwash Landing, Yukon Territory*, Geological Survey of Canada, Map 6-1978, scale 1:100,000.
- Surveys and Mapping Branch, Department of Energy, Mines, and Resources. The Atlas of Canada Website: <http://atlas.nrcan.gc.ca/site/english/maps/topo/map> Map 115 K/2, scale 1:50,000.
- Site inspections of October 23, 2011 and June 22, 2012.



3.1.2 Site Inspections

Prior to the Facility reconnaissance, Golder developed a Facility-specific health and safety plan (HASP) for implementation during the work. The health and safety plan included a description of the potential hazards that could be encountered during the Facility reconnaissance and proposed mitigation. Site inspections were conducted on October 23, 2011 and June 22, 2012. These two Site visits were conducted to review the layout of the Facility and confirm geological and topographic information obtained from the review of background data. Proposed monitoring well locations were reviewed for access constraints. Selected photographs of the Facility were taken during the reconnaissance and are presented in Appendix A.

3.1.3 Background Geological Information Sources

Geological information was obtained through a review of topographic and geological maps from the Department of Energy Mines and Resources Canada, and through the Canadian Geological Survey. Additional data on the subsurface of the surrounding area was obtained through the online Groundwater Information Network (GIN), provided by Natural Resources Canada (NRCAN), and the Yukon Water Well Registry. A search of the Yukon Water online Data Catalogue did not identify water testing results within the vicinity of the Facility.

3.1.4 Contaminated Sites Registry

A Site Registry search was conducted by Bethany Peters of Yukon Environment on December 1, 2011 and the results communicated to Golder via e-mail on October 5, 2012. The search identified no contaminated sites files or spill reports for the Destruction Bay Solid Waste Disposal Facility; however, it was noted that the Facility does not have any analytical results in the file to compare against Yukon Contaminated Site Regulation (CSR) standards to determine if any contamination exists. It was also noted that the Facility was largely unmonitored and that there was opportunity for improper disposal and unreported spillage of contaminants during its operation.

3.1.5 Review of Solid Waste Disposal Facility Permit and Waste Management Plan

Waste Management Permit 80-009 was issued on February 29, 2012 for the Facility. It states that the Facility is to be operated in compliance with any applicable requirements in federal, territorial, and municipal legislation including the Environment Act and Solid Waste Regulations.

Monitoring requirements set out in Waste Management Permit 80-009 include:

- Monitoring water levels and collecting water samples from groundwater monitoring wells at the Facility twice a year (spring and late summer);
- Sampling of downgradient surface water bodies concurrently with the groundwater sampling;
- Analyze surface water and groundwater samples for the parameters outlined in section 3.5;



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- Analyze water samples at a laboratory that is accredited as conforming to ISO/IEC 17025 by an accrediting body that conforms to ISO/IEC 17011 standards; and
- Submit monitoring results to Environment Yukon by January 31st each year.

A summary of the facility permits and groundwater monitoring requirements for the Site are summarized in Table 1 below.

Table 1: Summary of Waste Disposal Facility Permits and Groundwater Monitoring Requirements

Site	Site Disposal Facility Permit Number	Permit Type	Solid Waste Management Plan	Required Groundwater Monitoring
Destruction Bay Solid Waste Disposal Facility	80-009	Modified Waste Transfer Station	Community Services Operations and Programs (2008)	Twice Per Year

3.1.6 Review of Environment Yukon Information

Golder reviewed documents pertaining to the Destruction Bay Facility on October 3, 2012. Documents reviewed included: the most current waste facility permit issued for the Facility and the most current Solid Waste Operation Plan (October, 2008).

3.2 Field Investigations

3.2.1 Scope of Field Investigations

- Three onsite groundwater monitoring wells were drilled and installed by Midnight Sun Drilling under the supervision of Golder Associates between June 22 and 24, 2012.
- Wells were sampled by Golder Associates on August 23, 2012. The water levels at each well were measured prior to purging and sampling, and physiochemical parameters were monitored at each well during development and sampling. Groundwater samples were sent to ALS Environmental laboratory in Whitehorse, YT for analysis.
- All three newly installed monitoring wells were slug tested to assess hydraulic conductivity and linear groundwater velocity at the Site.
- Results of field and laboratory data are summarized and are interpreted in this report.

3.2.2 Groundwater Monitoring Well Network

Groundwater monitoring well installation was undertaken in general accordance with Yukon Contaminated Site Regulation Protocol (Yukon Environment, 2011).



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Three (3) groundwater monitoring wells were proposed to be installed at the Site to assess potential impact of the Facility on groundwater quality. DB-MW12-01 was targeted to characterize upgradient groundwater conditions, while DB-MW12-02, and DB-MW12-03 were intended to assess groundwater quality downgradient of the landfill. Locations of the monitoring wells (Figure 2) were selected based on areal photography, review of Site history, Site topography, suspected groundwater flow direction, and a Site inspection.

The drilling and monitoring well installation was completed by Midnight Sun Drilling of Whitehorse, Yukon under the direction of Golder Associates on June 22 and 23, 2012:

- DB-MW12-01 was installed in the south corner of the Site, and advanced to a depth of 26.5 m below grade (bg).
- DB-MW12-02 was installed on the east edge of the Site, and advanced to a depth of 23.2 m bg.
- DB-MW12-03 was installed in the north corner of the Site, and advanced to a depth of 25.9 m bg.

Wells were installed using a Driltech Marlin 5 truck mounted air rotary drill rig.

Coordinate locations of newly installed wells were obtained by Trimble handheld GPS to an accuracy of 0.5 m or better. Elevations for top of casing (TOC) for all wells were obtained by GPS to an accuracy of ± 0.6 m. In order to accurately determine groundwater elevation and flow direction, a level survey between wells was also carried out to an accuracy of ± 1 cm. A site plan showing the monitoring well locations and key Site features is provided in Figure 2.

Grab samples of drill cuttings were taken at regular intervals to log the stratigraphy encountered in each borehole. Borehole logs documenting observed stratigraphy, along with well construction details, are provided in Appendix B with a summary of well construction details provided in Table 2. At all three drilling locations groundwater was encountered at a depth ranging from 17.4 to 21.9 m bg in well graded sand (>35%) and gravel (>35%) with trace silt (<5%).

Each monitoring well was completed with the top of the screen installed as close as possible to the interval where the moisture content of the formation appeared to be transitioning from unsaturated to saturated conditions.

Installation details are included on the borehole logs in Appendix B. Typical monitoring well completion details for all three wells included:

- Monitoring wells were completed with 50 mm, flush-threaded Schedule 40 PVC casing;
- A 3 m long PVC, factory-slotted well screen (10-slot) was installed in all three monitoring wells;
- PVC casing was installed above the well screen to about 0.70 m above grade;
- A silica sand filter pack was used to fill the annulus between the PVC well screen and the borehole wall. The sand pack was extended approximately 0.75 m above the top of the screened interval;
- A bentonite chip seal, approximately 1.5 m thick, was placed directly above the sand pack. The remainder of the annulus was filled with bentonite grout;



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- Each well was covered with a PVC end-cap and a lockable steel protective casing was installed to protect the wellhead; and
- All wells were developed by removing a minimum of 3 well volumes using dedicated Waterra™ tubing and a Hydrolift™ pump or hand bailer. Development logs are provided in Appendix C.

Table 2: Well Construction Details

Well ID	Drilled Depth (m bg)	Aquifer Unit Monitored	Casing Diameter (mm)	Screened Interval (m bg)	Filter Pack Interval (m bg)
DB-MW12-01	26.5	Sand and Gravel	50	23.5 – 26.5	22.7 – 26.5
DB-MW12-02	23.2	Sand and Gravel	50	20.1 – 23.2	19.5 – 23.2
DB-MW12-03	25.9	Sand and Gravel	50	22.6 – 25.6	21.6 – 25.6

3.2.3 Monitoring Well Surveying

Golder carried out a level survey to determine the vertical elevation to the top of the PVC wellhead (measuring point) for each well on June 24, 2012. Initial absolute elevation was surveyed relative to the top of PVC pipe at DB-MW12-01, which was obtained using a Trimble hand-held GPS instrument with a vertical accuracy of ± 0.6 m. However, relative elevation between wells, as determined from the level survey, has an accuracy of ± 1 cm. Table 3 presents a summary of survey data and water level measurements.

Table 3: Monitoring Well Locations and Groundwater Elevations August 23, 2012

Well ID	UTM Coordinates (Zone 7 North)	Top of PVC Casing Elevation (masl)	Standing Water Level (mbtoc)	Groundwater Elevation (masl)
DB-MW12-01	6796943.6 m N 614725.6 m E	817.94	15.35	802.59
DB-MW12-02	6797058.0 m N 614732.8 m E	812.91	19.98	792.93
DB-MW12-03	6797014.9 m N 614754.0 m E	814.92	17.31	797.61

3.2.4 Groundwater Monitoring Event

Monitoring wells DB-MW12-01, and DB-MW12-02, were developed by Golder on June 23, 2012 following well installation. Due to logistical constraints DB-MW12-03 could not be developed at this time, and was instead developed during the August 23, 2012 groundwater monitoring event.



The procedure used for sampling followed Contaminated Sites Regulation Protocol No. 7. Prior to and during development and/or purging of each well, a water level was measured in each well with an electronic measuring tape. Between 3 and 10 well volumes were purged from each well using 5/8" high density polyethylene (HDPE) Waterra™ tubing, a foot valve, and a Hydrolift™ pump or HDPE hand bailer, prior to a sample being obtained. During purging, physiochemical parameters (pH, temperature, EC) were collected at regular intervals using a Hanna Instruments HI 991300 meter and purging continued until field parameters were stable before sampling. Following purging a sample was collected immediately. Groundwater Development and Sampling Datasheets are presented in Appendix C. In addition to the three groundwater monitoring wells that were sampled, a surface water sample was collected from a potential downgradient receptor on August 24, 2012. The nearest downgradient receptor was determined to be a small branch of Lewis Creek located approximately 400 m north of the Site (Figure 1). Due to access constraints the Lewis was sampled approximately 1,400 m northeast of the Site; downstream of its closest point.

Sample containers and appropriate preservatives were obtained from ALS's Whitehorse laboratory. Samples for dissolved metals were field filtered using 0.45-micron, in-line filters and preserved with nitric acid. Samples were kept in coolers with ice packs prior to their delivery to ALS Environmental laboratory in Whitehorse, within appropriate holding times. ALS's laboratory is certified by the Canadian Association for Laboratory Accreditation and is accredited as conforming to ISO/IEC 17025 for analysis.

3.2.5 Rising Head Hydraulic Response Tests

Hydraulic response (slug) tests were performed during the August 23, 2012 groundwater monitoring event to assess the hydraulic conductivity of the surficial aquifer underlying the Site. Tests were performed using a 1.5 m long, solid, 38 mm diameter PVC slug and a Solinst Levellogger pressure transducer set to measure head fluctuations at one-second intervals. Manual water level measurements were also recorded throughout the tests.

Multiple rising head tests were completed in all three newly installed monitoring wells. A summary of the analysis of these tests is provided in Section 4.5.

3.3 Laboratory Analysis

Parameters included in the laboratory analysis of groundwater and surface water samples are summarized in Table 4. The parameter list complies with the Facility's Waste Management Permit (Permit No. 80-009).

Sampling and analysis were undertaken in general accordance with Yukon CSR Protocols 2 and 5 (Government of Yukon, 2011).



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Table 4: Parameters Analyzed in August 2012

Sample ID	General Parameters	Nutrients	Dissolved Metals	PAH, BTEX, DOC ¹	VOCs ²
DB-MW12-01	√	√	√	√	√
DB-MW12-02	√	√	√	√	√
DB-MW12-03	√	√	√	√	√
Surface Water	√	√	√	√	√

3.4 Quality Control / Quality Assurance

The following section provides a detailed description of the Quality Assurance (QA) and Quality Control (QC) measures taken by Golder to ensure the accuracy and integrity of groundwater quality sample analysis.

The following table (Table 5) summarizes the QA/QC evaluation.

Table 5: Review of QA/QC Procedures Taken

QA/QC Aspect	Evidence and Evaluation
Data Representativeness	
Sample Integrity	All samples were kept at the appropriate temperature and delivered to the laboratory within the appropriate holding times.
Background Samples	DB-MW12-01 is upgradient of the Facility and is used to provide background levels of physiochemical parameters.
Field Procedures	Monitoring wells were purged and/or developed and sampled using dedicated tubing. Equipment used in sampling more than one well was decontaminated using soap (Alconox™) and distilled water. Surface water samples were collected using one-time-use syringes.
Calibration of Field Equipment	Calibration of field equipment was undertaken daily, prior to sampling wells.
Data Precision and Accuracy	
Blind Duplicate	One blind duplicate was collected from BC-MW12-04 (at the Beaver Creek Waste Disposal Facility) during the August 2012 groundwater monitoring event. Of the 110 analyte pairs tested, RPD values could not be calculated for 90 of the pairs, as both values in each pair were below the laboratory method detection limit (MDL). Of the remaining analyte pairs tested, none exceeded the RPD ³ acceptance criteria of $\pm 30\%$. See: Report # 1114360073-1500
Trip Blanks	A trip blank was not collected during the August 2012 groundwater monitoring event.
Laboratory Internal QA/QC	Laboratory QA/QC is detailed in the primary laboratory report (Appendix E). Overall, the lab report showed acceptable testing frequency and acceptable results for the method blanks, laboratory duplicates and matrix spikes.
Holding Times	Samples were delivered outside the acceptable (24 hour) hold time for physical parameters, however field parameters were taken during sample collection to compensate.

¹ PAH, polycyclic aromatic hydrocarbons, BTEX, benzene, toluene, ethyl-benzene, xylenes and DOC, dissolved organic carbon

² VOCs, volatile organic compounds

³ RPD calculations are presented in Appendix E of Golder's draft report entitled Beaver Creek Solid Waste Disposal Facility Hydrogeological Assessment" dated August 10, 2012



HYDROGEOLOGICAL ASSESSMENT DESTRUCTION BAY SOLID WASTE DISPOSAL FACILITY

QA/QC Aspect	Evidence and Evaluation
Laboratory Detection Limit	Laboratory reports indicate that detection limits were below the standards applicable to this assessment.
Charge Balance	A charge balance was calculated for all of the samples analyzed from the Site. The percent difference was calculated to be between 2.6% and 4.4%.
Completeness of test program	Wells were sampled in accordance with the Site Assessment and Work Plan criteria.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection or analysis process for groundwater. The results of laboratory internal QA/QC and analysis of blind duplicates were acceptable, and therefore, the data set is considered valid and complete for use as the basis for groundwater assessment.

3.5 Application of Applicable Water Quality Standards

In accordance with the Government of Yukon's solid waste facility monitoring requirements, groundwater wells and the downgradient surface water receptor were sampled and tested for the following parameters:

- Major ions (Ca, Mg, Na, K, Cl, SO₄, N, NO₂, NO₃ and P)
- Bicarbonate
- Chemical oxygen demand
- Dissolved Metals
- pH
- Total Kjeldahl Nitrogen
- Mercury
- Total dissolved solids
- EPH_{w10-10} & VH_{w6-10}
- Hardness
- Ammonia
- BTEX
- Alkalinity
- Dissolved organic carbon
- PAHs
- Carbonate
- VOCs

Groundwater and surface water analytical results were compared to the Yukon CSR water quality standards or to the Canadian Environmental Quality Guidelines where no Yukon standard was available.

The four types of water uses outlined in the CSR, the relevant water quality standards, and their applicability to this assessment are presented in Table 6.

Table 6: Applicable Water Quality Standards

Water Use	Applicable Water Quality Standard	Applicable Plume Radius (km)	Applicability to Assessment
Aquatic Life	Schedule 3 – Contaminated Sites Regulation (O.I.C. 2002/171)	1	Applicable
Drinking Water	Schedule 3 – Contaminated Sites Regulation (O.I.C. 2002/171)	1.5	Not Applicable
Irrigation	Schedule 3 – Contaminated Sites Regulation (O.I.C. 2002/171)	1.5	Not Applicable
Livestock	Schedule 3 – Contaminated Sites Regulation (O.I.C. 2002/171)	1.5	Not Applicable



The following discusses the applicability of each water quality standard to the Facility.

Aquatic Life

A search of the Yukon Lands viewer website, Google Earth, and Bing Maps, conducted by Golder September 6, 2012, showed Lewis Creek and Kluane Lake falling within a 1 km radius of the Site. The nearest downgradient body of water was determined to be a small branch of Lewis Creek located approximately 400 m north of the Site. It was therefore determined, due to the presence of several surface water bodies within 1 km of the Site, that CSR standards for freshwater aquatic life were **applicable** for the Destruction Bay Facility.

Drinking Water

A search of drinking water wells on the Groundwater Information Network website and the Yukon Water Data Catalogue (accessed September 6, 2012) showed no drinking water wells located along the predicted downgradient direction between the Site and Kluane Lake, nor in any other area within a 1.5 km radius of the Site. A review of the Solid Waste Operation Plan for Destruction Bay indicated that the nearest dwellings were located in the community of Destruction Bay; approximately 5 km south of the Site. It was therefore deemed that CSR drinking water standards were **not applicable** for the Destruction Bay Facility.

Irrigation and Livestock

A review of the Summary of Yukon Water Wells, compiled from the Yukon Water Well Registry, reviewed by Golder on September 6, 2012, showed no irrigation wells or wells for livestock on record for the Destruction Bay area. It should be noted that this is not a complete record of all wells in the Yukon, and it is possible that there are irrigation wells or wells for livestock in the area. A review of Bing Maps images from 2012, conducted by Golder on September 6, 2012, as well as several visits to the Facility conducted in May and June 2012 showed no agricultural land, active livestock, or livestock facilities within 1.5 km of the Site. It was therefore considered that CSR water quality standards for irrigation and livestock are **not applicable** to the Destruction Bay Facility.

4.0 CONCEPTUAL HYDROGEOLOGICAL MODEL

4.1 Setting

The Facility is at an elevation of approximately 815 m (2,650 feet) above sea level, and lies within the Kluane Lake watershed. A cleared area of approximately 12,000 square meters, which slopes eastward towards Kluane Lake is present at the Facility. Topography at the Site is dominated by quaternary deposits. Vegetation in the area around the Site is characterized by mature spruce forest with willows and poplar. The regional hydraulic gradient near the Site is expected to follow the regional topography, which slopes northeast towards Kluane Lake.



4.2 Climate

Climate data at the Site is likely similar to that at the Burwash Airport climate station (Climate ID 2100182), located approximately 13.5 kilometres northwest of the Facility at an elevation of approximately 806.2 m above sea level. Average monthly precipitation reported at the Burwash Airport station ranges from a low average of 8.5 mm in April to a high average of 66.2 mm in July. The average annual precipitation is approximately 279.7 mm, including 106.4 cm as snowfall. Temperature ranges from a low average of -22° C in January to a high average of 12.8° C in July (Environment Canada, 2012).

Annual precipitation is relatively low (about 280 mm per year). This suggests that the degree of infiltration of water through buried waste and into the subsurface soils is relatively low. With a significant portion of the precipitation occurring in the form of snow, and the relatively cold climate, little infiltration would be expected during the winter months. The greatest potential for infiltration of water through the waste is during spring snow melt; however, a significant portion of the water from snow melt would typically occur as surface runoff during this period.

4.3 Geology and Hydrogeology

4.3.1 Geological Framework

The southern Yukon, including the Destruction Bay area, has undergone several episodes of glaciation, the most recent being the Quaternary Macauley and Mirror Creek glaciations (Figure 3). During that period, sediments such as glacial till, glaciofluvial, and glaciolacustrine sediments were deposited, especially in low elevation areas such as the Shakwak Trench; where the Destruction Bay Facility is located.

The Destruction Bay area is mapped as being underlain primarily by moraine deposits, alluvium, and glaciofluvial deposits of Quaternary origin. Ablation till, colluvial glacial debris, morainal deposits and bedrock exposures are found at higher elevations in the mountains to the southwest of the Site.

Surficial geology maps published by the Yukon Geological Survey (YGS) indicate natural surficial materials at the Facility are representative of a sloping till plain and glacial outwash fan deposits. In general, the till plain consist of diamicton containing high sand, silt and stone contents. Topography is generally flat to gently sloping, and terraced in places. Bordering the Site to the northeast are hummocky glaciofluvial outwash fan deposits. The glacio-fluvial outwash fan deposits generally consist of a mixture of sand and gravel between 3 and 60 m thick, as was observed, below approximately 6 m below grade, during drilling at the Site (Rampton, 1977).

4.3.2 Surficial Aquifer

As shown in Figure 4 it is inferred from the drilling that groundwater at the Site occurs in a shallow unconfined aquifer composed primarily of unconsolidated sand and gravel, with minor silt, and cobbles.

For the purpose of this report, this aquifer has been named the Surficial Aquifer.



HYDROGEOLOGICAL ASSESSMENT DESTRUCTION BAY SOLID WASTE DISPOSAL FACILITY

Table 7: Aquifer Units Encountered at the Site

Aquifer Name	Location	Aquifer Type	Comments
Surficial Aquifer	DB-MW12-01 BD-MW12-02 BD-MW12-03	Unconsolidated sediments	<ul style="list-style-type: none">■ Sand and gravel■ Shallow aquifer■ High hydraulic conductivity

4.4 Groundwater Flow Systems

4.4.1 Regional Groundwater Flow

Topography in the area surrounding the Facility slopes from the mountains to the southwest of the Site (elevation approximately 2000 m amsl) to the northeast; towards Kluane Lake (elevation 895 m amsl). Groundwater flow was observed to be shallow throughout the surrounding area. Regional flow is inferred to discharge primarily to Kluane Lake.

4.4.2 Local Groundwater Flow

Local flow direction at the Site is inferred, from groundwater elevations in the newly installed monitoring well network, to be to the north towards Lewis Creek, which flows into Kluane Lake (Figure 6). Groundwater is located in a surficial sand and gravel aquifer at a depth of approximately 20 m bg. Hydraulic gradient at the Site was found to be approximately 0.08 m/m.

Golder used the groundwater depth data from August 23, 2012 and well survey elevation information collected in June 2012 to calculate the groundwater elevation at each monitoring well. The water level measurements and groundwater elevations are presented in Table 3.

4.5 Hydraulic Response Tests

Golder Associates conducted slug tests on the three newly installed monitoring wells at the Facility. The slug tests were analyzed using AQTESOLV version 4.5 software and the results are included in Appendix D. The following is a summary of the findings.

Table 8: Estimated Hydraulic Conductivity

Monitoring Well ID	Primary Hydrogeological Unit	Solution Used	Estimated Hydraulic Conductivity (m/s)
DB-MW12-01	SAND, and GRAVEL	Bouwer-Rice (1976)	5×10^{-4}
DB-MW12-02	SAND and GRAVEL	Bouwer-Rice (1976)	5×10^{-4}
DB-MW12-03	SAND, some gravel	Bouwer-Rice (1976)	5×10^{-4}



4.6 Estimated Linear Groundwater Velocity

As determined from the slug tests summarized in Table 8, the hydraulic conductivity of the shallow aquifer underlying the Site is approximately 5×10^{-4} m/s. The horizontal hydraulic gradient across the site was assessed, using the monitoring well network and groundwater level elevations, to be approximately 0.08 m/m to the north. A reasonable estimate for linear groundwater velocity is calculated using the following equation:

$$V = (Ki)/n$$

Where: V: is the groundwater velocity in metres per second (m/s).

K: is the hydraulic conductivity in m/s as determined by slug testing

i: is the horizontal hydraulic gradient (m/m)

n: is the porosity which is estimated to be approximately 0.35 (Fetter, 1994) in sand and gravel aquifers.

The resulting groundwater velocity is estimated to be approximately 1×10^{-4} m/s; meaning groundwater flow velocity can be estimated to be approximately 10 metres per day. Groundwater at the Site may travel faster or slower than this estimate due to inaccuracies or seasonal variations in these parameters.

4.7 Potential Contamination of Groundwater and Transport Mechanisms

Potential sources and transport mechanisms of groundwater contamination are evaluated based on the Site history, Site inspections, hydrogeological investigation, and contaminant transport principals. Potential sources include:

- Leachate from present and former domestic waste, commercial waste, industrial waste, metals, wood, rubber (tires), construction debris, derelict vehicles and any other waste disposed of at the Facility. Potential contaminants leaching from these sources include: heavy metals, nutrients (NO_3 , NH_3), organic hydrocarbons (Fuels, PAH's, chlorinated hydrocarbons), and salts; and
- Leakage and spillage from on-Site hydrocarbon storage areas.

Transport mechanisms that may act on these sources of potential contamination and cause contamination of downgradient receptors include:

- Percolation of precipitation from the surface, through the unsaturated zone, and into the saturated zone. This includes interflow, or flow of water through the unsaturated zone; and
- Transport of contaminants within the saturated zone (aquifer) to other downgradient locations.



5.0 GROUNDWATER IMPACT ASSESSMENT

5.1 Review of Groundwater Chemistry

As discussed in Section 3.2.4, one round of groundwater monitoring was conducted all the three newly installed wells at the Facility on August 23, 2012. In addition, a surface water sample was taken from Lewis Creek, downgradient of the Facility, on August 24, 2012. Chain of custody forms for the groundwater samples collected, along with the complete groundwater chemistry results and QA/QC data can be found in Appendix E. Table 9 summarizes important parameters from the groundwater chemistry results, which are used to identify potential leachate contamination.

Table 9: Important Groundwater Chemistry Results

Sample Location	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Ammonia (mg/L)	Sulphate (mg/L)	DOC (mg/L)	Sodium (mg/L)
DB-MW12-01	449	<0.50	0.0054	168	1.92	8.0
DB-MW12-02	465	<0.50	<0.0050	195	<0.50	8.0
DB-MW12-03	457	<0.50	0.0054	195	0.50	8.2
Surface Water	180	<0.50	<0.0050	56.8	1.38	2.6

Total Dissolved Solids

A total dissolved solids (TDS) is a measurement of the total amount of dissolved organic and inorganic material contained within a liquid. Elevated TDS can indicate the presence of groundwater contamination caused by, for example, landfill leachate. Typically, major ions that comprise TDS include: NO₃, NH₃, Na, K, Mg, Ca, SO₄, Cl, and HCO₃. Values of TDS in monitoring well samples ranged from 449 mg/L to 457 mg/L across the Site, which is well within the normal range for naturally occurring groundwater. TDS in the surface water sample was significantly lower (180 mg/L), which is typical of surface water. TDS concentrations in surface water and groundwater samples showed no evidence of influence from landfill leachate.

Dissolved Organic Carbon

Dissolved Organic Carbon (DOC) concentrations can be elevated by the presence of leachate originating from decomposed organic matter. Levels associated with landfill leachate can be in the hundreds or thousands of mg/L. DOC levels at DB-MW12-02 and DB-MW12-03 were at or below the detection limit, while low levels were detected in DB-MW12-01 (1.92 mg/L) and the surface water sample (1.38 mg/L). These values are considered to be within the normal range for naturally occurring waters. DOC concentrations in surface water and groundwater samples showed no evidence of influence from landfill leachate.



Chloride

Chloride is often used as a tracer for anthropogenic influence on groundwater. Elevated chloride levels are associated with a number of sources including sewage, leachate, and road salting. In the case of landfills, elevated chloride is typically expected due to degradation of waste with a high chloride concentration. Chloride concentrations were below laboratory detection limits in samples from the monitoring well network and surface water.

Ammonia

Ammonia is a typical landfill leachate indicator. Ammonia concentration from the monitoring well network and surface water sample were below, or just slightly above, laboratory detection limits. These levels are well within the range expected in naturally occurring waters, and well below Yukon CSR standards for freshwater aquatic life. Ammonia concentrations in surface water and groundwater samples showed no evidence of influence from landfill leachate.

Metals

In general metals concentrations in all surface water and groundwater samples were within the range expected in naturally occurring waters. No metals concentrations exceeded the standard set by the Yukon CSR for freshwater aquatic life. Metals concentrations in surface water and groundwater samples showed no evidence of influence from landfill leachate.

Organics

Detectable levels of organic constituents are often a sign of leachate contamination. Of the hydrocarbons analyzed (BTEX, PAH, $\text{EPH}_{\text{W10-32}}$, $\text{VH}_{\text{W6-10}}$, and chlorinated hydrocarbons), none were detected in any of the surface water or groundwater samples. Chlorinated hydrocarbons were analyzed outside of the recommended holding time as summarized in Table 5. Organics concentrations in surface water and groundwater samples showed no evidence of influence from landfill leachate.

5.2 Interpretation of Groundwater Chemistry

Four factors that may affect natural groundwater quality include:

- The source and chemical composition of recharge water;
- The lithological and hydrological properties of the geologic unit;
- The various chemical processes occurring within the geologic unit; and
- The amount of time the water has remained in contact with the geologic unit (residence time).



These factors may affect the type and quantities of dissolved constituents in groundwater. The ionic composition of water can be used to classify the water into ionic types based on the dominant dissolved cation and anion, expressed in milliequivalents per litre (meq/L). These can be compared for different water samples using various types of plots.

The ionic compositions of samples from the Site were compared to discern different water types by plotting the meq/L concentrations of the samples on three types of diagrams: a Schoeller plot (Figure 7), a Piper diagram (Figure 8), and a Stiff diagram (Figure 9).

- **Schoeller:** The Schoeller semi-logarithmic diagram (Figure 7) shows total concentrations of select cations, and anions and may be used to identify different water types. Here, the Schoeller plot indicates that concentration of major ions in all of the monitoring well samples is similar. The surface water contains similar ratios of ions as the monitoring well samples at slightly lower concentrations, with the notable exception that it is slightly depleted in sulphate.
- **Piper:** The Piper diagram (Figure 8) is used to compare the ratio of major ions in and can be used to identify different ionic types. Here the Piper diagram illustrates that the groundwater samples contain similar proportions of constituents, while the surface water sample has slightly higher ratios of Bicarbonate to Sulphate, and Calcium to Magnesium. The groundwater sample is classified as Ca-Mg-SO₄-HCO₃ type water while the surface water sample is classified as Ca-Mg- HCO₃-SO₄ type water.
- **Stiff:** The Stiff diagram (Figure 9) allows for groundwater chemistry to be presented and viewed spatially. Ion ratios are the most readily presented, but total concentrations of ions can also be determined using the Stiff diagram. Here, the stiff diagram shows that the groundwater samples from the monitoring well network all have similar concentrations of major ions, while the surface water sample contains lower concentrations of all major ions in similar ratios to the groundwater samples, with the exception of lower sulphate.

All three types of diagrams show that groundwater composition at all three monitoring wells is essentially the same. The only major difference is observed in any of the plots is lower concentrations of all ions and depleted sulphate observed in the surface water sample.

None of the samples indicate that landfill leachate from the Facility is influencing groundwater chemistry.

6.0 CONCLUSIONS

The following conclusions are made based on the results of the 2012 hydrogeological assessment:

- **Stratigraphy and Hydrogeology:**
 - Surface expression in the vicinity of the Facility is dominated by quaternary surficial deposits; reworked by mining activities.
 - Subsurface conditions were investigated with the installation of three monitoring wells, including DB-MW12-01, DB-MW12-02, and DB-MW12-03, which were installed on June 22 and 23, 2012 under the supervision of Golder Associates for the creation of a monitoring well network at the Facility.



HYDROGEOLOGICAL ASSESSMENT DESTRUCTION BAY SOLID WASTE DISPOSAL FACILITY

- The Site stratigraphy to a depth of 25 m below grade consists of mixed sand and gravel deposits with minor silt.
- An unconfined aquifer was encountered during drilling and installation of all three monitoring wells between 17 and 23 m below grade.
- A series of hydraulic response tests was performed on all three monitoring wells. The results of these tests indicate the hydraulic conductivity of the unconfined aquifer underlying the Site is approximately 5×10^{-4} m/s. This value is considered reasonable for the types of sediments encountered during well drilling.
- Horizontal hydraulic gradient at the Site was determined, using monitoring well water level data, to be 0.08 m/m sloping to the northwest.
- Groundwater velocity in the surficial aquifer is estimated to be approximately 10 m/day.
- The nearest potential downgradient receptor was determined to be a branch of Lewis Creek located approximately 400 m north of the Site.
- Based on the results of these investigations it was confirmed that the requirement of a minimum of one upgradient (DB-MW12-01) and two downgradient (DB-MW12-02 and DB-MW12-03) wells was met.

■ Groundwater Chemistry:

- The results of a desktop study and several Site visits indicated that the Yukon CSR freshwater aquatic life standard is applicable to the Site.
- A water quality assessment was performed on water samples collected from all monitoring wells, as well as Lewis Creek, downgradient of the Site, during a single monitoring event in August 2012. All samples showed acceptable levels of all chemical parameters as defined by the Yukon CSR criteria for freshwater aquatic life.
- Results of groundwater sampling performed on the monitoring well network showed low and non-detect levels of chemical parameters typically associated with leachate contamination. This suggests that leachate influence on shallow groundwater underlying the Site is not evident.

7.0 RECOMMENDATIONS

The following recommendations are made based on the results of the hydrogeological assessment presented in this report:

- As required by the Solid Waste Permit for the facility, future groundwater monitoring should be conducted twice per year; in the spring and late summer.
- The potential impact that landfill leachate may be having on groundwater quality at the facility should be reevaluated following an additional round of groundwater monitoring.



8.0 CLOSURE

We trust that this draft report is adequate for your current needs. Should you have any questions or require any additional information, please contact the undersigned at your convenience.

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

Calvin Beebe, M.Sc.
Hydrogeologist

Reviewed By:

ORIGINAL SIGNED

Gary Hamilton, P.Geo.
Principal Hydrogeologist

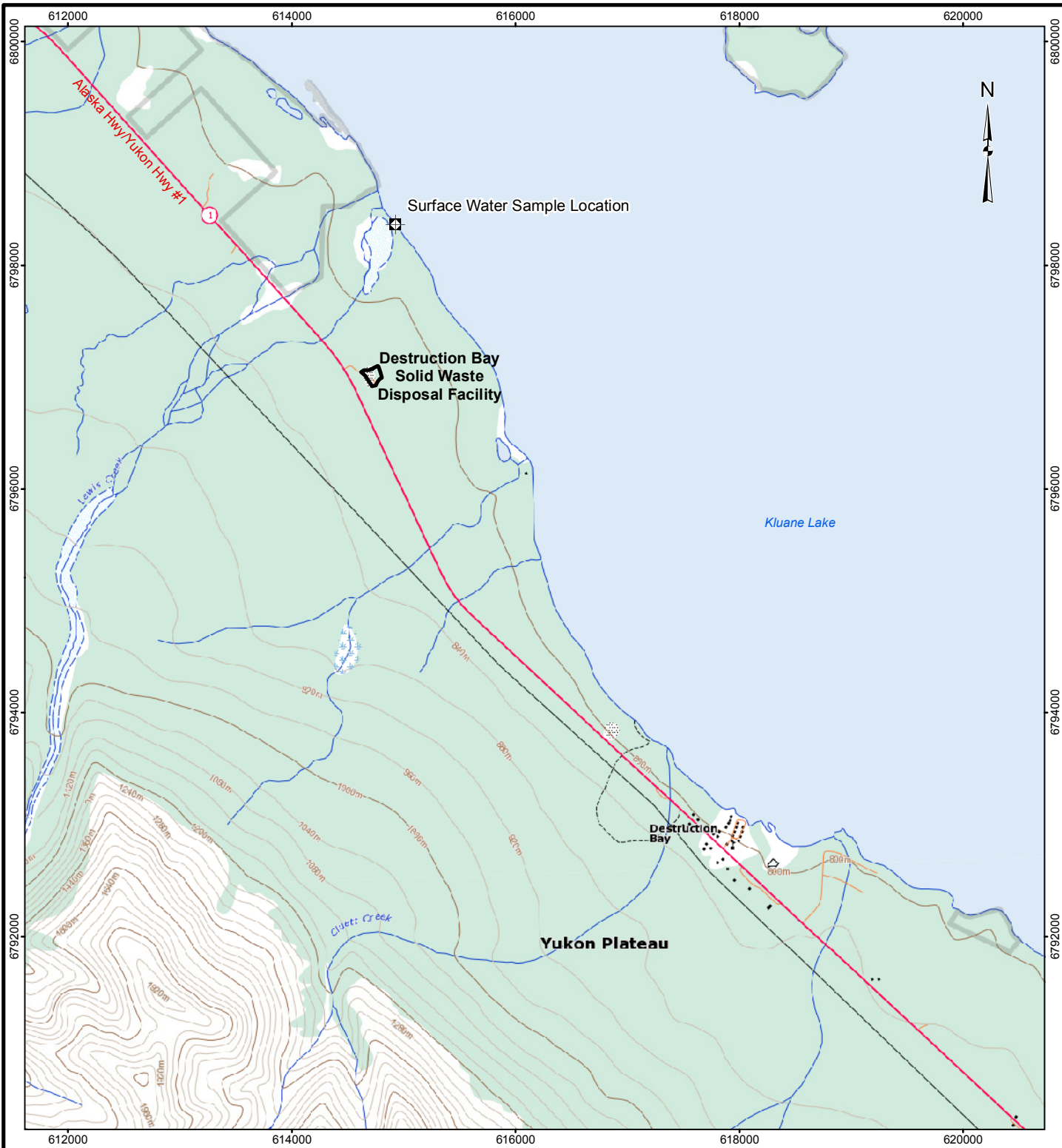
ORIGINAL SIGNED

Guy C. Patrick, P.Eng.
Principal Senior Hydrogeologist

CB/GJH/GCP/jcc

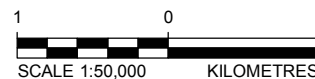
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LEGEND

- FACILITY
- SURFACE WATER SAMPLE LOCATION



REFERENCE

BASEDATA OBTAINED FROM GEOGRATIS (NATURAL RESOURCES CANADA).
DATUM: NAD83 PROJECTION: UTM ZONE 7

PROJECT YUKON GOVERNMENT - COMMUNITY SERVICES
SOLID WASTE DISPOSAL FACILITY
DESTRUCTION BAY, YUKON

TITLE

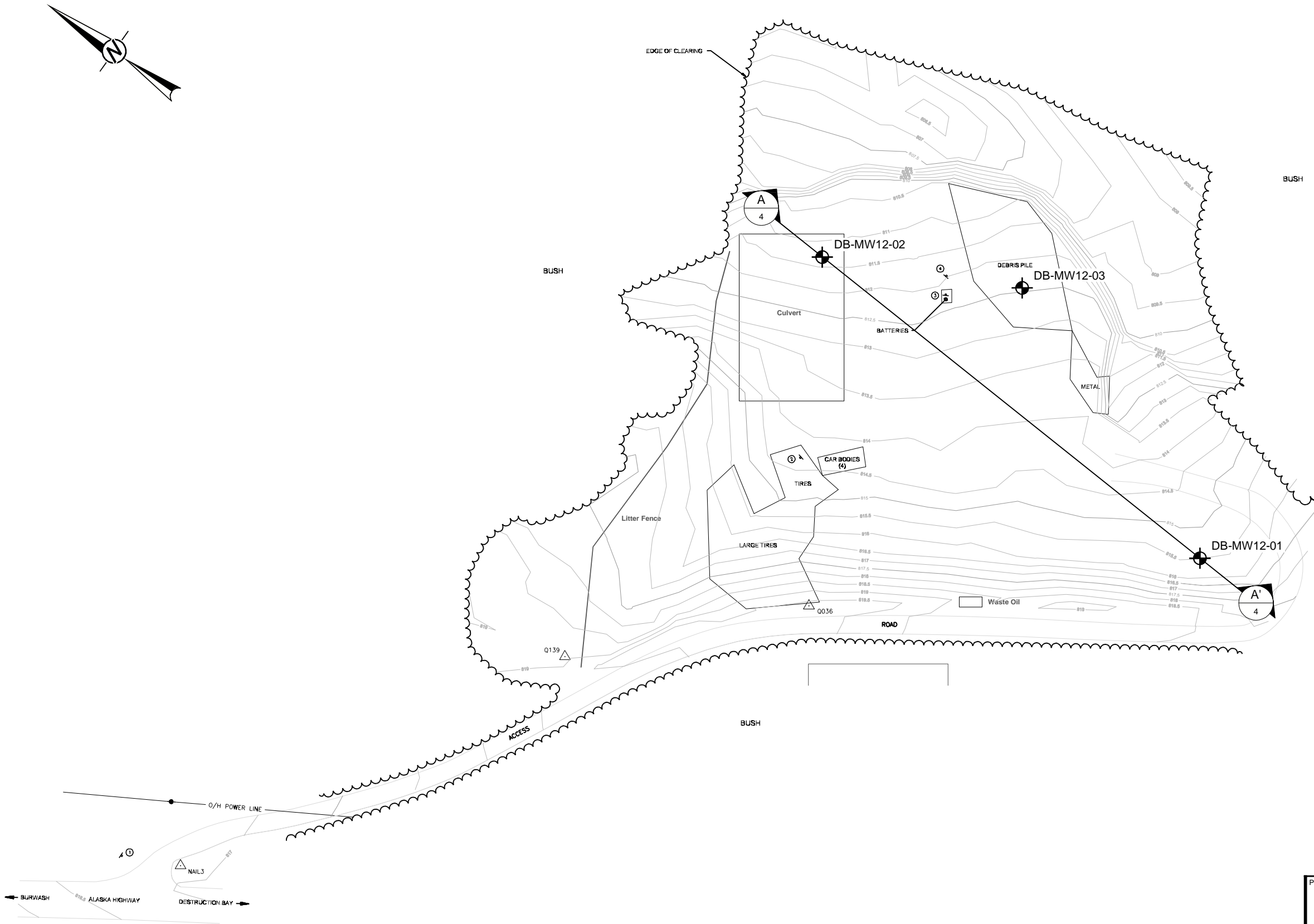
KEY PLAN



PROJECT No.	11-1436-0073	PHASE No.	1900
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GIS	DSC	14 Sep. 2012	REV. 0
CHECK			
REVIEW			

FIGURE: 1

FILENAME\LAYOUT\MODIFIED\PLOT\OFFICE



LEGEND

- MONITORING WELL LOCATION
- FENCE
- EDGE OF CLEARING
- SHOULDER OF ROAD
- SURVEY CONTROL POINT/BENCHMARK
- LEGAL POST - IRON BAR
- LEGAL POST - '77
- LEGAL POST - '89
- SIGN

REFERENCES

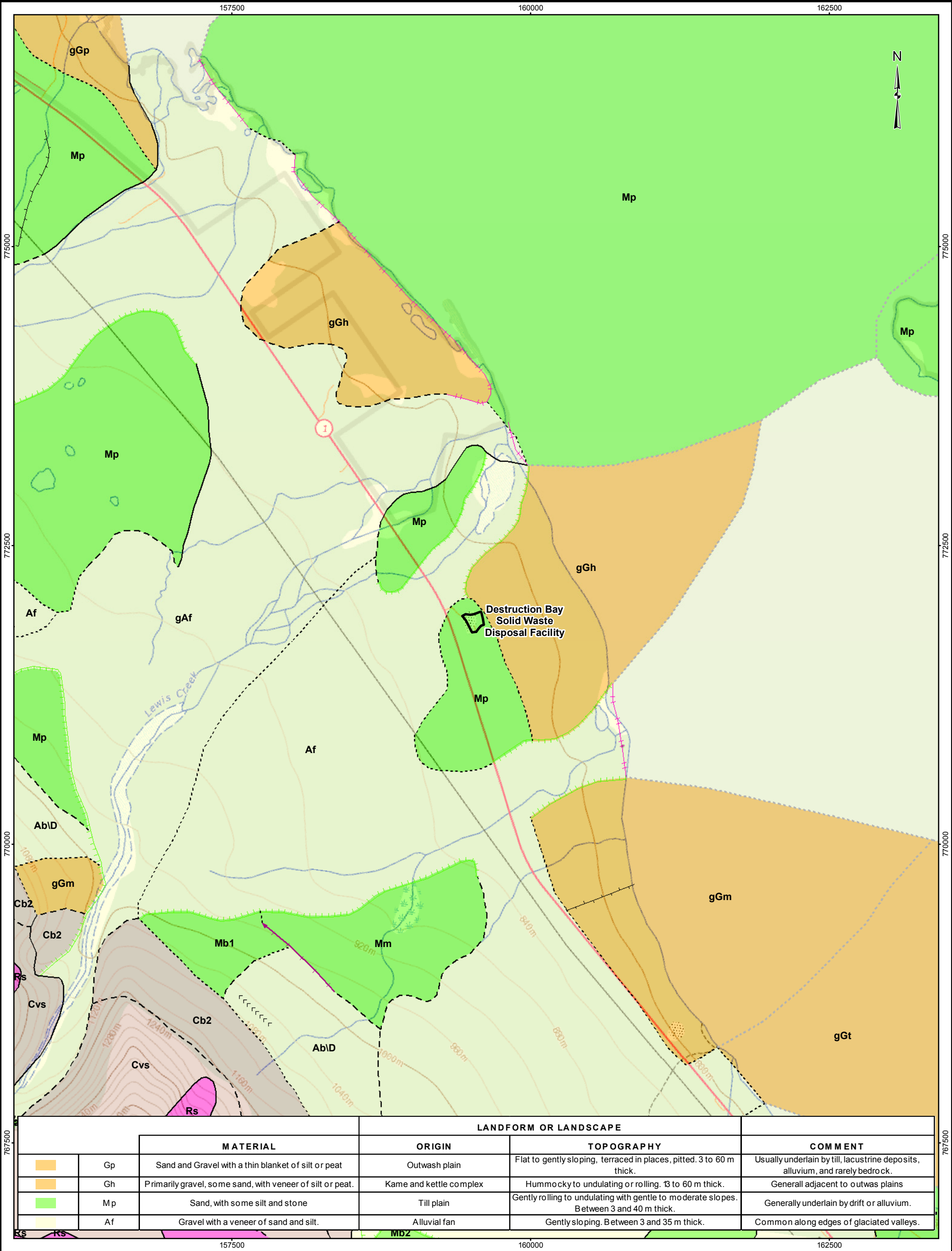
1. BASE PLAN PROVIDED BY QUEST ENGINEERING GROUP
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DATED:2002.01.15





NOTES






1. SITE PLAN IS NOT CONSISTENT WITH OBSERVED CONDITION DURING DRILLING, BUT IS INTENDED TO SHOW LOCATIONS OF NEWLY INSTALLED MONITORING WELLS IN RELATION TO BURIED STRUCTURES.



PROJECT YUKON GOVERNMENT-COMMUNITY SERVICES SOLID WASTE DISPOSAL FACILITY DESTRUCTION BAY, YUKON			
TITLE SITE PLAN AND CROSS-SECTION LOCATION			
	PROJECT No. 11-1436-0073		FILE No. 1900-1960
	DESIGN	CB	30AUG12
	CADD	TS	12SEP12
	CHECK	GCP	
	REVIEW		
			SCALE AS SHOWN
FIGURE 2			



		LANDFORM OR LANDSCAPE			
		MATERIAL	ORIGIN	TOPOGRAPHY	COMMENT
	Gp	Sand and Gravel with a thin blanket of silt or peat	Outwash plain	Flat to gently sloping, terraced in places, pitted. 3 to 60 m thick.	Usually underlain by till, lacustrine deposits, alluvium, and rarely bedrock.
	Gh	Primarily gravel, some sand, with veneer of silt or peat.	Kame and kettle complex	Hummocky to undulating or rolling. 13 to 60 m thick.	Generally adjacent to outwash plains
	Mp	Sand, with some silt and stone	Till plain	Gently rolling to undulating with gentle to moderate slopes. Between 3 and 40 m thick.	Generally underlain by drift or alluvium.
	Af	Gravel with a veneer of sand and silt.	Alluvial fan	Gently sloping. Between 3 and 35 m thick.	Common along edges of glaciated valleys.

- LEGEND**
-  FACILITY
 -  BUILDING
 -  MAJOR ROAD
 -  WATERCOURSE
 -  WATERBODY

REFERENCE

BASE DATA OBTAINED FROM GEOGRATIS (NATURAL RESOURCES CANADA).
SURFICIAL GEOLOGY DATA OBTAINED FROM THE YUKON GOVERNMENT, ENERGY, MINES AND RESOURCES.
DATUM: NAD83 PROJECTION: ALBERS




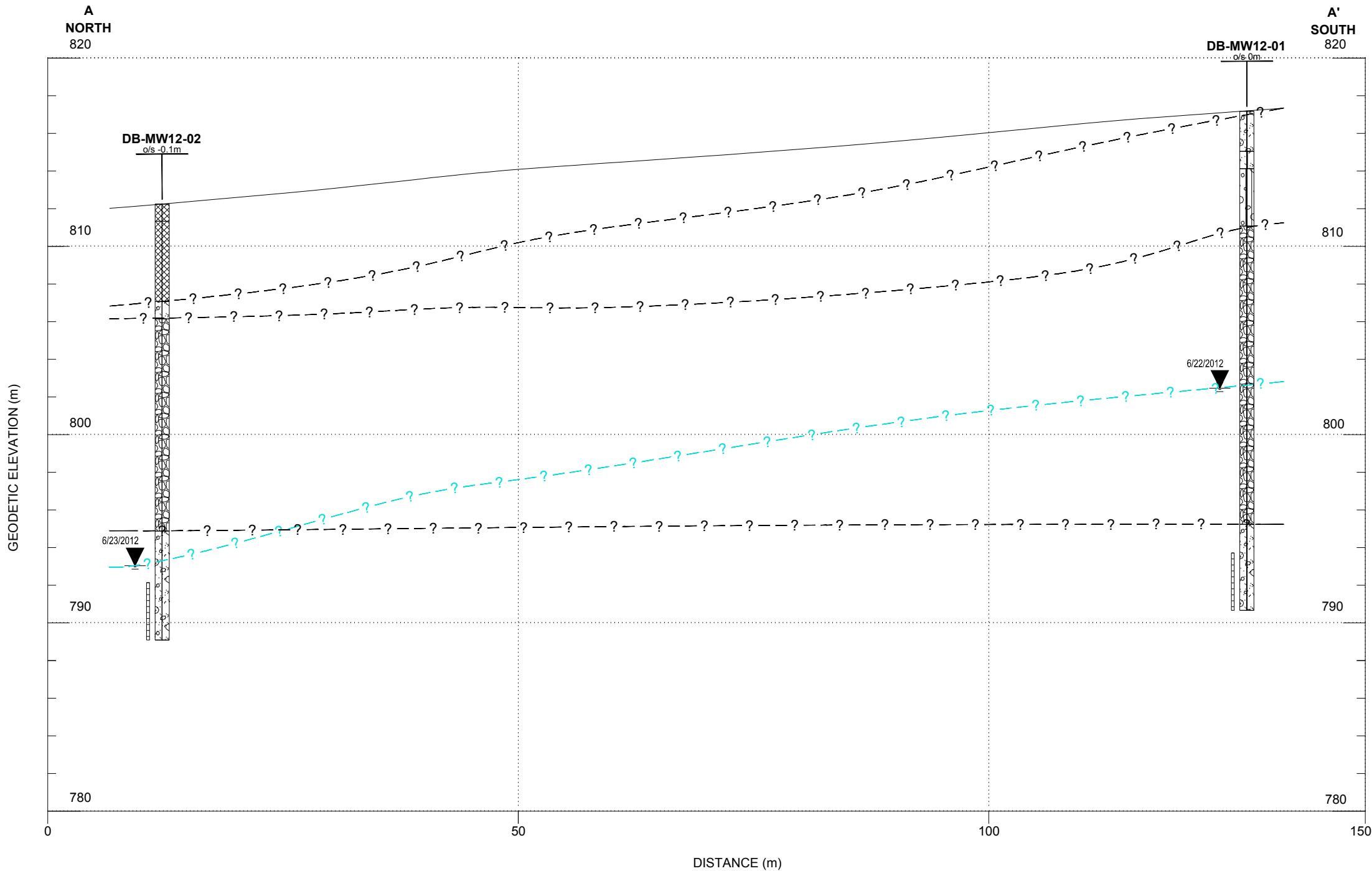
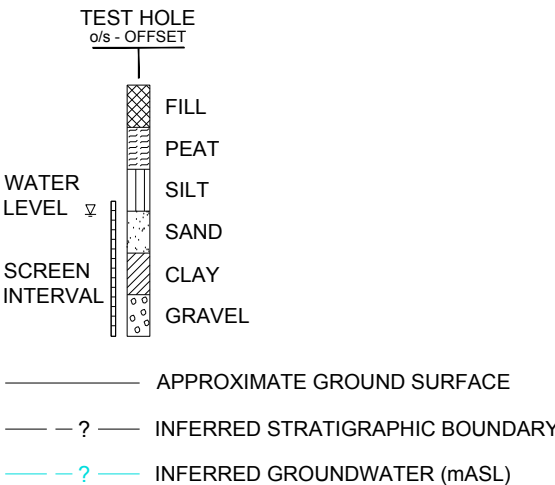
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TITLE	REGIONAL SURFICIAL GEOLOGY				
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	GIS	DSC	14 Sep. 2012	REV.	0
	CHECK				
REVIEW					

FIGURE: 3



LEGEND

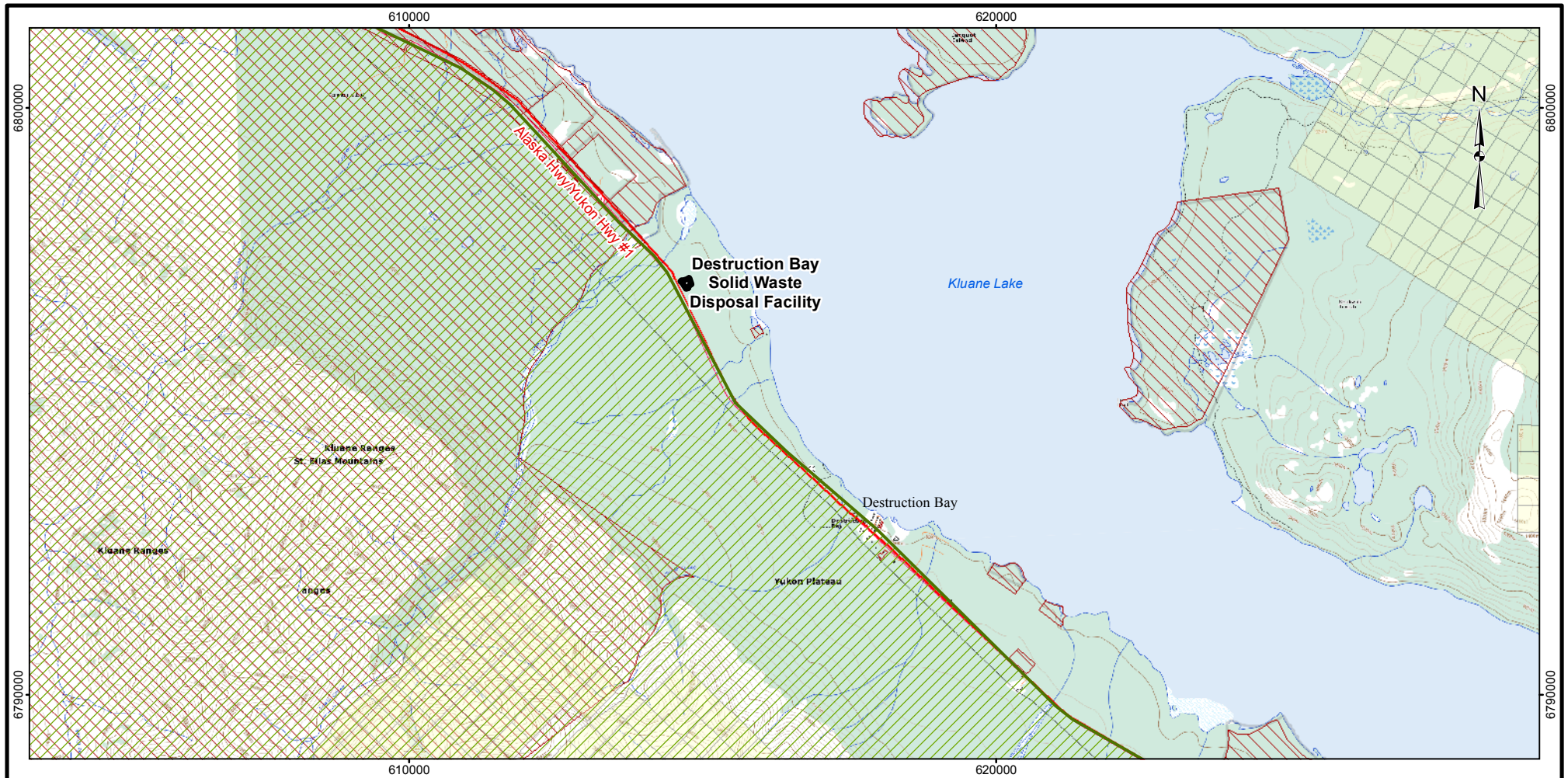
TEST HOLE LOCATION SHOWING INFERRED STRATIGRAPHIC DATA
FOR DETAILED STRATIGRAPHY REFER TO RECORD OF TEST HOLE
LOGS IN APPENDIX ?).









SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND MAY VARY FROM THAT SHOWN.



PROJECT	GOVERNMENT OF YUKON, DEPARTMENT OF COMMUNITY SERVICES DESTRUCTION BAY, Y.T.
TITLE	CONCEPTUAL HYDROGEOLOGICAL CROSS - SECTION A-A'

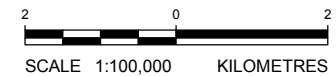


LEGEND

-  FACILITY
-  MAJOR HIGHWAY
-  FIRST NATIONS LANDS
-  PARK/PROTECTED AREA
-  QUARTZ CLAIM
-  WATERSHED BOUNDARY

REFERENCE

FEATURE DATA OBTAINED FROM THE YUKON GOVERNMENT YGS MAPMAKER ONLINE. BASEDATA OBTAINED FROM GEOGRATIS (NATURAL RESOURCES CANADA).
 DATUM: NAD83 PROJECTION: UTM ZONE 07







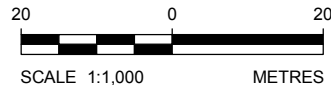
PROJECT YUKON GOVERNMENT - COMMUNITY SERVICES SOLID WASTE DISPOSAL FACILITY DESTRUCTION BAY, YUKON			
TITLE REGIONAL DRAINAGE & LAND ZONING			
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	GIS	DSC	14 Sep. 2012
	CHECK		
	REVIEW		
SCALE AS SHOWN			REV. 0
FIGURE: 5			

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LEGEND

-  MONITORING WELL
-  GROUNDWATER ELEVATION (MEASURED ON AUGUST 23, 2012)
-  INFERRED POTENTIOMETRIC CONTOURS
-  INFERRED GROUNDWATER FLOW DIRECTION



REFERENCE

IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009.
DATUM: NAD83 PROJECTION: UTM ZONE 7

PROJECT YUKON GOVERNMENT - COMMUNITY SERVICES
SOLID WASTE DISPOSAL FACILITY
DESTRUCTION BAY, YUKON

TITLE

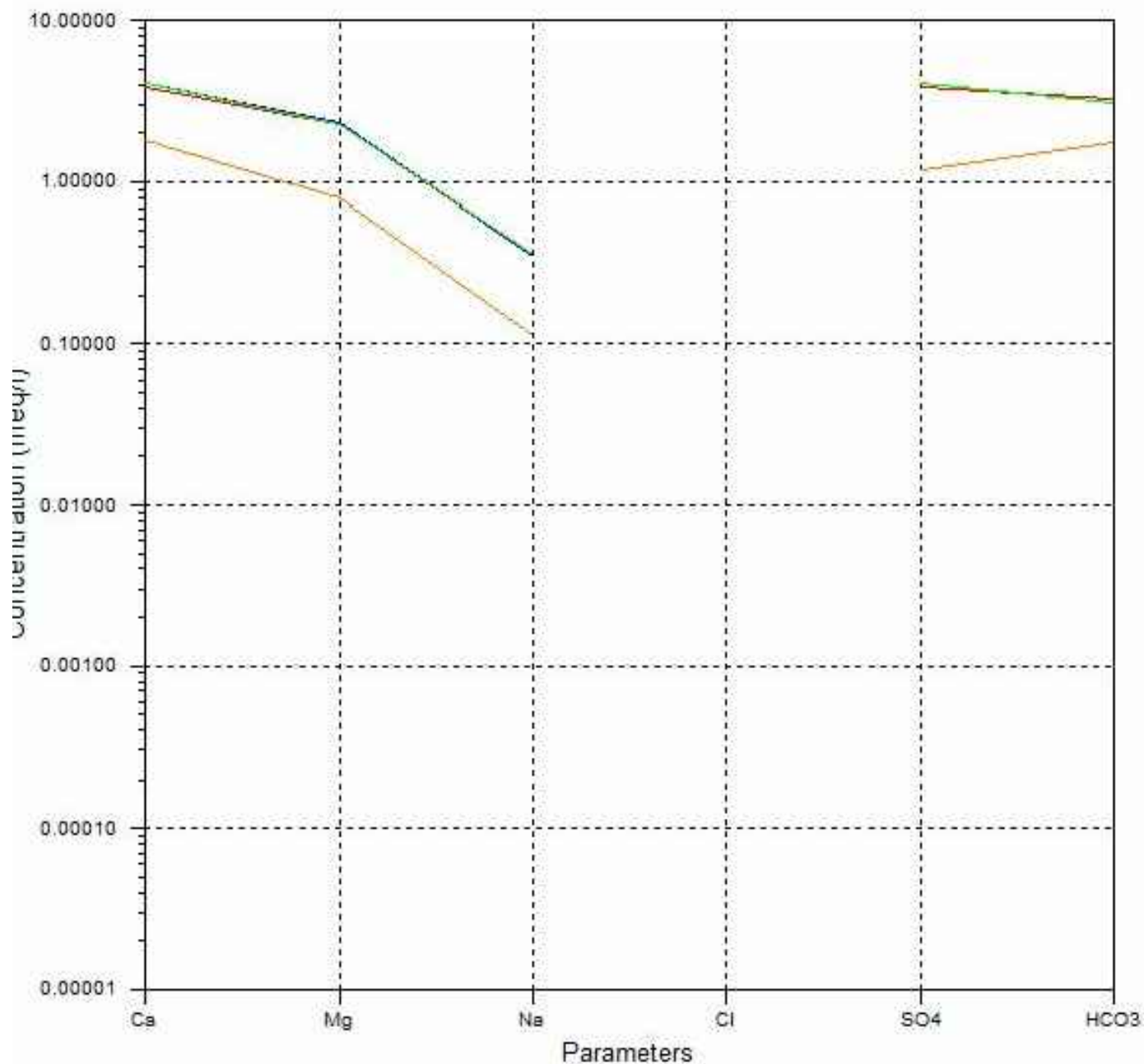
BOREHOLE LOCATION MAP GROUNDWATER ELEVATION



PROJECT No. 11-1436-0073			PHASE No. 1900	
DESIGN	CB	10 Sep. 2012	SCALE AS SHOWN	REV. 0
GIS	DSC	14 Sep. 2012	FIGURE: 6	
CHECK				
REVIEW				

N:\Bur-Graphics\Projects\2011\1436-0073\Drafting\Phase 1900\1900-1960-01.dwg | Layout: ANSI_A_FIG 7 | Modified: MMattenzo 09/19/2012 3:36 PM | Plotted: MMattenzo 09/24/2012

Schoeller Plot



LEGEND

Monitoring Event August 2012

- DB-MW12-01
- DB-MW12-02
- DB-MW12-03
- Destruction Bay Surface Water

NOTES

1. LINES OVERLAP AND ARE NOT VISIBLE DUE TO SIMILARITY IN CHEMISTRY OF SAMPLES.

PROJECT YUKON GOVERNMENT-COMMUNITY SERVICES
SOLID WASTE DISPOSAL FACILITY
DESTRUCTION BAY, YUKON

TITLE

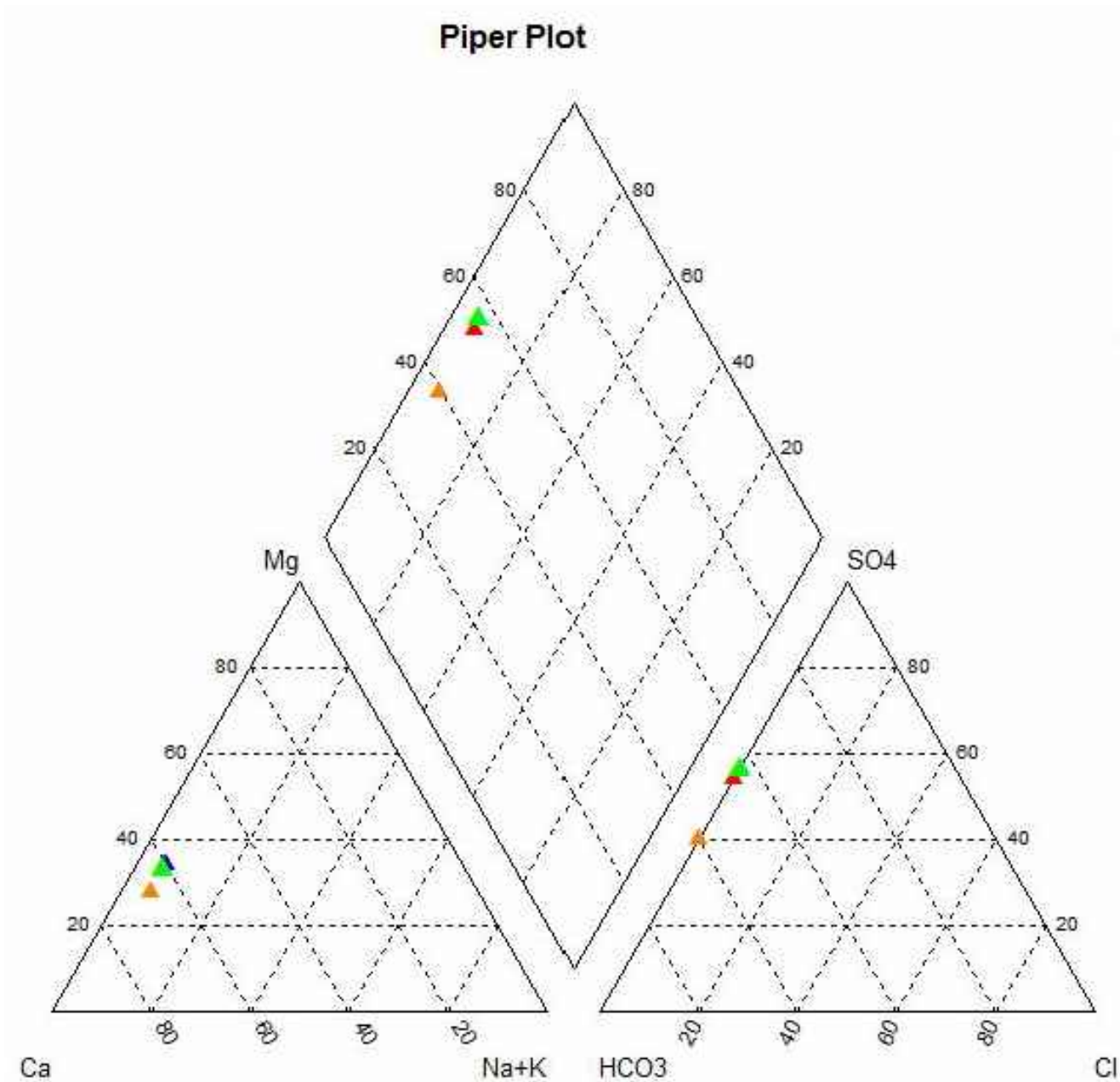
SCHOELLER PLOT



PROJECT No. 11-1436-0073			FILE No. 11-1436-0073-1900-1960-01
DESIGN	CB	19SEP12	SCALE NOT TO SCALE
CADD	MM	19SEP12	
CHECK			
REVIEW			

FIGURE 7

N:\Bur-Graphics\Projects\2011\1436-0073-Drafting\Phase 1900\1900-1960-01-1436-0073-1900-1960-01.dwg | Layout: ANSI_A_FIG 8 | Modified: mmaltenzo 09/19/2012 2:51 PM | Plotted: mmaltenzo 09/19/2012



LEGEND

Monitoring Event
August 2012

- ▲ DB-MW12-01
- ▲ DB-MW12-02
- ▲ DB-MW12-03
- ▲ Destruction Bay Surface Water

PROJECT YUKON GOVERNMENT-COMMUNITY SERVICES
SOLID WASTE DISPOSAL FACILITY
DESTRUCTION BAY, YUKON

TITLE

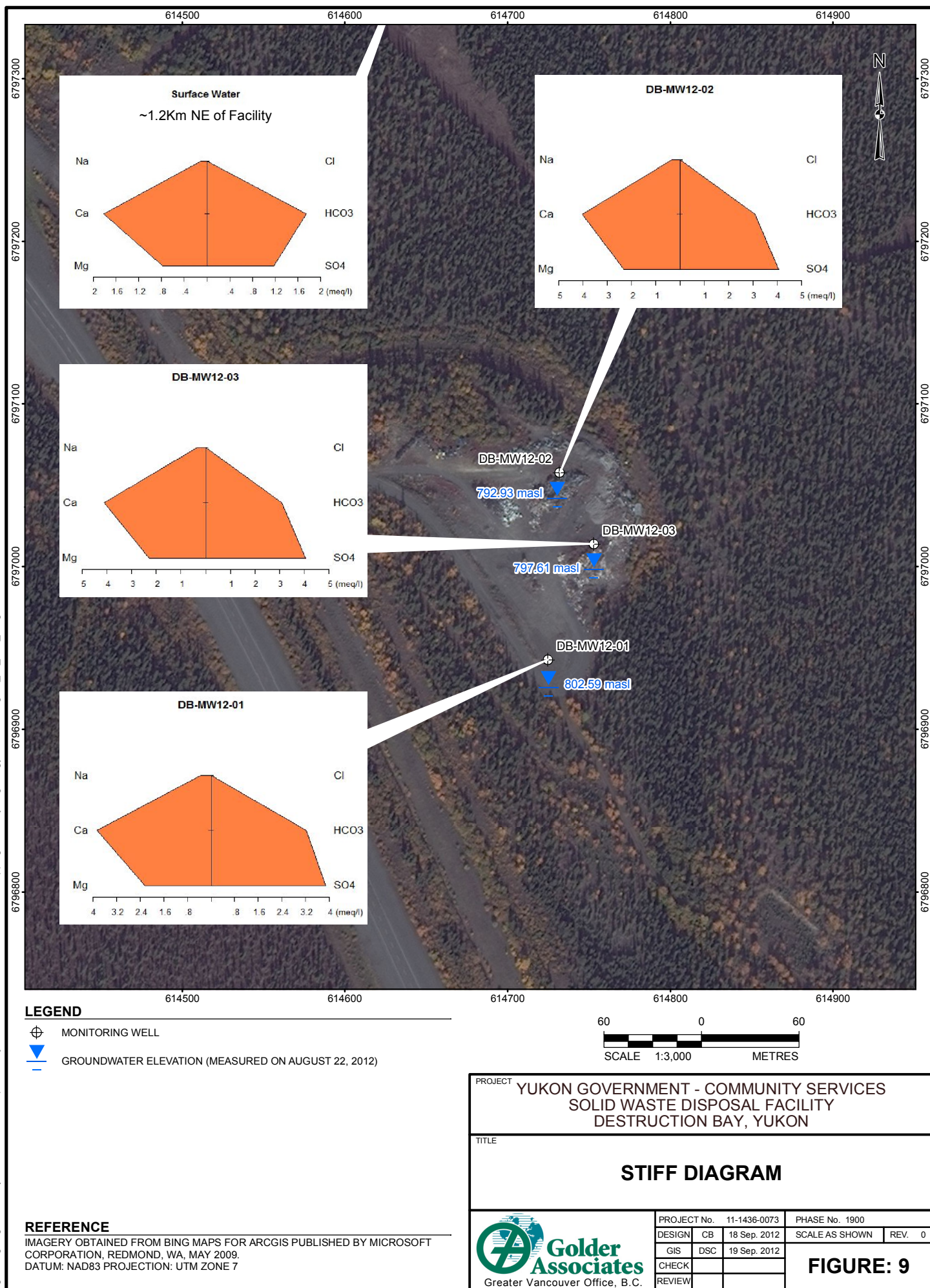
PIPER PLOT



PROJECT No.	11-1436-0073	FILE No. 11-1436-0073-1900-1960-01
DESIGN	CB	19SEP12
CADD	MM	19SEP12
CHECK		
REVIEW		
SCALE		NOT TO SCALE

FIGURE 8

\\golder.gds\ga\Burnaby\CAD-GIS\Bur-Graphics\Projects\2011\1436-0073\GIS\Mapping\MXD\Hydrogeology\Burwash\Figure_09_Stiff_Diagram.mxd





APPENDIX A

Site Photographs



APPENDIX A

Site Photographs



Photograph 1: Destruction Bay facility looking east.



Photograph 2: Destruction Bay facility looking north east (tire storage).



APPENDIX A

Site Photographs



Photograph 3: Destruction Bay facility looking north.

o:\final\2011\1436\11-1436-0073\1114360073-506-r-rev0-1900\appendices\app a\site photos.docx



APPENDIX B

Well Construction Logs

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-01SHEET 1 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6796943.56 E: 614725.63DRILLING DATE: June 22, 2012
DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PID ppm		WATER CONTENT PERCENT				ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %	5 10 15 20		Wp I W WI			
										PID ppm					
0	M5 Drilltech Truck Mounted Auger Drill Rig Air Rotary	Ground Surface (SM-GM) SAND and GRAVEL, some clay, some silt, with cobbles.		817.18 0.00											Stickup = 0.76m
1															
2		(ML) SANDY SILT, trace fine, subrounded gravel, brown, moist.		815.05 2.13											
3		(ML) gravelly SILT, subrounded gravel, some sand, brown, moist, very dense.		814.13 3.05											
4															
5															Bentonite Chip Seal
6	- grading to dry at 6.1m depth. (GW) GRAVEL, some sand, trace silt, grey, with cobbles, dry, very dense.		811.08 6.10												
7															
8															
9															
10															

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-01SHEET 2 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6796943.56 E: 614725.63

DRILLING DATE: June 22, 2012

DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PID ppm		WATER CONTENT PERCENT		ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %	PID ppm	Wp	Wi		
10	M5 Drilltech Truck Mounted Auger Drill Rig Air Rotary	(GW) GRAVEL, some sand, trace silt, grey, with cobbles, dry, very dense. (continued)											
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
		CONTINUED NEXT PAGE											

06/22/2012
▼Bentonite Chip
Seal

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-01SHEET 3 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6796943.56 E: 614725.63DRILLING DATE: June 22, 2012
DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES					PID ppm		WATER CONTENT PERCENT				ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %	PID ppm	PID ppm	Wp I — W — I Wi						
												5	10	15			20	10
20	M5 Drilled Truck Mounted Auger Drill Rig Air Rotary	(GW) GRAVEL, some sand, trace silt, grey, with cobbles, dry, very dense. (continued)																
21																		
22		(GW-SW) SAND and GRAVEL, trace silt, brown, moist to wet.		795.24 21.95														
23																		
24		- seepage at 23.47m depth.																
25																		
26																		
27		End of Borehole.		790.66 26.52														
28																		
29																		
30																		

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-02SHEET 1 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6797058.6 E: 614732.84DRILLING DATE: June 23, 2012
DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES					PID ppm		WATER CONTENT PERCENT					ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %	PID ppm		WATER CONTENT PERCENT						
										5	10	15	20	Wp	W			WI
0	M5 Drilltech Truck Mounted Auger Drill Rig Air Rotary	Ground Surface		812.25												Stickup = 0.66m		
		(ML) SILT, some gravel, brown, moist. (FILL)		0.00														
1		(GM-ML) GRAVEL and SILT, some sand, trace clay, moist. (FILL) - trace metal debris from 0.91m - 1.52m depth.		811.34 0.91														
2																		
3		- trace metal debris from 3.05m - 3.35m depth.																
4																		
5																Bentonite Seal		
	(GM-SM) GRAVEL and SAND, some silt, dark brown, moist.		807.07 5.18															
6																		
	(GW) GRAVEL, some sand, trace silt, grey, dry, very dense.		806.15 6.10															
7																		
8																		
9																		
10																		
CONTINUED NEXT PAGE																		

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-02SHEET 2 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6797058.6 E: 614732.84

DRILLING DATE: June 23, 2012

DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PID ppm		WATER CONTENT PERCENT Wp I — W — I Wi	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %				PID ppm	
10	M5 Driltech Truck Mounted Auger Drill Rig Air Rotary	(GW) GRAVEL, some sand, trace silt, grey, dry, very dense. (continued)												
11														
12														
13														
14														
15														
16														
17														
18				(GW-SW) GRAVEL and SAND, trace silt, dark brown, wet.										
19														
20		- very wet from 19.51m - 23.16m depth.												
		CONTINUED NEXT PAGE												

Bentonite Seal

06/23/2012

10/20 Silica
Sand

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-02SHEET 3 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6797058.6 E: 614732.84

DRILLING DATE: June 23, 2012

DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PID ppm		WATER CONTENT PERCENT				ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %	PID ppm	WATER CONTENT PERCENT					
											Wp	W	WI			
20	M5 Dritech Truck Mounted Auger Drill Rig Air Rotary	(GW-SW) GRAVEL and SAND, trace silt, dark brown, wet. <i>(continued)</i>														
21																
22																
23				789.09												
24		End of Borehole.		23.16												
25																
26																
27																
28																
29																
30																

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-03SHEET 1 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6797014.93 E: 614753.99

DRILLING DATE: June 23, 2012

DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PID ppm		WATER CONTENT PERCENT Wp I — W — I Wi	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %	PID ppm			
0	M5 Drilltech Truck Mounted Auger Drill Rig Air Rotary	Ground Surface (GM) GRAVEL, some sand, some silt, some wood debris. (FILL)	814.26 0.00									Stickup = 0.66m
1												
2												
3												
4		(ML) SILT, trace sand, trace clay, dark brown, moist.	810.60 3.66									Bentonite Seal
5												
6		(SM) silty SAND, some gravel, trace clay, brown, moist.	809.08 5.18									
7		(GW-SW) GRAVEL and SAND, with cobble, trace silt, grey-brown, moist.	808.16 6.10									
8												
9												
10												
		CONTINUED NEXT PAGE										

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-03SHEET 2 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6797014.93 E: 614753.99DRILLING DATE: June 23, 2012
DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PID ppm		WATER CONTENT PERCENT Wp I — W — I Wi	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %			
10	M5 Drilltech Truck Mounted Auger Drill Rig Air Rotary	(GW-SW) GRAVEL and SAND, with cobble, trace silt, grey-brown, moist. (continued)										
11		- trace clay from 10.97m - 12.19m depth.										
12												
13												
14		- dry from 13.72m - 18.29m depth.										
15												
16												
17												
18												
19												
20												
		CONTINUED NEXT PAGE										

Bentonite Seal

06/24/2012 ▼

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.

PROJECT No.: 11-1436-0073 (1900)

RECORD OF BOREHOLE: DB-MW12-03SHEET 3 OF 3
DATUM: Ground SurfaceCLIENT: Yukon Government Community Services
PROJECT: Yukon Landfill Assessment
LOCATION: Destruction Bay
N: 6797014.93 E: 614753.99

DRILLING DATE: June 23, 2012

DRILLING CONTRACTOR: Midnight Sun Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				PID ppm		WATER CONTENT PERCENT Wp — W — Wi	ADDITIONAL LAB. TESTING	PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	CORE No.	CORE RECOVERY %	PID ppm			
20	M5 Dritech Truck Mounted Auger Drill Rig Air Rotary	(GW-SW) GRAVEL and SAND, with cobble, trace silt, grey-brown, moist. (continued)										
21												
22		- wet from 21.64m - 26.21m depth.										
23												
24												
25												
26			788.35 25.91									
26		End of Borehole.										
27												
28												
29												
30												

DEPTH SCALE

1 : 50



LOGGED: C.B.

CHECKED: G.H.



APPENDIX C

Well Development and Sampling Sheets





- ☒ Development
- ☒ Purging/Sampling

Well No.: DB-MW12-03 Project No.: 11-1436-0073/1900
Location: DESTRUCTION DAY Date: 23-AUG-12 Time: 1200
Weather: CLEAR, WINDY Temperature: 15°C Completed by: A BRADGER

Time of Measurement: _____ Tidally Influenced: ☐ Yes ☒ No

Depth to product: _____ Product thickness: _____ One well volume: _____

Depth to water Below Top of Casing: A 17.31 metres (B-A)*2.0 = 9.40.2 = 18.80 litres - for a 51 mm (2.0 inch) diameter well

Depth to Bottom of Well Below Top of Casing: B 26.71 metres (B-A)*1.1 = _____ litres - for a 38 mm (1.5 inch) diameter well

Diameter Standpipe: C _____ mm Sample intake depth: _____ metres

pH and Temp. Meter: Model _____ Serial No. _____ Calibration Buffers: ☒ 4 ☒ 7 ☐ 10
 Conductivity Meter: Model _____ Serial No. _____ Calibration Solution: _____
 Dissolved Oxygen Meter: Model _____ Serial No. _____ ☐ D.O. Chemet Ampoule
 Pump: ☐ None ☒ Waterra ☐ Peristaltic ☐ Submersible ☐ Bailer Type: _____
 Pump Details: _____

Purge Volume: Well. Vol. X 2 = 60 litres
Avg. Flow Rate: _____ L/min. Start: 12:00 Finish: 12:30

[illegible]

Odour: ☐ Yes ☒ No If yes _____

Sheen: ☐ Yes ☒ No If yes Hydrocarbon-like ☐ OR Metallic-like ☐

Turbidity: Clear | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Very Silty

Analysis	Type		Container Size							Filtered		Preservatives
			40 mL	100 mL	250 mL	500 mL	1 L	2 L	4 L			
	<input type="checkbox"/> Plastic	<input type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<input type="checkbox"/> Plastic	<input type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<input type="checkbox"/> Plastic	<input type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<input type="checkbox"/> Plastic	<input type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<input type="checkbox"/> Plastic	<input type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<input checked="" type="checkbox"/> Plastic	<input checked="" type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<input type="checkbox"/> Plastic	<input type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	
	<input type="checkbox"/> Plastic	<input type="checkbox"/> Glass								<input type="checkbox"/> Yes	<input type="checkbox"/> No	

SCN No. _____ Consumables: ☐ Waterra Tubing _____ ☐ HDPE/Teflon Tubing _____ ☐ Groundwater Filter _____
Field Dup. _____ ☐ Silicon Tubing _____ ☐ D.O. Ampoules _____ ☐ _____



- ☐ Field Characterization
- ☒ Sampling

☐ Other

GROUNDWATER DEVELOPMENT AND PURGING/SAMPLING DATA SHEET

☒ Development
☐ Purging/Sampling

Well No.: DB-mw12-01
Location: Destruction Bay
Weather: _____ Temperature: 20° sunny

Project No.: 11-1436-0073 (1900)
Date: 23-Jun-12 Time: 14:16
Completed by: Calvin Beebe + A. Badger

MONITORING WELL INFORMATION

Time of Measurement: _____ Tidally Influenced: ☐ Yes ☒ No
Depth to product: X Product thickness: X One well volume: 8 L
Depth to water Below Top of Casing: A 23.48 metres (B-A)*2.0 = 8 L litres - for a 51 mm (2.0 inch) diameter well
Depth to Bottom of Well Below Top of Casing: B 27.24 metres (B-A)*1.1 = 25 litres - for a 38 mm (1.5 inch) diameter well
Diameter Standpipe: C 50 mm Sample intake depth: 25 metres

EQUIPMENT LIST

pH and Temp. Meter: Model YSI Serial No. _____ Calibration Buffers: ☒ 4 ☒ 7 ☐ 10
Conductivity Meter: Model YSI Serial No. _____ Calibration Solution: 1413 µS/cm
Dissolved Oxygen Meter: Model YSI Serial No. _____ ☐ D.O. Chemet Ampoule
Pump: ☐ None ☒ Waterra ☐ Peristaltic ☐ Submersible ☐ Bailor Type: _____
Pump Details: Hydralist & Waterra

WELL DEVELOPMENT/PURGING

Purge Volume: Well Vol. X 3 = 24 litres
Avg. Flow Rate: 2.5 L/min. Start: 14:16 Finish: 14:28

Time (elapsed)	Volume Removed (L)	Temp. (°C)	pH (Units)	Cond. (µS/cm)	Redox (mV)	Diss. O ₂ (mg/L or %)	Water Level (m)	Remarks
1:00	1	20.86	7.59	6.21				
3:00	8	5.00	7.71	6.27				
5:00	15	4.74	7.65	6.09				
8:00	24	4.48	7.69	6.09				
12:00	30	4.53	7.67	6.09				

Comments:

Odour: ☐ Yes ☐ No If yes _____
Sheen: ☐ Yes ☐ No If yes _____ Hydrocarbon-like ☐ OR Metallic-like ☐
Turbidity: Clear ☐ Very Silty

Analysis	Type	Container Size							Filtered		Preservatives
		40 mL	100 mL	250 mL	500 mL	1 L	2 L	4 L			
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		
	<input type="checkbox"/> Plastic <input type="checkbox"/> Glass								<input type="checkbox"/> Yes <input type="checkbox"/> No		

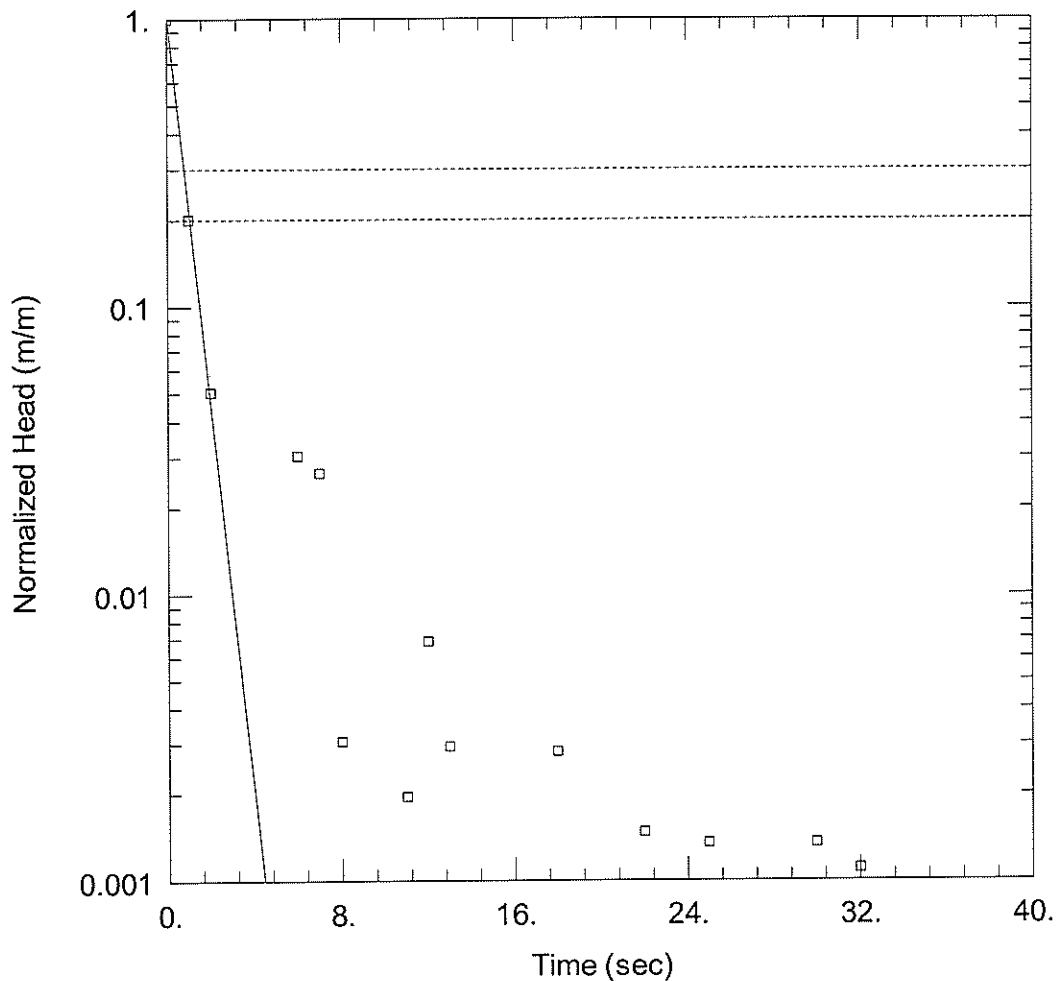
SCN No. _____ Consumables: ☐ Waterra Tubing ☐ HDPE/Teflon Tubing ☐ Groundwater Filter
Field Dup. ☐ Silicon Tubing ☐ D.O. Ampoules ☐

C:\Users\BriMacdonald\Desktop\New Forms\GW Development and Purging Sampling Data Sheet.docm



APPENDIX D

Slug Test Data



WELL TEST ANALYSIS

Data Set: \\...\DB-MW12-01 Slug Test 1.aqt

Date: 09/12/12

Time: 15:48:04

PROJECT INFORMATION

Test Well: DB-MW12-01

Test Date: 23-August-12

AQUIFER DATA

Saturated Thickness: 8.93 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (DB-MW12-01)

Initial Displacement: 0.817 m

Static Water Column Height: 8.93 m

Total Well Penetration Depth: 8.93 m

Screen Length: 3.05 m

Casing Radius: 0.025 m

Well Radius: 0.092 m

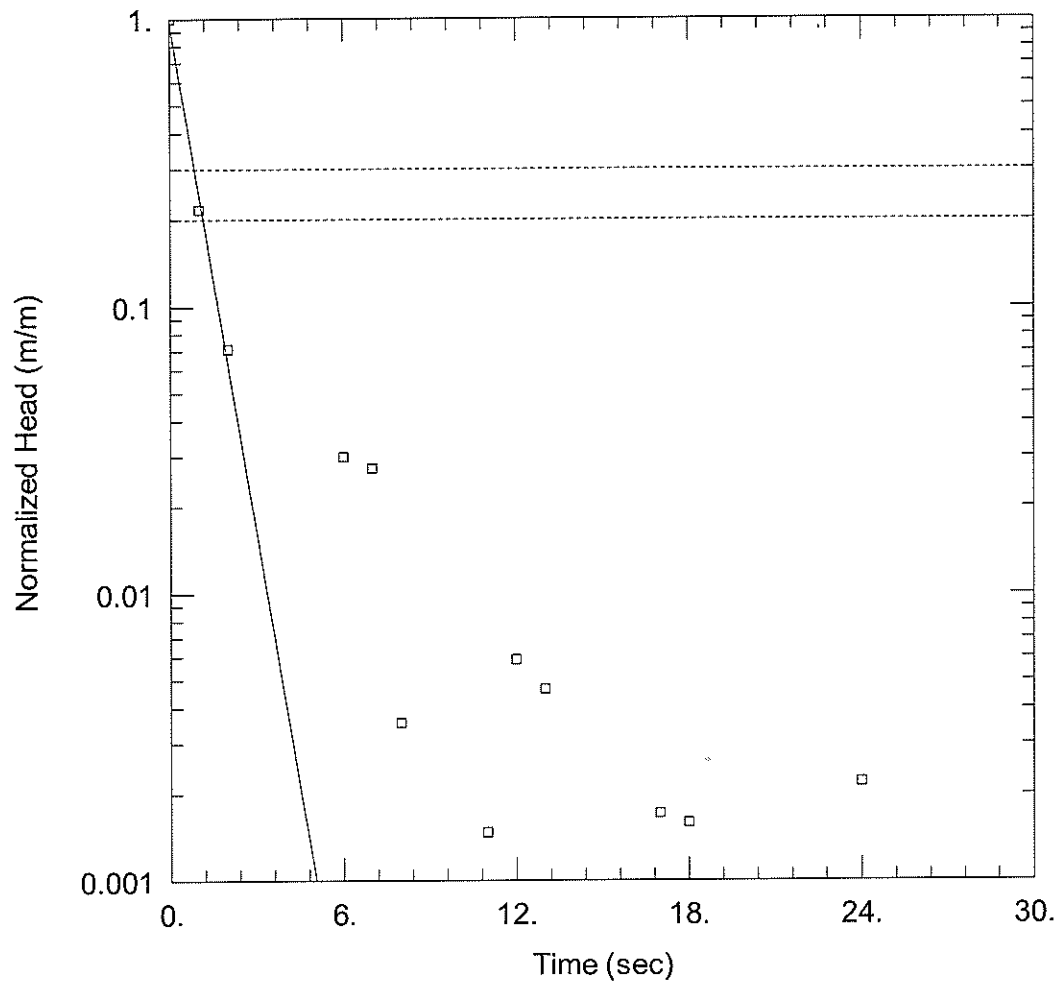
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0005319$ m/sec

$y_0 = 0.8295$ m



WELL TEST ANALYSIS

Data Set: \...\DB-MW12-01 Slug Test 2.aqt

Date: 09/12/12

Time: 15:48:31

PROJECT INFORMATION

Test Well: DB-MW12-01

Test Date: 23-August-12

AQUIFER DATA

Saturated Thickness: 8.93 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (DB-MW12-01)

Initial Displacement: 0.817 m

Static Water Column Height: 8.93 m

Total Well Penetration Depth: 8.93 m

Screen Length: 3.05 m

Casing Radius: 0.025 m

Well Radius: 0.092 m

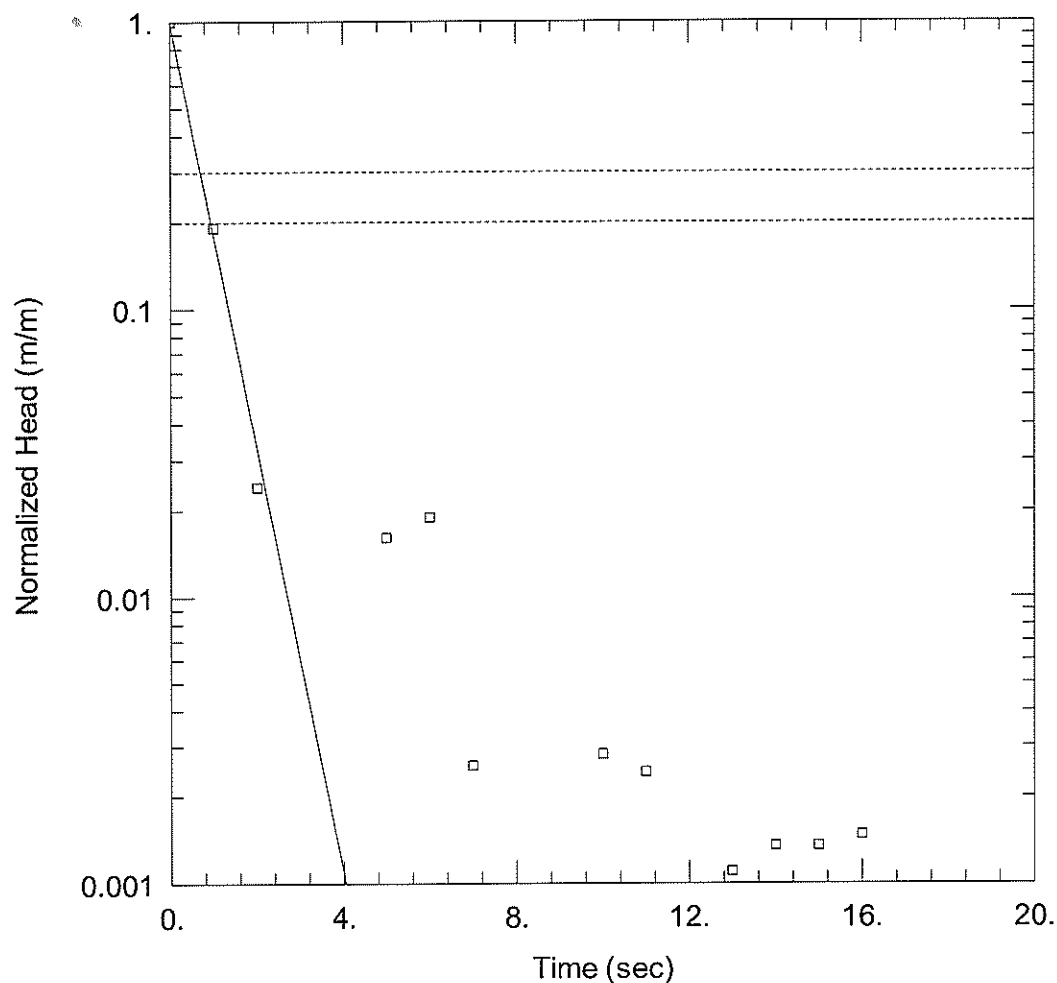
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0004614$ m/sec

$y_0 = 0.7948$ m



WELL TEST ANALYSIS

Data Set: \\...\DB-MW12-02 Slug Test 1.aqt

Date: 09/12/12

Time: 15:48:56

PROJECT INFORMATION

Test Well: DB-MW12-02

Test Date: 23-August-12

AQUIFER DATA

Saturated Thickness: 7.27 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (DB-MW12-02)

Initial Displacement: 0.817 m

Static Water Column Height: 7.27 m

Total Well Penetration Depth: 7.27 m

Screen Length: 3.05 m

Casing Radius: 0.025 m

Well Radius: 0.092 m

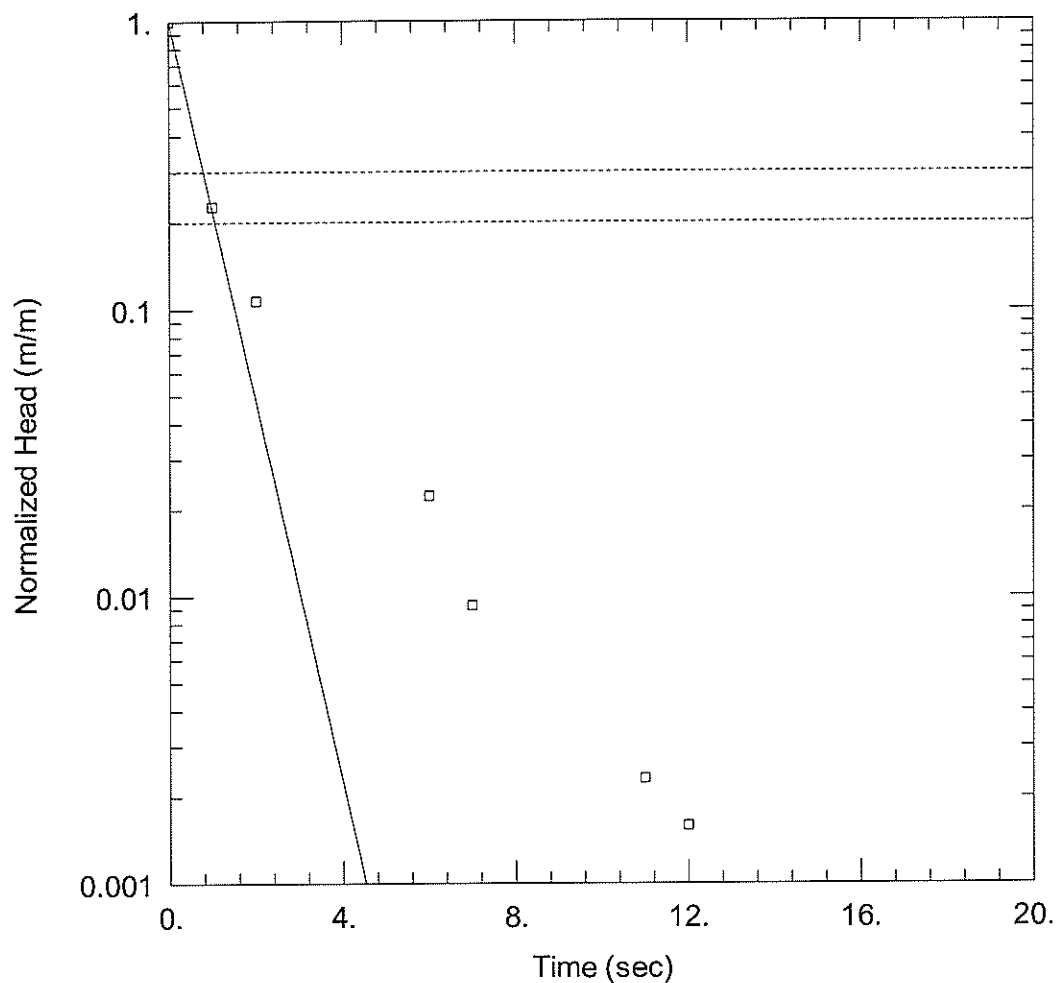
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0005576$ m/sec

$y_0 = 0.817$ m



WELL TEST ANALYSIS

Data Set: \...\DB-MW12-02 Slug Test 2.aqt

Date: 09/12/12

Time: 15:49:07

PROJECT INFORMATION

Test Well: DB-MW12-02

Test Date: 23-August-12

AQUIFER DATA

Saturated Thickness: 7.27 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (DB-MW12-02)

Initial Displacement: 0.817 m

Static Water Column Height: 7.27 m

Total Well Penetration Depth: 7.27 m

Screen Length: 3.05 m

Casing Radius: 0.025 m

Well Radius: 0.092 m

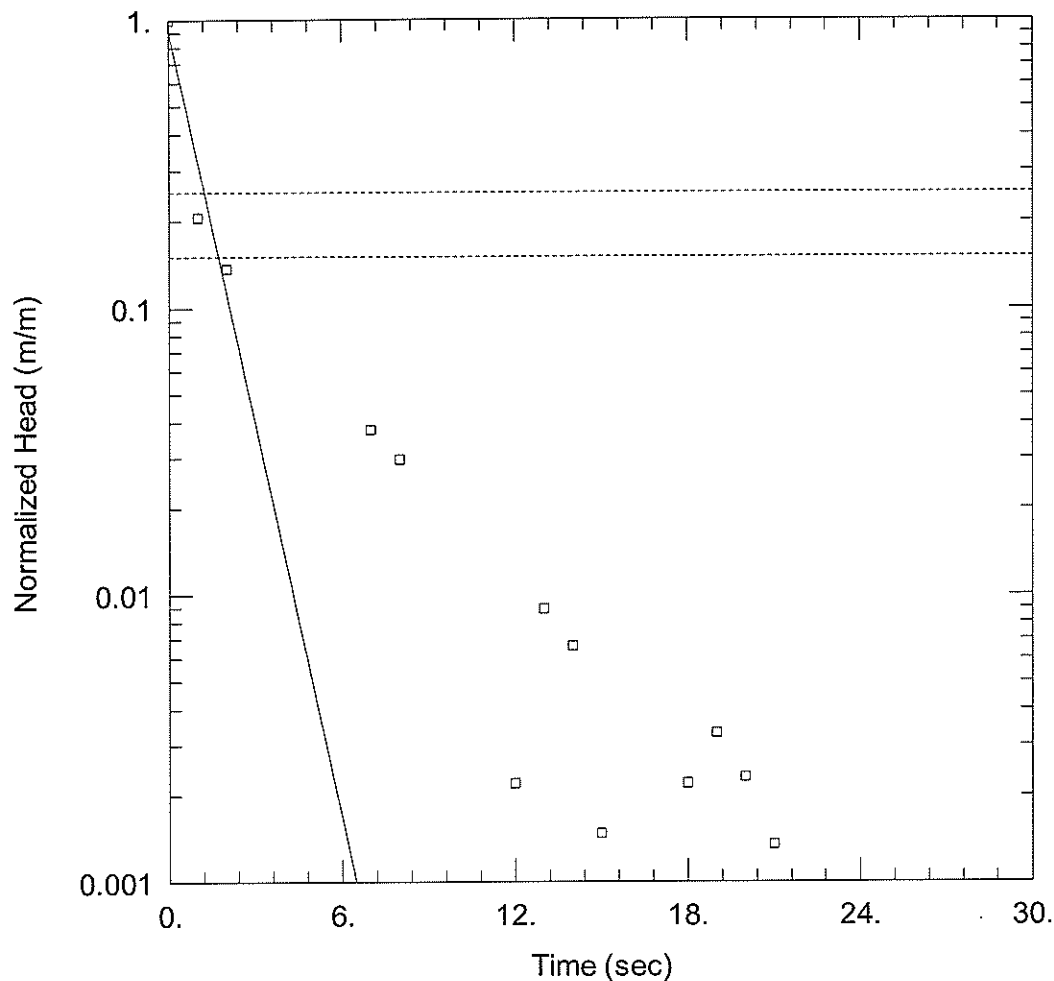
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.000497$ m/sec

$y_0 = 0.817$ m



WELL TEST ANALYSIS

Data Set: \\...\DB-MW12-03 Slug Test 2.aqt

Date: 09/12/12

Time: 15:49:30

PROJECT INFORMATION

Test Well: DB-MW12-03

Test Date: 23-August-12

AQUIFER DATA

Saturated Thickness: 9.4 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (DB-MW12-03)

Initial Displacement: 0.817 m

Static Water Column Height: 9.4 m

Total Well Penetration Depth: 9.4 m

Screen Length: 3.05 m

Casing Radius: 0.025 m

Well Radius: 0.092 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

$K = 0.0003775$ m/sec

$y_0 = 0.7451$ m

Single-well Response Test Data Sheet

☒ Rising Head

☐ Falling Head

Well No.: DB-MW12-01
 Location: DESTRUCTION BAY
 Project No.: 11-1436-0073/1900
 Completed By: A BADGER
 Date: 23-AUG-12
 Time: 14:10

MONITORING WELL INFORMATION

Depth to water below top of casing: 15.35 meters
 Depth to bottom of well below top of casing: 24.28 meters
 Distance from top of pipe to ground surface: 0.64 meters
 Well casing diameter: 0.05 meters (1 inch = 0.025 meters)
 Borehole diameter: _____ meters
 Screen length: _____ meters (1 foot = 0.3048 meters)
 Screened unit: _____ (eg: sand, silt, clay)

EQUIPMENT LIST

☒ Slug ☐ Bailer
 Mass: _____ kilograms Water column height: _____ meters
 Length: 1.5 meters Inside diameter: _____ meters
 Diameter: 0.0375 meters and/or Volume of water removed: _____ litres
 Pressure transducer serial #: 0051050342
 Sampling Interval: 1 seconds or minutes (circle one)

SINGLE-WELL RESPONSE TEST

Start time: 14:11 Finish time: 14:43

Time	Elapsed Time	Water Level (m)	Comments
<u>14:11</u>			<u>Tx IN 20 cm OFF BOTTOM</u>
<u>14:15</u>		<u>15.34</u>	<u>SLUG IN</u>
<u>14:20</u>		<u>15.35</u>	<u>SLUG OUT</u>
<u>14:26</u>			<u>SLUG IN</u>
<u>14:31</u>			<u>SLUG OUT</u>
<u>14:36</u>			<u>SLUG IN</u>
<u>14:41</u>			<u>SLUG OUT</u>
<u>14:43</u>			<u>Tx OUT</u>

* NOTE SAME WEGGLING ISSUE AS DB-MW12-03.

Single-well Response Test Data Sheet

☒ Rising Head

☒ Falling Head

Well No.: DB-MW12-02
 Location: DESTRUCTION BAY
 Project No.: 11-1436-0073/1900
 Completed By: A. BADGER
 Date: 23-AUG-12
 Time: 09:50

MONITORING WELL INFORMATION

Depth to water below top of casing: 19.98 meters
 Depth to bottom of well below top of casing: 27.25 meters
 Distance from top of pipe to ground surface: 0.77 meters
 Well casing diameter: 0.05 meters (1 inch = 0.025 meters)
 Borehole diameter: _____ meters
 Screen length: _____ meters (1 foot = 0.3048 meters)
 Screened unit: _____ (eg: sand, silt, clay)

EQUIPMENT LIST

☒ Slug ☐ Bailer
 Mass: _____ kilograms Water column height: _____ meters
 Length: 1.5 meters Inside diameter: _____ meters
 Diameter: 0.0375 meters and/or Volume of water removed: _____ litres
 Pressure transducer serial #: 005 1050342
 Sampling Interval: 1 seconds or minutes (circle one)

SINGLE-WELL RESPONSE TEST

Start time: 10:00

Finish time: 10:50

Time	Elapsed Time	Water Level (m)	Comments
10:00			TX IN - 20 cm off bottom
10:05		19.99	SLUG IN
10:10		19.99	
10:13			
10:14		19.99	SLUG OUT
10:23			SLUG IN
10:32			SLUG OUT
10:41			SLUG IN
10:50			SLUG OUT

Single-well Response Test Data Sheet

☒ Rising Head

☒ Falling Head

Well No.: DB-MW12-03
 Location: DESTRUCTION BAY
 Project No.: 11-1436-0073/1900
 Completed By: A BADGER
 Date: 23-AUG-12
 Time: 12:40

MONITORING WELL INFORMATION

Depth to water below top of casing: 17.31 meters
 Depth to bottom of well below top of casing: 26.71 meters
 Distance from top of pipe to ground surface: 0.76 meters
 Well casing diameter: 0.05 meters (1 inch = 0.025 meters)
 Borehole diameter: _____ meters
 Screen length: _____ meters (1 foot = 0.3048 meters)
 Screened unit: _____ (eg: sand, silt, clay)

EQUIPMENT LIST

☒ Slug ☐ Bailer
 Mass: _____ kilograms Water column height: _____ meters
 Length: 1.5 meters Inside diameter: _____ meters
 Diameter: 0.0375 meters and/or Volume of water removed: _____ litres
 Pressure transducer serial #: 0051050342
 Sampling Interval: 1 seconds or minutes (circle one)

SINGLE-WELL RESPONSE TEST

Start time: 12:40 Finish time: 13:13

Time	Elapsed Time	Water Level (m)	Comments
12:40			TX IN 20 cm off bottom
12:46		17.30	SLUG IN
12:51		17.30	SLUG OUT
12:56			SLUG IN
13:01			SLUG OUT
13:06			SLUG IN
13:11			SLUG OUT
13:13			TX OUT

* NOTE - WELL NOT FULLY GRADED IN CASING
 ADDITIONAL MOVEMENT WHEN MOVING SLUG
 IN/OUT. *



APPENDIX E

Analytical Reports and Chain of Custody Forms

Table E-1
Results of Water Analyses - Metals
YTG Landfill Monitoring, Watson Lake, Yukon

SCN Location QA/QC Date	Aquatic Life CSR-AW (freshwater)	Notes	L1199825-10	L1199825-11	L1199825-12	L1199825-13
			DB-MW12-01	DB-MW12-02	DB-MW12-03	DB SURFACE
			23-AUG-12	23-AUG-12	23-AUG-12	24-AUG-12
Parameters						
pH (field)			7.87	7.81	7.9	8.31
Temperature °C			5.10	4.3	5.50	10
Conductivity (uS/cm)			572	609	580	320
Dissolved Oxygen (mg/L)			-	-	-	-
Laboratory Parameters						
pH (laboratory)			8.09	8.03	8.08	8.17
Hardness (as CaCO3)			306	318	320	130
total dissolved solids			449	465	457	180
Aggregate Organics						
COD			<20	<20	<20	<20
dissolved organic carbon			1.92	<0.50	0.50	1.38
Dissolved Metals						
aluminum			<0.010	<0.010	<0.010	<0.010
antimony	0.2		<0.00050	<0.00050	<0.00050	<0.00050
arsenic	0.05		0.00021	0.00016	0.00020	0.00040
barium	10		0.034	0.026	0.028	0.025
beryllium	0.053		<0.0050	<0.0050	<0.0050	<0.0050
bismuth			<0.20	<0.20	<0.20	<0.20
boron			<0.10	<0.10	<0.10	<0.10
cadmium	0.0001 - 0.0006	H	<0.00020	<0.00020	<0.00020	<0.00020
calcium			77.6	80.9	82.5	36.5
chromium	0.010 ^{VI} , 0.090 ^{III}	V	0.0032	0.0031	0.0031	<0.0020
cobalt	0.009		<0.010	<0.010	<0.010	<0.010
copper	0.020 - 0.090	H	<0.0010	<0.0010	<0.0010	<0.0010
iron			<0.030	<0.030	<0.030	<0.030
lead	0.040 - 0.160	H	<0.00050	<0.00050	<0.00050	<0.00050
lithium			<0.010	<0.010	<0.010	<0.010
magnesium			27.3	28.1	27.7	9.53
manganese			<0.0020	<0.0020	<0.0020	<0.0020
mercury	0.001		<0.00020	<0.00020	<0.00020	<0.00020
molybdenum	10		<0.030	<0.030	<0.030	<0.030
nickel	0.250 - 1.5	H	<0.050	<0.050	<0.050	<0.050
phosphorus			<0.30	<0.30	<0.30	<0.30
potassium			1.43	1.40	1.40	2.24
selenium	0.01		0.0071	0.0073	0.0075	<0.0010
silicon			4.65	4.56	4.59	1.77
silver	0.0005 - 0.015	H	<0.010	<0.010	<0.010	<0.010
sodium			8.0	8.0	8.2	2.6
strontium			0.301	0.295	0.298	0.207
thallium	0.003		<0.20	<0.20	<0.20	<0.20
tin			<0.030	<0.030	<0.030	<0.030
titanium	1		0.011	0.011	0.011	<0.010
uranium	3		0.00053	0.00054	0.00053	0.00080
vanadium			<0.030	<0.030	<0.030	<0.030
zinc	0.075 - 2.4	H	<0.050	<0.050	<0.050	<0.050
Other Inorganics						
bicarbonate (CaCO3)			161	154	155	87.8
carbonate (CaCO3)			<2.0	<2.0	<2.0	<2.0
hydroxide (CaCO3)			<2.0	<2.0	<2.0	<2.0
total alkalinity (CaCO3)			161	154	155	87.8
ammonia	1.31 - 18.5	pH	0.0054	<0.0050	0.0054	<0.0050
chloride			<0.50	<0.50	<0.50	<0.50
fluoride	2 - 3	H	0.058	0.058	0.057	0.070
nitrate (as N)	400		0.398	0.316	0.358	0.0058
nitrite (as N)	0.2 - 2	Cl	<0.0010	<0.0010	<0.0010	<0.0010
total Kjeldahl nitrogen			0.052	<0.050	<0.050	0.069
sulphate	1000		186	195	195	56.8

Notes:

All concentrations in milligrams per litre (mg/L), unless otherwise noted.

Standards from the Yukon Contaminated Sites Regulation (CSR), from the Environment Act (O.I.C. 2002/171) its associated Schedules.

Land Use abbreviations: AW (Aquatic Life).

H = standard is Hardness dependent

CL = standard is chloride dependent

pH = standard is pH dependent

V= Standard is valence dependent VI refers to chromium VI and III refers to chromium III

T = standard varies with temperature

MCS = Most Conservative Standard

FDA = field duplicate available

FD = field duplicate

QA/QC = quality assurance/quality control

SCN = sample control number

Italics indicates standard is below detection limit.

COC = Chain of Custody

* = Samples tested for dissolved metals were unfiltered

Table E-2
Results of Water Analyses - Hydrocarbons
YTG Landfill Monitoring, Watson Lake, Yukon

SCN Location QA/QC Date	Aquatic Life CSR-AW (freshwater)	L1199825-10 DB-MW12-01	L1199825-11 DB-MW12-02	L1199825-12 DB-MW12-03	L1199825-13 DB SURFACE
	Notes	23-AUG-12	23-AUG-12	23-AUG-12	24-AUG-12
<i>Monoaromatic Hydrocarbons</i>					
benzene	4	<0.00050	<0.00050	<0.00050	<0.00050
ethylbenzene	2	<0.00050	<0.00050	<0.00050	<0.00050
styrene	0.72	<0.00050	<0.00050	<0.00050	<0.00050
toluene	0.390	<0.00050	<0.00050	<0.00050	<0.00050
ortho-xylene		<0.00050	<0.00050	<0.00050	<0.00050
meta- & para-xylene		<0.00050	<0.00050	<0.00050	<0.00050
total xylene		<0.00075	<0.00075	<0.00075	<0.00075
VHw ₆₋₁₀	15	<0.10	<0.10	<0.10	<0.10
VPHw	1.5	<0.10	<0.10	<0.10	<0.10
<i>Polycyclic Aromatic Hydrocarbons</i>					
acenaphthene		<0.000050	<0.000050	<0.000050	<0.000050
acenaphthylene		<0.000050	<0.000050	<0.000050	<0.000050
acridine	0.0005	<0.000050	<0.000050	<0.000050	<0.000050
anthracene	0.001	<0.000050	<0.000050	<0.000050	<0.000050
benzo(a)anthracene	0.001	<0.000050	<0.000050	<0.000050	<0.000050
benzo(a)pyrene	0.0001	<0.000010	<0.000010	<0.000010	<0.000010
benzo(b)fluoranthene		<0.000050	<0.000050	<0.000050	<0.000050
benzo(g,h,i)perylene		<0.000050	<0.000050	<0.000050	<0.000050
benzo(k)fluoranthene		<0.000050	<0.000050	<0.000050	<0.000050
chrysene		<0.000050	<0.000050	<0.000050	<0.000050
dibenzo(a,h)anthracene		<0.000050	<0.000050	<0.000050	<0.000050
fluoranthene	0.002	<0.000050	<0.000050	<0.000050	<0.000050
fluorene	0.12	<0.000050	<0.000050	<0.000050	<0.000050
indeno(1,2,3-c,d)pyrene		<0.000050	<0.000050	<0.000050	<0.000050
naphthalene	0.01	<0.000050	<0.000050	<0.000050	<0.000050
phenanthrene	0.003	<0.000050	<0.000050	<0.000050	<0.000050
pyrene	0.0002	<0.000050	<0.000050	<0.000050	<0.000050
quinoline	0.034	<0.000050	<0.000050	<0.000050	<0.000050
<i>Other Hydrocarbons</i>					
EPHw ₁₀₋₁₉	5	<0.25	<0.25	<0.25	<0.25
EPHw ₁₉₋₃₂		<0.25	<0.25	<0.25	<0.25
LEPHw	0.5	<0.25	<0.25	<0.25	<0.25
HEPHw		<0.25	<0.25	<0.25	<0.25
<i>Miscellaneous Organics</i>					
methyl tertiary butyl ether (MTBE)		<0.00050	<0.00050	<0.00050	<0.00050
<i>Chlorinated Hydrocarbons</i>					
bromodichloromethane (BDCM)		<0.0010	<0.0010	<0.0010	<0.0010
tribromomethane (bromoform)		<0.0010	<0.0010	<0.0010	<0.0010
tetrachloromethane (carbon tetrachloride)	0.13	<0.00050	<0.00050	<0.00050	<0.00050
monochlorobenzene (chlorobenzene)	0.013	<0.0010	<0.0010	<0.0010	<0.0010
dibromochloromethane (DBCM)		<0.0010	<0.0010	<0.0010	<0.0010
chloroethane (ethyl chloride)		<0.0010	<0.0010	<0.0010	<0.0010
trichloromethane (chloroform)	0.02	<0.0010	<0.0010	<0.0010	<0.0010
chloromethane (methyl chloride)		<0.0050	<0.0050	<0.0050	<0.0050
1,2-dichlorobenzene		<0.00070	<0.00070	<0.00070	<0.00070
1,3-dichlorobenzene	1.5	<0.0010	<0.0010	<0.0010	<0.0010
1,4-dichlorobenzene	0.26	<0.0010	<0.0010	<0.0010	<0.0010
1,1-dichloroethane		<0.0010	<0.0010	<0.0010	<0.0010
1,2-dichloroethane	1	<0.0010	<0.0010	<0.0010	<0.0010
1,1-dichloroethylene (1,1-dichloroethene)		<0.0010	<0.0010	<0.0010	<0.0010
1,2-dichloroethylene (cis) (1,2-dichloroethene (cis))		<0.0010	<0.0010	<0.0010	<0.0010
1,2-dichloroethylene (trans) (1,2-dichloroethene (trans))		<0.0010	<0.0010	<0.0010	<0.0010
1,3-dichloropropene		<0.0014	<0.0014	<0.0014	<0.0014
dichloromethane (methylene chloride)	0.98	<0.0050	<0.0050	<0.0050	<0.0050
1,2-dichloropropane (propylene dichloride)		<0.0010	<0.0010	<0.0010	<0.0010
cis-1,3-Dichloropropylene		<0.0010	<0.0010	<0.0010	<0.0010
trans-1,3-Dichloropropylene		<0.0010	<0.0010	<0.0010	<0.0010
1,1,1,2-tetrachloroethane		<0.0010	<0.0010	<0.0010	<0.0010
1,1,2,2-tetrachloroethane		<0.0010	<0.0010	<0.0010	<0.0010
tetrachloroethylene (1,1,2,2-tetrachloroethene)	1.1	<0.0010	<0.0010	<0.0010	<0.0010
1,1,1-trichloroethane		<0.0010	<0.0010	<0.0010	<0.0010
1,1,2-trichloroethane		<0.0010	<0.0010	<0.0010	<0.0010
trichloroethylene (1,1,2-trichloroethene)	0.2	<0.0010	<0.0010	<0.0010	<0.0010
trichlorofluoromethane (freon 11)		<0.0010	<0.0010	<0.0010	<0.0010
vinyl chloride (chloroethene)		<0.0010	<0.0010	<0.0010	<0.0010

Notes:

All concentrations in milligrams per litre (mg/L), unless otherwise noted.

Standards from the Yukon Contaminated Sites Regulation (CSR), from the Environment Act (O.I.C. 2002/171) its associated Schedules.

Land Use abbreviations: AW (Aquatic Life).

Italics indicates standard is below detection limit.

FDA = field duplicate available

FD = field duplicate

QA/QC = quality assurance/quality control

SCN = sample control number

COC = Chain of Custody

EPHw₁₀₋₁₉ = extractable petroleum hydrocarbons, carbon range 10-19

LEPHw = light extractable petroleum hydrocarbons

Where water use for the protection of aquatic life applies, the standards for EPHw₁₀₋₁₉ is equivalent to LEPHw, when no LEPHw analysis is undertaken.

VPHw = volatile petroleum hydrocarbons

VHw₆₋₁₀ = volatile hydrocarbons, carbon range 6-10

Where water use for the protection of aquatic life applies, the standards for VHw6-10 equivalent to VPHw, when no VPHw analysis is undertaken.

PAH = polycyclic aromatic hydrocarbon



GOLDER ASSOCIATES LTD.
ATTN: Andrea Badger
201B, 170 Titanium Way
Whitehorse YT Y1A 0G1

Date Received: 24-AUG-12
Report Date: 13-SEP-12 15:40 (MT)
Version: FINAL REV. 2

Client Phone: 867-633-6076

Certificate of Analysis

Lab Work Order #: L1199825
Project P.O. #: NOT SUBMITTED
Job Reference: 11-1436-0073/1600
C of C Numbers: 1, 2
Legal Site Desc:

Comments: This report contains missing VOC data.

Amber Springer
Account Manager

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

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-1 Ground Water 22-AUG-12 11:35 BC-MW12-01	L1199825-2 Ground Water 22-AUG-12 13:00 BC-MW12-02	L1199825-3 Ground Water 22-AUG-12 14:10 BC-MW12-03	L1199825-4 Ground Water 22-AUG-12 09:30 BC-MW12-04	L1199825-5 Ground Water 22-AUG-12 09:30 BC-MW12-05
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	160	161	157	162	163
	pH (pH)	8.01	8.08	8.01	7.91	7.96
	Total Dissolved Solids (mg/L)	220	220	209	219	224
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO ₃) (mg/L)	132	134	130	139	139
	Alkalinity, Carbonate (as CaCO ₃) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Hydroxide (as CaCO ₃) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Total (as CaCO ₃) (mg/L)	132	134	130	139	139
	Ammonia, Total (as N) (mg/L)	<0.0050	<0.0050	0.0106	<0.0050	<0.0050
	Chloride (Cl) (mg/L)	0.62	0.63	0.59	0.61	0.62
	Fluoride (F) (mg/L)	0.038	0.035	0.038	0.038	0.036
	Nitrate (as N) (mg/L)	0.275	0.283	0.305	0.337	0.337
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.051	<0.050	0.099	0.054	0.051
	Sulfate (SO ₄) (mg/L)	39.5	39.9	38.9	39.3	39.5
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	0.69	0.54	0.52	0.74	0.71
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	0.012
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.00083	0.00078	0.00089	0.00086	0.00085
	Barium (Ba)-Dissolved (mg/L)	0.025	0.021	0.023	0.024	0.024
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Dissolved (mg/L)	52.2	52.7	49.4	53.3	53.4
	Chromium (Cr)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Cobalt (Co)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Magnesium (Mg)-Dissolved (mg/L)	7.13	7.14	8.30	7.10	7.19
	Manganese (Mn)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Nickel (Ni)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-6 Surface Water 22-AUG-12 15:20 BC SURFACE	L1199825-7 Ground Water 22-AUG-12 17:00 HC-MW12-01	L1199825-8 Ground Water 22-AUG-12 18:15 HC-MW12-02	L1199825-9 Surface Water 22-AUG-12 19:30 HC SURFACE	L1199825-10 Ground Water 23-AUG-12 14:10 DB-MW12-01
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	157	68.5	60.8	220	306
	pH (pH)	8.04	7.17	7.65	7.66	8.09
	Total Dissolved Solids (mg/L)	192	106	112	328	449
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	148	67.9	59.5	216	161
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Total (as CaCO3) (mg/L)	148	67.9	59.5	216	161
	Ammonia, Total (as N) (mg/L)	0.0063	0.0074	0.0337	0.0747	0.0054
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	1.78	<0.50
	Fluoride (F) (mg/L)	0.039	0.062	0.048	0.071	0.058
	Nitrate (as N) (mg/L)	0.0512	0.106	0.243	<0.0050	0.398
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.156	0.537	0.91	0.650	0.052
	Sulfate (SO4) (mg/L)	21.5	2.48	2.72	55.8	186
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	2.28	13.6	11.8	7.00	1.92
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.043	0.091	0.081	<0.010	<0.010
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.00071	0.00043	0.00043	0.00033	0.00021
	Barium (Ba)-Dissolved (mg/L)	0.027	<0.020	0.023	0.081	0.034
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Dissolved (mg/L)	49.7	21.4	18.9	61.3	77.6
	Chromium (Cr)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0032
	Cobalt (Co)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Copper (Cu)-Dissolved (mg/L)	0.0015	0.0114	0.0096	0.0012	<0.0010
	Iron (Fe)-Dissolved (mg/L)	0.074	0.062	0.152	0.084	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Magnesium (Mg)-Dissolved (mg/L)	8.01	3.65	3.30	16.3	27.3
	Manganese (Mn)-Dissolved (mg/L)	0.0342	0.0065	0.0614	0.0326	<0.0020
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Nickel (Ni)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-11 Ground Water 23-AUG-12 11:30 DB-MW12-02	L1199825-12 Ground Water 23-AUG-12 12:30 DB-MW12-03	L1199825-13 Surface Water 24-AUG-12 09:30 DB SURFACE	L1199825-14 Ground Water 23-AUG-12 15:45 BU-MW12-01	L1199825-15 Ground Water 23-AUG-12 17:20 BU-MW12-02
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	318	320	130	351	360
	pH (pH)	8.03	8.08	8.17	8.05	7.97
	Total Dissolved Solids (mg/L)	465	457	180	490	498
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO ₃) (mg/L)	154	155	87.8	184	186
	Alkalinity, Carbonate (as CaCO ₃) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Hydroxide (as CaCO ₃) (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Alkalinity, Total (as CaCO ₃) (mg/L)	154	155	87.8	184	186
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0054	<0.0050	<0.0050	<0.0050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.058	0.057	0.070	0.054	0.061
	Nitrate (as N) (mg/L)	0.316	0.358	0.0058	0.436	0.446
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	<0.050	<0.050	0.069	<0.050	<0.050
	Sulfate (SO ₄) (mg/L)	195	195	56.8	204	205
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50	0.50	1.38	<0.50	<0.50
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.00016	0.00020	0.00040	0.00014	0.00014
	Barium (Ba)-Dissolved (mg/L)	0.026	0.028	0.025	0.060	0.060
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Dissolved (mg/L)	80.9	82.5	36.5	92.6	96.5
	Chromium (Cr)-Dissolved (mg/L)	0.0031	0.0031	<0.0020	0.0032	0.0030
	Cobalt (Co)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Copper (Cu)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Magnesium (Mg)-Dissolved (mg/L)	28.1	27.7	9.53	29.1	28.8
	Manganese (Mn)-Dissolved (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	0.0054
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Nickel (Ni)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-16 Ground Water 23-AUG-12 16:40 BU-MW12-03	L1199825-17 Surface Water 23-AUG-12 18:30 BU-SURFACE	L1199825-18 Ground Water 24-AUG-12 14:00 SC-MW12-01	L1199825-19 Ground Water 24-AUG-12 13:00 SC-MW12-02	L1199825-20 Ground Water 24-AUG-12 11:50 SC-MW12-03
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	361	365	351	223	258
	pH (pH)	8.06	8.34	7.91	8.15	8.07
	Total Dissolved Solids (mg/L)	510	486	526	345	328
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO ₃) (mg/L)	188	192	245	175	219
	Alkalinity, Carbonate (as CaCO ₃) (mg/L)	<2.0	2.7	<2.0	<2.0	<2.0
	Alkalinity, Hydroxide (as CaCO ₃) (mg/L)	<2.0	<1.0	<2.0	<2.0	<2.0
	Alkalinity, Total (as CaCO ₃) (mg/L)	188	195	245	175	219
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0057	0.0201	0.147	0.168
	Chloride (Cl) (mg/L)	<0.50	0.62	15.3	<0.50	<0.50
	Fluoride (F) (mg/L)	0.058	0.068	0.116	0.137	0.109
	Nitrate (as N) (mg/L)	0.457	0.135	0.125	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	0.0039	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.085	0.146	0.170	0.415	0.198
	Sulfate (SO ₄) (mg/L)	207	194	129	83.7	71.1
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50	1.83	1.78	1.43	<0.50
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.010	0.020	<0.010	0.010	<0.010
	Antimony (Sb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.00018	0.00056	0.00080	0.00600	0.00570
	Barium (Ba)-Dissolved (mg/L)	0.058	0.039	0.042	0.026	0.028
	Beryllium (Be)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Bismuth (Bi)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Boron (B)-Dissolved (mg/L)	<0.10	0.11	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Dissolved (mg/L)	94.9	96.2	65.3	35.8	43.6
	Chromium (Cr)-Dissolved (mg/L)	0.0034	<0.0020	<0.0020	<0.0020	<0.0020
	Cobalt (Co)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Copper (Cu)-Dissolved (mg/L)	<0.0010	0.0013	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Dissolved (mg/L)	<0.030	0.032	<0.030	<0.030	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Magnesium (Mg)-Dissolved (mg/L)	30.0	30.2	45.6	32.5	36.2
	Manganese (Mn)-Dissolved (mg/L)	0.0168	0.0106	0.0984	0.354	0.0796
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Nickel (Ni)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-21 Surface Water 24-AUG-12 14:40 SC SURFACE				
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	884				
	pH (pH)	8.09				
	Total Dissolved Solids (mg/L)	1150				
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	336				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<2.0				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<2.0				
	Alkalinity, Total (as CaCO3) (mg/L)	336				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Chloride (Cl) (mg/L)	<5.0 ^{DLA}				
	Fluoride (F) (mg/L)	<0.20 ^{DLA}				
	Nitrate (as N) (mg/L)	<0.050 ^{DLA}				
	Nitrite (as N) (mg/L)	<0.010 ^{DLA}				
	Total Kjeldahl Nitrogen (mg/L)	0.166				
	Sulfate (SO4) (mg/L)	557				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	5.95				
Dissolved Metals	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	<0.020 ^{DLA}				
	Antimony (Sb)-Dissolved (mg/L)	<0.0010 ^{DLA}				
	Arsenic (As)-Dissolved (mg/L)	0.00074				
	Barium (Ba)-Dissolved (mg/L)	0.074				
	Beryllium (Be)-Dissolved (mg/L)	<0.0050				
	Bismuth (Bi)-Dissolved (mg/L)	<0.20				
	Boron (B)-Dissolved (mg/L)	<0.20 ^{DLA}				
	Cadmium (Cd)-Dissolved (mg/L)	<0.00040 ^{DLA}				
	Calcium (Ca)-Dissolved (mg/L)	225				
	Chromium (Cr)-Dissolved (mg/L)	<0.0040 ^{DLA}				
	Cobalt (Co)-Dissolved (mg/L)	<0.010				
	Copper (Cu)-Dissolved (mg/L)	<0.0020 ^{DLA}				
	Iron (Fe)-Dissolved (mg/L)	0.076				
	Lead (Pb)-Dissolved (mg/L)	<0.0010 ^{DLA}				
	Lithium (Li)-Dissolved (mg/L)	<0.010				
	Magnesium (Mg)-Dissolved (mg/L)	78.5				
	Manganese (Mn)-Dissolved (mg/L)	0.248				
	Mercury (Hg)-Dissolved (mg/L)	<0.00020				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.030				
	Nickel (Ni)-Dissolved (mg/L)	<0.050				

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-1 Ground Water 22-AUG-12 11:35 BC-MW12-01	L1199825-2 Ground Water 22-AUG-12 13:00 BC-MW12-02	L1199825-3 Ground Water 22-AUG-12 14:10 BC-MW12-03	L1199825-4 Ground Water 22-AUG-12 09:30 BC-MW12-04	L1199825-5 Ground Water 22-AUG-12 09:30 BC-MW12-05
Grouping	Analyte					
WATER						
Dissolved Metals	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	1.28	1.27	1.47	1.33	1.36
	Selenium (Se)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silicon (Si)-Dissolved (mg/L)	6.33	6.34	6.29	6.42	6.45
	Silver (Ag)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Sodium (Na)-Dissolved (mg/L)	3.6	3.6	3.7	3.6	3.6
	Strontium (Sr)-Dissolved (mg/L)	0.167	0.170	0.171	0.167	0.168
	Thallium (Tl)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Tin (Sn)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00034	0.00032	0.00036	0.00033	0.00033
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Zinc (Zn)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Aggregate Organics	COD (mg/L)	<20	<20	<20	<20	<20
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bromodichloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Bromoform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Carbon Tetrachloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Chlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Dibromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	1,2-Dichlorobenzene (mg/L)	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070
	1,3-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,4-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	cis-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	trans-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,3-Dichloropropene (cis & trans) (mg/L)	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014
	Dichloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	1,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	cis-1,3-Dichloropropylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	trans-1,3-Dichloropropylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-16 Ground Water 23-AUG-12 16:40 BU-MW12-03	L1199825-17 Surface Water 23-AUG-12 18:30 BU-SURFACE	L1199825-18 Ground Water 24-AUG-12 14:00 SC-MW12-01	L1199825-19 Ground Water 24-AUG-12 13:00 SC-MW12-02	L1199825-20 Ground Water 24-AUG-12 11:50 SC-MW12-03
Grouping	Analyte					
WATER						
Dissolved Metals	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Dissolved (mg/L)	1.42	1.86	4.42	3.59	3.32
	Selenium (Se)-Dissolved (mg/L)	0.0084	0.0063	0.0014	<0.0010	<0.0010
	Silicon (Si)-Dissolved (mg/L)	4.18	4.93	7.01	8.05	9.85
	Silver (Ag)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Sodium (Na)-Dissolved (mg/L)	8.2	8.2	8.7	10.9	7.6
	Strontium (Sr)-Dissolved (mg/L)	0.330	0.337	0.450	0.278	0.347
	Thallium (Tl)-Dissolved (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Tin (Sn)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Titanium (Ti)-Dissolved (mg/L)	0.012	0.013	0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00061	0.00053	0.00149	0.00104	0.00077
	Vanadium (V)-Dissolved (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Zinc (Zn)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Aggregate Organics	COD (mg/L)	<20	<20	32	45	<20
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bromodichloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Bromoform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Carbon Tetrachloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Chlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Dibromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	1,2-Dichlorobenzene (mg/L)	<0.00070	<0.00070	<0.00070	<0.00070	<0.00070
	1,3-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,4-Dichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	cis-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	trans-1,2-Dichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,3-Dichloropropene (cis & trans) (mg/L)	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014
	Dichloromethane (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	1,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	cis-1,3-Dichloropropylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	trans-1,3-Dichloropropylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1199825-1	L1199825-2	L1199825-3	L1199825-4	L1199825-5
		Description	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
		Sampled Date	22-AUG-12	22-AUG-12	22-AUG-12	22-AUG-12	22-AUG-12
		Sampled Time	11:35	13:00	14:10	09:30	09:30
		Client ID	BC-MW12-01	BC-MW12-02	BC-MW12-03	BC-MW12-04	BC-MW12-05
Grouping	Analyte						
WATER							
Volatile Organic Compounds	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	
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,2,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,2-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Vinyl Chloride (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	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	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	87.3	84.8	86.0	85.6	86.2	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	85.3	85.0	84.9	85.2	84.9	
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	EPH19-32 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	LEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	HEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	113.3	104.9	105.6	103.4	105.6	
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)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	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	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1199825-6 Surface Water 22-AUG-12 15:20 BC SURFACE	L1199825-7 Ground Water 22-AUG-12 17:00 HC-MW12-01	L1199825-8 Ground Water 22-AUG-12 18:15 HC-MW12-02	L1199825-9 Surface Water 22-AUG-12 19:30 HC SURFACE	L1199825-10 Ground Water 23-AUG-12 14:10 DB-MW12-01
Grouping	Analyte						
WATER							
Volatile Organic Compounds	Ethylbenzene (mg/L)	<0.00050	<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	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1,2,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1,2-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Vinyl Chloride (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	ortho-Xylene (mg/L)	<0.00050	<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	<0.00050
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
	Surrogate: 4-Bromofluorobenzene (SS) (%)	86.4	85.4	83.5	86.5	86.6	86.6
	Surrogate: 1,4-Difluorobenzene (SS) (%)	85.1	84.9	85.5	84.9	85.4	85.4
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
	EPH19-32 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
	LEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
	HEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	101.2	108.7	99.4	104.9	101.4	101.4
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acenaphthylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acridine (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Anthracene (mg/L)	<0.000050	<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	<0.000050
	Benzo(a)pyrene (mg/L)	<0.000010	<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	<0.000050
	Benzo(g,h,i)perylene (mg/L)	<0.000050	<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	<0.000050
	Chrysene (mg/L)	<0.000050	<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	<0.000050
	Fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1199825-11	L1199825-12	L1199825-13	L1199825-14	L1199825-15
		Description	Ground Water	Ground Water	Surface Water	Ground Water	Ground Water
		Sampled Date	23-AUG-12	23-AUG-12	24-AUG-12	23-AUG-12	23-AUG-12
		Sampled Time	11:30	12:30	09:30	15:45	17:20
		Client ID	DB-MW12-02	DB-MW12-03	DB SURFACE	BU-MW12-01	BU-MW12-02
Grouping	Analyte						
WATER							
Volatile Organic Compounds	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	
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,2,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,2-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Vinyl Chloride (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	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	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	84.8	86.0	85.7	85.3	84.2	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	85.0	84.9	85.0	84.9	84.8	
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	EPH19-32 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	LEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	HEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	99.6	101.2	100.8	100.8	93.8	
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)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	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	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1199825-16	L1199825-17	L1199825-18	L1199825-19	L1199825-20
		Description	Ground Water	Surface Water	Ground Water	Ground Water	Ground Water
		Sampled Date	23-AUG-12	23-AUG-12	24-AUG-12	24-AUG-12	24-AUG-12
		Sampled Time	16:40	18:30	14:00	13:00	11:50
		Client ID	BU-MW12-03	BU-SURFACE	SC-MW12-01	SC-MW12-02	SC-MW12-03
Grouping	Analyte						
WATER							
Volatile Organic Compounds	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	
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,2,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Tetrachloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	1,1,1-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,2-Trichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Trichloroethylene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Vinyl Chloride (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	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	
	Surrogate: 4-Bromofluorobenzene (SS) (%)	83.3	83.6	83.7	84.5	83.5	
	Surrogate: 1,4-Difluorobenzene (SS) (%)	84.6	84.9	85.1	84.6	84.9	
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<1.0	<0.25	<0.25	<0.25	
	EPH19-32 (mg/L)	<0.25	<1.0	<0.25	<0.25	<0.25	
	LEPH (mg/L)	<0.25	<1.0	<0.25	<0.25	<0.25	
	HEPH (mg/L)	<0.25	<1.0	<0.25	<0.25	<0.25	
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	93.8	99.4	89.9	95.1	89.6	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Acenaphthylene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Acridine (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Anthracene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Benz(a)anthracene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Benzo(a)pyrene (mg/L)	<0.000010	<0.000040	<0.000010	<0.000010	<0.000010	
	Benzo(b)fluoranthene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Benzo(g,h,i)perylene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Benzo(k)fluoranthene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Chrysene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Dibenz(a,h)anthracene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050	
	Fluoranthene (mg/L)	<0.000050	<0.00020	<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				
		Description				
		Sampled Date				
		Sampled Time				
		Client ID				
		L1199825-21				
		Surface Water				
		24-AUG-12				
		14:40				
		SC SURFACE				
Grouping	Analyte					
WATER						
Volatile Organic Compounds	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010				
	1,1,2,2-Tetrachloroethane (mg/L)	<0.0010				
	Tetrachloroethylene (mg/L)	<0.0010				
	Toluene (mg/L)	<0.00050				
	1,1,1-Trichloroethane (mg/L)	<0.0010				
	1,1,2-Trichloroethane (mg/L)	<0.0010				
	Trichloroethylene (mg/L)	<0.0010				
	Trichlorofluoromethane (mg/L)	<0.0010				
	Vinyl Chloride (mg/L)	<0.0010				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	85.0				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	84.9				
Hydrocarbons	EPH10-19 (mg/L)	<0.25				
	EPH19-32 (mg/L)	<0.25				
	LEPH (mg/L)	<0.25				
	HEPH (mg/L)	<0.25				
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10				
	VPH (C6-C10) (mg/L)	<0.10				
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	99.0				
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				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-1 Ground Water 22-AUG-12 11:35 BC-MW12-01	L1199825-2 Ground Water 22-AUG-12 13:00 BC-MW12-02	L1199825-3 Ground Water 22-AUG-12 14:10 BC-MW12-03	L1199825-4 Ground Water 22-AUG-12 09:30 BC-MW12-04	L1199825-5 Ground Water 22-AUG-12 09:30 BC-MW12-05
Grouping	Analyte					
WATER						
Polycyclic Aromatic Hydrocarbons	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
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acenaphthene d10 (%)	91.3	90.0	92.0	92.8	95.5
	Surrogate: Acridine d9 (%)	91.9	95.4	94.1	94.4	90.4
	Surrogate: Chrysene d12 (%)	88.1	87.4	86.0	87.6	86.4
	Surrogate: Naphthalene d8 (%)	89.7	87.9	88.6	90.4	94.6
	Surrogate: Phenanthrene d10 (%)	92.2	93.4	94.0	93.6	94.2

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-6 Surface Water 22-AUG-12 15:20 BC SURFACE	L1199825-7 Ground Water 22-AUG-12 17:00 HC-MW12-01	L1199825-8 Ground Water 22-AUG-12 18:15 HC-MW12-02	L1199825-9 Surface Water 22-AUG-12 19:30 HC SURFACE	L1199825-10 Ground Water 23-AUG-12 14:10 DB-MW12-01
Grouping	Analyte					
WATER						
Polycyclic Aromatic Hydrocarbons	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
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acenaphthene d10 (%)	86.7	92.2	96.8	100.1	96.0
	Surrogate: Acridine d9 (%)	85.5	94.0	91.4	102.8	97.9
	Surrogate: Chrysene d12 (%)	82.0	85.3	89.2	92.8	91.1
	Surrogate: Naphthalene d8 (%)	86.2	89.4	93.4	103.3	92.9
	Surrogate: Phenanthrene d10 (%)	89.5	94.1	93.8	100.5	97.6

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1199825-11 Ground Water 23-AUG-12 11:30 DB-MW12-02	L1199825-12 Ground Water 23-AUG-12 12:30 DB-MW12-03	L1199825-13 Surface Water 24-AUG-12 09:30 DB SURFACE	L1199825-14 Ground Water 23-AUG-12 15:45 BU-MW12-01	L1199825-15 Ground Water 23-AUG-12 17:20 BU-MW12-02
Grouping	Analyte					
WATER						
Polycyclic Aromatic Hydrocarbons	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
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acenaphthene d10 (%)	92.6	95.7	91.4	95.9	92.0
	Surrogate: Acridine d9 (%)	93.1	98.3	101.1	98.2	91.1
	Surrogate: Chrysene d12 (%)	90.4	90.6	87.2	89.6	87.2
	Surrogate: Naphthalene d8 (%)	89.7	92.2	89.3	93.6	89.2
	Surrogate: Phenanthrene d10 (%)	94.7	99.1	95.0	98.0	94.8

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1199825-16	Ground Water	23-AUG-12	16:40	BU-MW12-03
		L1199825-17	Surface Water	23-AUG-12	18:30	BU-SURFACE
		L1199825-18	Ground Water	24-AUG-12	14:00	SC-MW12-01
		L1199825-19	Ground Water	24-AUG-12	13:00	SC-MW12-02
		L1199825-20	Ground Water	24-AUG-12	11:50	SC-MW12-03
Grouping	Analyte					
WATER						
Polycyclic Aromatic Hydrocarbons	Fluorene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050
	Naphthalene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050
	Pyrene (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050
	Quinoline (mg/L)	<0.000050	<0.00020	<0.000050	<0.000050	<0.000050
	Surrogate: Acenaphthene d10 (%)	92.3	31.6 ^{SOL:P P}	98.4	93.7	100.4
	Surrogate: Acridine d9 (%)	96.2	31.7 ^{SOL:P P}	94.5	96.5	102.4
	Surrogate: Chrysene d12 (%)	86.2	28.1 ^{SOL:P P}	90.5	82.0	91.7
	Surrogate: Naphthalene d8 (%)	88.6	15.5 ^{SOL:P P}	95.2	97.8	103.3
	Surrogate: Phenanthrene d10 (%)	95.1	32.2 ^{SOL:P P}	103.6	96.3	105.2

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID				
		Description				
		Sampled Date				
		Sampled Time				
		Client ID				
Grouping	Analyte					
WATER						
Polycyclic Aromatic Hydrocarbons	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: Acenaphthene d10 (%)	99.5				
	Surrogate: Acridine d9 (%)	102.8				
	Surrogate: Chrysene d12 (%)	92.4				
	Surrogate: Naphthalene d8 (%)	97.4				
	Surrogate: Phenanthrene d10 (%)	101.8				

* 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	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Duplicate	Chromium (Cr)-Dissolved	DLA	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Duplicate	Lead (Pb)-Dissolved	DLA	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Duplicate	Chromium (Cr)-Dissolved	DLA	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Duplicate	Lead (Pb)-Dissolved	DLA	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Duplicate	Selenium (Se)-Dissolved	DLA	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Duplicate	Zinc (Zn)-Dissolved	DLA	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Duplicate	Chloride (Cl)	DLA	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1199825-4
Matrix Spike	Sulfate (SO4)	MS-B	L1199825-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -21, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SOL:PP	Surrogate recovery outside acceptable limits due to prep process

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 "Alkalinity"
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ALK-PCT-VA	Water	Alkalinity by Auto. Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
ALK-SCR-VA	Water	Alkalinity by colour or titration	EPA 310.2 OR APHA 2320
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
OR			
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-CL-IC-WR	Water	Chloride by Ion Chromatography	EPA 300.1
This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.			
ANIONS-F-IC-WR	Water	Fluoride by Ion Chromatography	EPA 300.1

Reference Information

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

ANIONS-NO2-IC-WR Water Nitrite Nitrogen by Ion Chromatography EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.

ANIONS-NO3-IC-WR Water Nitrate Nitrogen by Ion Chromatography EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.

ANIONS-SO4-IC-WR Water Sulphate by Ion Chromatography EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

CARBONS-DOC-VA Water Dissolved organic carbon by combustion APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

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.

EPH-SF-FID-VA Water EPH in Water by GCFID BCMOE EPH GCFID

This analysis is carried out in accordance with the British Columbia Ministry of Environment, Lands and Parks (BCMELP) Analytical Method for Contaminated Sites "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 1999). The procedure involves extraction of the entire water sample with dichloromethane. The extract is then solvent exchanged to toluene and analysed by capillary column gas chromatography with flame ionization detection (GC/FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

HARDNESS-CALC-VA Water Hardness APHA 2340B

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

HG-DIS-CVAFS-VA Water Dissolved Mercury in Water by CVAFS EPA SW-846 3005A & EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

LEPH/HEPH-CALC-VA Water LEPHs and HEPHs BC MOE LABORATORY MANUAL (2005)

Light and Heavy Extractable Petroleum Hydrocarbons in water. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999).

MET-DIS-ICP-VA Water Dissolved Metals in Water by ICP-OES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-LOW-MS-VA Water Dissolved Metals in Water by ICPMS(Low) EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures involves preliminary sample treatment by filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

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.

PAH-SF-MS-VA Water PAH in Water by GCMS EPA 3510, 8270

Reference Information

The entire water sample is extracted with dichloromethane, prior to analysis by gas chromatography with mass spectrometric detection (GC/MS). Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PAH-SURR-MS-VA Water PAH Surrogates for Waters EPA 3510, 8270

Analysed as per the corresponding PAH test method. Known quantities of surrogate compounds are added prior to analysis to each sample to demonstrate analytical accuracy.

PH-MAN-WR Water pH by Meter APHA 4500-H (B)

"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."

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-HSFID-VA Water VH in Water by Headspace GCFID B.C. MIN. OF ENV. LAB. MAN. (2009)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VH-SURR-FID-VA Water VH Surrogates for Waters B.C. MIN. OF ENV. LAB. MAN. (2009)

VOC-HSMS-VA Water VOCs in water 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 transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

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 transferred 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

VPH-CALC-VA Water VPH is VH minus select aromatics BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).

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
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1 2

Reference Information

GLOSSARY OF REPORT TERMS

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

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

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

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

mg/L - milligrams per litre.

< - Less than.

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

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

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

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

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

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Client: GOLDER ASSOCIATES LTD.

201B, 170 Titanium Way
Whitehorse YT Y1A 0G1

Contact: Andrea Badger

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-PCT-VA		Water						
Batch	R2431168							
WG1540768-10 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			105.0		%		85-115	06-SEP-12
WG1540768-11 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			105.0		%		85-115	06-SEP-12
WG1540768-12 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			104.7		%		85-115	06-SEP-12
WG1540768-13 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			104.9		%		85-115	06-SEP-12
WG1540768-14 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			102.3		%		85-115	06-SEP-12
WG1540768-15 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			105.5		%		85-115	06-SEP-12
WG1540768-16 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			105.7		%		85-115	06-SEP-12
WG1540768-9 CRM		VA-ALK-PCT-CONTROL						
Alkalinity, Total (as CaCO ₃)			104.8		%		85-115	06-SEP-12
WG1540768-31 DUP		L1199825-17						
Alkalinity, Total (as CaCO ₃)		195	198		mg/L	1.5	20	06-SEP-12
Alkalinity, Bicarbonate (as CaCO ₃)		192	195		mg/L	1.2	20	06-SEP-12
Alkalinity, Carbonate (as CaCO ₃)		2.7	3.2		mg/L	18	25	06-SEP-12
Alkalinity, Hydroxide (as CaCO ₃)		<1.0	<1.0	RPD-NA	mg/L	N/A	20	06-SEP-12
WG1540768-1 MB								
Alkalinity, Total (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Bicarbonate (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
WG1540768-2 MB								
Alkalinity, Total (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Bicarbonate (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
WG1540768-3 MB								
Alkalinity, Total (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Bicarbonate (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12
WG1540768-4 MB								
Alkalinity, Total (as CaCO ₃)			<1.0		mg/L		1	06-SEP-12

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ALK-PCT-VA		Water						
Batch	R2431168							
WG1540768-4 MB								
Alkalinity, Bicarbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO3)			<1.0		mg/L		1	06-SEP-12
WG1540768-5 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Bicarbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO3)			<1.0		mg/L		1	06-SEP-12
WG1540768-6 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Bicarbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO3)			<1.0		mg/L		1	06-SEP-12
WG1540768-7 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Bicarbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO3)			<1.0		mg/L		1	06-SEP-12
WG1540768-8 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Bicarbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Carbonate (as CaCO3)			<1.0		mg/L		1	06-SEP-12
Alkalinity, Hydroxide (as CaCO3)			<1.0		mg/L		1	06-SEP-12
ALK-SCR-VA		Water						
Batch	R2426042							
WG1535785-2 CRM		VA-ALKL-CONTROL						
Alkalinity, Total (as CaCO3)			98.6		%		85-115	28-AUG-12
WG1535785-5 CRM		VA-ALKM-CONTROL						
Alkalinity, Total (as CaCO3)			104.7		%		85-115	28-AUG-12
WG1535785-11 DUP		L1199825-19						
Alkalinity, Total (as CaCO3)		175	178		mg/L	2.0	20	28-AUG-12
WG1535785-1 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	28-AUG-12
WG1535785-4 MB								
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	28-AUG-12
WG1535785-7 MB								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-SCR-VA		Water						
Batch	R2426042							
WG1535785-7	MB							
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	28-AUG-12
ANIONS-CL-IC-WR		Water						
Batch	R2430124							
WG1534216-7	DUP	L1199825-2						
Chloride (Cl)			0.63	0.61	mg/L	1.8	20	24-AUG-12
WG1534216-2	LCS							
Chloride (Cl)				102.3	%		85-115	24-AUG-12
WG1534216-6	LCS							
Chloride (Cl)				102.1	%		85-115	24-AUG-12
WG1534216-1	MB							
Chloride (Cl)				<0.50	mg/L		0.5	24-AUG-12
WG1534216-5	MB							
Chloride (Cl)				<0.50	mg/L		0.5	24-AUG-12
WG1534216-4	MS	L1199540-2						
Chloride (Cl)				102.9	%		75-125	24-AUG-12
WG1534216-8	MS	L1199825-2						
Chloride (Cl)				95.7	%		75-125	24-AUG-12
ANIONS-F-IC-WR		Water						
Batch	R2430124							
WG1534216-7	DUP	L1199825-2						
Fluoride (F)			0.035	0.035	mg/L	0.0	20	24-AUG-12
WG1534216-2	LCS							
Fluoride (F)				95.9	%		85-115	24-AUG-12
WG1534216-6	LCS							
Fluoride (F)				92.9	%		85-115	24-AUG-12
WG1534216-1	MB							
Fluoride (F)				<0.020	mg/L		0.02	24-AUG-12
WG1534216-5	MB							
Fluoride (F)				<0.020	mg/L		0.02	24-AUG-12
WG1534216-8	MS	L1199825-2						
Fluoride (F)				87.3	%		75-125	24-AUG-12
ANIONS-NO2-IC-WR		Water						
Batch	R2430124							
WG1534216-7	DUP	L1199825-2						
Nitrite (as N)			<0.0010	<0.0010	RPD-NA mg/L	N/A	20	24-AUG-12
WG1534216-2	LCS							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-NO2-IC-WR								
Batch R2430124								
WG1534216-2	LCS							
Nitrite (as N)			96.3		%		85-115	24-AUG-12
WG1534216-6	LCS							
Nitrite (as N)			102.5		%		85-115	24-AUG-12
WG1534216-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	24-AUG-12
WG1534216-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	24-AUG-12
WG1534216-8	MS	L1199825-2						
Nitrite (as N)			99.6		%		75-125	24-AUG-12
ANIONS-NO3-IC-WR								
Batch R2430124								
WG1534216-7	DUP	L1199825-2						
Nitrate (as N)		0.283	0.282		mg/L	0.4	20	24-AUG-12
WG1534216-2	LCS							
Nitrate (as N)			103.5		%		85-115	24-AUG-12
WG1534216-6	LCS							
Nitrate (as N)			103.6		%		85-115	24-AUG-12
WG1534216-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	24-AUG-12
WG1534216-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	24-AUG-12
WG1534216-4	MS	L1199540-2						
Nitrate (as N)			102.5		%		75-125	24-AUG-12
WG1534216-8	MS	L1199825-2						
Nitrate (as N)			97.2		%		75-125	24-AUG-12
ANIONS-SO4-IC-WR								
Batch R2430124								
WG1534216-7	DUP	L1199825-2						
Sulfate (SO4)		39.9	39.9		mg/L	0.1	20	24-AUG-12
WG1534216-2	LCS							
Sulfate (SO4)			103.4		%		85-115	24-AUG-12
WG1534216-6	LCS							
Sulfate (SO4)			106.3		%		85-115	24-AUG-12
WG1534216-1	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	24-AUG-12
WG1534216-5	MB							
Sulfate (SO4)			<0.50		mg/L		0.5	24-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-SO4-IC-WR								
Batch R2430124								
WG1534216-4 MS		L1199540-2						
Sulfate (SO4)			N/A	MS-B	%		-	24-AUG-12
WG1534216-8 MS		L1199825-2						
Sulfate (SO4)			92.7		%		75-125	24-AUG-12
CARBONS-DOC-VA								
Batch R2427184								
WG1537210-15 CRM		VA-DOC-C-CAFFEINE						
Dissolved Organic Carbon			99.2		%		80-120	29-AUG-12
WG1537210-2 CRM		VA-DOC-C-CAFFEINE						
Dissolved Organic Carbon			99.4		%		80-120	29-AUG-12
WG1537210-4 CRM		VA-DOC-C-CAFFEINE						
Dissolved Organic Carbon			99.9		%		80-120	29-AUG-12
WG1537210-6 CRM		VA-DOC-C-CAFFEINE						
Dissolved Organic Carbon			100.6		%		80-120	29-AUG-12
WG1537210-9 DUP		L1199825-14						
Dissolved Organic Carbon		<0.50	<0.50	RPD-NA	mg/L	N/A	20	29-AUG-12
WG1537210-1 MB			<0.50		mg/L		0.5	29-AUG-12
WG1537210-14 MB			<0.50		mg/L		0.5	29-AUG-12
WG1537210-3 MB			<0.50		mg/L		0.5	29-AUG-12
WG1537210-5 MB			<0.50		mg/L		0.5	29-AUG-12
WG1537210-10 MS		L1199896-3						
Dissolved Organic Carbon			N/A	MS-B	%		-	29-AUG-12
WG1537210-12 MS		L1199911-5						
Dissolved Organic Carbon			N/A	MS-B	%		-	29-AUG-12
Batch R2429154								
WG1539205-2 CRM		VA-DOC-C-CAFFEINE						
Dissolved Organic Carbon			95.6		%		80-120	31-AUG-12
WG1539205-4 CRM		VA-DOC-C-CAFFEINE						
Dissolved Organic Carbon			98.0		%		80-120	31-AUG-12
WG1539205-1 MB			<0.50		mg/L		0.5	31-AUG-12
WG1539205-3 MB			<0.50		mg/L		0.5	31-AUG-12
WG1539205-6 MS		L1201634-5						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CARBONS-DOC-VA								
Water								
Batch	R2429154							
WG1539205-6	MS	L1201634-5						
Dissolved Organic Carbon			N/A	MS-B	%		-	31-AUG-12
COD-COL-VA								
Water								
Batch	R2426372							
WG1536259-10	LCS							
COD			103.8		%		85-115	29-AUG-12
WG1536259-2	LCS							
COD			106.0		%		85-115	29-AUG-12
WG1536259-6	LCS							
COD			105.8		%		85-115	29-AUG-12
WG1536259-1	MB							
COD			<20		mg/L		20	29-AUG-12
WG1536259-5	MB							
COD			<20		mg/L		20	29-AUG-12
WG1536259-9	MB							
COD			<20		mg/L		20	29-AUG-12
WG1536259-12	MS	L1200185-1						
COD			94.0		%		75-125	29-AUG-12
WG1536259-4	MS	L1199717-9						
COD			104.3		%		75-125	29-AUG-12
WG1536259-8	MS	L1200103-9						
COD			104.6		%		75-125	29-AUG-12
EPH-SF-FID-VA								
Water								
Batch	R2426236							
WG1535548-1	MB							
EPH10-19			<0.25		mg/L		0.25	29-AUG-12
EPH19-32			<0.25		mg/L		0.25	29-AUG-12
Batch	R2426306							
WG1535548-3	MB							
EPH10-19			<0.25		mg/L		0.25	30-AUG-12
EPH19-32			<0.25		mg/L		0.25	30-AUG-12
HG-DIS-CVAFS-VA								
Water								
Batch	R2427021							
WG1535973-8	DUP	L1199825-12						
Mercury (Hg)-Dissolved		<0.00020	<0.000050	RPD-NA	mg/L	N/A	20	30-AUG-12
WG1537425-2	LCS							
Mercury (Hg)-Dissolved			97.4		%		80-120	30-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-DIS-CVAFS-VA		Water						
Batch	R2427021							
WG1537425-1 MB								
Mercury (Hg)-Dissolved			<0.000050		mg/L		0.00005	30-AUG-12
WG1535973-4 MS		L1199751-1						
Mercury (Hg)-Dissolved			83.0		%		70-130	30-AUG-12
WG1535973-5 MS		L1200298-2						
Mercury (Hg)-Dissolved			81.9		%		70-130	30-AUG-12
Batch	R2427960							
WG1538442-2 LCS								
Mercury (Hg)-Dissolved			94.0		%		80-120	31-AUG-12
WG1538442-1 MB								
Mercury (Hg)-Dissolved			<0.000050		mg/L		0.00005	31-AUG-12
Batch	R2429147							
WG1535973-6 MS		L1198788-2						
Mercury (Hg)-Dissolved			122.8		%		70-130	04-SEP-12
MET-DIS-ICP-VA		Water						
Batch	R2426332							
WG1535973-2 CRM		VA-HIGH-WATRM						
Beryllium (Be)-Dissolved			98.1		%		80-120	29-AUG-12
Bismuth (Bi)-Dissolved			100.0		%		80-120	29-AUG-12
Cobalt (Co)-Dissolved			96.1		%		80-120	29-AUG-12
Iron (Fe)-Dissolved			101.8		%		80-120	29-AUG-12
Lithium (Li)-Dissolved			101.7		%		80-120	29-AUG-12
Molybdenum (Mo)-Dissolved			99.6		%		80-120	29-AUG-12
Nickel (Ni)-Dissolved			98.9		%		80-120	29-AUG-12
Phosphorus (P)-Dissolved			100.5		%		80-120	29-AUG-12
Silicon (Si)-Dissolved			101.5		%		80-120	29-AUG-12
Silver (Ag)-Dissolved			100.6		%		80-120	29-AUG-12
Sodium (Na)-Dissolved			99.8		%		80-120	29-AUG-12
Strontium (Sr)-Dissolved			100.7		%		80-120	29-AUG-12
Thallium (Tl)-Dissolved			98.0		%		80-120	29-AUG-12
Tin (Sn)-Dissolved			100.5		%		80-120	29-AUG-12
Titanium (Ti)-Dissolved			104.2		%		80-120	29-AUG-12
Vanadium (V)-Dissolved			101.8		%		80-120	29-AUG-12
WG1535973-1 MB								
Beryllium (Be)-Dissolved			<0.0050		mg/L		0.005	29-AUG-12
Bismuth (Bi)-Dissolved			<0.20		mg/L		0.2	29-AUG-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-ICP-VA								
Water								
Batch	R2426332							
WG1535973-1 MB								
Cobalt (Co)-Dissolved			<0.010		mg/L		0.01	29-AUG-12
Iron (Fe)-Dissolved			<0.030		mg/L		0.03	29-AUG-12
Lithium (Li)-Dissolved			<0.010		mg/L		0.01	29-AUG-12
Molybdenum (Mo)-Dissolved			<0.030		mg/L		0.03	29-AUG-12
Nickel (Ni)-Dissolved			<0.050		mg/L		0.05	29-AUG-12
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	29-AUG-12
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-AUG-12
Silver (Ag)-Dissolved			<0.010		mg/L		0.01	29-AUG-12
Sodium (Na)-Dissolved			<2.0		mg/L		2	29-AUG-12
Strontium (Sr)-Dissolved			<0.0050		mg/L		0.005	29-AUG-12
Thallium (Tl)-Dissolved			<0.20		mg/L		0.2	29-AUG-12
Tin (Sn)-Dissolved			<0.030		mg/L		0.03	29-AUG-12
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	29-AUG-12
Vanadium (V)-Dissolved			<0.030		mg/L		0.03	29-AUG-12
Batch	R2427019							
WG1535973-4 MS		L1199751-1						
Iron (Fe)-Dissolved			105.9		%		70-130	29-AUG-12
Sodium (Na)-Dissolved			114.3		%		70-130	29-AUG-12
Titanium (Ti)-Dissolved			115.7		%		70-130	29-AUG-12
Batch	R2427206							
WG1535973-5 MS		L1200298-2						
Iron (Fe)-Dissolved			101.7		%		70-130	30-AUG-12
Sodium (Na)-Dissolved			108.5		%		70-130	30-AUG-12
Titanium (Ti)-Dissolved			119.6		%		70-130	30-AUG-12
Batch	R2427313							
WG1535973-11 DUP		L1199825-1						
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	29-AUG-12
Bismuth (Bi)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	20	29-AUG-12
Cobalt (Co)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-12
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
Lithium (Li)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-12
Molybdenum (Mo)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
Nickel (Ni)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	29-AUG-12
Phosphorus (P)-Dissolved		<0.30	<0.30	RPD-NA	mg/L	N/A	20	29-AUG-12
Silicon (Si)-Dissolved		6.33	6.30		mg/L	0.5	20	29-AUG-12

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MET-DIS-ICP-VA		Water						
Batch	R2427313							
WG1535973-11 DUP		L1199825-1						
Silver (Ag)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-12
Sodium (Na)-Dissolved		3.6	3.5		mg/L	1.0	20	29-AUG-12
Strontium (Sr)-Dissolved		0.167	0.166		mg/L	0.7	20	29-AUG-12
Thallium (Tl)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	20	29-AUG-12
Tin (Sn)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-12
Vanadium (V)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
WG1535973-8 DUP		L1199825-12						
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	29-AUG-12
Bismuth (Bi)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	20	29-AUG-12
Cobalt (Co)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-12
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
Lithium (Li)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-12
Molybdenum (Mo)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
Nickel (Ni)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	29-AUG-12
Phosphorus (P)-Dissolved		<0.30	<0.30	RPD-NA	mg/L	N/A	20	29-AUG-12
Silicon (Si)-Dissolved		4.59	4.59		mg/L	0.1	20	29-AUG-12
Silver (Ag)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	29-AUG-12
Sodium (Na)-Dissolved		8.2	8.2		mg/L	0.2	20	29-AUG-12
Strontium (Sr)-Dissolved		0.298	0.300		mg/L	0.7	20	29-AUG-12
Thallium (Tl)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	20	29-AUG-12
Tin (Sn)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
Titanium (Ti)-Dissolved		0.011	0.011		mg/L	2.0	20	29-AUG-12
Vanadium (V)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	20	29-AUG-12
WG1535973-3 MS		L1199825-13						
Iron (Fe)-Dissolved			96.2		%		70-130	29-AUG-12
Sodium (Na)-Dissolved			103.8		%		70-130	29-AUG-12
Titanium (Ti)-Dissolved			107.0		%		70-130	29-AUG-12
MET-DIS-LOW-MS-VA		Water						
Batch	R2427074							
WG1535973-4 MS		L1199751-1						
Aluminum (Al)-Dissolved			95.9		%		70-130	29-AUG-12
Antimony (Sb)-Dissolved			97.0		%		70-130	29-AUG-12
Arsenic (As)-Dissolved			107.2		%		70-130	29-AUG-12
Barium (Ba)-Dissolved			N/A	MS-B	%		-	29-AUG-12

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MET-DIS-LOW-MS-VA		Water						
Batch R2427074								
WG1535973-4 MS		L1199751-1						
Boron (B)-Dissolved			94.2		%		70-130	29-AUG-12
Cadmium (Cd)-Dissolved			102.8		%		70-130	29-AUG-12
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	29-AUG-12
Chromium (Cr)-Dissolved			99.1		%		70-130	29-AUG-12
Copper (Cu)-Dissolved			99.98		%		70-130	29-AUG-12
Lead (Pb)-Dissolved			96.9		%		70-130	29-AUG-12
Magnesium (Mg)-Dissolved			87.2		%		70-130	29-AUG-12
Manganese (Mn)-Dissolved			110.5		%		70-130	29-AUG-12
Potassium (K)-Dissolved			99.5		%		70-130	29-AUG-12
Selenium (Se)-Dissolved			106.4		%		70-130	29-AUG-12
Uranium (U)-Dissolved			97.2		%		70-130	29-AUG-12
Zinc (Zn)-Dissolved			100.1		%		70-130	29-AUG-12
Batch R2427075								
WG1535973-1 MB								
Aluminum (Al)-Dissolved			<0.0030		mg/L		0.003	29-AUG-12
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-12
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-AUG-12
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-12
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-AUG-12
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-12
Calcium (Ca)-Dissolved			<0.020		mg/L		0.02	29-AUG-12
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	29-AUG-12
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	29-AUG-12
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-12
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	29-AUG-12
Manganese (Mn)-Dissolved			<0.000050		mg/L		0.00005	29-AUG-12
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-AUG-12
Selenium (Se)-Dissolved			<0.0010		mg/L		0.001	29-AUG-12
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-AUG-12
Zinc (Zn)-Dissolved			<0.0030		mg/L		0.003	29-AUG-12
Batch R2427170								
WG1535973-2 CRM		VA-HIGH-WATRM						
Aluminum (Al)-Dissolved			100.1		%		80-120	29-AUG-12
Antimony (Sb)-Dissolved			100.6		%		80-120	29-AUG-12

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MET-DIS-LOW-MS-VA		Water						
Batch	R2427170							
WG1535973-2 CRM		VA-HIGH-WATRM						
Arsenic (As)-Dissolved			103.3		%		80-120	29-AUG-12
Barium (Ba)-Dissolved			99.1		%		80-120	29-AUG-12
Boron (B)-Dissolved			96.8		%		80-120	29-AUG-12
Cadmium (Cd)-Dissolved			102.5		%		80-120	29-AUG-12
Calcium (Ca)-Dissolved			98.8		%		80-120	29-AUG-12
Chromium (Cr)-Dissolved			103.9		%		80-120	29-AUG-12
Copper (Cu)-Dissolved			97.7		%		80-120	29-AUG-12
Lead (Pb)-Dissolved			101.4		%		80-120	29-AUG-12
Magnesium (Mg)-Dissolved			103.4		%		80-120	29-AUG-12
Manganese (Mn)-Dissolved			101.1		%		80-120	29-AUG-12
Potassium (K)-Dissolved			102.3		%		80-120	29-AUG-12
Selenium (Se)-Dissolved			100.2		%		80-120	29-AUG-12
Uranium (U)-Dissolved			101.2		%		80-120	29-AUG-12
Zinc (Zn)-Dissolved			99.9		%		80-120	29-AUG-12
Batch	R2427183							
WG1535973-11 DUP		L1199825-1						
Aluminum (Al)-Dissolved		<0.010	<0.0030	RPD-NA	mg/L	N/A	20	29-AUG-12
Antimony (Sb)-Dissolved		<0.00050	<0.00010	RPD-NA	mg/L	N/A	20	29-AUG-12
Arsenic (As)-Dissolved		0.00083	0.00080		mg/L	4.0	20	29-AUG-12
Barium (Ba)-Dissolved		0.025	0.0251		mg/L	1.0	20	29-AUG-12
Boron (B)-Dissolved		<0.10	0.020		mg/L	1.3	20	29-AUG-12
Cadmium (Cd)-Dissolved		<0.00020	<0.000050	RPD-NA	mg/L	N/A	20	29-AUG-12
Calcium (Ca)-Dissolved		52.2	51.4		mg/L	1.5	20	29-AUG-12
Chromium (Cr)-Dissolved		<0.0020	0.00054		mg/L	7.8	20	29-AUG-12
Copper (Cu)-Dissolved		<0.0010	<0.00050	RPD-NA	mg/L	N/A	20	29-AUG-12
Lead (Pb)-Dissolved		<0.00050	<0.000050	RPD-NA	mg/L	N/A	20	29-AUG-12
Magnesium (Mg)-Dissolved		7.13	7.11		mg/L	0.3	20	29-AUG-12
Manganese (Mn)-Dissolved		<0.0020	0.000225		mg/L	6.0	20	29-AUG-12
Potassium (K)-Dissolved		1.28	1.27		mg/L	0.4	20	29-AUG-12
Selenium (Se)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	29-AUG-12
Uranium (U)-Dissolved		0.00034	0.000327		mg/L	3.8	20	29-AUG-12
Zinc (Zn)-Dissolved		<0.050	<0.0030	RPD-NA	mg/L	N/A	20	29-AUG-12
WG1535973-8 DUP		L1199825-12						
Aluminum (Al)-Dissolved		<0.010	<0.0030	RPD-NA	mg/L	N/A	20	29-AUG-12
Antimony (Sb)-Dissolved		<0.00050	<0.00010	RPD-NA	mg/L	N/A	20	29-AUG-12

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MET-DIS-LOW-MS-VA		Water						
Batch	R2427183							
WG1535973-8	DUP	L1199825-12						
Arsenic (As)-Dissolved		0.00020	0.00018		mg/L	13	20	29-AUG-12
Barium (Ba)-Dissolved		0.028	0.0276		mg/L	1.0	20	29-AUG-12
Boron (B)-Dissolved		<0.10	0.091		mg/L	0.8	20	29-AUG-12
Cadmium (Cd)-Dissolved		<0.00020	<0.000050	RPD-NA	mg/L	N/A	20	29-AUG-12
Calcium (Ca)-Dissolved		82.5	82.4		mg/L	0.1	20	29-AUG-12
Chromium (Cr)-Dissolved		0.0031	0.00304		mg/L	3.5	20	29-AUG-12
Copper (Cu)-Dissolved		<0.0010	<0.00050	RPD-NA	mg/L	N/A	20	29-AUG-12
Lead (Pb)-Dissolved		<0.00050	<0.000050	RPD-NA	mg/L	N/A	20	29-AUG-12
Magnesium (Mg)-Dissolved		27.7	28.4		mg/L	2.3	20	29-AUG-12
Manganese (Mn)-Dissolved		<0.0020	0.00109		mg/L	1.0	20	29-AUG-12
Potassium (K)-Dissolved		1.40	1.39		mg/L	0.4	20	29-AUG-12
Selenium (Se)-Dissolved		0.0075	0.0075		mg/L	0.4	20	29-AUG-12
Uranium (U)-Dissolved		0.00053	0.000519		mg/L	2.3	20	29-AUG-12
Zinc (Zn)-Dissolved		<0.050	<0.0030	RPD-NA	mg/L	N/A	20	29-AUG-12
WG1535973-3	MS	L1199825-13						
Aluminum (Al)-Dissolved			119.8		%		70-130	29-AUG-12
Antimony (Sb)-Dissolved			105.6		%		70-130	29-AUG-12
Arsenic (As)-Dissolved			124.0		%		70-130	29-AUG-12
Barium (Ba)-Dissolved			N/A	MS-B	%		-	29-AUG-12
Boron (B)-Dissolved			94.7		%		70-130	29-AUG-12
Cadmium (Cd)-Dissolved			122.1		%		70-130	29-AUG-12
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	29-AUG-12
Chromium (Cr)-Dissolved			118.0		%		70-130	29-AUG-12
Copper (Cu)-Dissolved			119.7		%		70-130	29-AUG-12
Lead (Pb)-Dissolved			102.7		%		70-130	29-AUG-12
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	29-AUG-12
Manganese (Mn)-Dissolved			117.0		%		70-130	29-AUG-12
Selenium (Se)-Dissolved			97.2		%		70-130	29-AUG-12
Uranium (U)-Dissolved			84.3		%		70-130	29-AUG-12
Zinc (Zn)-Dissolved			117.3		%		70-130	29-AUG-12
NH3-F-VA		Water						
Batch	R2427382							
WG1537645-10	CRM	VA-NH3-F						
Ammonia, Total (as N)			99.6		%		85-115	30-AUG-12
WG1537645-2	CRM	VA-NH3-F						

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NH3-F-VA		Water						
Batch	R2427382							
WG1537645-2 CRM		VA-NH3-F						
Ammonia, Total (as N)			102.9		%		85-115	30-AUG-12
WG1537645-4 CRM		VA-NH3-F						
Ammonia, Total (as N)			95.4		%		85-115	30-AUG-12
WG1537645-6 CRM		VA-NH3-F						
Ammonia, Total (as N)			99.5		%		85-115	30-AUG-12
WG1537645-8 CRM		VA-NH3-F						
Ammonia, Total (as N)			100.2		%		85-115	30-AUG-12
WG1537645-11 DUP		L1199825-21						
Ammonia, Total (as N)		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	30-AUG-12
WG1537645-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-12
WG1537645-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-12
WG1537645-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-12
WG1537645-7 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-12
WG1537645-9 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	30-AUG-12
WG1537645-12 MS		L1199825-21						
Ammonia, Total (as N)			95.6		%		75-125	30-AUG-12
WG1537645-14 MS		L1200094-1						
Ammonia, Total (as N)			99.5		%		75-125	30-AUG-12
PAH-SF-MS-VA		Water						
Batch	R2427369							
WG1535548-2 LCS								
Acenaphthene			91.5		%		60-130	30-AUG-12
Acenaphthylene			91.6		%		60-130	30-AUG-12
Acridine			88.2		%		60-130	30-AUG-12
Anthracene			93.3		%		60-130	30-AUG-12
Benz(a)anthracene			88.5		%		60-130	30-AUG-12
Benzo(a)pyrene			82.1		%		60-130	30-AUG-12
Benzo(b)fluoranthene			79.7		%		60-130	30-AUG-12
Benzo(g,h,i)perylene			96.6		%		60-130	30-AUG-12
Benzo(k)fluoranthene			102.4		%		60-130	30-AUG-12
Chrysene			101.6		%		60-130	30-AUG-12

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PAH-SF-MS-VA		Water						
Batch	R2427369							
WG1535548-2	LCS							
Dibenz(a,h)anthracene			93.0		%		60-130	30-AUG-12
Fluoranthene			94.7		%		60-130	30-AUG-12
Fluorene			90.1		%		60-130	30-AUG-12
Indeno(1,2,3-c,d)pyrene			87.9		%		60-130	30-AUG-12
Naphthalene			86.8		%		50-130	30-AUG-12
Phenanthrene			94.4		%		60-130	30-AUG-12
Pyrene			93.6		%		60-130	30-AUG-12
Quinoline			91.2		%		60-130	30-AUG-12
WG1535548-1	MB							
Acenaphthene			<0.000050		mg/L		0.00005	30-AUG-12
Acenaphthylene			<0.000050		mg/L		0.00005	30-AUG-12
Acridine			<0.000050		mg/L		0.00005	30-AUG-12
Anthracene			<0.000050		mg/L		0.00005	30-AUG-12
Benz(a)anthracene			<0.000050		mg/L		0.00005	30-AUG-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	30-AUG-12
Benzo(b)fluoranthene			<0.000050		mg/L		0.00005	30-AUG-12
Benzo(g,h,i)perylene			<0.000050		mg/L		0.00005	30-AUG-12
Benzo(k)fluoranthene			<0.000050		mg/L		0.00005	30-AUG-12
Chrysene			<0.000050		mg/L		0.00005	30-AUG-12
Dibenz(a,h)anthracene			<0.000050		mg/L		0.00005	30-AUG-12
Fluoranthene			<0.000050		mg/L		0.00005	30-AUG-12
Fluorene			<0.000050		mg/L		0.00005	30-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.000050		mg/L		0.00005	30-AUG-12
Naphthalene			<0.000050		mg/L		0.00005	30-AUG-12
Phenanthrene			<0.000050		mg/L		0.00005	30-AUG-12
Pyrene			<0.000050		mg/L		0.00005	30-AUG-12
Quinoline			<0.000050		mg/L		0.00005	30-AUG-12
WG1535548-3	MB							
Acenaphthene			<0.000050		mg/L		0.00005	30-AUG-12
Acenaphthylene			<0.000050		mg/L		0.00005	30-AUG-12
Acridine			<0.000050		mg/L		0.00005	30-AUG-12
Anthracene			<0.000050		mg/L		0.00005	30-AUG-12
Benz(a)anthracene			<0.000050		mg/L		0.00005	30-AUG-12
Benzo(a)pyrene			<0.000010		mg/L		0.00001	30-AUG-12
Benzo(b)fluoranthene			<0.000050		mg/L		0.00005	30-AUG-12

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PAH-SF-MS-VA								
Batch R2427369								
WG1535548-3 MB								
Benzo(g,h,i)perylene			<0.000050		mg/L		0.00005	30-AUG-12
Benzo(k)fluoranthene			<0.000050		mg/L		0.00005	30-AUG-12
Chrysene			<0.000050		mg/L		0.00005	30-AUG-12
Dibenz(a,h)anthracene			<0.000050		mg/L		0.00005	30-AUG-12
Fluoranthene			<0.000050		mg/L		0.00005	30-AUG-12
Fluorene			<0.000050		mg/L		0.00005	30-AUG-12
Indeno(1,2,3-c,d)pyrene			<0.000050		mg/L		0.00005	30-AUG-12
Naphthalene			<0.000050		mg/L		0.00005	30-AUG-12
Phenanthrene			<0.000050		mg/L		0.00005	30-AUG-12
Pyrene			<0.000050		mg/L		0.00005	30-AUG-12
Quinoline			<0.000050		mg/L		0.00005	30-AUG-12
PH-MAN-WR								
Batch R2430231								
WG1534970-4 DUP		L1199825-1						
pH		8.01	8.02		pH	0.1	25	27-AUG-12
WG1534970-1 LCS								
pH			99.9		%		70-130	27-AUG-12
WG1534970-3 LCS								
pH			99.9		%		70-130	27-AUG-12
TDS-VA								
Batch R2427807								
WG1536565-6 DUP		L1199825-15						
Total Dissolved Solids		498	510		mg/L	2.5	20	29-AUG-12
WG1536565-2 LCS								
Total Dissolved Solids			104.4		%		85-115	29-AUG-12
WG1536565-5 LCS								
Total Dissolved Solids			101.3		%		85-115	29-AUG-12
WG1536565-1 MB								
Total Dissolved Solids			<10		mg/L		10	29-AUG-12
WG1536565-4 MB								
Total Dissolved Solids			<10		mg/L		10	29-AUG-12
TKN-F-VA								
Batch R2427212								
WG1536242-3 DUP		L1199825-10						
Total Kjeldahl Nitrogen		0.052	0.074	J	mg/L	0.022	0.1	30-AUG-12
WG1536242-2 LCS								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-F-VA		Water						
Batch	R2427212							
WG1536242-2	LCS							
Total Kjeldahl Nitrogen			98.7		%		75-125	30-AUG-12
WG1536242-5	LCS							
Total Kjeldahl Nitrogen			93.2		%		75-125	30-AUG-12
WG1536242-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-AUG-12
WG1536242-4	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-AUG-12
VH-HSFID-VA		Water						
Batch	R2426189							
WG1537421-3	DUP	L1199825-21						
Volatile Hydrocarbons (VH6-10)		<0.10	<0.10	RPD-NA	mg/L	N/A	50	31-AUG-12
WG1537421-2	LCS							
Volatile Hydrocarbons (VH6-10)			105.7		%		70-130	31-AUG-12
WG1537421-1	MB							
Volatile Hydrocarbons (VH6-10)			<0.10		mg/L		0.1	31-AUG-12
VOC-HSMS-VA		Water						
Batch	R2428608							
WG1544270-3	DUP	L1199825-21						
Bromodichloromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Bromoform		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Carbon Tetrachloride		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	12-SEP-12
Chlorobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Dibromochloromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Chloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-SEP-12
Chloroform		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Chloromethane		<0.0050	<0.0050	RPD-NA	mg/L	N/A	50	12-SEP-12
1,2-Dichlorobenzene		<0.00070	<0.00070	RPD-NA	mg/L	N/A	30	12-SEP-12
1,3-Dichlorobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,4-Dichlorobenzene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,1-Dichloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,2-Dichloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,1-Dichloroethylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
cis-1,2-Dichloroethylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
trans-1,2-Dichloroethylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Dichloromethane		<0.0050	<0.0050	RPD-NA	mg/L	N/A	50	12-SEP-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HSMS-VA		Water						
Batch	R2428608							
WG1544270-3	DUP	L1199825-21						
1,2-Dichloropropane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
cis-1,3-Dichloropropylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
trans-1,3-Dichloropropylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,1,1,2-Tetrachloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,1,2,2-Tetrachloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Tetrachloroethylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,1,1-Trichloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
1,1,2-Trichloroethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Trichloroethylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	12-SEP-12
Trichlorofluoromethane		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-SEP-12
Vinyl Chloride		<0.0010	<0.0010	RPD-NA	mg/L	N/A	50	12-SEP-12
WG1544270-2	LCS							
Bromodichloromethane			87.1		%		70-130	12-SEP-12
Bromoform			100.4		%		70-130	12-SEP-12
Carbon Tetrachloride			100.8		%		70-130	12-SEP-12
Chlorobenzene			96.4		%		70-130	12-SEP-12
Dibromochloromethane			100.0		%		70-130	12-SEP-12
Chloroethane			84.5		%		60-140	12-SEP-12
Chloroform			89.2		%		70-130	12-SEP-12
Chloromethane			74.1		%		60-140	12-SEP-12
1,2-Dichlorobenzene			96.9		%		70-130	12-SEP-12
1,3-Dichlorobenzene			98.3		%		70-130	12-SEP-12
1,4-Dichlorobenzene			96.6		%		70-130	12-SEP-12
1,1-Dichloroethane			82.0		%		70-130	12-SEP-12
1,2-Dichloroethane			78.2		%		70-130	12-SEP-12
1,1-Dichloroethylene			71.2		%		70-130	12-SEP-12
cis-1,2-Dichloroethylene			94.3		%		70-130	12-SEP-12
trans-1,2-Dichloroethylene			80.1		%		70-130	12-SEP-12
Dichloromethane			83.3		%		60-140	12-SEP-12
1,2-Dichloropropane			84.5		%		70-130	12-SEP-12
cis-1,3-Dichloropropylene			87.3		%		70-130	12-SEP-12
trans-1,3-Dichloropropylene			80.5		%		70-130	12-SEP-12
1,1,1,2-Tetrachloroethane			104.2		%		70-130	12-SEP-12
1,1,2,2-Tetrachloroethane			81.6		%		70-130	12-SEP-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HSMS-VA		Water						
Batch	R2428608							
WG1544270-2	LCS							
Tetrachloroethylene			105.0		%		70-130	12-SEP-12
1,1,1-Trichloroethane			94.1		%		70-130	12-SEP-12
1,1,2-Trichloroethane			89.1		%		70-130	12-SEP-12
Trichloroethylene			105.6		%		70-130	12-SEP-12
Trichlorofluoromethane			100.7		%		60-140	12-SEP-12
Vinyl Chloride			83.1		%		60-140	12-SEP-12
WG1544270-1	MB							
Bromodichloromethane			<0.0010		mg/L		0.001	12-SEP-12
Bromoform			<0.0010		mg/L		0.001	12-SEP-12
Carbon Tetrachloride			<0.00050		mg/L		0.0005	12-SEP-12
Chlorobenzene			<0.0010		mg/L		0.001	12-SEP-12
Dibromochloromethane			<0.0010		mg/L		0.001	12-SEP-12
Chloroethane			<0.0010		mg/L		0.001	12-SEP-12
Chloroform			<0.0010		mg/L		0.001	12-SEP-12
Chloromethane			<0.0050		mg/L		0.005	12-SEP-12
1,2-Dichlorobenzene			<0.00070		mg/L		0.0007	12-SEP-12
1,3-Dichlorobenzene			<0.0010		mg/L		0.001	12-SEP-12
1,4-Dichlorobenzene			<0.0010		mg/L		0.001	12-SEP-12
1,1-Dichloroethane			<0.0010		mg/L		0.001	12-SEP-12
1,2-Dichloroethane			<0.0010		mg/L		0.001	12-SEP-12
1,1-Dichloroethylene			<0.0010		mg/L		0.001	12-SEP-12
cis-1,2-Dichloroethylene			<0.0010		mg/L		0.001	12-SEP-12
trans-1,2-Dichloroethylene			<0.0010		mg/L		0.001	12-SEP-12
Dichloromethane			<0.0050		mg/L		0.005	12-SEP-12
1,2-Dichloropropane			<0.0010		mg/L		0.001	12-SEP-12
cis-1,3-Dichloropropylene			<0.0010		mg/L		0.001	12-SEP-12
trans-1,3-Dichloropropylene			<0.0010		mg/L		0.001	12-SEP-12
1,1,1,2-Tetrachloroethane			<0.0010		mg/L		0.001	12-SEP-12
1,1,2,2-Tetrachloroethane			<0.0010		mg/L		0.001	12-SEP-12
Tetrachloroethylene			<0.0010		mg/L		0.001	12-SEP-12
1,1,1-Trichloroethane			<0.0010		mg/L		0.001	12-SEP-12
1,1,2-Trichloroethane			<0.0010		mg/L		0.001	12-SEP-12
Trichloroethylene			<0.0010		mg/L		0.001	12-SEP-12
Trichlorofluoromethane			<0.0010		mg/L		0.001	12-SEP-12

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-HSMS-VA								
Water								
Batch	R2428608							
WG1544270-1	MB							
Vinyl Chloride			<0.0010		mg/L		0.001	12-SEP-12
VOC7-HSMS-VA								
Water								
Batch	R2425830							
WG1537421-3	DUP	L1199825-21						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	30-AUG-12
Ethylbenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	30-AUG-12
Methyl t-butyl ether (MTBE)		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	30-AUG-12
Styrene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	30-AUG-12
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	30-AUG-12
meta- & para-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	30-AUG-12
ortho-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	30-AUG-12
WG1537421-2	LCS							
Benzene			103.5		%		70-130	30-AUG-12
Ethylbenzene			102.1		%		70-130	30-AUG-12
Methyl t-butyl ether (MTBE)			102.8		%		70-130	30-AUG-12
Styrene			103.3		%		70-130	30-AUG-12
Toluene			101.8		%		70-130	30-AUG-12
meta- & para-Xylene			101.1		%		70-130	30-AUG-12
ortho-Xylene			103.3		%		70-130	30-AUG-12
WG1537421-1	MB							
Benzene			<0.00050		mg/L		0.0005	30-AUG-12
Ethylbenzene			<0.00050		mg/L		0.0005	30-AUG-12
Methyl t-butyl ether (MTBE)			<0.00050		mg/L		0.0005	30-AUG-12
Styrene			<0.00050		mg/L		0.0005	30-AUG-12
Toluene			<0.00050		mg/L		0.0005	30-AUG-12
meta- & para-Xylene			<0.00050		mg/L		0.0005	30-AUG-12
ortho-Xylene			<0.00050		mg/L		0.0005	30-AUG-12

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Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter							
	1	22-AUG-12 11:35	27-AUG-12 15:48	24	124	hours	EHTR
	2	22-AUG-12 13:00	27-AUG-12 15:48	24	123	hours	EHTR
	3	22-AUG-12 14:10	27-AUG-12 15:48	24	122	hours	EHTR
	4	22-AUG-12 09:30	27-AUG-12 15:48	24	126	hours	EHTR
	5	22-AUG-12 09:30	27-AUG-12 15:48	24	126	hours	EHTR
	6	22-AUG-12 15:20	27-AUG-12 15:48	24	120	hours	EHTR
	7	22-AUG-12 17:00	27-AUG-12 15:48	24	119	hours	EHTR
	8	22-AUG-12 18:15	27-AUG-12 15:48	24	118	hours	EHTR
	9	22-AUG-12 19:30	27-AUG-12 15:48	24	116	hours	EHTR
	10	23-AUG-12 14:10	27-AUG-12 15:48	24	98	hours	EHTR
	11	23-AUG-12 11:30	27-AUG-12 15:48	24	100	hours	EHTR
	12	23-AUG-12 12:30	27-AUG-12 15:48	24	99	hours	EHTR
	13	24-AUG-12 09:30	27-AUG-12 15:48	24	78	hours	EHTL
	14	23-AUG-12 15:45	27-AUG-12 15:48	24	96	hours	EHTR
	15	23-AUG-12 17:20	27-AUG-12 15:48	24	95	hours	EHTR
	16	23-AUG-12 16:40	27-AUG-12 15:48	24	95	hours	EHTR
	17	23-AUG-12 18:30	27-AUG-12 15:48	24	93	hours	EHTR
	18	24-AUG-12 14:00	27-AUG-12 15:48	24	74	hours	EHTL
	19	24-AUG-12 13:00	27-AUG-12 15:48	24	75	hours	EHTL
	20	24-AUG-12 11:50	27-AUG-12 15:48	24	76	hours	EHTL
	21	24-AUG-12 14:40	27-AUG-12 15:48	24	73	hours	EHTL

Volatile Organic Compounds

VOCs in water by Headspace GCMS

	1	22-AUG-12 11:35	11-SEP-12 16:49	14	20	days	EHT
	2	22-AUG-12 13:00	11-SEP-12 16:49	14	20	days	EHT
	3	22-AUG-12 14:10	11-SEP-12 16:49	14	20	days	EHT
	4	22-AUG-12 09:30	11-SEP-12 16:49	14	20	days	EHT
	5	22-AUG-12 09:30	11-SEP-12 16:49	14	20	days	EHT
	6	22-AUG-12 15:20	11-SEP-12 16:49	14	20	days	EHT
	7	22-AUG-12 17:00	11-SEP-12 16:49	14	20	days	EHT
	8	22-AUG-12 18:15	11-SEP-12 16:49	14	20	days	EHT
	9	22-AUG-12 19:30	11-SEP-12 16:49	14	20	days	EHT
	10	23-AUG-12 14:10	11-SEP-12 16:49	14	19	days	EHT
	11	23-AUG-12 11:30	11-SEP-12 16:49	14	19	days	EHT
	12	23-AUG-12 12:30	11-SEP-12 16:49	14	19	days	EHT
	13	24-AUG-12 09:30	11-SEP-12 16:49	14	18	days	EHT
	14	23-AUG-12 15:45	11-SEP-12 16:49	14	19	days	EHT
	15	23-AUG-12 17:20	11-SEP-12 16:49	14	19	days	EHT
	16	23-AUG-12 16:40	11-SEP-12 16:49	14	19	days	EHT
	17	23-AUG-12 18:30	11-SEP-12 16:49	14	19	days	EHT
	18	24-AUG-12 14:00	11-SEP-12 16:49	14	18	days	EHT
	19	24-AUG-12 13:00	11-SEP-12 16:49	14	18	days	EHT
	20	24-AUG-12 11:50	11-SEP-12 16:49	14	18	days	EHT
	21	24-AUG-12 14:40	11-SEP-12 16:49	14	18	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.

Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1199825 were received on 24-AUG-12 19:50.

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ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

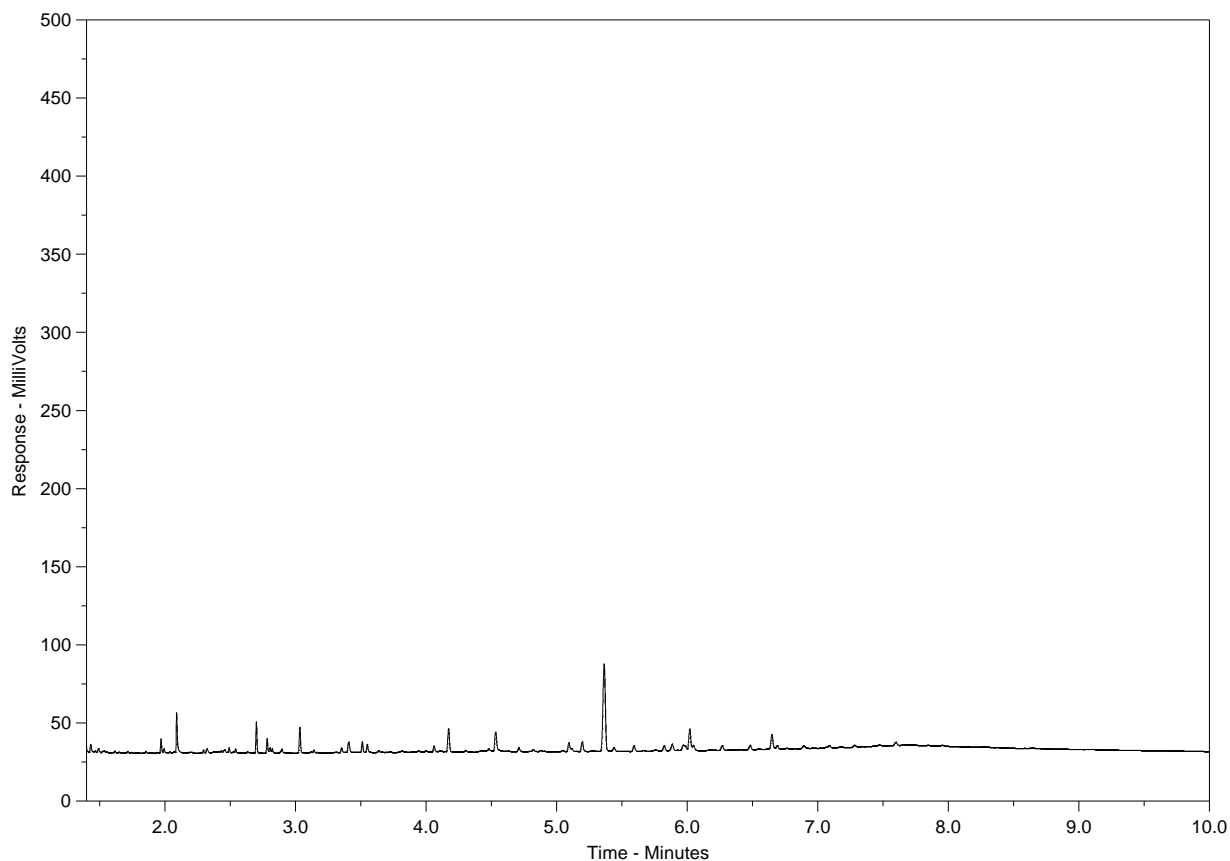
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-1
Client Sample ID: BC-MW12-01



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

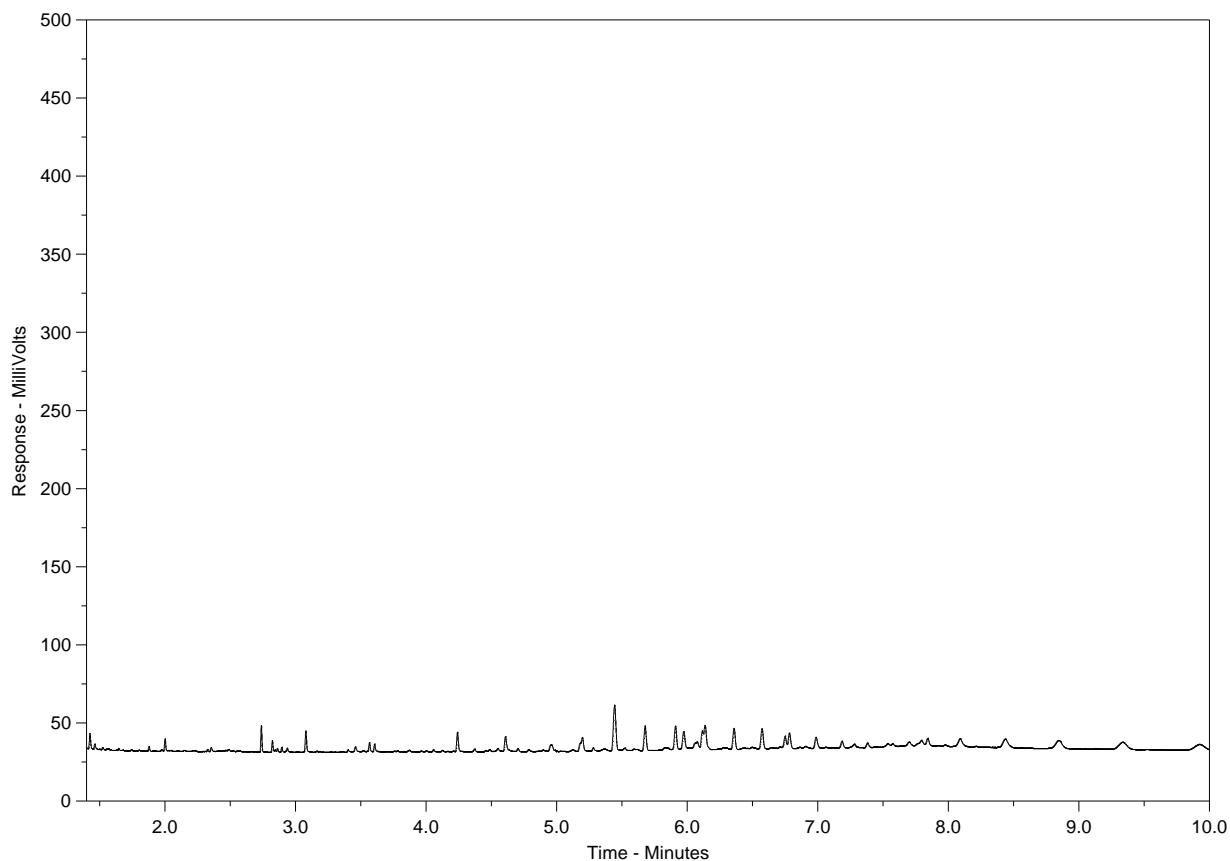
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-2
Client Sample ID: BC-MW12-02



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

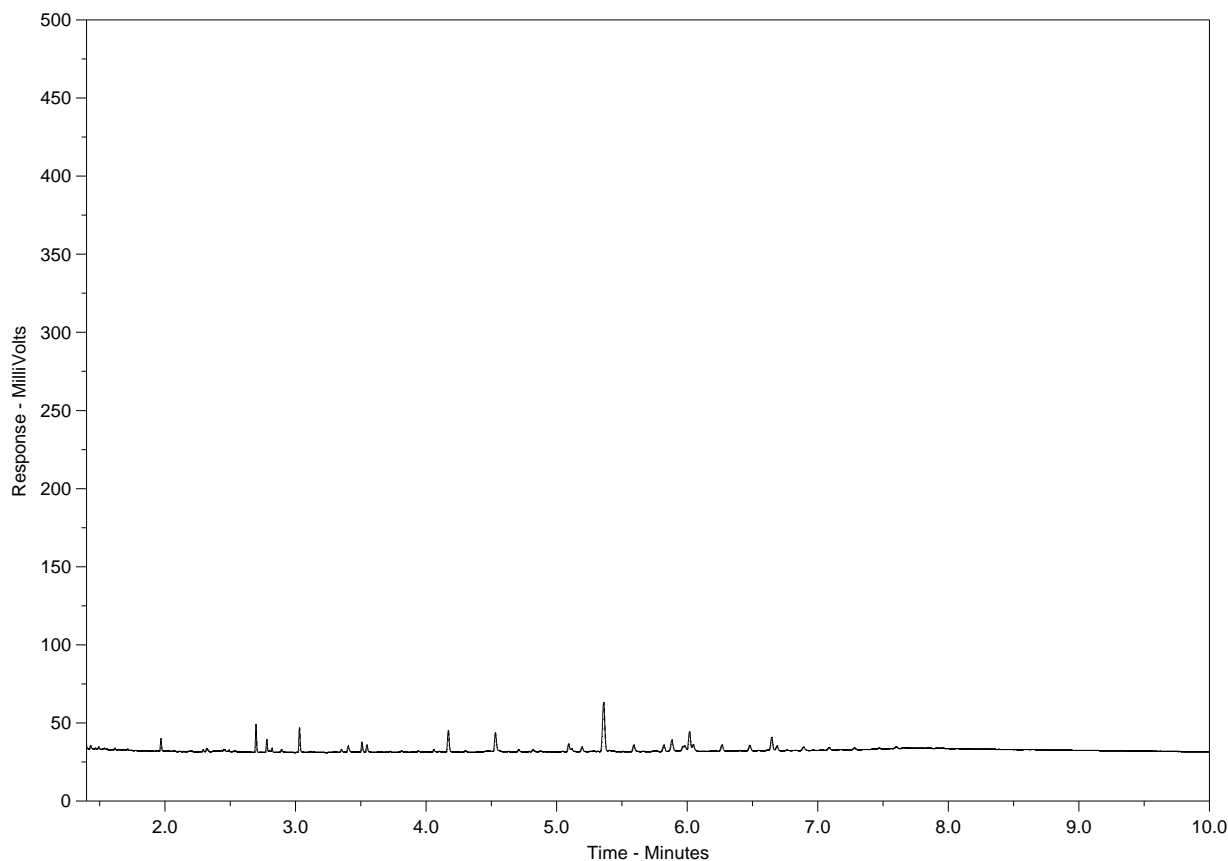
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-3
Client Sample ID: BC-MW12-03



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

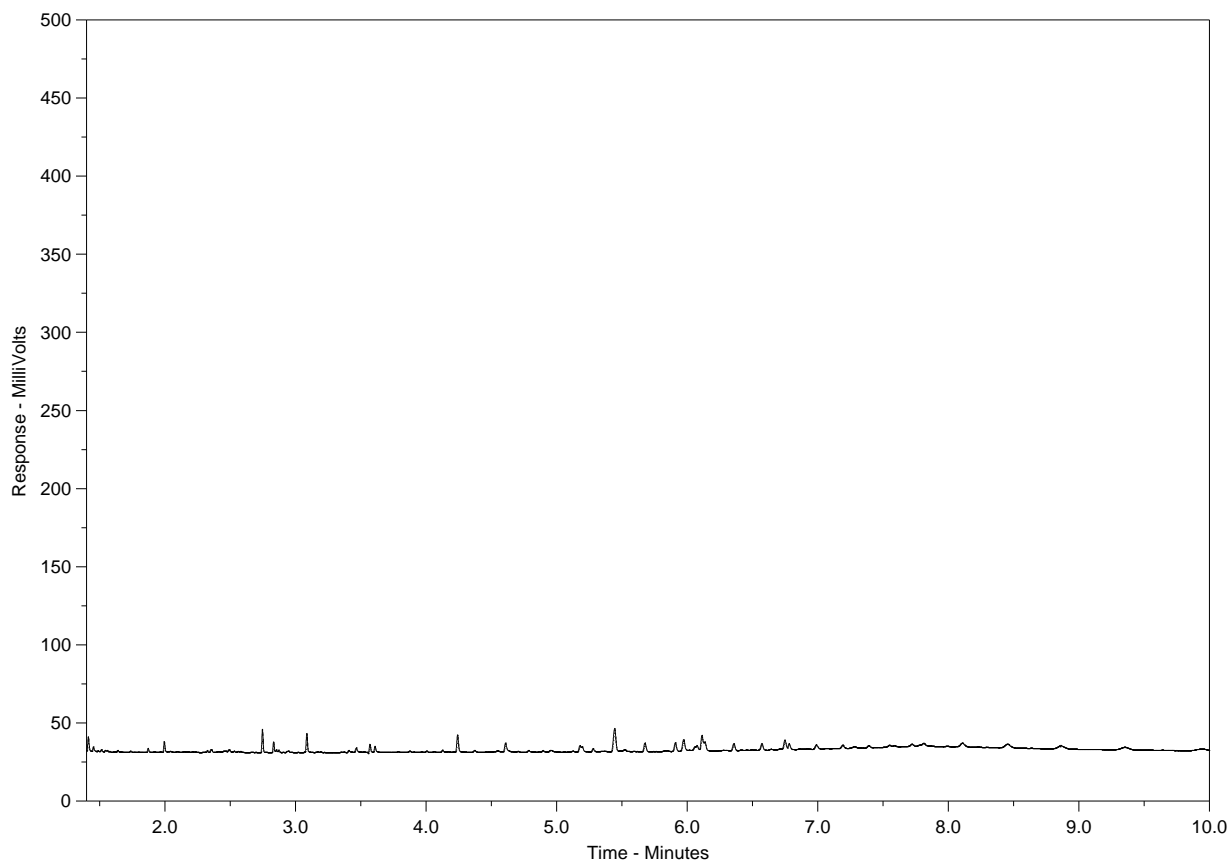
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-4
Client Sample ID: BC-MW12-04



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

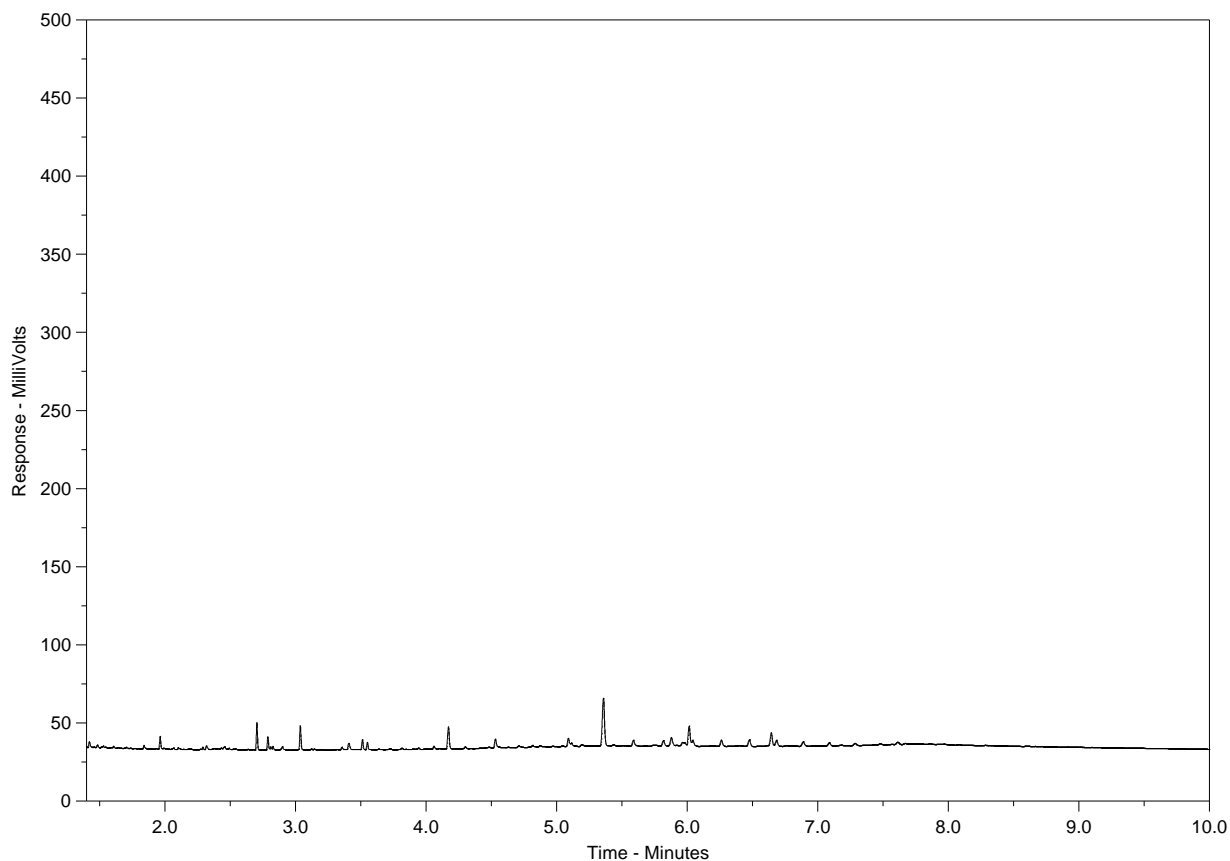
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-5
Client Sample ID: BC-MW12-05



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

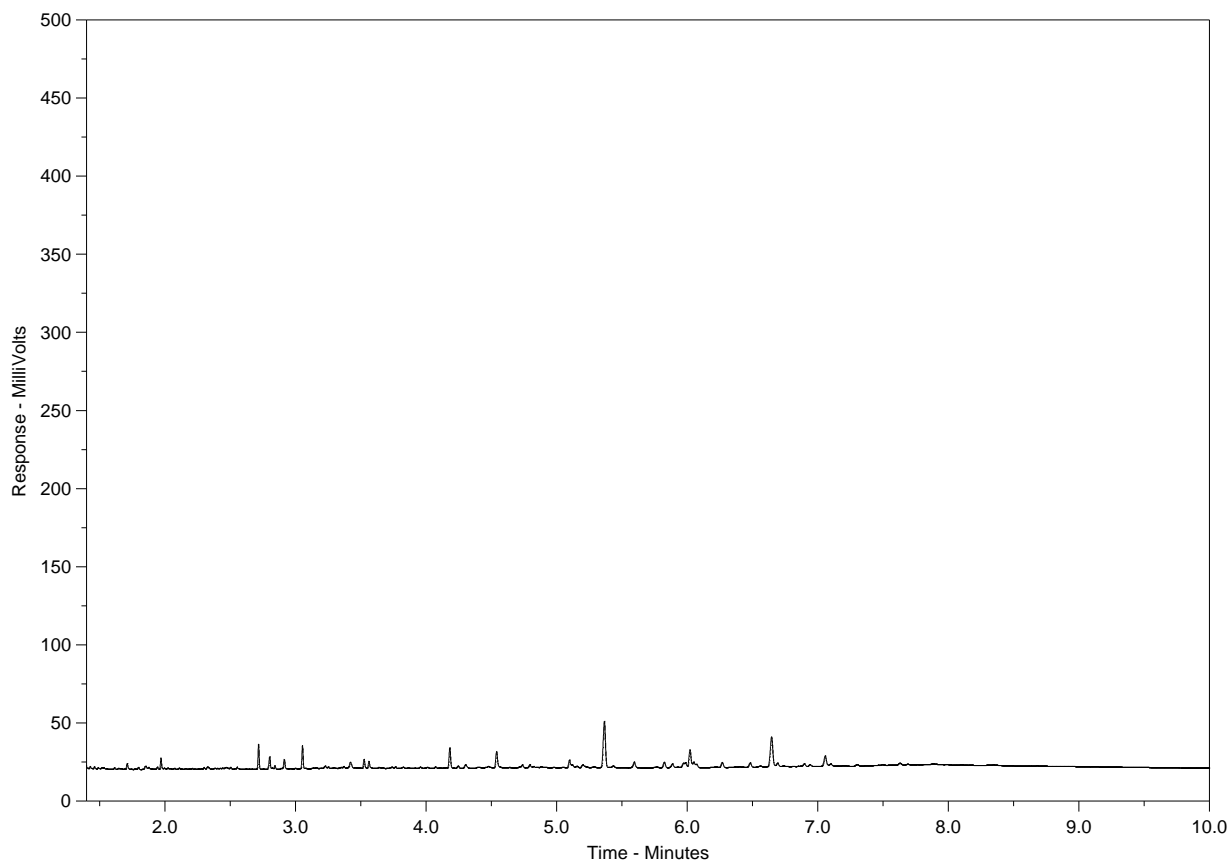
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-6
Client Sample ID: BC SURFACE



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

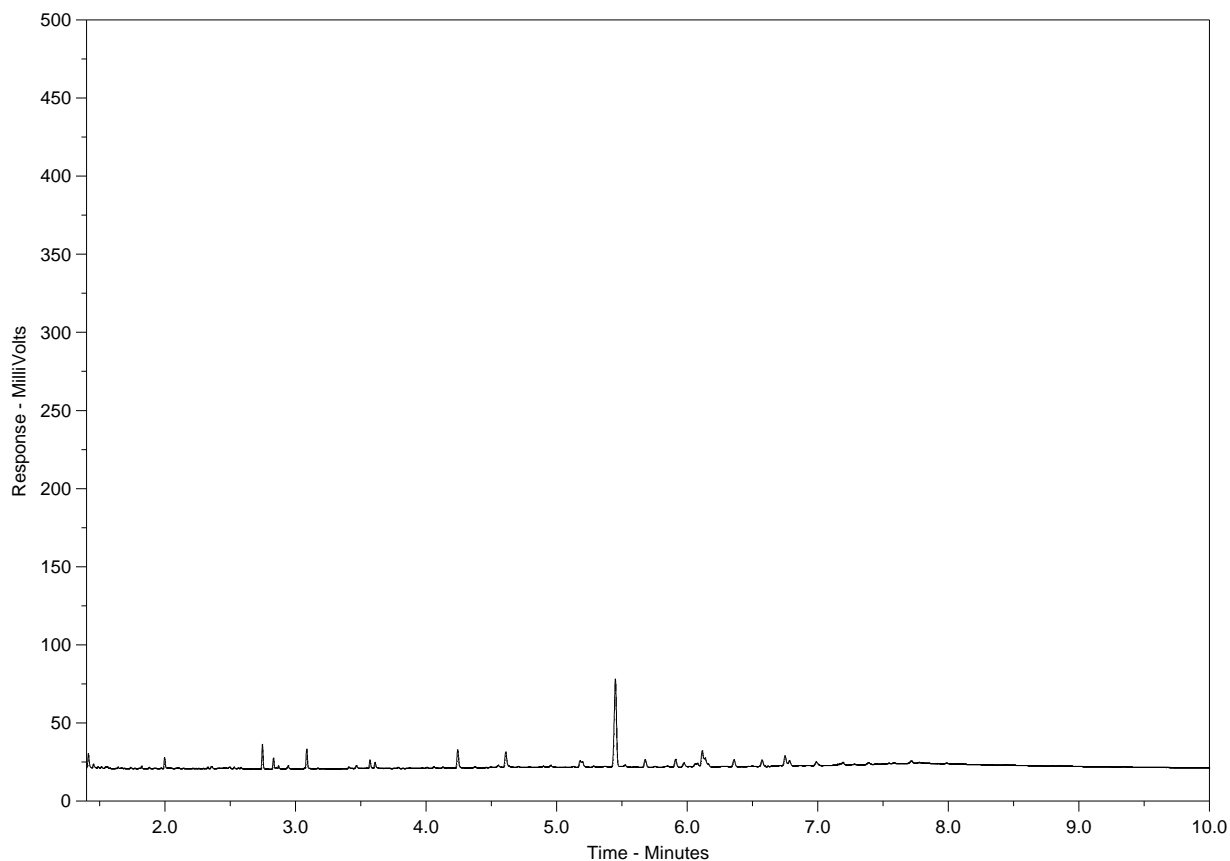
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-7
Client Sample ID: HC-MW12-01



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

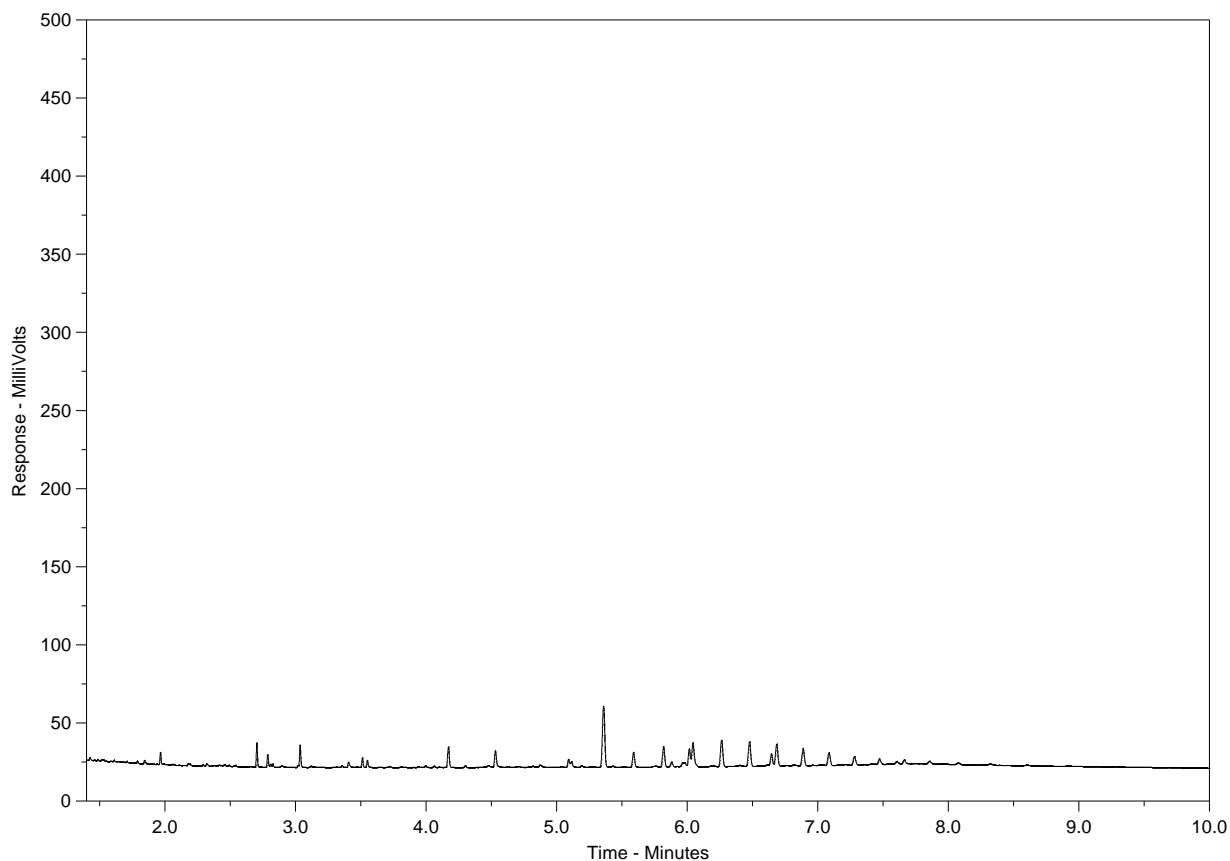
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-8
Client Sample ID: HC-MW12-02



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

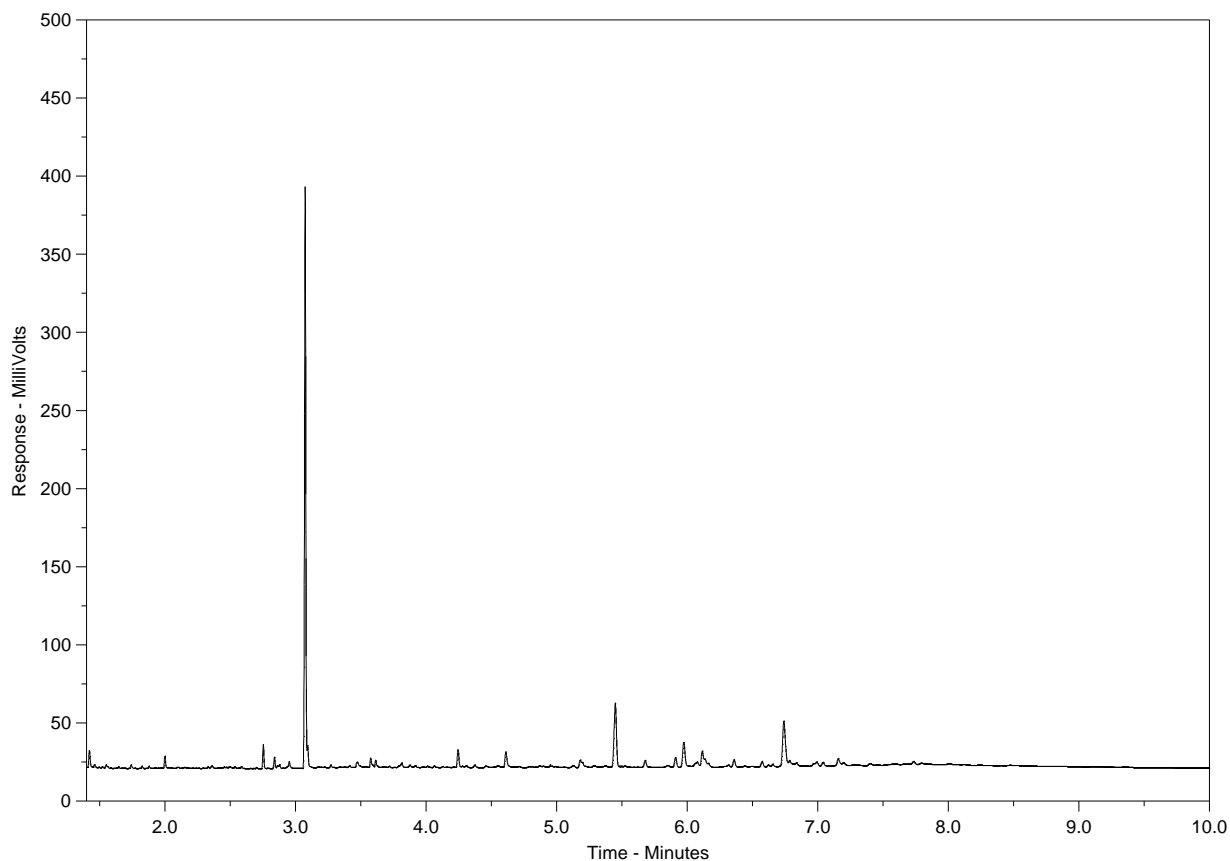
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-9
Client Sample ID: HC SURFACE



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

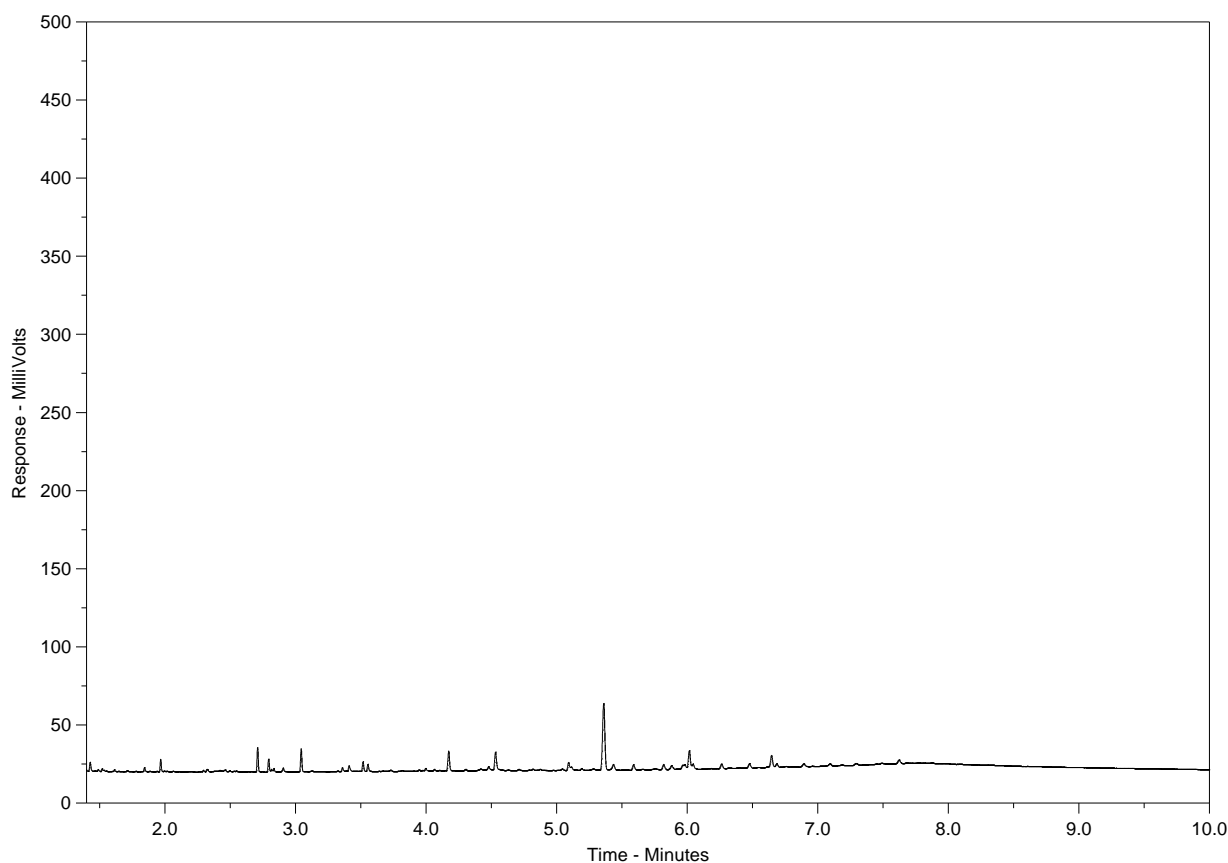
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-10
Client Sample ID: DB-MW12-01



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

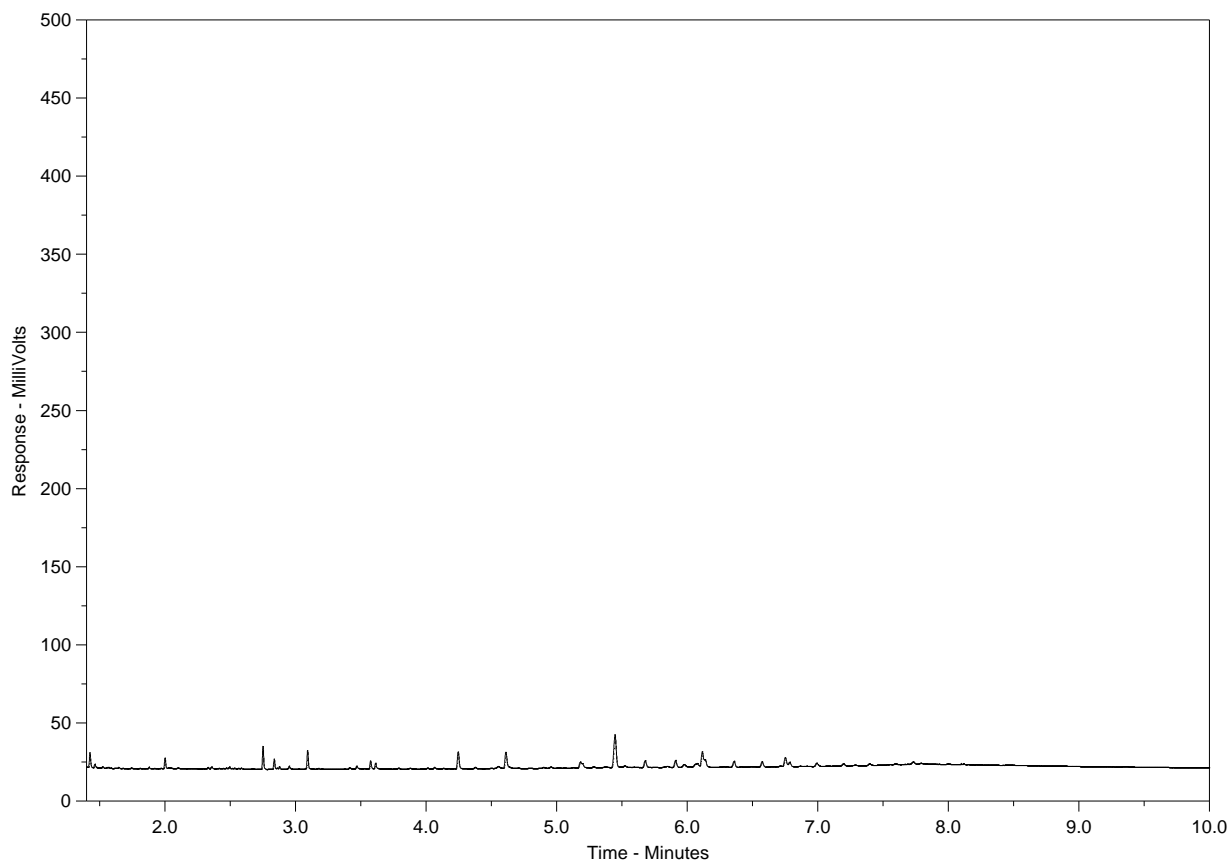
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-11
Client Sample ID: DB-MW12-02



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

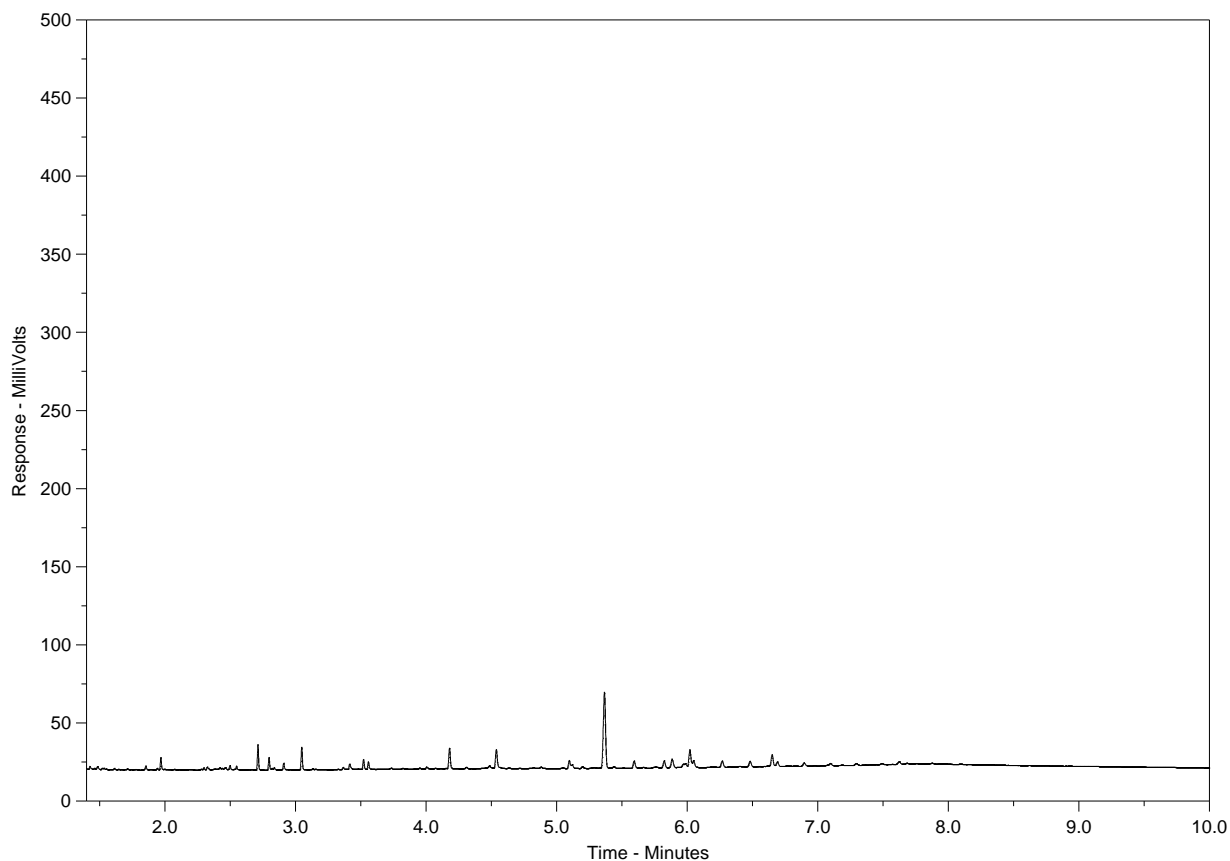
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-12
Client Sample ID: DB-MW12-03



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

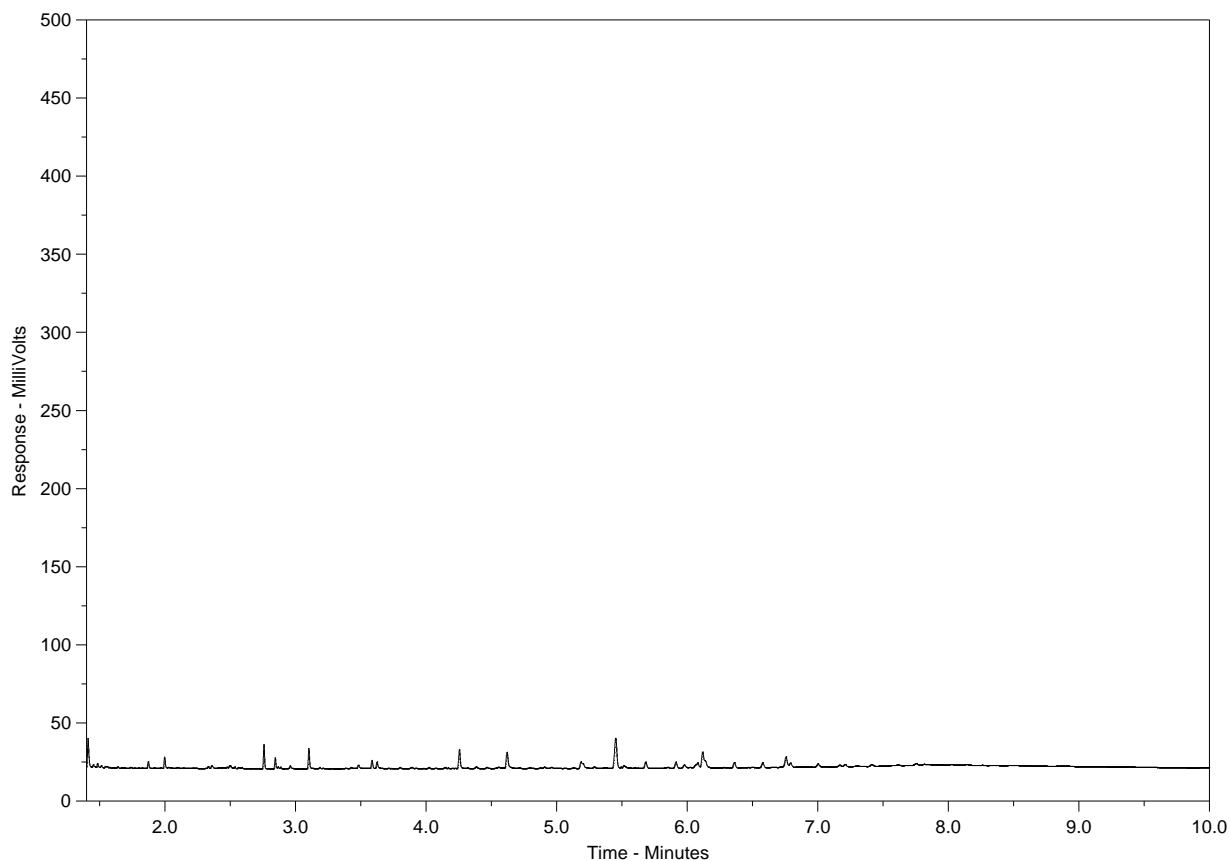
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-13
Client Sample ID: DB SURFACE



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

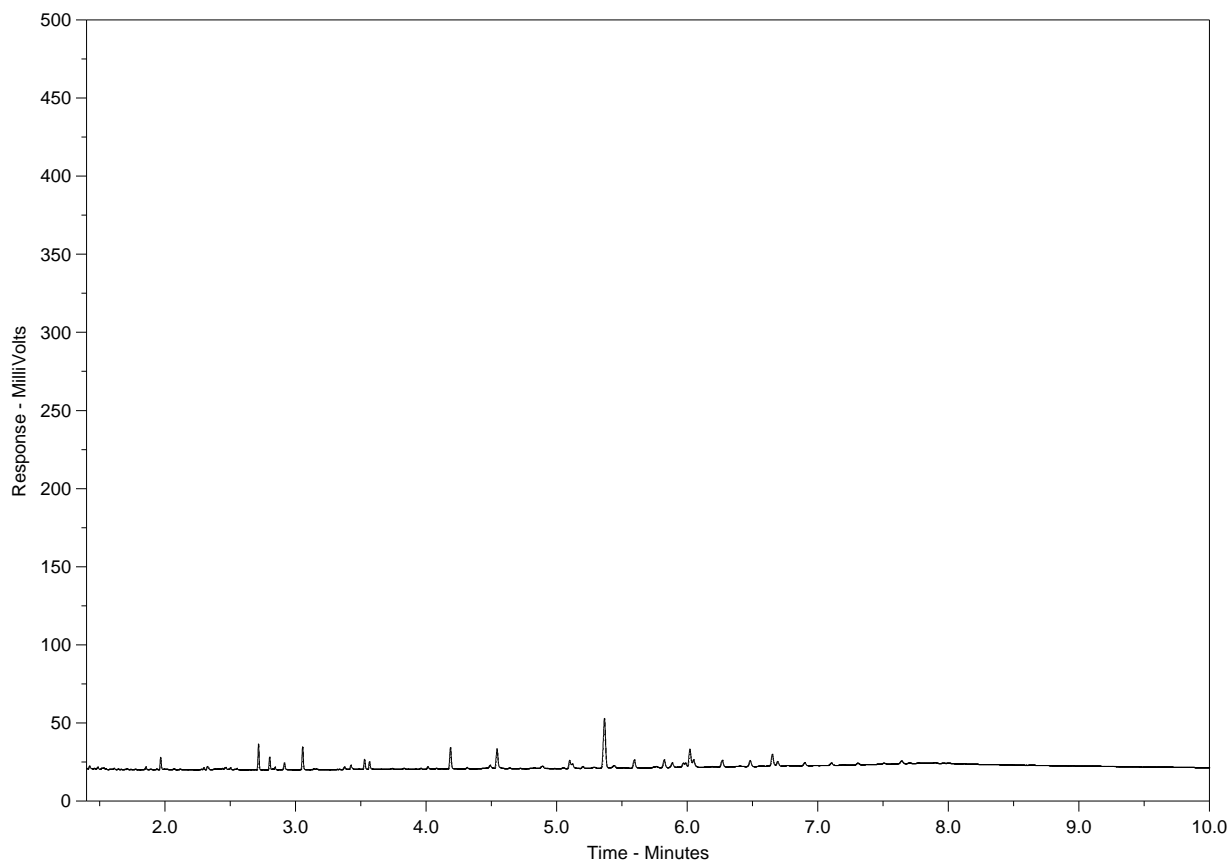
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-14
Client Sample ID: BU-MW12-01



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

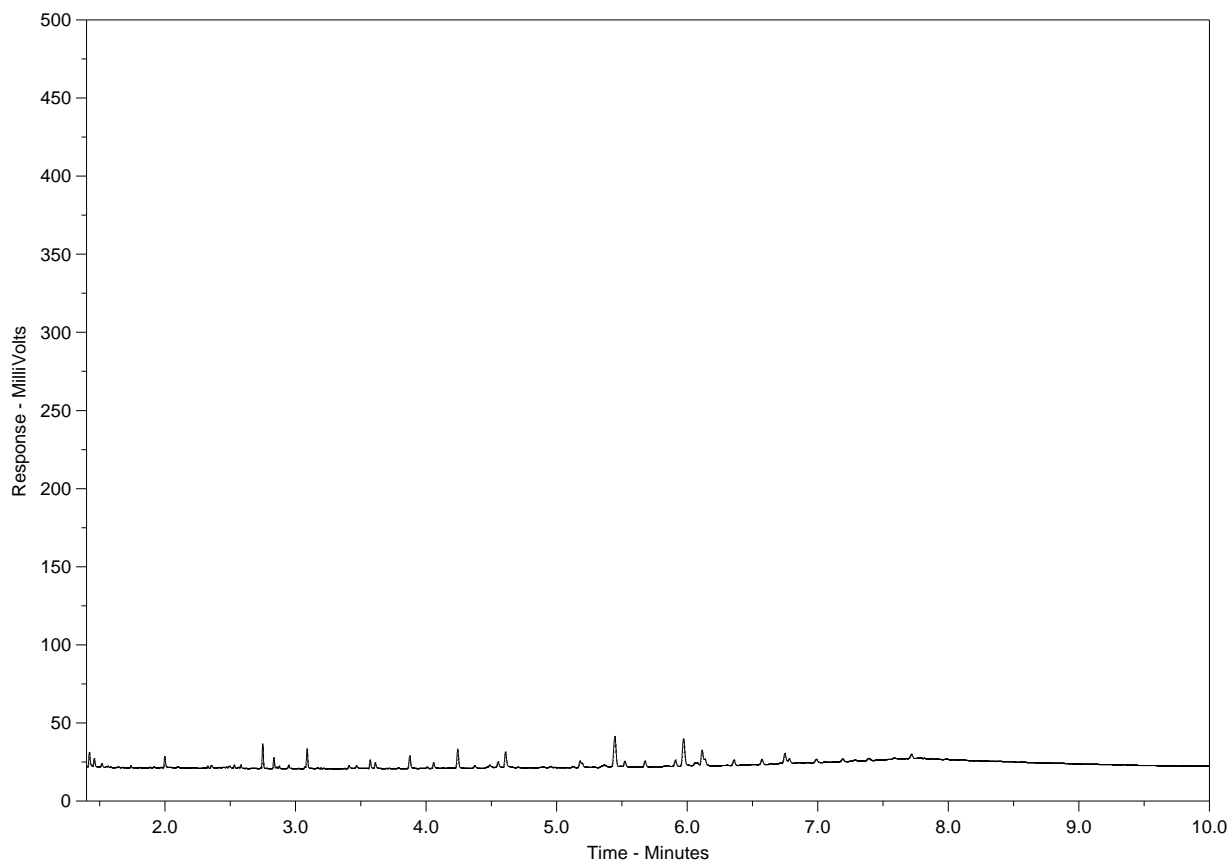
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-15
Client Sample ID: BU-MW12-02



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

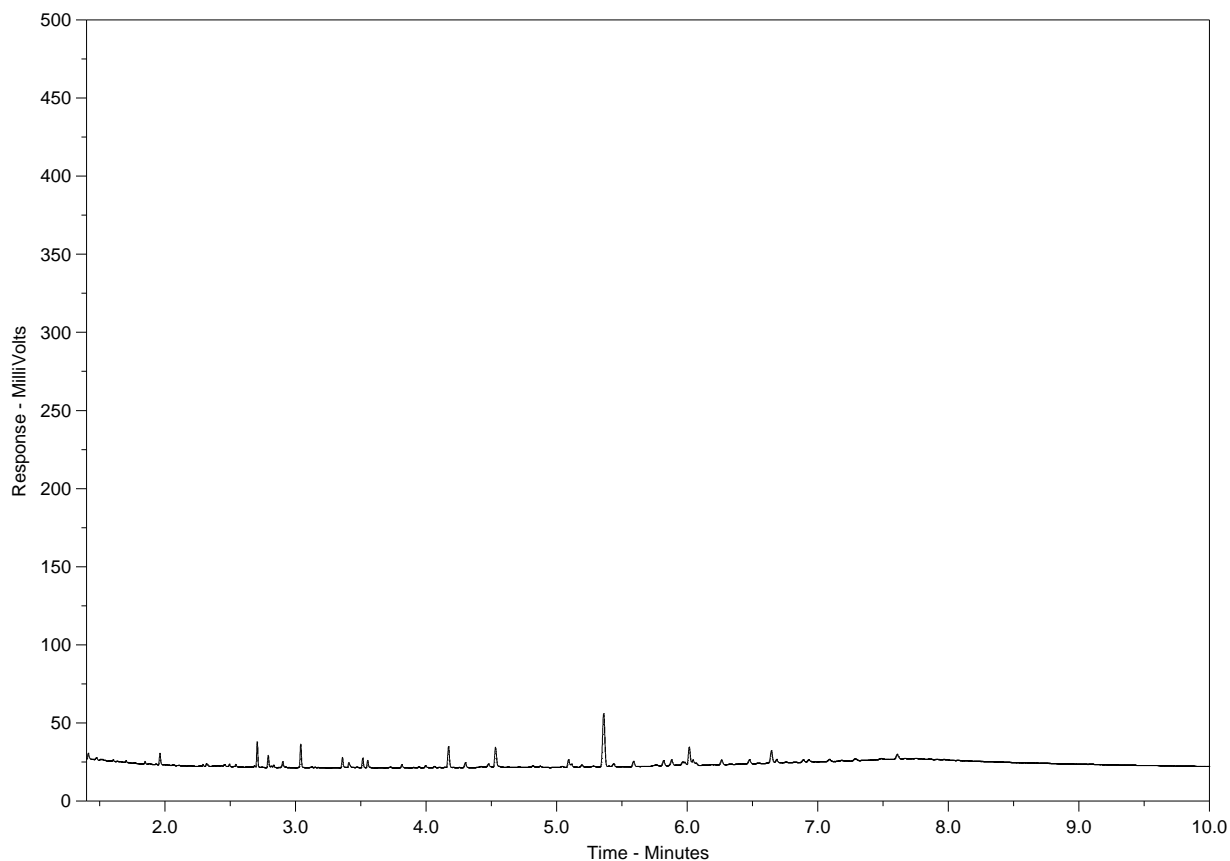
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-16
Client Sample ID: BU-MW12-03



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

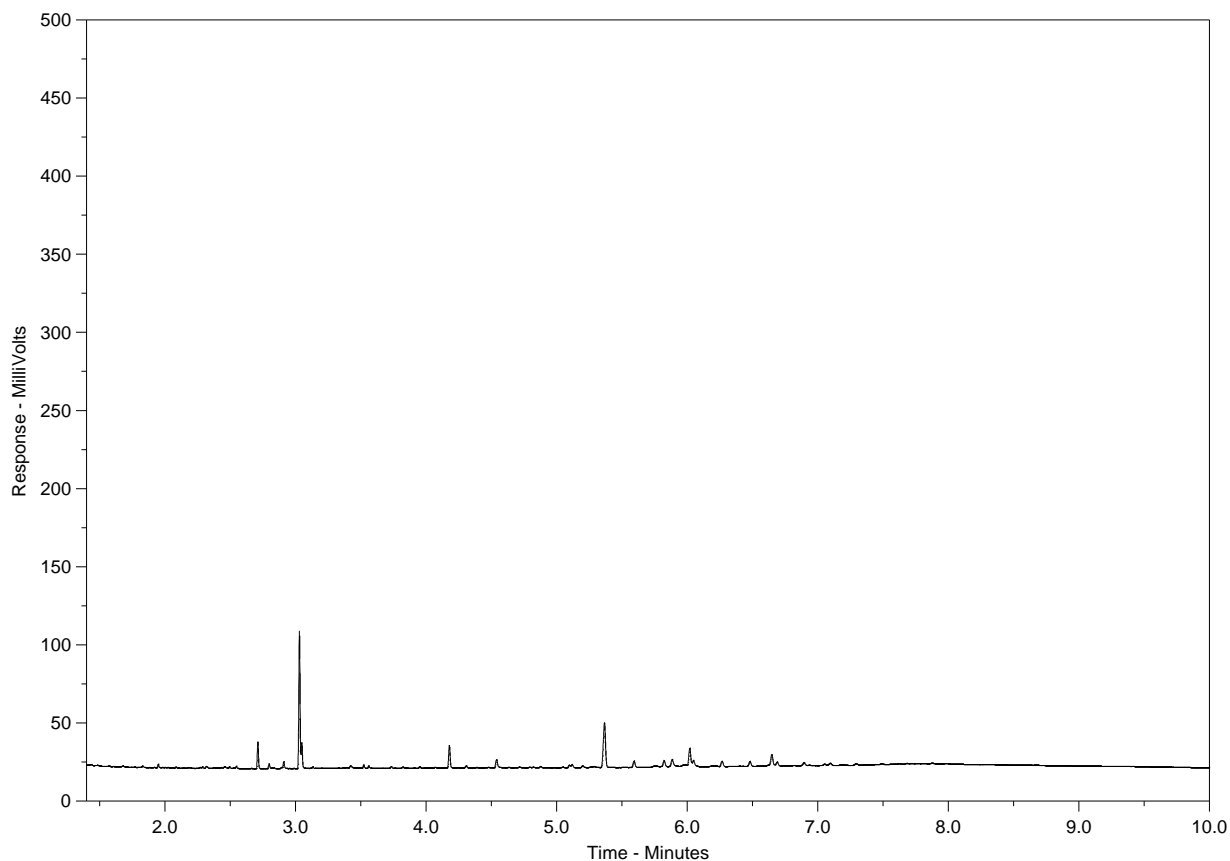
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-17
Client Sample ID: BU-SURFACE



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

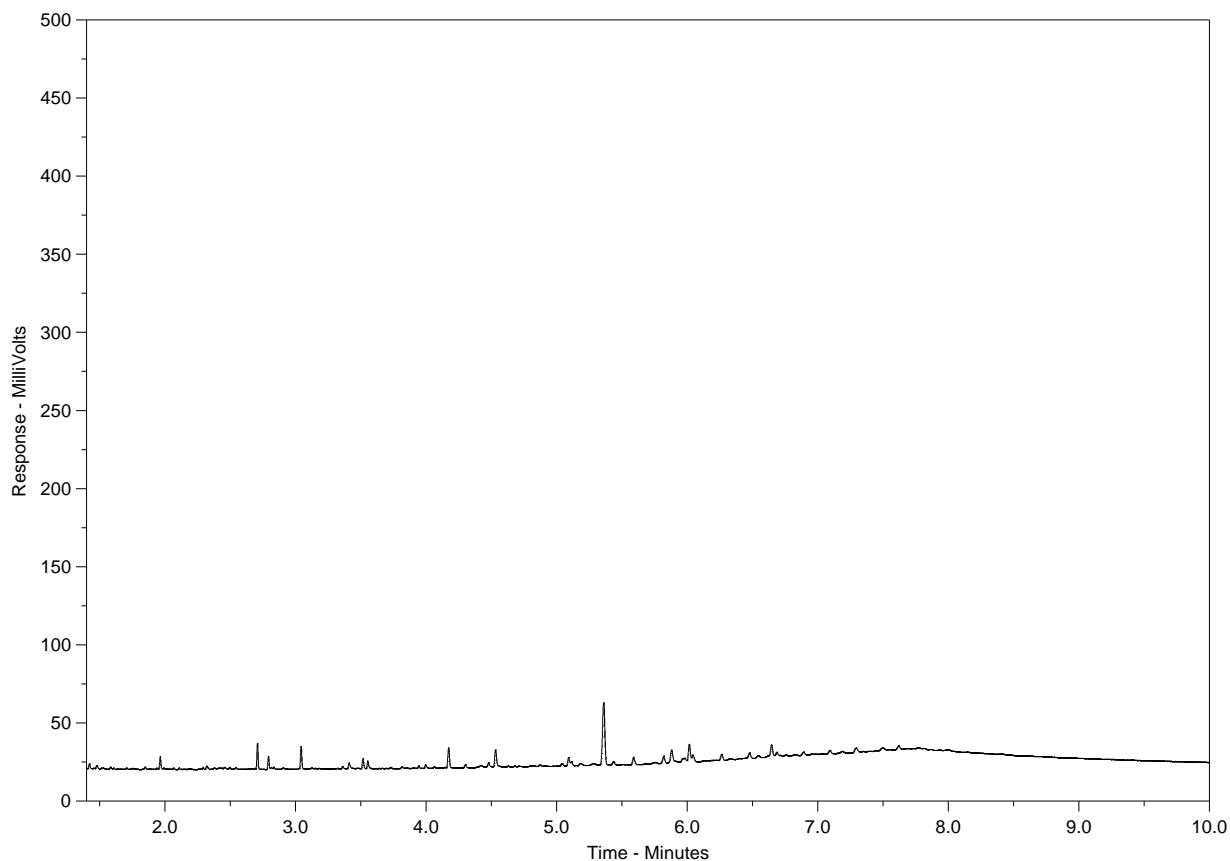
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-18
Client Sample ID: SC-MW12-01



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

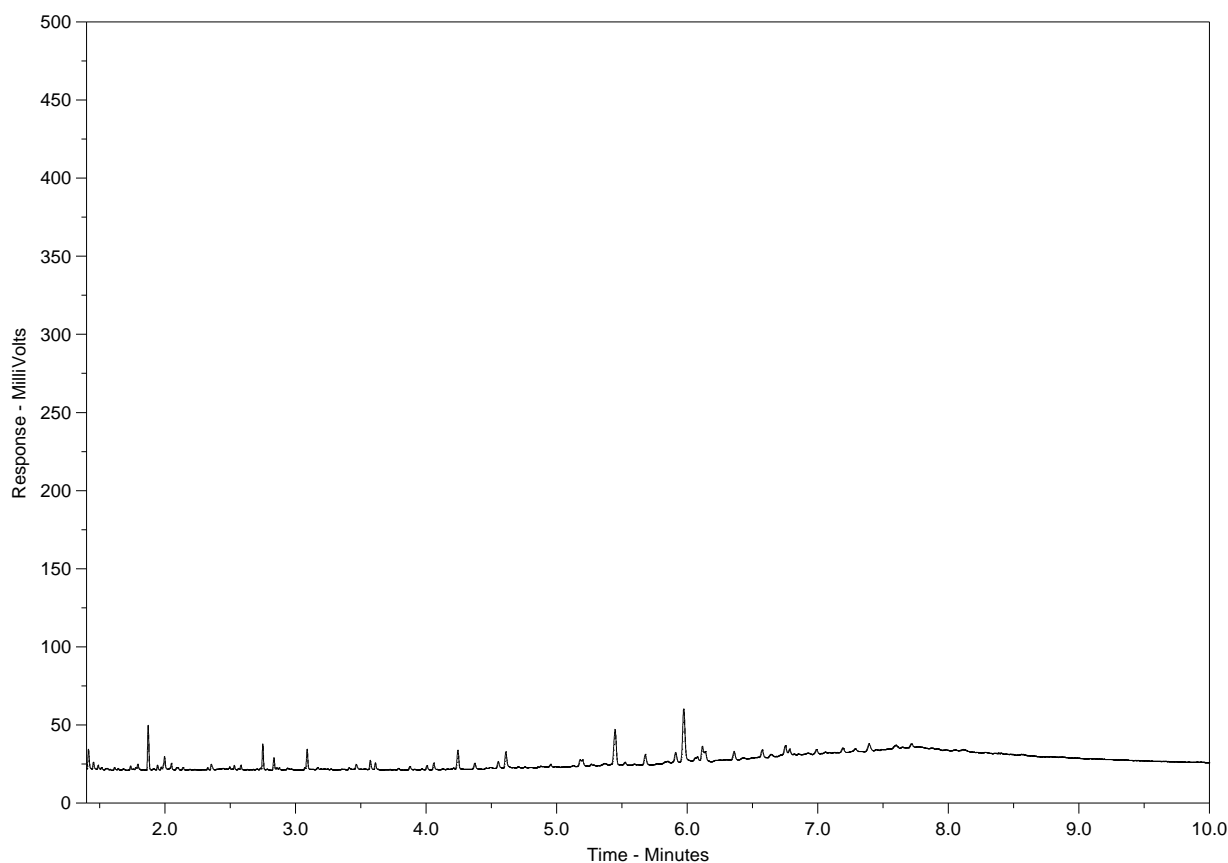
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-19
Client Sample ID: SC-MW12-02



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

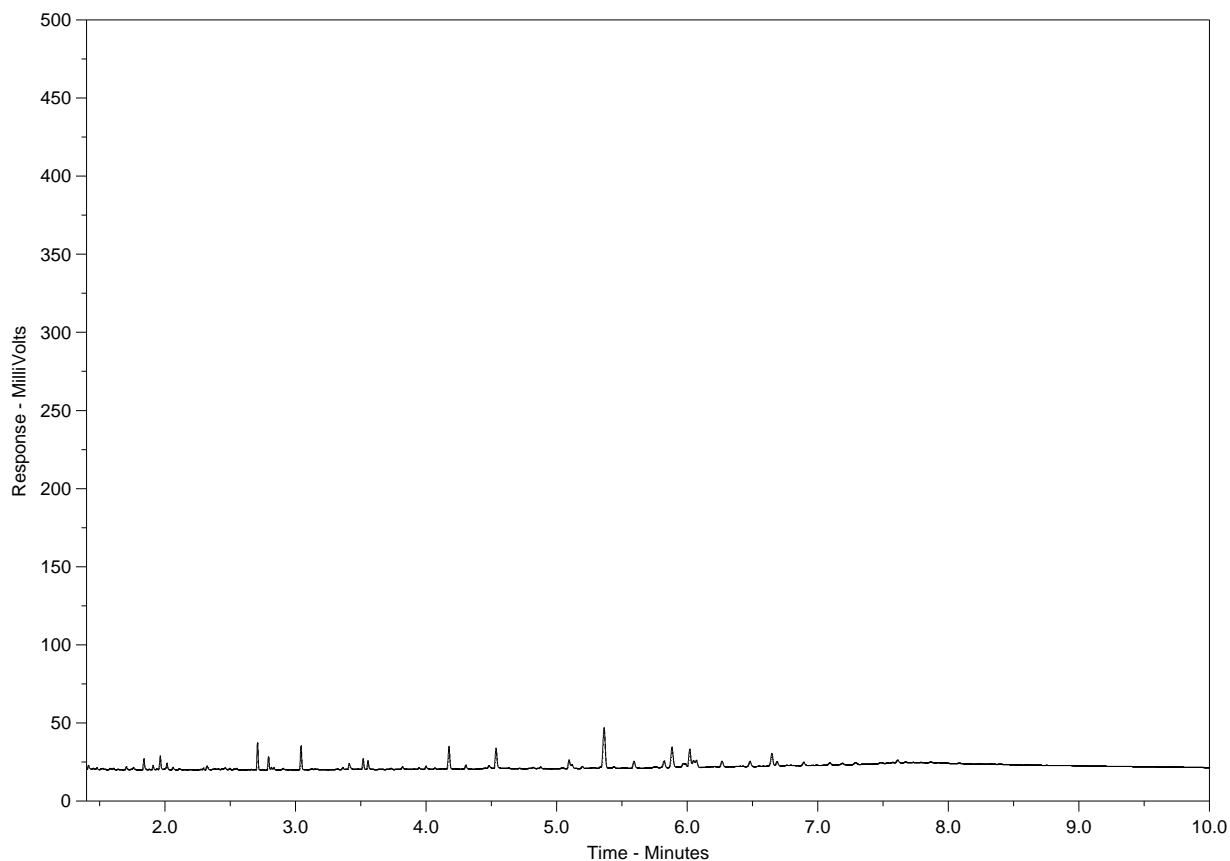
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-20
Client Sample ID: SC-MW12-03



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

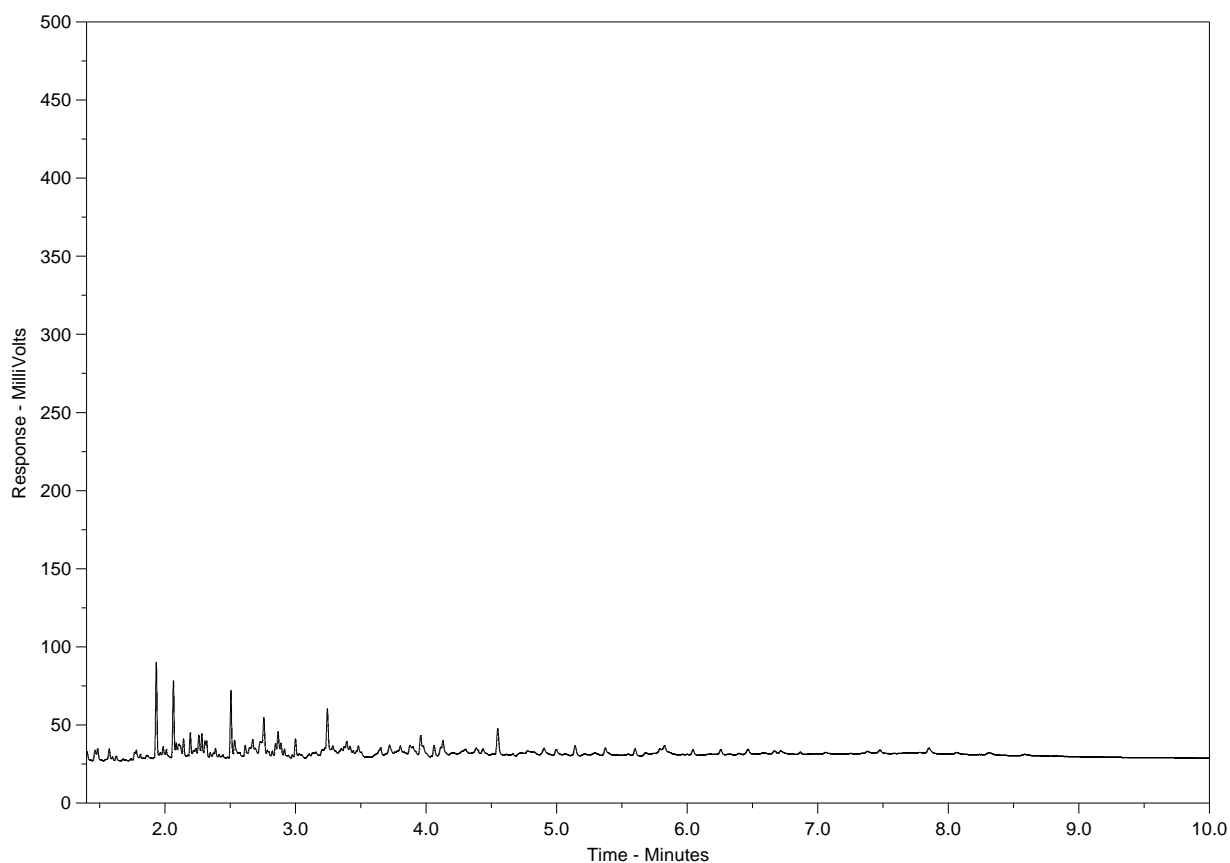
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Hydrocarbon Distribution Report



ALS Sample ID: L1199825-21
Client Sample ID: SC SURFACE



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on www.alsglobal.com or upon request.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products, and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples by as much as 0.5 minutes.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

[illegible]

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

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